Remedial Investigation Report

Volume I of II - Text, Tables, Plate, and Figures

Peter Cooper Markhams Site
Dayton, New York

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REMEDIAL INVESTIGATION REPORT
Peter Cooper Markhams Site
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1.0 INTRODUCTION

This Remedial Investigation (RI) Report has been prepared by Geomatrix Consultants, Inc. (Geomatrix) for the Peter Cooper Markhams Site (also referred to as Site) in the Town of Dayton, New York (Figure 1-1). The investigation was conducted by Geomatrix with assistance from Benchmark Environmental Engineering & Science, PLLC (Benchmark). The RI was completed on behalf of the responding potentially responsible parties (PRPs) (herein referred to as the "Respondents") for the Peter Cooper Markhams Site, in accordance with the requirements of Paragraph 23 and Appendix 1 of Administrative Order CERCLA-02-2000-2003 (the "Order") and Respondents' Notices of Intent to Comply (February 2001) as well as the U.S. EPA-approved Remedial Investigation/Feasibility Study (RI/FS) Work Plan dated February 2001, revised September 2001 prepared by Geomatrix and Benchmark.

1.1 RI OBJECTIVE

The objective of the RI is to describe the nature and extent of chemical constituents in Site media, provide data for analysis of a potential for adverse health and ecological effects, and support the evaluation of feasible remedial alternatives for the Site.

1.2 RI REPORT OUTLINE

This report contains seven sections.

- The remainder of Section 1.0 includes a description of the Site and location.
- Section 2.0 presents a description of site history and previous investigations.
- Section 3.0 presents a discussion of the RI sampling and methodology.
- Section 4.0 presents a discussion of land use and physical conditions of the Site.
- Section 5.0 presents the nature and extent of chemical presence in Site media.
- Section 6.0 describes chemical constituent migration pathways.
- Section 7.0 presents a summary of the Baseline Risk Assessments.

- Section 8.0 presents references.

1.3 SITE LOCATION AND DESCRIPTION

The Peter Cooper Markhams Superfund Site, hereinafter referred to as the "Peter Cooper Markhams Site" or the "Site," is located off Bentley Road approximately 6 miles south of the Village of Gowanda in the Town of Dayton, Cattaraugus County, New York. A site location map is presented on Figure 1-1 and a site plan is presented on Plate 1. The Site encompasses approximately 103 acres and is bordered to the northwest by Bentley Road, to the northeast by a wooded property and farm field, to the southeast by a railroad right-of-way, and to the southwest by hardwood forest. Site access is restricted by a locked cable gate at the Bentley Road entrance. Surrounding property is entirely rural, consisting of small farm fields, open meadow and forests.

In general, the majority of the Site, including the northeastern, northwestern and southwestern areas of the property, is characterized by mature hardwood tree cover, as well as open fields. An approximately 15 to 20-acre area within the central and southeast portions of the Site contains several covered/vegetated fill piles arranged in an elliptical pattern. For the purpose of this report, the terms "waste fill", "mounded fill" and "fill piles" refer to the elevated piles of material disposed at the Site. Several of the fill piles consist only of re-worked native soil. Other fill piles consist of vacuum filter sludge and cookhouse sludge (see Section 2.1 for description). The fill piles vary in size and elevation, with base dimensions ranging from approximately 1,100 - 160,000 square feet and elevations of 5 to 15 feet above surrounding grade. The total area covered by fill piles (base area) is approximately 7 acres.

Site topography, with the exception of the fill piles, is relatively flat with some natural relief and a moderate grade to the west-southwest. An approximately 5-foot high berm, which provides an elevated bed for the Buffalo and Jamestown Railroad Company (also known as Erie-Lackawanna Railroad) rail track, runs along the entire southeast border of the Site. A dirt access road extends to the fill area from Bentley Road and continues around a portion of the fill area perimeter. The road also appears to provide access to a natural gas wellhead located on the eastern side of the drive, north of the fill areas.

2.0 SITE HISTORY AND PREVIOUS INVESTIGATIONS

2.1 SITE HISTORY

The Peter Cooper Markhams Site was used for the disposal of certain wastes from a former animal glue and adhesives manufacturing company located in Gowanda, New York. Materials disposed at the Peter Cooper Markhams Site were reported to consist of residue pile material, vacuum filter sludge and cookhouse sludge (O'Brien & Gere Engineers, Inc., 1971). Cookhouse sludge reportedly was derived from the animal glue manufacturing process, and is comprised of settled sludge resulting from the processing of animal hides, some of which were chrome-tanned. Residue pile material is described as air-dried cookhouse sludge, which was stabilized to a fairly dry, granular form. Vacuum filter sludge reportedly was produced during primary (settling) treatment of liquid wastes, including liquids generated during gravity dewatering of cookhouse sludge.

Peter Cooper Corporations (PCC) reportedly purchased the Site in 1955. PCC sold the Site in 1976 to a buyer that was subsequently renamed Peter Cooper Corporation (PCCII). PCCII continues to own the Site and is listed as the current landowner on tax assessor maps. From approximately 1955 until September 1971, it was reported that approximately 9,600 tons of residuals were placed at the Peter Cooper Markhams Site over an approximately 15-acre area. Pursuant to a New York State Supreme Court Order dated June 1971, approximately 38,600 tons of previously accumulated residual materials from the Gowanda Plant reportedly were also transferred to the Markhams Site. No further disposal reportedly occurred at the Markhams Site, and the fill area has since re-vegetated.

Historic aerial photographs of the site for the years 1939, 1956, 1966, 1980 and 1990 were obtained from the Cattaraugus County Soil Conservation Office in Ellicottville, New York to assess historic Site land use (Appendix A-1). Although the scale of the photographs somewhat limits detailed observations, the photographs support a historically sparse population and rural property use in the area surrounding the Site. The following summarizes a review of these aerial photographs:

- The 1939 photograph shows pasture and farm field (cornfield) land use in the southeastern portion of the Site. A large wetland, centrally located on the site, is visible and is bordered by undeveloped, forested areas. The Markhams Site property is surrounded by cultivated land developed for agricultural purposes (pastureland or crop fields). Four farmhouses are observed on Bentley Road southwest of the intersection of

Bentley and Markhams Roads. The photograph documents property use prior to PCC purchase in 1955.

- The 1956 aerial photograph indicates anthropogenic disturbance for purposes other than agricultural land use at the Markhams Site. Site disturbance is evident northwest of the central wetland in the form of a pathway from Bentley Road onto the Site leading to a cleared area near the existing location of the natural gas wellhead. Site disturbance related to an extension of a rail spur from the Erie-Lackawanna Railroad onto the Markham's Site is visible in the southeastern portion of the site. Surrounding areas are little changed from the 1939 photograph.

- The 1966 aerial photograph shows significant disturbance of the areas south of the central wetland apparently related to the on-Site disposal of materials. Two rail cars are visible on the Markhams Site rail spur. The Bentley Road site entrance extends past the natural gas wellhead into the disturbed area utilized for disposal. Surrounding areas show agricultural lands remain relatively unchanged. An additional dwelling with outbuildings occupies a portion of the farm field approximately 1/3 mile south of the Bentley Road Site entrance. No other new land use development is observed along Bentley Road.

- The 1980 photograph shows significant re-vegetation of the Site. The natural gas wellhead area is barely visible. The cornfield in the northeast portion of the Site is abandoned and vegetated. It is surmised that soil from the cornfield was used to cover the fill piles during the late 1960s through 1971. The rail spur is no longer visible. No new land use development is observed along Bentley Road.

- The 1990 photograph closely resembles the features described in the 1980 photograph. Vegetation density increased on-Site. A new dwelling is present on Bentley Road north of the Site near the intersection of Markhams and Bentley Road. No new land use is observed farther south along Bentley Road.

2.2 PREVIOUS INVESTIGATIONS AND REMEDIAL MEASURES

In accordance with the June 1971 State Supreme Court Order, PCC initiated transfer of residue pile material to the Markhams Site in August 1971. Shortly thereafter, PCC submitted to the New York State Department of Environmental Conservation (NYSDEC) a Solid Waste Management Report (O'Brien & Gere Engineers, Inc., November 1971) documenting the

means for transfer of these materials to the Markhams Site. Follow-up discussion between PCC and the NYSDEC in August 1972 provided for grading the waste piles to a height of approximately 10 feet and covering them with six-inches of soil or stabilized residue, followed by seeding to promote fast growing cover vegetation. PCC apparently completed the closure of the landfill pursuant to these work plans and to the satisfaction of NYSDEC.

Subsequent to closure, several different parties have investigated the Site since 1983. A summary of media sampled, number of samples collected, and analyte list during each investigation is presented in Table 2-1. The NYSDEC completed Phase I and Phase II Environmental Site Investigations at the Peter Cooper Markhams Site in 1983 and 1985, respectively (Recra Research, 1983 and 1985). In 1986, PCCII, under NYSDEC Consent Order, commissioned O'Brien & Gere Engineers, Inc. (OBG) to perform a Remedial Investigation and Feasibility Study (RI/FS) at the site, which included a quantitative human health risk assessment (OBG, 1989, herein referred to as the 1989 OBG RI). In conjunction with the 1989 OBG RI, interim remedial measures were performed in 1989 to remove a number of buried containers that had been disposed within an isolated area of the site (OBG, 1991). The containers and impacted soils were excavated and transported off-site for proper disposal. Additional detail is presented in the HRS Documentation Package prepared for the USEPA which is included in Appendix A-2.

The 1989 RI indicated the presence of total chromium, hexavalent chromium and arsenic above background levels in waste materials and some adjacent soils. Low levels of these parameters were also detected in groundwater wells installed immediately adjacent to the fill piles. None of the samples tested exhibited hazardous waste (toxicity) characteristics. The 1989 OBG RI concluded that the Site does not pose a risk to human health or the environment. OBG completed a Feasibility Study (FS) for the Site in March 1991. The FS recommended a remedial alternative involving consolidation, compaction, and covering of the waste materials.

NYSDEC apparently did not pursue any remedial action because the Site did not meet the statutory definition of an inactive hazardous waste disposal site. Consequently, the NYSDEC removed the site from its Registry of Inactive Hazardous Waste Sites.

In 1993, the United States Environmental Protection Agency (U.S. EPA) conducted a Site Sampling Inspection, which included the collection and analysis of soil and surface water samples from the Peter Cooper Markhams Site (Malcolm Pirnie, Inc., 1993, herein referred to

as the 1993 SSI). Chromium and arsenic were detected in soils above background concentrations on and within the waste piles.

In March 1999, U.S. EPA Region II prepared a Hazard Ranking System Model score for the site and listed the Peter Cooper Markhams Site on the National Priority List (NPL) in February 2000. On September 29, 2000, U.S. EPA issued a Unilateral Administrative Order (UAO) to several potentially responsible parties (PRPs) directing completion of an updated RI/FS for the Site.

The RI/FS Work Plan was prepared for the U.S. EPA by Geomatrix and Benchmark on behalf the responding PRPs (the "Respondents") for the Peter Cooper Markhams Site, in accordance with the requirements of Paragraph 23 and Appendix 1 of Administrative Order CERCLA-02-2000-2003 (the "Order") and Respondents Notices of Intent to Comply (February 2001). The revised final Work Plan was submitted to the U.S. EPA in September 2001.

2.2.1 Chemical Constituents Historically Detected in Site Media

The following subsections describe the results of historic sampling programs used to characterize the nature and distribution of chemical constituents in media at the Site. A summary table of the media and parameters analyzed under each of the previous investigations is provided in Table 2-1. Figure A-3 in Appendix A presents a site plan of historic sample locations. Site media sampled included soil, fill, groundwater, surface water and seeps. Summary tables of detected constituent concentrations identified for each of the investigations are presented on a media-specific basis and included in Appendix A-4.

2.2.1.1 Soil and Sediment Samples

Surface soil, subsurface soil and sediment samples were collected for analyses from the Peter Cooper Markhams Site between 1981 and 1993. In general, investigations performed by Recra Research on behalf of the NYSDEC in 1981 and 1984 were limited to a relatively small number of samples analyzed for a large suite of parameters. This was consistent with the goal of these investigations to evaluate the need for further, comprehensive remedial investigation of the Site. Conversely, the 1989 RI involved collection of a larger number of samples with analyses focused primarily on arsenic, total chromium, and hexavalent chromium, and to a lesser extent zinc, based on the Recra Research findings. The 1993 SSI performed by Malcolm Pirnie, Inc. (MPI) on behalf of the U.S. EPA was also limited to a relatively small number of samples analyzed for a wide range of parameters.

Summary tables of the results of historic surface soil, subsurface soil and sediment analyses for the Peter Cooper Markhams Site are provided in Appendix A-4a. These findings are described below.

Surface Soil

Surface soil sampling was performed at two locations in 1981. Samples were analyzed for thirteen Priority Pollutant metals, as well as total halogenated organics. Although mapping information is not available, descriptions of the 1981 sample locations suggest that they were collected on or proximate to the fill material. Both 1981 locations contained arsenic (49 to 84 mg/kg), total chromium (66 to 31,000 mg/kg) and zinc (500 to 1,300 mg/kg), and a number of additional inorganic parameters at concentrations generally below 100 mg/kg. Halogenated organics were not detected. In 1984, seven surface soil samples were also collected on or near the fill material. These samples yielded similar concentration ranges as the 1981 samples for arsenic and total chromium (9.2 to 20.2 mg/kg and 42.7 to 25,400 mg/kg, respectively), with zinc detected at somewhat lesser concentrations (119 to 991 mg/kg). No detectable concentrations of volatile organic or semi-volatile organic compounds were identified in the 1984 surface soils.

The 1989 RI investigation performed by OBG involved collection of 53 surface soil and/or surface sediment samples. Although certain samples were specifically designated by OBG as sediment (i.e., Samples 45 and 46), a number of samples designated as soil were collected from areas previously determined to be wetlands. Excluding these locations, 1989 surface soil sample concentrations for total chromium ranged from 74 to 69,300 mg/kg and hexavalent chromium ranged from non-detectable to 854 mg/kg. Arsenic was detected in surface soils at concentrations ranging from 1.6 to 27 mg/kg, with zinc detected at concentrations ranging from 20 to 330 mg/kg. In all instances, a significant decrease in concentrations is observed for samples collected outside the immediate waste fill area, particularly for chromium and hexavalent chromium, which generally decrease in concentration by an order of magnitude in soils outside the fill perimeter.

Surface soil samples collected in 1993 by MPI were collected from various locations both on and away from the fill piles. Although all soil samples collected in 1993 were designated as surface soil, field notes from the 1993 SSI indicate that several of the samples (S1 through S6) may have contained fill, based on their descriptions as "rich in organic material". In particular, mapping information indicates that Samples S1 and S2 were collected directly from soils covering the fill piles. As 1993 surface soil samples were collected to a depth of 6 inches

below grade, it is likely that soils from these locations may have been intermingled with and were positively biased by waste fill material. All eight soil samples collected in 1993 were analyzed for Target Command List (TCL) organics and Target Analyte List (TAL) inorganics. Inorganic concentrations varied with sample location, with concentrations of samples collected on the fill generally elevated with respect to surrounding samples. Semi-volatile organic compounds and a few pesticide/PCB parameters were detected primarily at or adjacent to the fill piles. Polynuclear Aromatic Hydrocarbon compounds (PAHs) were detected at elevated concentrations in primarily two samples - S1 and S2. Several of the PAHs were detected at concentrations above USEPA Region 9 Preliminary Remediation Goals (PRGs) for industrial soils.

Subsurface Soil

Subsurface soil samples were collected during the 1984 Phase II investigation and the 1989 OBG RI. Samples collected in 1984 were taken from monitoring well borings B-1 through B-4, corresponding to wells MW-1S through MW-4S. Two split-spoon samples were collected from each of the four boring locations for a total of eight subsurface soil samples. All samples were analyzed for arsenic, beryllium, total chromium, copper, lead, mercury, silver and zinc, as well as total halogenated volatile and non-volatile organics. Arsenic was detected in subsurface soils at concentrations of 5.2 to 11.6 mg/kg, total chromium was detected at concentrations of 4.9 to 1,290 mg/kg, and zinc was detected at concentrations of 73.4 to 269 mg/kg. Lead and copper were detected at concentrations below 50 mg/kg. Mercury and beryllium were not detected, and only trace levels of silver were present in four of the samples. Halogenated volatile or semi-volatile organic compounds were not detected.

The subsurface samples collected in 1989 were generally from a depth of 9 to 12 inches below grade, excluding boring samples collected during installation of MW-1D through MW-5D, which varied in depth from 4 to 10 feet below grade. A total of 19 subsurface soil samples were collected during the 1989 RI. Sample concentrations generally follow a similar pattern as corresponding surface soil samples, with concentrations decreasing with depth and with lateral distance from the fill piles.

Wetland Sediment

Sediment samples were collected in support of the 1983, 1985 and 1989 investigations. Three samples were collected in 1981 for analysis of priority pollutant inorganics. Arsenic was detected at one of the locations at a concentration of 20 mg/kg. Total chromium and zinc were detected at concentrations ranging from 0.01 to 77.6 mg/kg and 0.006 to 26 mg/kg,

respectively. Excluding a detection of copper at 3.18 mg/kg in one of the locations, all remaining 1981 inorganic parameters were non-detectable or present at less than 0.5 mg/kg.

Sediment sampling in 1984 involved the collection of three samples for analysis of arsenic, beryllium, total chromium, copper, lead, mercury, silver and zinc, as well as total halogenated volatile and non-volatile organics. Arsenic concentrations ranged from 2.7 to 3.9 mg/kg. Total chromium was detected at 27.2 to 134 mg/kg. Zinc ranged from 91.5 to 867 mg/kg. No total halogenated volatile or non-volatile organics were detected.

As discussed above, only two samples (i.e., Samples 45 and 46) were designated as sediment under the 1989 OBG RI, although approximately eight additional samples designated as "soil" were collected from the previously-determined wetland areas. Review of these locations in addition to Samples 45 and 46 indicates a range of arsenic concentrations from non-detectable to 30 mg/kg. Similar review indicates total and hexavalent chromium in the range of 4.7 to 1,270 mg/kg and non-detectable to 25 mg/kg, respectively. Zinc analysis was limited to Samples 45 (140 mg/kg) and 46 (180 mg/kg).

2.2.1.2 Fill and Seeps Samples

During the 1989 OBG RI, a total of three fill samples (i.e. M-59, M-66, and M-68) were collected for analysis of total chromium, arsenic, and zinc. One composite sample (of M-60, M-64, and M-67) was also collected for analysis of Hazardous Substance List (HSL) Organics and TAL metals. Summary tables for the results of fill characterization are provided in Appendix A-4b. As indicated, concentrations of arsenic ranged from 7.1 to 10 mg/kg in the three discrete fill samples. Total chromium concentrations ranged from 4,600 mg/kg for sample M-89 to 46,000 mg/kg for sample M-68. Zinc concentrations ranged from 680 mg/kg to 900 mg/kg. HSL organics were not detected in the composite waste sample. Arsenic, total chromium and zinc concentrations from the composite fill sample were similar to the three discrete sample concentrations. Extraction Procedure (EP) toxicity testing for total chromium, arsenic and zinc was also conducted on the six discrete fill samples identified above. Analytical results indicate that the leachable fractions of these parameters were below EP Toxicity criteria (40CFR 261.24).

In addition to the direct fill analyses described above, one sample was also collected from a seep observed on a fill pile during the 1989 OBG RI. The seep was analyzed for total chromium, hexavalent chromium, arsenic, zinc, ammonia, biochemical oxygen demand

(BOD_5), nitrate, nitrite, and total kdjeldal nitrogen (TKN). Analytical results for the seep sample are summarized in Appendix A-3.

2.2.1.3 Surface Water Samples

A total of twelve surface water samples were collected from the Site during the 1985 Phase II, 1989 OBG RI, and 1993 SSI. Results are summarized in Appendix A-4c. These included three samples analyzed during the 1984 Phase II for arsenic, beryllium, chloride, total chromium, copper, lead, mercury, silver, zinc and total halogenated volatile and non-volatile organics; six samples, as well as two duplicate samples, analyzed during the 1989 OBG RI for total hexavalent chromium, arsenic, and zinc (one location); and three samples analyzed during the 1993 SSI for TCL organics and TAL inorganics. The analytical results for these samples are summarized in Appendix A-3. Surface water samples collected in 1984 yielded detectable concentrations of arsenic, chloride, total chromium, copper, and zinc, with all parameters, excluding chloride, detected below 1 mg/L. Total halogenated volatile organics were detected at concentrations ranging from 10 to 58 μg/L. Total halogenated non-volatile organics were not detected. Results for 1989 samples showed concentrations of total chromium ranging from 0.02 to 2.84 mg/L and arsenic ranging from 0.005 to 0.104 mg/L. Hexavalent chromium was not detected, with the exception of one sample (i.e., 14) detected at 0.007 mg/L. TAL inorganic analyses performed on surface water samples collected in 1993 generally produced concentrations less than 1 mg/L for each of the TAL inorganics with the exception of naturally occurring inorganics, such as calcium, iron and magnesium. The only parameter detected during the 1993 TCL organic analysis was carbon disulfide (one sample at 100 μg/L).

2.2.1.4 Groundwater Samples

Groundwater samples were collected during the 1984 Phase II investigation and the 1989 RI. Results are summarized in Appendix A-4d. The 1984 Phase II samples were collected from four shallow monitoring wells (i.e., MW-1S, MW-2S, MW-3S, and MW-4S) and analyzed for several inorganics including total chromium, arsenic, zinc, chloride, beryllium, copper, lead, mercury, and silver. In addition, 1984 Phase II samples were analyzed for total volatile and non-volatile halogenated organics. During the 1989 OBG RI, four deep monitoring wells were installed adjacent to the abovementioned shallow wells, and two additional well pairs were also installed (i.e. MW-5S and 5D, and MW-6S and 6D) to monitor further down-gradient of the fill pile area. Monitoring wells were sampled for analysis of total and filterable chromium, hexavalent chromium, arsenic, zinc, and select water quality parameters during two to four events between September 1986 and August 1988. In addition, monitoring wells 1S, 3S, 3D, 6S, and 6D were analyzed for HSL organics during one sampling event. Samples were also

collected from wells 6D, 6S, 3D, and 3S for analysis of polychlorinated biphenyls (PCBs) and pesticides during the July 1988 sampling event.

The 1984 groundwater results for inorganics showed non-detectable concentrations at the majority of the sample locations with the exception of total chromium, zinc and chloride. Halogenated volatile and semi-volatile organic compounds, were detected at low detections in wells MW-2S, MW-3S, and MW-4S.

The 1989 OBG RI groundwater sampling results yielded concentrations of total (unfiltered) chromium ranging from non-detectable to 0.25 mg/L, unfiltered hexavalent chromium from non-detectable to 0.018 mg/L, and unfiltered arsenic from non-detectable to 0.49 mg/L. Zinc was also detected in unfiltered groundwater at concentrations ranging from non-detectable to 3.9 mg/L, with a single anomalous detection of 80 μg/L in well MW-4S from the August 1988 sampling event. Filtered groundwater analyses generally showed expectedly lower concentrations of inorganics, with total chromium in the filtered fraction ranging from non-detectable to 0.082 mg/L, filtered arsenic ranging from non-detectable to 0.025 mg/L and filtered zinc from non-detectable to 10.5 mg/L. HSL organic and PCB/pesticide compounds were not detected, with the exception of three organic parameters detected at trace levels in MW-1S groundwater during a 1987 sampling event. Those included Bis(2-ethylhexyl) phthalate (a common compound detected as an artifact of sampling with plastic-based equipment), N-nitrosodiphenyl amine and delta-BHC.

2.3 CURRENT CONDITIONS

Geomatrix and Benchmark performed Remedial Investigation field activities on several occasions at the Peter Cooper Markhams site during the period of November 28, 2000 to December 4, 2003. In general, site topography and conditions remain similar to those presented by OBG in 1989. A dense mat of grassy vegetation, low-lying brush, and briar thickets cover the fill piles and immediate surrounding areas. No seeps or significant erosional features were observed on the fill piles. Low-lying brush and trees surround the fill pile area. Beyond the area of the fill piles, non-contiguous wetland areas exist on Site property west, north, and east of the fill piles. As shown on Plate 1, each of the larger wetland areas was assigned an alphabetic designation (Wetland A through G). Standing water is present seasonally (generally December through April months) in all of the wetland areas. Wetland B, located north of the fill piles, retains standing surface water longer than the other wetland areas on the Site. Wetland F, the largest wetland area on-Site, contains both wetland vegetation and large trees with high water demand (cottonwoods and poplars). No structures were present on

the property, with the exception of a natural gas wellhead located east of the access drive. The access drive was relatively clear from Bentley Road to the fill area and along the northern perimeter of the fill piles, but had re-vegetated around the southern and eastern fill area perimeter - to the point where it was no longer distinguishable.

The rail spur, disconnected from the main Erie-Lackawanna Railroad track, was located during Site investigations. The rail spur is camouflaged by heavy vegetative growth, is partially covered with soil, and terminates below grade on the western end of the Site. The switchgear was not observed on the adjacent active rail line, indicating that the siding was disconnected from the main rail following Site closure.

Surrounding demographics are rural and sparsely populated as indicated by both direct observations during site reconnaissance and information provided by the Town of Dayton. The Hamlet of Markhams is generally characterized by large-acreage fields and pasture-lands and includes forested property. Agricultural fields (primarily livestock feed) surround the Site. Land use near the Site is consistent with the "agricultural/forestry" zoning designation for surrounding lands. The Site is zoned "Industrial". Section 4.1 describes surrounding land use and demographics.

3.0 REMEDIAL INVESTIGATION DATA COLLECTION

The focus of the RI conducted by Geomatrix and Benchmark was to supplement existing data to assess chemical constituent migration pathways, assess human health and ecological risks, and perform the FS. The Remedial Investigation scope of work is fully described in the U.S. EPA-approved RI/FS Work Plan dated February 2001, revised September 2001. This section of the RI documents data collection activities.

Site investigation was initiated in October 2001 and was generally completed in the spring of 2002. A re-sampling event was conducted in December 2003 to address a laboratory quality control issue concerning the analysis of hexavalent chromium in soil. A majority of hexavalent chromium data were not considered usable and rejected during data validation. Since total chromium was not detected in all samples, approximately half of the number of soil and sediment having concentrations of total chromium above the compared to the U.S. EPA Region 9 Preliminary Remedial Goal (PRG) for hexavalent chromium in industrial soil (64 mg/kg) were recollected and analyzed. This re-analysis is discussed in more detail in Section 3.7. The method of confirming hexavalent chromium detections in Site soil and sediments was approved by the U.S. EPA. Hexavalent chromium data rejection as well as samples affected is discussed in greater detail in Section 3.7.

The RI characterized the following media types:

- Waste Fill.
- Soil (including background soil quality, surface soil and subsurface soil around the perimeter of the fill piles, and soil covering the fill piles).
- Groundwater.
- Surface water in wetland areas.
- Sediment in wetland areas.
- Soil vapor from the fill piles.

As discussed in Section 2.1, the Markhams Site has been the subject of numerous investigations, including investigations conducted under the direction of the U.S. EPA. Previous investigation results guided the development of the scope of work presented in the U.S. EPA-approved RI/FS Work Plan for the Markhams Site dated February 2001, revised

September 2001. The work plan included rationale for developing a preliminary list of constituents detected in site media considered to pose a potential concern (COPCs) at the Markhams Site. These analytes included: arsenic, total chromium and hexavalent chromium (metal COPCs). Organic chemicals were either not detected or detected at very low concentrations in previous investigations. This is expected based on the nature of the material placed at the Markhams Site and results of the RI conducted at the Peter Cooper Gowanda Landfill (source material of the fill piles). Therefore, improved characterization of the distribution of the metal COPCs is an objective of the Markhams RI. The investigation also included the analyses of a large number of environmental samples for organic and other inorganic compounds to verify the findings reported by others and assess the fate of constituents detected at the Site.

RI environmental samples collected for laboratory analysis were each given a unique nine-digit sample identification code and placed on ice for a laboratory-provided courier to pick up under chain-of-custody procedures. Samples were sent to Severn-Trent Laboratories, (STL) in Amherst, New York and validated by Data Validation Services, Inc. Laboratory data validation reports are presented in Appendix B. Third Rock, LLC (Third Rock) in East Aurora, New York analyzed samples for physical characteristics. Geotechnical reports are presented in Appendix C. RI field activities were conducted by Geomatrix and Benchmark in accordance with the Site Health and Safety Plan (HASP) for Remedial Investigation Activities, Peter Cooper Markhams Site, Dayton, New York, (Benchmark and Geomatrix, 2001). Environmental sample collection was performed in accordance with the Field Operating Procedures (FOPs) provided in the Quality Assurance Project Plan (QAPP) for Remedial Investigation/Feasibility Study, Peter Cooper Markhams Site, Dayton, New York prepared in February 2001, revised in September 2001, by Benchmark and Geomatrix. All field activities were conducted under the oversight of the U.S. EPA contractor, TAMS Consultants, Inc. (TAMS) (now known as EarthTech). Each sampling location was surveyed by E & M Engineers and Surveyors, P.C. and plotted on the site plan (Plate 1) with property boundaries and site topography. Sample locations in the field were identified with a wooden stake (lathe). Lathe numbers in this report refer to field surveyed sample locations. The drilling contractor, Nothnagle Drilling Company of Scottsville, New York, mobilized to the Site on October 1, 2001 to facilitate subsurface soil sample collection and monitoring well installation.

3.1 WASTE FILL

The waste fill was characterized through examination and laboratory analysis of split-spoon soil samples collected from soil borings designated B-1, B-1A, and B-2 through B-6. Boring

locations are shown on Figure 3-1. Samples of waste fill material were collected for laboratory analysis from borings B-4, B-5, and B-6. Sample depths were slightly deeper than planned (originally planned to be within three feet of the ground surface) due to poor sample recovery of fill at shallow depths (2 to 4 foot sample at B-4 and B-5) and the presence of more than four feet of cover soil over the fill pile at B-6. Samples were analyzed for metal COPCs by STL. Samples were also analyzed following a synthetic leaching procedure (Synthetic Precipitation Leaching Procedure {SPLP}) to assess metal COPC leachability from the waste.

Each boring was advanced to the base of the fill pile. At boring locations B-1A, B-4, B5, and B-6, the boring was extended farther into native soil below the fill pile/native soil interface using a 4 1/4-inch inner diameter (ID) hollow stem auger (HSA) and sampled continuously using a 2-inch outer diameter (OD) split spoon sampler. Boring termination depths were: B-1A - 20 feet below ground surface (bgs), B-4 – 22 feet bgs, B-5 - 18 feet bgs, and B-6 – 13 feet bgs. The methodologies for split spoon sampling and standard hollow stem auguring are described in the QAPP. Standard penetration tests (in blow counts) were recorded for estimating the relative in situ compressive strength of subsurface materials. To characterize the subsurface soil and to evaluate the extent of impact from the fill piles (potential leaching of chemical constituents from the waste pile), three discrete samples were collected from native soil. Native soil samples were collected from the upper two feet of native soil immediately beneath the waste pile, the next two foot increment, and the two foot interval above the water table. Sample depths are included on Table 3-1. I t is important to note that the soil sampled collected from a depth of 17 to 19 feet bgs was actually collected approximately four feet below the water table and that the sample collected from 10 to 11 feet bgs is actually representative of soil conditions in the two feet interval above the water table. Soil samples were analyzed for metal COPCs. Samples were collected using procedures described in the QAPP. Each soil sample was examined by a hydrogeologist who identified the contrast between soil properties of the fill and native soil through color, grain size, texture, moisture content, and other physical characteristics. All soil samples were field screened for the presence of VOCs using a field photoionization detector (PID). Boring logs are presented in Appendix E.

At boring locations B-1, B-2, and B-3, the black, waste fill material was not encountered beneath the soil covering the soil pile. The non-waste fill consisted of buried debris composed of concrete, wood, roofing shingles, and re-worked native soil. Descriptive details are presented in Section 4.5.4.

Physical testing results are discussed in Section 4.5. Chemical testing results are presented in Section 5.1.

3.2 SOIL

Surface and subsurface soil samples were collected across the Site to evaluate the nature and extent of chemical impact in soil, if any, supplement existing site characterization data, and support human health and ecological risk assessments. Background surface soil samples were also collected as part of the soils evaluation. Background soil concentration data was used in conjunction with existing 1989 RI and 1993 SSI background data to provide a basis for comparison of other soil investigation results. Soil sample locations are shown on Figures 3-1 and 3-2.

3.2.1 Surface Soil Sampling

The following surface soil samples were collected:

Background Soils

The background surface soil concentrations were established by sampling at six locations (sample numbers 50Bto 55) approximately 500 to 600 feet northwest of the fill piles. Sample locations are shown on Figure 3-2. These six samples supplement existing background surface soil analytical results. The samples were collected from 0 to 6 inches below ground surface (bgs) and analyzed for arsenic and total chromium. Hexavalent chromium is not a naturally occurring constituent under normal soil conditions; therefore, a background concentration was not developed. Background surface soil sample analytical results are presented and discussed in Section 5.2.

Fill Pile Cover Soil

To characterize the soil covering the fill piles and evaluate the extent of surface soil impacts to support the risk assessment, nine surface soil samples were collected from 0 to 6 inches bgs. Sample locations are provided on Figure 3-2. If fill was encountered in the 3 to 6 inch range, the sample was collected to represent the 0 to 3 inch depth range. The samples were analyzed for metal COPCs.

Three Shelby tube samples were collected surface soil covering fill piles at boring locations B-4, B-5, and B-6. Shelby tube samples were sent to Third Rock for analysis of hydraulic

conductivity (ASTM D5084). Other physical parameters tested include moisture content, grain size analysis, and wet/dry density.

Perimeter Soils

To characterize soils that may have been impacted by the adjacent fill piles and evaluate the extent of surface soil impacts to support the risk assessment, 48 discrete surface soil samples were collected adjacent to and at topographically lower elevations relative to the fill piles. Sample locations are shown on Figure 3-1. Samples were collected with dedicated stainless steel sampling equipment from 0 to 6 inches bgs and analyzed for metal COPCs. At ten of these locations, soil samples were also analyzed for target compound list (TCL) volatile organic compounds (VOCs) and TCL semi-volatile organic compounds (SVOCs). Samples selected for organic compound analysis are identified in Table 3-1. Physical testing of soil included grain size and total organic content analysis of five composite soil samples.

3.2.2 Subsurface Soil Sampling

Subsurface soils near the fill piles were sampled to assess potential vertical migration of metal COPCs with percolating surface water. Samples were collected from 29 locations (see Table 3-1 for sample numbers) with a stainless steel hand auger from a depth of 6 to 12 inches below grade. Each sample was analyzed for metal COPCs. Subsurface soil samples are shown on Figure 3-2.

Five composite subsurface soil samples were also analyzed for grain size analysis, total organic carbon (TOC), and cation exchange capacity (CEC). Subsurface soil samples collected from the newly-installed down-gradient monitoring wells (i.e., MW-7S, MW-7D, MW-8S and MW-8D) were analyzed for pH and manganese to assess chemical fate. Well locations are shown on Figure 3-3.

3.3 GROUNDWATER

A groundwater quality assessment program was conducted at the Peter Cooper Markhams Site to identify chemical presence in groundwater and support the human health and ecological risk assessments. Hydraulic information influencing potential COPC groundwater migration pathways was obtained from monitoring well testing data. Monitoring well locations discussed in this section are shown on Figure 3-3.

The groundwater evaluation included the following activities:

- Well re-development to determine the usability of the existing monitoring wells and identify wells that required decommissioning or replacement. Each well was re-developed for use in the groundwater monitoring program;

- Groundwater elevation and water quality data collected from newly-installed wells was used to update the characterization of up-gradient and down-gradient water quality and support development of hydrogeological and fate and transport conceptual models;

- Water level data was collected at all existing and newly-installed groundwater monitoring wells was used to support hydrologic evaluations concerning groundwater and surface water interaction, to verify groundwater flow direction and assess seasonal variability, and to establish hydraulic gradients for groundwater flow rate calculations;

- Analytical data from all existing and newly-installed groundwater monitoring wells was used to characterize groundwater impacts from historic site activities, evaluate potential risk, refine the COPC list for subsequent groundwater water monitoring events, and determine the effects of seasonal variation on groundwater quality and flow; and

- Hydraulic conductivity testing performed at all existing and newly-installed groundwater monitoring wells was used to determine groundwater flow velocity and support the development of a hydrogeological model and assess chemical fate and transport.

3.3.1 Existing Monitoring Well Evaluation

Monitoring wells pre-existed the RI conducted by Geomatrix and Benchmark. Monitoring wells MW-1, MW-1S, MW-1D, MW-2S, MW-2D, MW-3S, MW-3D, MW-3D2, MW-4S, MW-4D, MW-5S, and MW-5D were identified during site reconnaissance prior to the RI. A preliminary inspection of existing monitoring well integrity identified all existing monitoring wells to be in good physical condition with the exception of MW-3S and MW-3D. The protective casing and riser on MW-3S were bent at an approximately 45-degree angle to grade. Accordingly, this well was not used during the RI and was replaced by groundwater monitoring well MW-3SR, located adjacent to existing well MW-3D2. A protective casing cap and lock

were missing from MW-3D; however, this well was replaced with MW-3D2 during the OBG 1989 RI, which was in satisfactory condition.

Excluding MW-3S, all recorded bottom depths were at or near the recorded well log datum. The integrity of existing monitoring wells MW-1 and MW-3D were previously determined to be unserviceable during the OBG investigations. These three wells (MW-1, MW-3S, and MW-3D) were no longer useful in the remedial investigation and were abandoned in accordance with the QAPP. Each serviceable well was redeveloped on September 24 and 25, 2001.

3.3.2 Monitoring Well Installation

A total of 7 overburden monitoring wells (MW-3SR, MW-7S, MW-7D, MW-8S, MW-8D, MW-9S, MW-9D) were installed at the Site. Monitoring well MW-3SR was paired with existing MW-3D2 to replace the abandoned MW-3S well. Among the new wells installed, monitoring well pairs MW-7 and MW-8 were installed farther downgradient from the fill piles to assess groundwater quality near Wetland F. Monitoring well pair MW-9 was installed up-gradient of the fill piles to assess background water quality. Shallow wells were constructed with well screens positioned to monitor the shallow glacial outwash unit and deep wells were constructed with well screens positioned to monitor the lacustrine unit. Monitoring well locations are presented in Figure 3-3. A detailed methodology for overburden monitoring well construction is provided in the QAPP. In brief, Nothnagle Drilling Company of Scottsville, New York installed the new monitoring wells under the direction of a Geomatrix hydrogeologist from October 1 through 10, 2001. Boreholes were advanced into the overburden using 4 1/4-inch ID HSA and the unconsolidated deposits were sampled continuously using standard 2-inch OD split spoon samplers at the deeper of the well pair boring location. Monitoring wells were constructed of 2-inch ID flush-joint Schedule 40 PVC riser pipe with a monitoring well screen either 5 or 10-feet in length (0.01-inch slot size). Deeper monitoring wells were installed with 10-foot screen lengths to monitor the deeper lacustrine unit. Shallow wells were primarily installed with five foot screen lengths to monitor the saturated outwash deposits. However, at well location MW-7S a 10-foot screen was used because significant areas of saturated outwash deposits were not observed during drilling so the boring was advanced several feet into the lacustrine unit. A 10-foot screen length was installed to ensure monitoring of groundwater in the outwash sand, as well as in the upper saturated zone if the water table seasonally fluctuated below the outwash at that location. Monitoring well logs for new and existing wells are provided in Appendix E. Table 3-2 summarizes monitoring well construction details.

3.3.3 Monitoring Well Development

The seven newly installed monitoring wells and the 11 existing monitoring wells (MW-1S, MW-1D, MW-2S, MW-2D, MW-3D2, MW-4S, MW-4D, MW-5S, MW-5D, MW-6S, and MW-6D) were developed to removed entrained fines from the sand pack.

Development was accomplished using a suction-lift pump, air-displacement pump, bottom-discharging bailer, or Waterra™ hand pump. Development was considered complete when the pH, specific conductivity and temperature had stabilized, and when the turbidity was at or below 5 NTU, or had stabilized above 5 NTU and a minimum of 10 well volumes had been removed. Stability was defined as a variation between measurements of 10 percent or less and no overall upward or downward trend in the measurements. Well development protocols were consistent with well development procedures presented in the QAPP.

3.3.4 Groundwater Elevation Measurements

Water level measurements were recorded on a monthly basis from October 2001 through April 2002. A discussion of the results of the groundwater elevation measurements is presented in Section 4.4.

3.3.5 Aquifer Testing

In situ permeability tests were conducted in all wells on November 1 and 2, 2001 to estimate the hydraulic conductivity of saturated deposits open to the well screen using the "rising head" variable head slug test method described in the QAPP.

In general, a "slug" of known volume was instantaneously removed from the well and the water level recovery was recorded over time. Recovery data was analyzed using the Bouwer and Rice Method (1976) to estimate hydraulic conductivity. The results of the hydraulic conductivity testing are presented in Section 4.4.

3.3.6 Groundwater Sampling and Field Parameter Analysis

To assess the nature and extent of potential groundwater quality impacts at the Site, existing and newly-installed monitoring wells (MW-1S, MW-1D, MW-2S, MW-2D, MW-3SR, MW-3D2, MW-4S, MW-4D, MW-5S, MW-5D, MW-6S, MW-6D, MW-7S, MW-7D, MW-8S, MW-8D, MW-9S, and MW-9D) were sampled two weeks after completing well development. The first sampling event, conducted in November 2001, included the analysis for TCL VOCs, TCL SVOCs, TAL metals, fate and transport parameters, and field-measured parameters. Groundwater concentrations were compared to NYSDEC Technical and Operational Guidance

Series (TOGs) Ambient Water Quality Standards for groundwater, and US EPA Region 9 Preliminary Remediation Goals (PRGs) for tap water. For the second sampling event, a reduced list of target analytes was proposed in Geomatrix correspondence to the U.S. EPA dated April 8, 2002. The proposed list included TCL VOCs (shallow wells), arsenic, chromium, hexavalent chromium, ammonia, nitrate, and sulfate in addition to the field measured parameters. The U.S. EPA concurred (April 17, 2002) but requested a reduced analytical reporting limit from 10 ug/l to 1 ug/l and the inclusion of TCL SVOCs on the target analyte list for MW-2S and MW-8S.

The first groundwater sampling event occurred approximately two weeks following well installation and development in November 2001. The second sampling event was completed in April 2002. The field work schedule allowed the first groundwater sampling event to occur during the fall (low water table conditions), and the second event to occur during the spring (high water table conditions). The correlation between spring and fall water table elevations is supported through other western New York groundwater monitoring programs.

Low-flow groundwater sampling procedures outlined in the QAPP were followed for 14 of the 18 monitoring wells. Low well yields at MW-2S, MW-4S, MW-6S, and MW-9D precluded the use of the submersible bladder pump. A well was considered low yielding when purging rates were less than 100 mL/min and when more than 2 feet of drawdown occurred in the well. At those locations, a peristaltic pump was used to slowly evacuate the well, allow sufficient time for recharge, and collect inorganic parameters through the low flow discharge. A bailer was used to collect samples required for analysis of organic compounds. Samples collected from MW-2S were accomplished over a three-day period due to the low yield of the well and an effort to minimize sample turbidity.

Groundwater purging was discharged to a flow through cell to measure the field parameters of pH, specific conductivity, dissolved oxygen (DO), oxidation-reduction potential (ORP), and temperature. In addition, turbidity was measured using a portable field turbidity meter. Purging was considered complete when the pH, specific conductivity, and temperature had stabilized, and when the turbidity was below 5 NTU, or had stabilized above 5 NTU. Field parameters measured during each monitoring event also included ferrous iron. Ferrous iron concentrations were analyzed to support assessment of chemical constituent fate in groundwater.

Samples were collected in pre-preserved sample bottles and were analyzed for the parameters summarized in Table 3-1. Groundwater samples for metals analysis were not field filtered with the exception of MW-2D. Due to the elevated turbidity at well location MW-2, two samples were attempted to be collected for metals analysis: one unfiltered (total metals) and one filtered (soluble metals). The very slow recharge rate described for MW-2S precluded the collection of a filtered metals sample during both sampling events. Adequate recharge at MW-2 allowed for the collection of both a total and soluble metals sample. The sample was filtered using a 40-micron flow through filter to compare the difference between total and soluble metals water quality data.

Results are provided in Section 5.3.

3.4 SURFACE WATER

Surface water is seasonally present in wetlands downgradient and adjacent to the fill piles. Surface water samples were collected and analyzed during the RI to support the human health and ecological risk assessments and assess the fate of chemical constituents at the Site.

Surface water grab samples were collected from the wetlands designated Wetland F (SW-1 and SW-2) and Wetland B (SW-3) during each of the two sampling events. Wetland D (SW-4) was dry during the December 2001 sampling event but standing water was present and sampled during the April 2002 sampling event. Surface water sampling was conducted in accordance with the QAPP. Sample locations are shown on Figure 3-3.

Field-measured parameters included temperature, pH, specific conductivity, DO, ORP, turbidity, and ferrous iron. Surface water samples from each sampling event were analyzed for the parameters summarized in Table 3-1.

A staff gauge was installed in each of the wetlands in proximity to the surface water sample locations during the first sampling event. Surface water elevations were collected in conjunction with the groundwater elevation monitoring program to support hydrologic evaluations concerning groundwater and surface water interaction.

3.5 WETLAND SEDIMENT

Sediment in wetlands proximate to the fill piles was sampled to assess sediment quality. The sampling included wetlands more distant from the fill piles to establish background sediment concentrations. Samples were collected using a stainless steel hand trowel shovel, stainless

steel putty knife or hand auger, and analyzed for metal COPCs (arsenic, chromium and hexavalent chromium).

Background sediment samples were collected and analyzed for arsenic and chromium to supplement previously collected data and support the risk assessments. Background wetland sediment concentrations were established by sampling wetland areas approximately 500 to 600 feet north and northwest of the waste fill piles. Background samples include locations 75, 76, 77, 78, 79A, 80, 81A, 82, and 83. Figure 3-4 identifies background sediment sampling locations. Hexavalent chromium was not analyzed since its naturally occurring presence is very rare.

A total of 14 discrete sediment samples were collected from the upper six inches of the wetland sediments and analyzed for arsenic, chromium, and hexavalent chromium to assess potential impacts to wetland sediments. As identified in Table 4-3, sediment sample were collected from wetland sediments and composited into samples representative of different wetland areas and analyzed for pH, TOC and grain size distribution:

Grain size analysis:	Composite Sample 150 – three locations from Wetland D Composite Sample 152 – three locations from Wetland F Composite Sample 153 – one sample each from Wetlands A, B, and G
TOC:	Composite Sample 150 – three locations from Wetland D Composite Sample 152 – three locations from Wetland F Composite Sample 153 – one sample each from Wetlands A, B, and G
Leachable pH:	Composite Sample 174 – three locations from Wetland F Composite Sample 175 – three locations from Wetland B Composite Sample 176 – three locations from Wetland D

3.6 SOIL VAPOR

Soil vapor from the largest waste fill pile was monitored with field instruments to characterize the composition of soil vapor present from decomposition of the waste material. A soil vapor monitoring well was installed into the largest waste fill pile after completion of boring B-4. The soil vapor monitoring location is shown on Figure 3-3 and is designated GPZ-1. The probe was constructed as a piezometer with 1-inch diameter, Schedule 40 PVC riser pipe, and was screened from approximately 4 feet below the surface of the fill material to the top of native soil. The soil vapor monitoring well was installed in accordance with the procedures for

piezometer installation as described in the QAPP. Construction details are shown in Appendix E.

After installation, the soil vapor monitoring well was monitored during for vapors during each monitoring event (November 5, 2001 and April 22, 2002) using a calibrated multigas meter for landfill gases (carbon monoxide, hydrogen sulfide, oxygen, and methane). Methodologies for gas monitoring and instrument calibration are provided in the QAPP.

3.7 QUALITY ASSURANCE/QUALITY CONTROL MEASURES

Field investigation data were collected and processed using the procedures outlined in the QAPP and the Work Plan to ensure representative sample collection and to achieve the data quality objectives of the Remedial Investigation. The field activities were recorded in bound project field books consisting of field forms from the FOPs in the QAPP. Any deviation from the Work Plan or the QAPP procedures were discussed in the field with the U.S. EPA contractor oversight person from TAMS and submitted in correspondence to the U.S. EPA.

As part of the quality assurance/quality control (QA/QC) measures, the Project Quality Control Officer conducted a QA/QC audit of sample collection activities during the first and second groundwater sampling events. The audit did not identify any procedures or activities that deviated from the QAPP or impacted the quality of the data.

The entire field investigation program was conducted with USEPA contractor oversight provided by TAMS. The TAMS oversight person recorded field data (sample locations, depths of borings, soil classifications, etc.) and collected several split samples of environmental media. The samples collected by TAMS were sent to a USEPA selected laboratory for analysis of select parameters.

Geomatrix collected blind duplicates and matrix spike/matrix spike duplicates (MS/MSD) at a quantity of one in every 20 samples for each environmental media. A trip blank, analyzed for the most comprehensive VOC list accompanied each cooler of aqueous media to be analyzed for VOCs. An equipment blank was collected on non-dedicated equipment prior to collection of Site environmental media samples. Equipment blanks were analyzed for the COPC list requested for the Site. Table 3-3 summarizes the QA/QC sample locations. The correlation between samples and duplicate samples are provided in Table 3-4. The relative percent difference (RPD) between detected compounds in surface and groundwater samples was

acceptable, except for ammonia in surface waters. Therefore, the results for ammonia were qualified as estimated.

USEPA split samples from samples MW-1S, MW-2D, and SW-3 were analyzed for hexavalent chromium, using the same analytical method. Hexavalent chromium was not detected in any of the samples. USEPA hexavalent chromium data packages are provided in Appendix D.

The laboratory provided complete data packages suitable for full data validation. Data packages were validated by a third party data validator, Ms. Judy Harry of Data Validation Services in North Creek, New York. Data validation reports are provided in Appendix B.

Data validation reported generally usable data with minor qualifications with the exception of several groundwater, soil, and sediment hexavalent chromium samples during sampling conducted in Fall 2001 and April 2002 (groundwater sampling only). However, a major data qualification resulted in the rejection of some soil samples analyzed for hexavalent chromium. Total chromium sample analytical results were determined to be usable with no or minor qualification. The rejection of the data by the third party validator was based on low percent recoveries of hexavalent chromium in the matrix spike samples. The matrix spike samples were spiked with a known concentration of hexavalent chromium and the samples analyzed to determine the concentration of the spike. The laboratory indicated poor to no recovery of the matrix spike samples. Negative matrix interference can be caused by numerous factors including certain chemical presence (i.e., sulfate compounds) and organic matter in the sample media. The data validator qualified all laboratory-reported non-detectable concentrations of hexavalent chromium as unusable data (specified with an R) due to negative matrix interference effects. Positive detections of hexavalent chromium were determined to potentially have a low bias and are therefore qualified as estimated (J) or edited to non-detection. It is important to note that the data validator did not reject these values.

Although a majority of hexavalent chromium data are considered not usable (R), where total chromium values were reported as non-detect, it can be assumed that hexavalent chromium is not present above the detection limit in the sample. Samples in which the total chromium was reported as non-detect and the hexavalent chromium was reported slightly above detection limits are likely a result of the difference in method techniques. In these cases, the hexavalent chromium result is qualified by the data validator as estimated (J).

Additional sediment and soil samples were collected on December 3 and 4, 2003, to address the data rejection for hexavalent chromium samples. Approximately 50% of the soil/sediment locations where hexavalent chromium results were rejected and where total chromium results indicated the potential for exceedance of the U.S. EPA Region 9 Preliminary Remedial Goal (PRG) for hexavalent chromium in industrial soil (64 mg/kg) were re-sampled. Confirmation sample analysis was conducted at 16 sample locations. Only two data qualifications were necessary for the results and all were considered usable for quantitative risk assessment. The method of confirming hexavalent chromium detections in Site soil and sediments was approved by the U.S. EPA.

Based on an assessment of precision, accuracy, and completeness, sample collection and laboratory analyses met data quality objectives of the remedial investigation with the exception of certain data rejections for hexavalent chromium. However, the overall characterization of metal constituent concentrations in all environmental media was not compromised based on the data quality of total metals analysis and results from hexavalent chromium confirmation sampling results.

4.0 LAND USE AND PHYSICAL CONDITIONS OF THE SITE

As described in Section 1.0, the Peter Cooper Markhams Site is located off Bentley Road, approximately 6 miles south of the Village of Gowanda in the Town of Dayton, Cattaraugus County, New York. The Site encompasses approximately 91 acres and is bordered to the northwest by Bentley Road, to the northeast by wooded property and field, to the southeast by the Erie-Lackawanna Railroad right-of-way, and to the southwest by hardwood forest. Surrounding property is entirely rural, consisting of small farm fields, open meadow and forests.

4.1 POPULATION AND LAND USE

The Town of Dayton, including the Village of South Dayton, and the Hamlets of Cottage, Wesley, and Markhams, has a combined population of 1945 persons (2000 U.S. Census Bureau), an increase of 14 persons from the 1990 U.S. census. Dayton encompasses an area of approximately 23,500 acres (Cattaraugus County, 2000). Thus, population density in the Dayton area is sparse with less than one person per 12 acres. The Dayton area is rural and sparsely populated with mixed-use zoning, the majority of which is designated agricultural (i.e., dairy and livestock farming and livestock feed crops) and forestry. Residential and commercial zones are primarily located northeast of the Site along Route 62 and in the Village of South Dayton. The nearest residence to the Site is located approximately ¼ mile west of the Site. The Peter Cooper Markhams Site carries an industrial zoning designation, which, in accordance with the Town Zoning Law, precludes other non-industrial uses. A zoning map is included in Appendix F.

4.2 SITE PHYSIOGRAPHY AND CLIMATE

4.2.1 Site Physiography

The Towns of Markhams and Dayton, New York are located at the extreme northern end of a gently southerly-sloping, north-south trending glacial valley within the uplands of the Allegheny Plateau physiographic province. Within the glacial valley, little change in topographic relief occurs. Elevations range from approximately 1,330 feet above mean sea level (fmsl) from the northern end of the valley to approximately 1,280 fmsl near the confluence of the West and East Branch of Conewango Creek. Elevations of the valley floor in the nearby hills located north, west and east of the Site range from approximately 1,670 to more than 1,700 fmsl. The topographic relief of the 91-acre Site is low. The Site slopes gently in a southwesterly direction ranging from 1,316 to 1,300 fmsl over a distance of approximately 2,000 feet. The low relief of the Site is interrupted by areas of mounded fill material covering

an approximate 20-acre area situated near the eastern Site perimeter. The mounded fill piles extend from approximately 5 to 15 feet above grade. Nearly a dozen discrete fill piles of various dimensions are present. The mounded fill piles are generally elliptical in form.

4.2.2 Climate

Western New York has a cold continental climate, with moisture from Lake Erie causing increased precipitation. Average annual precipitation is nearly 40 inches and snowfall is 165.5 inches (NOAA, 1998). Average monthly temperatures range from 21 degrees Fahrenheit (°F) in January to 66°F in July (NOAA, 1998). The ground and lakes generally remain frozen from December to March. Natural stream temperatures range from 32°F in winter to 80°F in summer (OBG, 1989). Winds are generally from the southwest (240 degrees) with a mean velocity of 10 miles per hour (Buffalo Airport, 1999).

4.3 SURFACE WATER

Drainage patterns in the broad glacial valley of the Markhams/Dayton area are dendritic and generally flow in a southwesterly direction. The area is located within the Allegheny River basin with creeks and tributaries flowing to Conewango Creek located at the southern end of the glacial valley. Slab City Creek and Johnson Creek, small tributaries of Conewango Creek, are the nearest named surface water drainage features to the Site (Figure 4-1). The southern property boundary of the Site and the closest fill piles are respectively 2,000 feet and 3,000 feet north of the confluence of the named creeks. The Site is well beyond the limits of the 100-year floodplain (see Appendix G). Direct discharge of surface water from the areas previously characterized as wetlands does not occur to tributaries of Slab City Creek or Johnson Creek. Areas previously characterized as wetlands in the northern portion of the Site are generally not contiguous. Ponded water in these northern wetland areas infiltrates into the subsurface. An area previously characterized as wetlands in the southwestern portion of the Site appears to be an area of localized groundwater discharge or surface water retention. No visible drainage from wetland areas are apparent on topographic maps or aerial photographs, or were any observed during field mapping of site features.

4.4 CULTURAL RESOURCES

A cultural resources investigation was completed by Panamerican Consultants, Inc. (Panamerican) in accordance with the Work Plan. The investigation included a site file and literature review, archival and documentary research, and a walkover site reconnaissance. The investigation report titled "Phase 1A Cultural Resources Survey" prepared by Panamerican

(2002) is presented in Appendix H. The investigation concludes that the presence of the wetland areas within the site boundaries and the proximity to two water resources (Slab City Creek and Johnson Creek) suggests the Site may be located in an area having prehistoric camps. However, significant disturbance to portions of the Site has already occurred during development of the Markhams Site since the 1950s (i.e., construction of roads, natural gas wellhead installation, construction of a rail spur and placement of waste fill piles). Panamerican recommends completing a Phase 1B investigation for areas outside these previously disturbed areas if activities requiring the disturbance of surface soils in these areas are planned.

4.5 REGIONAL GEOLOGY AND HYDROGEOLOGY

This section describes the regional and Site geology and hydrogeology. Physical characteristics of Site soils, fill material and wetland sediments are summarized from field investigations.

4.5.1 Regional Hydrogeology

The broad glacial valley in the vicinity of the Towns of Markhams and Dayton, New York consists of sediments deposited in pro-glacial Lake Conewango. The formation of glacial moraines at the south end of the valley dammed melt water from the retreating glacier to form a glacial lake across the valley. Lacustrine deposition and outwash deposition of clay to gravel size material is prevalent in the valley. According to Hazen and Sawyer (1969), sediments in the valley are more than 400 feet thick. Upper Devonian age shale bedrock formations exist below these sediments.

Groundwater exists within the sediments of the glacial valley. The depth to groundwater is shallow throughout the valley and generally occurs within 10 feet of the ground surface. Wetland areas exist throughout the valley as a function of the shallow water table conditions and the presence of isolated clay lenses that produce perched groundwater conditions. The regional direction of groundwater flow within the valley floor is to the south, toward Conewango Creek.

4.5.2 Site Geology

The Markhams Site is located on glacial sediments deposited in pro-glacial Conewango Lake. Anthropogenic deposition of two distinct types of fill material have been disposed of at the Site: a waste-fill material consisting of de-watered sludge, silt, sand and gravel, and a non-waste fill, consisting of re-worked native soil with occasional debris from building construction

(i.e.. shingles, concrete, plastic, etc.). Fill materials are generally unsaturated and directly overlie the surface of the glacially-derived soils. The thickness of the fill material piled above the native soil ranges from approximately 2 to 15 feet. No seeps were observed on or below fill piles during the RI.

Six distinct wetland areas were identified during the RI investigation, and are shown on Plate 1. The wetland areas are generally characterized by slightly lower topography with a thin veneer (< 2 feet) of vegetative matter, detrital matter and peat. The wetland sediments directly overlie the glacial soils native to the Site.

The overburden thickness at the Markhams Site is reported to be approximately 440 feet (OBG, 1989) based on the well log for the gas well located near the entrance road to the Site. Native glacially derived materials consist of a glacial outwash unit, and a lacustrine (lake deposited) unit. The outwash deposits are continuous across the Site, and consist of poorly sorted fine to coarse sand and fine gravel. The outwash unit varies in thickness from 8 feet near the center of the Site (MW-2 series monitoring wells) to a maximum of 18 feet at the southwest corner of the Site (MW-6 series monitoring wells) Lacustrine silt and fine sand occurs below the outwash sand. The lacustrine deposits are locally stratified, and exhibit discontinuous, alternating layers of silt and clay (varves) suggesting periods of a deep water depositional environment. The thickness of the fine-grained lacustrine deposits is not known, however the depositional environment suggests that the thickness of the lacustrine deposits is extensive.

The Site stratigraphy is illustrated in cross section on Figures 4-2, 4-3 and 4-4. Cross section profile lines for each cross-section are shown on Plate 1. The surface elevation, cover soil thickness, fill thickness, and native material thickness at each soil boring and monitoring well location is summarized in Table 4-1. Boring installation logs for borings completed during the RI are provided in Appendix E.

4.5.3 Site Hydrogeology

Groundwater monitoring well screens were installed in the outwash sand deposits (designated as S-series wells) and in the lacustrine fine sand and silt deposits (designated as D-series wells) at the Site. A total of 9 monitoring well locations (6 existing and 3 newly-installed well pairs) were investigated during the RI. Monitoring well completion logs are provided in Appendix E.

4.5.3.1 Hydraulic Properties

Synoptic rounds of water levels taken from site monitoring wells during the RI are summarized in Table 4-2. Groundwater elevations were measured at each of the existing and newly-installed monitoring wells on seven occasions during the RI. During that monitoring period, groundwater in shallow and deep monitoring wells fluctuated within a five foot range. The depth to the shallow water-bearing zone ranges from being present near the ground surface (MW-9S) to over 14 feet below the ground surface (MW-6S). With the exception of MW-3DR, groundwater levels measured in the deep monitoring wells near the fill piles (MW-1D, MW-2D, MW-6D, and MW-9D) screened in the lacustrine deposits, were generally lower than the shallow wells, indicating a slight downward vertical hydraulic gradient. Water levels measured in monitoring wells farther downgradient of the fill piles (MW-5D, MW-7D, and MW-8D) were generally higher than the shallow wells, indicating an upward vertical hydraulic gradient in the southwestern portion of the Site proximal to Wetland F. During the April 2002 sampling event, groundwater at monitoring well MW-5D was artesian; groundwater was observed to be flowing from the top of the PVC riser.

Water levels coincident with groundwater sampling events representing seasonal low and high water table conditions were used to prepare potentiometric surface maps of overburden groundwater. Figure 4-5 presents an overburden groundwater contour map for the Site during the November 2001 sampling event (representative of low water table conditions) and Figure 4-6 presents an overburden groundwater contour map for the Site during the April 2002 sampling event (representative of high water table conditions). Groundwater flows generally in a southwesterly direction toward the locally significant groundwater discharge area, Wetland F. During higher groundwater elevations, localized groundwater discharge also occurs to Wetland D. The upward vertical hydraulic gradients that exist below and downgradient of the fill piles indicates groundwater at the Site is strongly influenced by Wetland F and groundwater will ultimately flow toward Wetland F located southwest of the fill piles.

Hydraulic conductivity testing results are summarized in Table 4-3. The table presents ranges of hydraulic conductivity values estimated for the outwash sand & gravel as well as the lacustrine silt and sand. The hydraulic conductivity of the outwash sand and gravel deposits range from 1.2×10^{-3} cm/s (MW-5S) to 3.7×10^{-2} cm/s (MW-1S) with a geometric mean hydraulic conductivity of 5.5×10^{-3} cm/s. Monitoring well MW-2S yielded an extremely slow rate of recovery during hydraulic testing (less than 5% recovery in 24 hours). MW-2S was installed as part of the initial 1984 Phase II investigation by RECRA Environmental which reported a low hydraulic conductivity as well. The anomalously low hydraulic conductivity at

MW-2S maybe caused by very fine grain materials locally present at that location and/or smearing of the borehole wall during 1984 drilling/well installation program that could not be removed during well development. In any case, the hydraulic conductivity values obtained for MW-2S are anomalous and considered data outliers. Therefore, conductivity estimates obtained from MW-2S have not been used in the calculation of average hydraulic conductivity of the outwash deposits.

The hydraulic conductivity of the lacustrine silt and sand deposits ranged from 1.1 x 10^{-3} cm/s (MW-9D) to 6.4 x 10^{-3} (MW-3D2) with a geometric mean hydraulic conductivity of 3.8 x 10^{-3} cm/s. The slightly lower mean conductivity of the lacustrine unit is due to the finer-grained deposits (fine sand and silt) representative of the unit. The stratification of fine and coarser grained deposits associated with the lacustrine unit can yield hydraulic conductivity values comparable to the shallower outwash deposits if coarse sand and fine gravel sequences are locally thicker than silt and clay sequences.

Comparable hydraulic conductivity of shallow and deep wells, the absence of a separating confining layer, and similar geochemistry of the shallow and deeper groundwater indicates that the outwash and lacustrine units represent a single hydrostratigraphic unit. A geochemical comparison (Stiff diagram) shown on Figure 4-7 was prepared using the groundwater chemistry data (presented in Section 5.0) from the November 2001 groundwater sampling event. The diagram illustrates the similarity in the cation/anion balances between groundwater samples collected from shallow and deep monitoring wells indicating complete mixing of overburden groundwater.

The groundwater seepage velocity was calculated for the overburden hydrostratigraphic unit (referred to as the overburden groundwater flow system). Applying April 2002 groundwater elevation data between the upgradient monitoring well pair (MW-9S/D) and downgradient well pair (MW-8S/D), a mean hydraulic conductivity value of 4.4 x 10^{-3} cm/s (12.5 ft/day) was used to represent the groundwater flow system below the Site.

Groundwater seepage velocity is defined as: $V = (-K / n_e) * I$, where,

V= seepage velocity
K = hydraulic conductivity
n_e = porosity (dimensionless, estimated at 0.25 which is within a range of effective porosity values presented in Fetter 1994 for sand and silt)

I = hydraulic gradient (dimensionless, calculated at 0.004)

A seepage velocity (rate of groundwater flow) of 2.0 x 10^{-1} ft/day (73 ft/year) was calculated for the overburden flow system.

A Darcy flux was also calculated to approximate the volume of groundwater leaving the portion of the Site below the fill piles in the direction of Wetland F. Specifically, the flux was estimated across a saturated cross-sectional area 30 feet deep (depth of D-series wells) and 650 feet wide (distance from well MW-5S/5D to the railroad tracks). Calculations are provided in Appendix I. The estimated groundwater flux in the direction of Wetland F is approximately 1,060 ft^3/day. This flux was calculated for high water table conditions. The smaller saturated thickness of a low water table condition reduces the flux by approximately 15%.

4.5.3.2 Groundwater Flow and Surface Water Interaction

Groundwater flow in the overburden is influenced by topographic elevation, recharge from infiltrating precipitation, and the presence of seasonal groundwater discharge/recharge areas. Surface water presence in the wetland areas is controlled by recharge from precipitation and groundwater discharge during high water table conditions. Surface water infiltrates the bottom of the wetland area when the water table is low.

The recharge/discharge relationship between surface water and groundwater at the Site is a dynamic condition. Wetlands are recharged by groundwater when the water table is high. The upward vertical hydraulic gradients observed between the shallow wells and the surface water, as well as, upward vertical gradients between the deep and shallow wells (including the elevation of surface water) indicate the groundwater system is discharging to the wetland. However, the condition reverses when the elevation of the water table is below the wetland sediments and the wetlands lose water to the groundwater system. The wetland areas ultimately become dry when the volume of precipitation (only source of recharge) is less than overall water losses from evapotranspiration and vertical infiltration.

To quantify the volume of groundwater discharging to Wetland F in the area immediately downgradient from the fill piles, a Darcy flux was calculated for a high water table condition. The Darcy flux calculation is presented in Appendix I. The calculation represents the volume of groundwater discharging to an 11-acre portion of Wetland F that encompasses the wetland area between the southwestern property boundary and the southeastern wetland perimeter near wells MW-8S/8D and MW-5S/5D. The selected area is directly downgradient from the fill piles. The calculated Darcy flux assumes vertical hydraulic gradients in these wells are

consistent across the entire wetland. Since the vertical hydraulic conductivity of the wetland sediments is an important variable, and vertical hydraulic conductivities of the wetland sediments have not been directly measured, hydraulic conductivity data for other areas of the Site were used. Based on similar grain size distributions between the fill pile cover soil (having vertical hydraulic conductivity data measured from Shelby tubes) and the wetland sediments, as well as visual grain size assessments, the vertical hydraulic conductivity data used in the calculation were selected from the range of values ascertained for the cover soil. A one order of magnitude difference exists between the lowest and highest vertical hydraulic conductivity value calculated for the gravelly, silty fine sand compositing the cover soils on the fill piles (i.e., $K = 5.1 \times 10^{-6}$ cm/s {at ST-3} to 7.8×10^{-5} cm/s {at ST-4}. The sole grain size analysis for Wetland F describes the sediments as fine sand and silt which is somewhat similar to the cover soil description. Therefore, the groundwater flux discharging to the wetland area was calculated for both the lower and upper range of Shelby tube hydraulic conductivity data.

The resulting range of calculated flux values is 1,229 ft^3/day to 18,804 ft^3/day. These values represent the groundwater discharge volume (upward vertical discharge) to the 11-acre wetland area immediately downgradient from the Site.

The range of vertical discharge flux was compared to the volume of groundwater flowing laterally beneath the fill piles in the direction of Wetland F. As reported previously, this lateral flux is approximately 1,060 ft^3/day and is less than the calculated range of values of vertical discharge to the wetland (1,229 ft^3/day to 18,804 ft^3/day). Since the vertical groundwater flux to Wetland F is greater than the lateral groundwater flux from the Site, the wetland has the capacity to receive all potentially impacted groundwater from the Site. It is important to note that the dynamic interaction between the groundwater and surface water results in non-continuous discharge to the wetland. When the water table is seasonally low, groundwater not discharging to the wetland flows laterally at a velocity of less than 100 feet per year. Since the distance to the western limit of the wetland is more than 500 feet, sufficient seasonal cycles of high groundwater conditions will eventually allow the discharge of Site groundwater to the wetland. Consequently, overburden groundwater leaving the Site eventually discharges to Wetland F.

4.5.4 Physical Properties of Soil/Fill/Sediment

The Remedial Investigation characterized the physical properties of the waste fill, fill cover and perimeter surface soils, native subsurface soils, and wetland sediments, as described below. Geotechnical testing reports are provided in Appendix C. Geotechnical testing data are

summarized in Table 4-4.

4.5.4.1 Waste Fill and Surface Soils

As described in Section 3.2.1, the low relief of the Site is interrupted by areas of mounded fill material covering an approximate 20-acre area situated near the eastern Site perimeter. The mounded fill piles extend from approximately 5 to 15 feet above grade level. Several discrete fill piles of various dimensions are present, which are generally elliptical in form. The fill pile areas are illustrated on Plate 1. The waste-fill consists of vacuum filter sludge and cookhouse sludge derived from the animal glue manufacturing process. The waste fill is associated with an ammonia and sulfur-type odor. The sludge is mixed within a silt and fine sand matrix (native soils) and various amounts of animal hair, ash and cinders, gravel and clay.

Non-waste fill, comprised of reworked native soils, organic matter (roots, peat), and construction debris, including shingles, concrete and plastic, was encountered in several of the piles. The non-waste fill was encountered at boring locations B-1, B-2 and B-3, and varies between three and six feet in thickness at these locations.

The geotechnical testing of the waste-fill is provided in Appendix C. Grain size analysis of the sludge fill indicates the material consists primarily of sand and fines (52% and 40%, respectively), with some fine gravel (8%). Table 4-4 summarizes the geotechnical testing results of the undisturbed (Shelby tube) cover soil samples. Vertical hydraulic conductivity of cover soil (laboratory analysis from Shelby tubes) ranged from 7.8×10^{-5} to 5.1×10^{-6} cm/s. The vertical hydraulic conductivity measured in the cover soils are lower than horizontal hydraulic conductivity values of the shallow saturated native soils. The cover soils were analyzed for Total Organic Carbon (TOC) content at eight locations. The results of the TOC analyses are presented in Table 4-4. TOC percentages for the cover soils ranged from 1.1 % (lathe #118) to 13.2 % (lathe #114).

Surface soils at the perimeter of the fill piles were also sampled for geotechnical analysis. Grain size distribution results are similar for composite samples 151, 154 and 155 and consist primarily of sand, silt and gravel. Composite sample 156 differs slightly in grain size distribution, and dominantly consists of sand, silt and clay. The finer grained nature of composite 156 (collected from lathe locations near Wetland "F") may be representative of surface soils that have not been disturbed to the extent of other areas proximal to the fill piles.

Four composite samples were collected from the fill pile perimeter surface soils for analysis of TOC. Composite sample results ranged from 1.2% (composite 156) to 3.6% (composite 151).

4.5.4.2 Wetland Sediments

As described in Section 2.3, wetland areas in the northern and southwestern portion of the Site are generally not contiguous. Ponded water in these wetland areas is seasonally present. No visible drainage from these features has been observed. The wetland areas resulting from ponded storm water drainage and groundwater discharge are underlain by a layer of organic-rich alluvial soil (referred to as wetland sediments). Grain size distribution of two of the three composite samples suggests that the sediments consist primarily of fines (mostly silt) and sand (52 to 53 % and 37 to 42 %, respectively). The third composite sample is well graded, with 30 % gravel, 47 % sand, and 23% fines. Grain size distribution results for sediments are summarized in Table 4-4.

The three composite samples collected from the wetland sediments were also analyzed for leachable pH and TOC. Results of the analyses are presented in Table 4-4. Leachable pH ranged from 5.1 (composite 175) to 6.5 (composite 174) indicating a weakly acid soil. Wetland sediment TOC results ranged from 1.4% (composite D) to 7.9% (composite 152).

4.5.4.3 Native subsurface soils

Grain size analysis was conducted on native soils taken from borings of newly installed monitoring wells at the approximate center of the screened interval. The grain size distribution analysis of seven samples is summarized in Table 4-4. Results of the shallow monitoring well soil analysis indicate that soils are primarily sand (56 to 62 %), with some fines (mostly silt) (17 to 30 %) and fine gravel (9 to 27 %) in three of the four samples; however, one of the three shallow samples was primarily silt (56 %) with some sand (30 %) and gravel (10%). Results of the lacustrine soil sample analyses indicate the sample is primarily silt (68 to 83 %), with some fine sand (5 to 29 %) and clay (3 to 12 %). Native subsurface soils were also analyzed for TOC, leachable pH and manganese content. TOC percentages ranged from 0.24% (MW-3SR) to 1.2% (MW-9D). Leachable pH analysis performed on native subsurface materials yielded a range of 7.8 (MW-7S and MW-8S) to 8.2 (MW-8D) indicating slightly alkaline soil conditions within the saturated zone. Manganese concentrations in the native subsurface soils range from 210 mg/kg (MW-8D) to 561 mg/kg (MW-8S) and are generally not considered to be elevated.

Subsurface soils were analyzed for Cation Exchange Capacity (CEC) and ranged from 0.9 meq/100g at MW-8D to 19.2 meq/100g at the upgradient MW-9D location. CEC is a direct

measure of the amount of positively charged ions (cations) able to be retained by the soil matrix. CEC is directly related to the amount of organic matter and clay content of the soil. The CEC result of 19.2 meq/100g for MW-9D is reflective of the relatively high organic content of the soil (1.2% TOC) and the clay content of the soil (12.2%). Comparatively, MW-8D returned a low CEC value (0.9 meq/100g) yielding 0.28% TOC and 3.0 % clay. Higher CEC values indicate an increase in the soil's ability to retain cations such as sodium, magnesium, calcium, and other positively charged ions. The absence of trace metals such as arsenic, zinc, magnesium and chromium in downgradient groundwater samples suggests that the lacustrine sediments, which tend to have a higher clay and TOC content than the outwash deposits, may have a higher capacity to bind with these cations.

5.0 CHEMICAL PRESENCE IN SITE MEDIA

The results of the sampling and analytical programs described in Section 3.0 are presented in this section. The following subsections describe the chemical analytical results for the following media:

- Waste fill;
- Surface and subsurface soil;
- Groundwater;
- Wetland surface water;
- Wetland sediments, and
- Soil vapor.

The laboratory analytical data for each media sampled are summarized in Tables 5-1 through 5-13. The data tables include appropriate regulatory comparison criteria. The comparison criteria for soil samples include: USEPA Soil Screening Level Guidance, USEPA Region 9 Preliminary Remediation Goals for Industrial Soil, Eastern USA Background Metals provided in NYSDEC TAGM #4046, and Site Background concentrations. The comparison criteria for groundwater samples include: USEPA Region 9 Preliminary Remediation Goals for Tap Water and NYSDEC Ambient Water Quality Standards and Guidance in Technical and Operational Guidance Series (TOGS). The comparison criterion for surface water samples is the NYSDEC TOGS. The comparison criterion for wetland sediment samples is the NYSDEC Technical Guidance for Screening Contaminated Sediments and Site Background. The referenced summary tables highlight concentrations that exceed comparison criteria. Where multiple comparison criteria exist, concentrations above the highest comparison criteria for the media being discussed are highlighted. This approach is appropriate for the Peter Cooper Site Markhams Site because all of the identified comparison criteria do not exist for many of the compounds analyzed and selecting a single comparison criterion for each dataset could lead to a false interpretation of results. All parameters that exceed comparison criteria are discussed in the text. The text and analytical summary tables, collectively, should be used to assess chemical presence at the Site.

5.1 WASTE FILL

Chemical analytical results for waste fill samples collected from borings B-4, B-5 and B-6 and analyzed for total and leachable (SPLP) metal COPCs (arsenic, chromium, and hexavalent chromium) are summarized in Table 5-1. A summary discussion of the analytical results follows.

The range of detected metal COPC concentrations in the waste fill is:

Arsenic	9.1 to 65.6 mg/kg;
Chromium	4,490 to 31,200 mg/kg; and
Hexavalent Chromium	4.7 mg/kg.

For comparison, the range of concentrations of these constituents detected in waste fill samples collected by OBG during the 1989 RI and by Malcolm Pirnie during the 1993 SSI is:

	1989 OBG RI	1993 SSI
Arsenic	7.1 to 10 mg/kg	1.1 to 25 mg/kg
Chromium	4,600 to 46,000 mg/kg	946 to 26,800 mg/kg

The range of concentrations detected historically are comparable to those detected during this RI. Hexavalent chromium was not analyzed in waste samples during previous investigations. Chromium was elevated compared to all soil comparison criteria. Arsenic was elevated compared to all soil comparison criteria in two of three samples. At B-4, the arsenic in the fill exceeded the USEPA Region 9 PRG and site background.

Analysis of leachable metal COPCs by SPLP detected the following concentrations:

Arsenic	14.2 μg/L;
Chromium	226 to 1,010 μg/L; and
Hexavalent Chromium	22.0 μg/L.

These results suggest that low concentrations of metal COPCs can leach from the waste fill. Leached constituents would become subject to attenuation processes present in the subsurface environment. Each of these values is less than one or more of the groundwater criteria discussed in Section 5.3.

5.2 SOIL

Chemical data for soil samples collected during this RI are presented in the following sub-sections. Chemical data for soil samples collected during investigations prior to this RI are provided in Appendix A. U.S. EPA Region 9 Preliminary Remediation Goals (PRGs) for industrial soil (October, 2004) and NYSDEC background metals concentrations in soil from Technical and Administrative Guidance Memorandum (TAGM) #4046 for Eastern USA are presented for comparison. In addition, U.S. EPA soil screening levels (SSLs) for migration to

groundwater (with a dilution attenuation factor of 20) are also provided to assess the potential for chemical migration to groundwater via leaching from soil. Since SSLs are theoretically derived values utilizing many assumptions, groundwater analytical data provide better indicators of groundwater quality impact from chemical presence in soil.

Values shaded on the data summary tables are concentrations detected above all listed soil criteria. Parameter concentrations detected above all listed soil criteria are shown on Figure 5-1 and 5-2.

5.2.1 Surface Soil

Background surface soil samples were collected from locations northwest of the fill piles, as described in Section 3.2. Surface soil samples were collected from the cover soil on top of the fill piles and from the perimeter of the fill piles. Figure 5-1 illustrates the distribution of metal COPCs in surface soil samples detected above all comparative soil criteria.

5.2.1.1 Background Surface Soil

Background surface soil samples were collected at six locations and analyzed for arsenic and chromium. The analytical results are summarized in Table 5-2. Background concentrations of arsenic and chromium are as follows:

Arsenic	ND (not detected) to 8.1 mg/kg
Chromium	7.8 to 31.8 mg/kg

Similar locations representative of background surface soils were analyses during the 1989 OBG RI. The range of detected concentrations is:

Arsenic	1.6 to 7.4 mg/kg
Chromium	8.6 to 17 mg/kg

The concentrations detected during this RI and the 1989 OBG RI indicate background concentrations of metal COPCs are within the range of Eastern US Background metals concentrations presented in NYSDEC TAGM #4046. During this RI, five of the six background samples analyzed reported arsenic concentrations above the USEPA Region 9 PRG.

5.2.1.2 Cover Surface Soil Samples from Top of Fill Piles

Nine surface soil samples were collected from the cover of the fill piles and analyzed for metal COPCs. Sample results are summarized in Table 5-3 and compared to Eastern US Background concentrations presented in TAGM #4046, U.S. EPA Region 9 PRGs for industrial soils, U.S. EPA Soil Screening Levels (SSLs), and Site background levels, collectively referred to as soil criteria.

Arsenic concentrations in two of the nine soil samples and chromium concentrations detected in all cover surface soil samples were above all soil criteria. Hexavalent chromium concentrations were detected above soil criteria SSLs in two of the five samples re-analyzed for hexavalent chromium. The concentration range of constituents detected above all soil criteria is:

Arsenic	30.2 to 95.5 mg/kg; and
Chromium	1,440 to 65,300 mg/kg.

Figure 5-1 identifies sample locations with analyte concentrations above all soil criteria. All samples analyzed for chromium reported concentrations above all comparison criteria. Arsenic was detected above Eastern US and site background in five of nine samples.

5.2.1.3 Perimeter Surface Soil Samples Surrounding Fill Piles

A total of 48 discrete surface soil samples were collected adjacent to and down-gradient from the waste fill piles. All samples were analyzed for metal COPCs (arsenic, chromium, hexavalent chromium). Ten of the samples were also analyzed for TCL VOCs and TCL SVOCs. The analytical results are summarized in Table 5-4 and Table 5-5. No VOCs were detected above soil criteria.

Five perimeter soil samples detected low concentrations of SVOCs:

Constituent	Result	PRG	SSL
Benzo(a)anthracene	20 to 27 µg/kg	2.1 µg/kg	2.0 µg/kg
Benzo(b)fluoranthene	38 to 82 µg/kg	2.1 µg/kg	5.0 µg/kg
Benzo(k)fluoranthene	28 to 41 µg/kg	21 µg/kg	49 µg/kg
Benzo(a)pyrene	22 to 71 µg/kg	0.21 µg/kg	8.0 µg/kg
Indeno(1,2,3-cd)pyrene	40 µg/kg	2.1 µg/kg	14 µg/kg

As a group of chemicals, the SVOCs detected are known as polynuclear aromatic hydrocarbons (PAHs). PAHs are most frequently associated with deposition of emission by-products from petroleum fuel combustion.

The concentration range of metal COPCs in perimeter surface soil samples is:

Arsenic	1.9 to 55.1 mg/kg;
Chromium	7.1 to 11,800 mg/kg; and
Hexavalent Chromium	ND to 33.0 mg/kg.

All of the 48 sample analyzed for arsenic detected concentrations above the PRG soil criteria of 1.6 mg/kg (background arsenic concentrations are also present above PRG soil criteria). Of these samples, 42 samples were within Site background or the Eastern USA background range. Four samples were above the background range for arsenic but below the SSL of 29 mg/kg. Concentrations detected in two samples were above all comparative soil criteria for arsenic (background, SSL, and PRG) at concentrations of 55.1 and 35.6 mg/kg (at locations 127 and 128, respectively).

A total of 10 sample locations (out of 48) analyzed for chromium were detected above all comparative soil criteria. An additional five samples were detected above background and SSL criteria, but below the PRG soil criteria of 450 mg/kg.

Hexavalent chromium concentrations were not detected above PRGs (64 mg/kg) or SSLs (38 mg/kg). It is important to note that, as discussed in Section 3.7, many of the soil samples analyzed for hexavalent chromium were rejected by the data validator. However, the majority of samples having chromium concentrations above the PRG of 64 mg/kg were re-sampled and re-analyzed for both total and hexavalent chromium and none of the detected hexavalent chromium concentrations were above comparison criteria.

Figure 5-2 identifies sample locations with analyte concentrations above all comparative soil criteria.

Perimeter area surface soil sample results from previous investigations indicate metal COPC concentrations as follows:

	1985 Phase II	1989 OBG RI	1993 SSI
Arsenic (mg/kg)	9.2 to 20.2	5.4 to 21	11.6 to 12.9

Chromium (mg/kg)	42.7 to 25,400	12 to 29,900	337 to 18,100
Hexavalent Chromium (mg/kg)	NA	< 0.1 to 612	NA

These results are generally similar to those presented in this RI.

5.2.2 Subsurface Soil

Subsurface soil samples were collected from the perimeter of the fill piles and from monitoring well and soil boring locations, as described in Section 3.2. Analytical results are discussed below.

5.2.2.1 Subsurface Soil Samples from Perimeters of Fill Piles

Perimeter area subsurface soil samples were collected at 29 sample locations from depths of 6 to 12 inches bgs and analyzed for metal COPCs (arsenic, chromium, and hexavalent chromium). Table 5-6 summarizes the analytical results for perimeter area subsurface soil samples.

The range of detected metal COPC concentrations in the subsurface samples is:

Arsenic	3.7 to 28.9 mg/kg;
Chromium	13.9 to 19,700 mg/kg; and
Hexavalent Chromium	Not Detected.

None of the arsenic concentrations detected in the soil were above all soil criteria. Of the 29 samples, concentrations of 23 samples were detected within background levels. Arsenic concentrations detected in six of the 29 samples were above the background range but below the SSL of 29 mg/kg.

Analysis of nine of the 29 samples detected chromium concentrations above all soil criteria. Concentrations of an additional five samples were detected above the background range and SSLs for chromium.

Hexavalent chromium was not detected in any of the perimeter subsurface soil samples. All of the hexavalent chromium data were considered valid by the data validator. Figure 5-2 identifies sample locations with analyte concentrations above soil criteria.

Samples collected from similar locations and depths (9 to 12 inches BGS) during previous investigations (1989 RI only), were analyzed for arsenic, chromium and hexavalent chromium. The detected range of concentrations was:

Arsenic	9.3 to 20 mg/kg;
Chromium	11 to 10,050 mg/kg; and
Hexavalent Chromium	ND to 59 mg/kg.

Results from the current RI for arsenic and chromium are comparable to 1989 OBG RI data. The detected hexavalent chromium concentrations were below the PRG criteria of 64 mg/kg.

5.2.2.2 Subsurface Soil Samples from Monitoring Well and Soil Boring Locations

Native soil samples (non-waste fill) were collected below waste fill from four soil borings (B-1A, B-4, B-5, and B-6) at three depth discrete intervals: 1. immediately below the below the waste fill/native soil interface, 2. the subsequent one foot incremental depth, and 3. soil immediately above the water table, as described in Section 3.2. A subsurface soil sample was also collected from the unsaturated zone (1 foot above the water table) at monitoring well location MW-8S. Each of the depth discrete native soil samples were analyzed for metal COPCs (arsenic, chromium, and hexavalent chromium). A summary of the analytical results is presented in Table 5-7.

Arsenic concentrations were detected within or near the range of values considered representative of background. Chromium concentrations were detected above all soil criteria at two boring locations: B-4 (16 to 17 feet below ground surface {depth interval of 1 to 2 feet below the waste fill}), and B-6 (7.5 to 8.5 feet below ground surface {depth interval of 1 to 2 feet below the waste fill}). The chromium concentration at these locations ranged from 1,150 to 5,860 mg/kg at B-4 and B-6, respectively. Chromium concentrations below these sample depths were within background levels. Hexavalent chromium was not detected in any of the samples analyzed. Figure 5-2 identifies sample locations with analyte concentrations above soil criteria.

These data indicate that metal COPCs have not migrated substantially in native soil below the bottom of the waste fill piles.

Similar native subsurface soil samples were not collected during the 1989 OBG RI or the 1993 SSL. Analytical data presented in 1985 RECRA Phase II indicated samples were collected

from depths of ranging from six to 18 feet at eight sample locations and analyzed for arsenic and chromium. The detected concentration range is:

Arsenic	5.2 to 11.7 mg/kg; and
Chromium	4.9 to 1,290 mg/kg.

5.3 GROUNDWATER

Groundwater samples were collected from shallow and deep overburden monitoring wells during November 2001 and April 2002 sampling events. The groundwater sampling rationale is described in Section 3.3. Groundwater samples were analyzed for TCL VOCs, TCL SVOCs, TAL metals, and geochemical and field-measured parameters during the first event. A U.S. EPA-approved select analyte list was analyzed for during the second event. The select analyte list included: TCL VOCs, metal COPCs, ammonia, nitrate, sulfate, and field measured parameters. The analytical results are summarized in Table 5-8 and 5-9 for shallow and deep overburden monitoring wells, respectively. Groundwater criteria applicable for analyte detection comparisons include New York State Division of Water Technical and Operational Guidance Series (TOGS) Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, June 1998 and U.S. EPA Region 9 Tap Water PRGs. These are collectively referred to as groundwater criteria. The groundwater both regionally and locally to the Site has a New York State designation of Class GA.

Figure 5-3 identifies sample locations with analyte concentrations above groundwater criteria. Results are discussed in the following sections.

5.3.1 Shallow Overburden Groundwater

Shallow overburden groundwater samples were collected from nine monitoring wells at the Site. During the first sampling event (November 5 to 8, 2001), monitoring well MW-4S was not sampled because the well was dry. Samples collected from monitoring well MW-2S were analyzed for metals only due to very low well volume and slow recharge. All monitoring wells were sampled during the second sampling event (April 22 to 25, 2002). Groundwater data for monitoring well MW-9S and MW-9D are representative of background water quality since the well pair is located upgradient of the waste fill piles.

Two VOCs were detected above comparison groundwater criteria at two downgradient monitoring wells; MW-2S and MW-8S. The groundwater sample collected from MW-2S

during the second sampling event contained the following VOC at a concentration above groundwater criteria:

	Result	TOGS	PRG
Benzene	1.8 µg/L	1 µg/L	0.34 µg/L

Analyses of groundwater samples collected during the first and second sampling events from MW-8S detected the analytes above groundwater criteria for one VOC:

	Results	TOGS	PRG
Trichloroethene	4.2 and 2.8 µg/L	5 µg/L	0.028 µg/L

Among the TCL SVOCs, Benzo(b)fluoranthene and Bis(2-ethylhexyl)phthalate were detected at concentrations above groundwater criteria in samples from MW-8S and MW-6S, respectively, during the first sampling event, as follows:

	Result	TOGS	PRG
Benzo(b)fluoranthene	0.6 µg/L	0.002	0.092
Bis(2-ethylhexyl)phthalate	5 µg/L	5 µg/L	4.8 µg/L

Additionally, phenol was detected at a concentration above groundwater criteria in a sample from MW-2S during the second sampling event, as follows:

	Result	TOGS	PRG
Phenol	2 µg/L	1 µg/L	22,000 µg/L

A selected list of organic compounds were analyzed for in samples from monitoring wells MW-1S, MW-3S and MW-6S during previous investigations (1989 OBG RI only). Organic compounds were not detected above groundwater criteria for any of the TCL VOCs or SVOCs.

TAL metals were detected above groundwater criteria in several samples. A number of monitoring wells sampled during the first sampling event (excluding MW-2S, discussed below) resulted in detection of iron, magnesium, and/or manganese, as follows:

	Results	TOGS	PRG
Iron	326 to 11,100 µg/L	300 µg/L	11,000 µg/L
Magnesium	36,900 to 96,400 µg/L	35,000 µg/L	No Criteria (NC)
Manganese	4,220 to 15,000 µg/L	300 µg/L	880 µg/L

Additionally, one sample from monitoring well MW-7S (first sampling event) resulted in an exceedance of sodium, as follows:

Sodium	27,800 µg/L

The TOG groundwater criterion for sodium is 20,000 µg/L. No PRG criteria was available for this parameter.

Samples collected from monitoring well MW-2S during both sampling events were anomalous compared to past samples collected from this well and compared to all other groundwater samples collected at the Site. Results for samples from MW-2S for the first sampling event are as follows:

	Results	TOG	PRG
Aluminum	36,000 µg/L	NC	36,000 µg/L
Antimony	72.6 µg/L	3 µg/L	15 µg/L
Arsenic	133 µg/L	25 µg/L	0.045 µg/L
Cadmium	50.1 µg/L	5 µg/L	18 µg/L
Chromium	981µg/L	50 µg/L	55,000 µg/L
Copper	2,220 µg/L	200 µg/L	1,500 µg/L
Iron	3,160,000 µg/L	300 µg/L	11,000 µg/L
Lead	1,020 µg/L	25 µg/L	NA
Magnesium	39,400 µg/L	35,000 µg/L	NA
Manganese	9,800 µg/L	300 µg/L	880 µg/L
Nickel	2,820 µg/L	100 µg/L	730 µg/L
Selenium	39.2 µg/L	10 µg/L	180 µg/L
Thallium	1,300 µg/L	0.5 µg/L	2.4 µg/L
Zinc	146,000 µg/L	2,000 µg/L	11,000 µg/L

It is noted that all of the MW-2S results above were qualified as estimated by the data validator, due to outlying correlations evaluated for serial dilution and suspected matrix effects. The

sample turbidity was measured in the field at 110 NTUs. The elevated turbidity value indicates a high degree of suspended solids which imparts a high bias for metals analytical results. Results for samples from MW-2S for the second sampling event are as follows:

	Results	TOG	PRG
Iron	94,300 µg/L	300 µg/L	11,000 µg/L
Lead	29.1 µg/L	25 µg/L	NC
Manganese	804 µg/L	300 µg/L	880 µg/L
Thallium	13.5 µg/L	0.5 µg/L	2.4 µg/L
Zinc	3,090 µg/L	2,000 µg/L	11,000 µg/L

The metals analytical results for MW-2S also vary significantly between the November 2001 and April 2002 sampling events which suggests the well is not yielding representative samples. Furthermore, the metals concentrations are far higher than historically measured in this well. A comparison of metal analytical results for samples collected previously from the well in 1987 and 1988 by OBG and analyzed for arsenic, chromium, hexavalent chromium, and zinc indicated concentrations of these constituents were either not detected or detected at significantly lower concentrations than those detected during this RI. The sample turbidity was measured by the laboratory at 262 NTUs. Similar to the November 2001 sampling event, the elevated turbidity value indicates a high degree of suspended solids which imparts a high bias for metals analytical results.

The difficulty in obtaining representative samples from MW-2S may be related to its age and construction materials. The well was installed more than twenty years ago during the 1984 RECRA Environmental investigation. It is constructed with a carbon-steel riser having a wire-wrap well screen. Only one other well used in the RI, MW-4S, has this construction (the newer wells are constructed of PVC) and it was not sampled for most of the metals because it was dry during the first RI sampling event. Considering the age and construction of MW-2S and the extremely high and extremely variable concentrations of iron and other metals in the RI samples, it appears that water samples from this well are no longer representative of groundwater quality in the surrounding formation.

Comparison of results with those from MW-2D provide further evidence that MW-2S no longer yields representative samples. MW-2D is co-located with MW-2S and monitors an interval approximately 10 feet beneath that monitored by MW-2S. However, it has the newer well construction consisting of PVC well screen and riser. There is no confining layer which

would provide a barrier to groundwater flow between the intervals monitored by the two wells. That said, metals concentrations, and in particular naturally occurring metals concentrations, would be expected to be similar in samples collected from the two wells (as is generally seen in other paired wells across the Site). However, metals concentrations were not elevated in MW-2D and were in fact orders of magnitude lower in comparison to MW-2S. Such a large concentration gradient over 10 feet in granular soil is unlikely.

These findings show that MW-2S is not yielding representative samples. Therefore, data from MW-2S is not acceptable for use in this RI.

Hexavalent chromium was not detected in any of the groundwater samples.

Analysis of groundwater samples collected from six shallow monitoring wells (MW-1S through MW-6S) during the 1989 OBG RI detected arsenic and chromium above groundwater criteria in several wells. A summary of the range of results exceeding groundwater criteria for metals from the 1989 RI investigation is as follows:

Arsenic	5 to 80 µg/L; and
Chromium	50 to 230 µg/L.

Unlike the 1989 RI, arsenic and chromium were only detected above groundwater criteria in one monitoring well (MW-2S) during this RI.

Other geochemical parameters resulting in concentrations above groundwater criteria in monitoring well samples included ammonia, nitrate and sulfate, as follows:

	Results	TOG	PRG
Ammonia	2.0 to 2.9 mg/L	2 mg/L	No Criterion (NC)
Nitrate	12.4 to 50.9 mg/L	10 mg/L	10 mg/L
Sulfate	309 to 1,060 mg/L	250 mg/L	NC

Sulfate was analyzed for in one shallow groundwater sample from monitoring well MW-1S during the 1989 OBG RI. The sample result (840 mg/L) was similar to results obtained during the RI, as summarized above.

The geochemical parameters were used to evaluate chemical fate and compare upgradient water quality parameters to constituents detected in downgradient groundwater. The geochemical data are presented in Table 5-10, and summarized briefly as follows:

Ammonia concentrations ranged from < 0.10 to 2.9 mg/L, with highest concentration (above groundwater criteria of 2 mg/L) at MW-1S and MW-6S. Ammonia was not detected in the upgradient shallow monitoring well.

Bicarbonate is the form of alkalinity detected in groundwater with concentrations ranging from 143 to 446 mg/L in downgradient wells. Alkalinity bicarbonate concentrations in the upgradient well is lower (131 mg/L).

Nitrate concentrations ranged from < 0.5 to 50.9 mg/L, with greatest concentration (above groundwater criteria of 10 mg/L) at MW-1S, MW-4S, MW-6S, and MW-8S. Nitrate was also detected upgradient of the Site in MW-9S at a maximum concentration of 9.3 mg/L. Nitrate is a common component of agricultural fertilizers.

Sulfate concentrations ranged from 25.6 to 1,060 mg/L, with greatest concentration (above groundwater criteria of 250 mg/L) at MW-1S, MW-4S, MW-5S, MW-6S, and MW-7S. The maximum detected sulfate concentration in upgradient groundwater at MW-9S was 40 mg/L.

Sulfide was not detected, ORP readings ranged from 1.8 to 252 mV, and dissolved oxygen (DO) concentrations ranged from 0.04 to 8.41 mg/L (concentrations less than 1 mg/L were measured in MW-1S, MW-6S, MW-7S, and MW-8S). The absence of sulfide, the lack of negative ORP readings, and presence of DO indicate subsurface redox conditions are not anaerobic.

TDS ranged from 185 to 2,100 mg/L in downgradient wells, with the greatest concentrations (>1,000 mg/L) at MW-1S, MW-5S, MW-6S, and MW-7S. The TDS concentration in the upgradient well was 232 mg/L.

TOC concentrations in downgradient wells ranged from 1.0 to 15.7 mg/L. Upgradient TOC in the upgradient well was 1.2 mg/L;

Ferrous iron concentrations measured in the field ranged from non-detection to 8.1 mg/L, with the greatest concentrations (> 6 mg/L) at MW-1S and MW-7S.

5.3.2 Deeper Overburden Groundwater

Deeper overburden groundwater samples were collected from nine monitoring wells at the Site. All wells were sampled during the first and second sampling events, on November 5 to 8, 2001

and April 22 to 26, 2002, respectively. Groundwater samples were analyzed for the same sample analyte list as the shallow wells. The analytical results are summarized in Table 5-9. Results analytes detected at concentrations above applicable groundwater criteria are discussed below.

One VOC was detected above groundwater criteria in monitoring well MW-7D during the first sampling event, as follows:

Acetone	74 µg/L

This result is above the TOGS groundwater criterion of 50 µg/L, but is below the PRG groundwater criterion of 610 µg/L. Acetone was not detected in monitoring well MW-7D during the second sampling event. Since acetone was not detected during the second sampling event, (which would have provided confirmation of the detection), it is possible that the acetone detection was an artifact of laboratory contamination.

One SVOC, Bis(2-ethylhexyl)phthalate {BEHP} (19 µg/L), was detected above groundwater criteria in upgradient monitoring well MW-9D during the first sampling event and BEHP compound presence may be an artifact of using sampling equipment containing plastic. This concentration is above TOGS and PRG groundwater criteria of 5.0 and 4.8 µg/L, respectively. SVOCs in deep groundwater samples were not analyzed during the second sampling event. During the 1989 OBG RI, organic compounds were not detected in samples collected two deep wells sampled (MW-3D2 and MW-6D).

The metals analysis (total metals) resulted in detection above groundwater criteria for iron, magnesium, manganese, and sodium in a number of wells during the first sampling event, as follows:

	Results	TOG	PRG
Iron	413 to 15,500 µg/L	300 µg/L	11,000 µg/L
Magnesium	40,800 to 125, 000 µg/L	35,000 µg/L	NC
Manganese	337 to 2,330 µg/L	300 µg/L	880 µg/L
Sodium	20,700 to 22,300 µg/L	20,000 µg/L	NC

Hexavalent chromium was detected in one groundwater sample collected from monitoring well MW-5D during the first sampling event, as follows:

Hexavalent Chromium 321 µg/L.

This result exceeds TOG and PRG groundwater criteria of 50 µg/L and 110 µg/L, respectively. However, the result was flagged as estimated by the laboratory and the detected presence was not confirmed during the second sampling event nor was it detected in shallow groundwater.

Total metals in groundwater samples from deep monitoring wells were not analyzed during the second sampling event. Only total metal COPCs (arsenic, chromium, and hexavalent chromium) were analyzed during the second sampling event and were not detected above groundwater criteria in any of the deep monitoring wells.

Due to elevated sample turbidity, a filtered metals sample was collected from deep monitoring well MW-2D during the first sampling event, which resulted in detections above groundwater criteria for two metals (soluble), as follows:

	Results	TOG	PRG
Iron	351 µg/L	300 µg/L	11,000 µg/L
Selenium	10.6 µg/L	10 µg/L	180 µg/L

The detection of selenium is suspect since it was not detected in the unfiltered sample. The detection of iron in the filtered sample at a concentration about an order of magnitude lower than the unfiltered sample indicates suspended particulate matter affected the iron concentration in the unfiltered sample. Metal COPCs, both total and soluble were analyzed for in the sample collected from MW-2D. Metal COPCs were not detected in either sample.

Geochemical parameters resulting in concentrations above groundwater criteria in deep monitoring well samples included ammonia and sulfate, as follows:

	Results	TOG	PRG
Ammonia	ND to 150 mg/L	2 mg/L	NC
Sulfate	8.5 to 1,040 mg/L	250 mg/L	NC

The highest concentrations of these constituents were detected directly downgradient of waste fill piles at MW-1D and MW-6D. Nitrate was not detected in samples collected from the deep overburden wells.

Other geochemical data are presented in Table 5-9, and summarized briefly as follows:

Alkalinity (bicarbonate) concentrations ranged from 135 to 608 mg/L in downgradient deep wells. Alkalinity bicarbonate concentrations in the upgradient well is lower (108 mg/L) and similar to the shallow well.

Sulfate concentrations ranged from 8.5 (MW-3D2) to 1,040 mg/L (MW-6D), with greatest concentration (above groundwater criteria of 250 mg/L) at MW-1D, MW-5D, MW-6D, and MW-7D. The maximum detected sulfate concentration in upgradient groundwater at MW-9S was 40 mg/L - similar to sulfate levels in the shallow zone.

Nitrate and sulfide were not detected in the deep wells.

TDS ranged from 133 to 1,770 mg/L, with greatest concentration (> 970 mg/L) at MW-1D, MW-5D, MW-6D, and MW-7D; concentrations were below 225 mg/L in all other wells.

TOC concentrations ranged from 4.1 to 17.8 mg/L.

Dissolved oxygen concentrations ranged from 0.03 to 1.2 mg/L, with all but one sample (MW-3DR, first monitoring event) at concentrations less than 1 mg/L during both sampling events. ORP readings ranged from 32 to 399 mV, with no negative readings. These data suggest weak aerobic conditions are present in deeper groundwater.

Ferrous iron concentrations measured in the field ranged from non-detection to 7 mg/L, with the greatest concentrations (> 4.5 mg/L) in downgradient wells MW-1D, MW-5D, and MW-7D.

5.4 SURFACE WATER

Surface water samples were collected from wetland areas at the Site. Two locations in Wetland F (SW-1 and SW-2) and one location in Wetland B (SW-3) were sampled on December 3, 2001, and April 24 to 25, 2002. Wetland D was dry during the December 2001 sampling event, but surface water present in April 2002 was sampled (SW-4). Wetland surface water samples were analyzed for metal COPCs and geochemical parameters. Analytical data are summarized in Table 5-10. Surface water criteria for applicable analyte detection comparisons are found in New York State Division of Water Technical and Operational Guidance Series (TOGS) Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, June 1998.

Arsenic and total chromium were not detected in the surface water samples. However, hexavalent chromium was detected at 13.0 μg/L in the sample analyzed from SW-2 during the first round. Its detected presence is questionable since total chromium was not detected in the sample above the reporting limit of 10 μg/L. The second round of sampling did not confirm the presence of hexavalent chromium in the surface water. Results are summarized in Figure 5-3.

Among the geochemical parameters analyzed for in the surface water samples, sulfate levels in surface water samples collected from Wetland F were higher than other surface water sample locations - sulfate concentrations ranged from 83.2 mg/L to 337 mg/L. The sulfate concentration in sample SW-1 detected during the first sampling event was above surface water criteria. However, the sulfate concentration was below surface water criteria during the second sampling event. In Wetlands B and D, sulfate concentrations ranged from 18.2 mg/L to 34.5 mg/L. Surface water in Wetland F receives groundwater discharge with elevated sulfate concentrations. Sulfide was not detected in any of the surface water samples. Results for other geochemical parameter are summarized below:

Ammonia was detected during the second sampling event in sample SW-2 at a concentration of 0.11 mg/L. Ammonia was not detected at that location during the first event nor at other surface water sample locations.

Nitrate concentrations ranged from < 0.5 to 5.6 mg/L.

TDS concentrations ranged from 111 to 603 mg/L.

TOC concentrations ranged from 17.8 to 33.0 mg/L.

Dissolved oxygen concentrations ranged from 0.66 to 11.8 mg/L, with the higher range (7.03 to 11.8 mg/L) observed during the first sampling event, and the lower range (0.66 to 1.09 mg/L) observed during the second sampling event.

5.5 WETLAND SEDIMENT

Background wetland sediment samples and sediment samples near the waste fill piles were collected from locations shown on Plate 1. Background wetland sediment samples were collected at nine sample locations during the first sampling event on October 15, 2001, and

analyzed for arsenic and chromium. Sample results are summarized in Table 5-11. The range of concentrations detected in the background sediment samples is:

Arsenic	< 1.4 to 10.3 mg/kg
Chromium	7.8 to 23.1 mg/kg

For comparison purposes, the Low Effect Level (LEL) and Severe Effect Level (SEL) sediment quality guideline values presented in NYSDEC Division of Fish, Wildlife, and Marine Resources Technical Guidance for Screening Contaminated Sediments were provided for arsenic and chromium. As shown in Table 5-11, five of the nine background sediment samples analyzed for arsenic were within the range of the LEL and SEL. All chromium concentrations were below the LEL.

A sediment sample considered representative of wetland sediment background (Sample 17) was collected during the 1989 OBG RI. The detected concentrations of arsenic and chromium are as follows:

Arsenic	25 mg/kg
Chromium	31 mg/kg.

Including these values into the range of wetland sediment background values for the Markhams Site provides a range of:

Arsenic	< 1.4 to 25 mg/kg
Chromium	7.8 to 31 mg/kg

Fourteen sediment samples were collected from wetland areas near and downgradient from the waste fill piles during the initial sampling event on October 15, 2002, and analyzed for metal COPCs (arsenic, chromium, and hexavalent chromium). The results are summarized in Table 5-12.

The range of metal COPCs detected in wetland sediments is:

Arsenic	2.3 to 11.4 mg/kg
Chromium	9.2 to 215 mg/kg
Hexavalent Chromium	1.3 to 18.3 mg/kg.

Chromium concentrations in two of the 14 wetland sediment samples were detected above background and sediment criteria. None of the arsenic concentrations were detected above

background or sediment criteria. Hexavalent chromium was detected in two of the sediment samples and these were detected during the supplemental soil sampling event to assess the significance of the hexavalent chromium data rejection (three of the 14 sample locations needed to be resampled based on the total chromium concentrations exceeding sediment or soil criteria). A sediment quality criterion is not available for hexavalent chromium. The detection of hexavalent chromium at these two locations correlates with total chromium detections above sediment criteria. At all other sample locations, total chromium concentrations were below sediment criteria. Figure 5-4 identifies sample locations above sediment criteria.

Section 4.5.3 describes Wetland F as the receptor of groundwater discharge from the Site. Metal COPCs detected in samples collected from the wetland were not elevated compared to Site background.

5.6 SOIL VAPOR

Field-measured soil vapor samples were analyzed using a calibrated multi-gas meter at gas probe (GPZ-1) during the initial monitoring event of the RI (November 5, 2001) and the other during the second monitoring event (April 22, 2002). Sample results are presented in Table 5-13. The soil vapor monitoring data are summarized as follows:

The lower explosive limit (percent of methane in air) exceeded the range of the instrument (0 to 5% methane) in all samples.

Hydrogen sulfide was detected at low levels (1 to 4 ppm) during the first monitoring event, and ranged from 195 to 305 ppm during the second monitoring event.

Oxygen content was detected near 0% (0.4 to 0.9 %) during the first monitoring event, and ranged from 6.1 to 9.8 % during the second monitoring event.

Carbon monoxide was detected at low levels (3 to 6 ppm) during the first monitoring event and ranged from 103 to 185 ppm during the second monitoring event.

No vapors were detected in ambient air on or near the waste fill piles.

6.0 CHEMICAL MIGRATION ASSESSMENT

The results of the chemical analyses were incorporated with the characterization of the physical setting of the Site to evaluate the fate and transport of chemical constituents in Site media. There are a number of mechanisms by which the chemicals can migrate to other areas or media. These mechanisms are briefly outlined below.

Fugitive Dust Generation: Non-volatile chemicals present in soil can be released to ambient air as a result of fugitive dust generation. Although the majority of the site is covered by vegetation that would prevent the re-suspension of surface soil particles, there has been some erosion of surface cover on some of the fill piles. In addition, the use of recreational vehicles on-site may re-suspend surface soil into the air. Consequently, this pathway is potentially relevant under current land use. Under a hypothetical future industrial land use, the majority of the Site would be covered by industrial or commercial structures, asphalt parking areas, grassed lawn and/or ornamental landscaping. However, the extent of surface cover cannot be predicted. Further, fugitive dusts may also be generated during excavation for new construction. Therefore, this migration pathway is potentially relevant under future land use.

Volatilization: Volatile chemicals in soil and groundwater may be released to ambient air through volatilization either through the soil or waste fill. There are no volatile COPCs in soil at the Site. Therefore, the release of these chemicals from soil is not relevant to the Site. Two volatile COPCs were detected at low concentrations in groundwater at the Site. Therefore, the groundwater-to-air pathway may be relevant.

Surface Water Runoff: Chemicals present in on-site soil could be released to adjacent wetland areas as a result of surface water runoff. Thick grasses and abundant vegetation across the majority of the site minimize off-site transport via storm water runoff. Therefore, this migration pathway is potentially relevant.

Leaching (percolation): Chemicals present in surface and subsurface soil may migrate downward to groundwater as a result of infiltration of precipitation. Chemicals from the Site have entered groundwater in the overburden. Therefore, this migration pathway is potentially relevant.

Groundwater Transport: Groundwater underlying the site discharges to adjacent wetlands. Chemicals present in groundwater may be transported to surface water and sediment via this pathway. Therefore, this migration pathway is potentially relevant.

6.1 AIRBORNE PATHWAYS

Potential migration pathways involving airborne transport include:

- Erosion and transport of soil particles and sorbed chemical constituents in fugitive dust emissions; and
- Volatilization of chemical constituents from groundwater and subsequent atmospheric dispersion.

6.1.1 Fugitive Dust

Although the majority of the site is covered by vegetation that would prevent the re-suspension of surface soil particles, a small amount of fugitive dust emissions could occur. Wind erosion of the surface cover on some of the fill piles or the use of recreational vehicles on-site may re-suspend surface soil into the air. The potential significance of current and future fugitive dust emissions is evaluated in the Human Health Risk Assessment (HHRA) Report (Geomatrix, February 2005).

6.1.2 Volatilization

Volatile chemicals present in the waste fill or groundwater could volatilize to the atmosphere and be transported off-site. Since volatile chemicals were not detected in the surface soils, volatilization of chemicals direct to the atmosphere is not a significant migration pathway. For subsurface soil within the waste fill piles, volatilized constituents need to diffuse through the overlying cover soil into the atmosphere if the vapors are not produced by disturbance of subsurface soil. Monitoring of the soil vapor probe GPZ-1 identified methane and hydrogen sulfide vapors present from the decomposition of waste fill. No vapors were detected in the ambient air on or near waste fill soil piles, so diffusive vapor transport is not a significant migration pathway. Two VOCs were detected in samples collected from groundwater samples collected from two of the 18 wells sampled (MW-2S and MW-8S). The concentrations were very low (less than 5 μg/L). The relevancy of the groundwater-to-air volatilization pathway and disturbance of waste fill is analyzed in the HHRA (Geomatrix, February 2005).

6.2 WATERBORNE PATHWAYS

Chemicals in surface soils could be potentially transported via storm water runoff. Chemicals in Site soil and waste fill could also leach and migrate downward to groundwater and transported to groundwater discharge areas.

6.2.1 Surface Water Runoff

Erosion and transport of surface soils and associated sorbed chemicals in surface water runoff is a potential migration pathway for on-Site areas. Off-Site transport via this pathway is unlikely because the Site is located more than 4,000 feet from the nearest flowing surface water body (Slab City Creek), the Site and waste fill piles are outside the 100-year floodplain of Johnson and Slab City Creeks, and on-Site drainage swales do not lead to off-Site areas. Therefore, transport of sorbed chemicals to soil particles is limited to on-Site areas in the immediate vicinity of the waste fill piles. Metal COPCs were detected in surface soil covering the waste fill. Although limited by the abundant vegetated growth on the waste fill piles, fill pile topographic relief (as much as 15 feet) provides the potential for soil particle transport with surface water runoff. Topographic relief surrounding the waste fill piles is low, and combined with the heavy vegetative growth at the Site, overland transport distances of sorbed chemicals to soil particles is limited. Constituent migration into topographically lower wetland areas from waste fill piles is possible. Chemicals present in on-site soil could be released to adjacent wetland areas as a result of surface water runoff. Risks associated with this process are evaluated in the in the baseline risk assessment.

6.2.2 Groundwater Migration

Site related chemicals exist in overburden groundwater and are transported beneath the Site to the southwest in the direction of Wetland F. Section 4.5 describes the relationship between groundwater flow and surface water in the wetlands. Based on the calculated seepage velocity and Darcy flux estimated for the lateral movement of groundwater, it was concluded that all groundwater from the Site ultimately discharges to the wetland area before reaching the southwestern property boundary located more than 500 feet across the wetland. Therefore, chemicals present in groundwater will influence surface water chemistry and possibly sediment quality via this pathway.

The assessment of geochemical parameters indicates an increase in concentration of dissolved chemical constituents (i.e., alkalinity, ammonia, calcium, magnesium, and sulfate) in groundwater as it flows beneath the Site from upgradient areas to downgradient areas. These geochemical changes were mentioned in Section 4.5.3 and are shown graphically on Figure 4-7. The change in groundwater chemistry occurs from percolation of chemical constituents in the waste fill piles to the groundwater. The geochemical change is uniform between shallow and deeper groundwater.

Once chemicals are in the groundwater flow system, groundwater flow paths and the geochemical environment affect chemical fate. Geochemical data indicate that aerobic and oxidizing conditions exist in shallow groundwater and weaken with depth. Groundwater flow directions are to the southwest toward Wetland F.

Water quality data indicate subsurface conditions are not conducive to metal COPC transport. Although chromium was widely detected in soils across the Site, chromium concentrations were not elevated in groundwater. Total chromium was detected at MW-6S near the fill piles, but the concentrations were well below groundwater criteria. Hexavalent chromium was detected at a low concentration in one (MW-5D) of 18 samples analyzed. The detection was not confirmed in the second sampling event nor was total chromium detected during either event. The lack of hexavalent chromium in groundwater suggests conditions are not suitable for the oxidation of chromium (+3) to hexavalent chromium. The slightly alkaline subsurface soil conditions and relatively low concentrations of manganese inhibit oxidation reactions that can produce hexavalent chromium. Soil testing beneath the file piles identified decreasing metal COPCs with depth and metal COPCs are not elevated in groundwater. Transport of trace metals and organic compounds is not considered significant at the Site.

Groundwater quality has been affected by the presence of the fill piles. Trace non-metals, including nitrogen (in the form of ammonia), sulfur (in the form of sulfate), magnesium, and alkalinity are elevated in Site groundwater compared to background. Ammonia was detected in groundwater samples collected from downgradient wells. Conversion of organic nitrogen in the waste fill material to ammonium (a process known as ammonification) and leaching through unsaturated soil to the water table is the likely source of ammonia in the groundwater system. Ammonia was detected in many of the downgradient wells and concentrations at well pairs MW-6 and MW-1 were above groundwater criteria. The presence of ammonia in shallow groundwater (oxidizing environments) is typically short-lived due to uptake by plants and nitrification (conversion to nitrate). At the Site, ammonia concentrations in shallow wells are lower compared to deeper wells and nitrate was also detected at elevated concentrations. These data support a nitrifying ammonia fate in shallow groundwater. In deeper monitoring wells, the absence of nitrate and detection of ammonia at somewhat higher concentrations indicates limited nitrification and increasing ammonia stability. Since affected groundwater discharges to Wetland F, the ammonia in the deeper groundwater migrates toward shallow depths farther west into the wetland area. Ammonia was detected in only one of the surface water samples at a low concentration. In surface water environments, nitrification processes dominate and microorganisms and plant life assimilate ammonia. Consequently, the attenuation of ammonia

in surface water does not present a substantial concern for exceeding surface water criteria in wetland discharge areas at the Site.

Sulfate was present at elevated concentrations in downgradient groundwater. The absence of sulfide suggests conditions are insufficient to reduce sulfate. Therefore, sulfate stability in groundwater allows constituent transport without conversion. Sulfate, and other trace non-metals detected at elevated concentrations in groundwater, migrate with groundwater flow and ultimately discharge to the wetland.

The exposure to migrating chemicals is addressed in the baseline risk assessments (human health and ecological) submitted under separate cover.

6.3 Exposure Pathways

Exposure pathways are discussed in the Pathways Analysis Report (Geomatrix 2002). Based on the analysis of chemical fate and transport provided above, pathways through which Site COPCs could reach receptors off-site at significant exposure point concentrations include:

1. Fugitive Dust Emissions from Site soils; and
2. Volatilization from Site groundwater.

These exposure pathways, along with direct on-site contact scenarios for visitors, trespassers, and future workers are summarized in Table 6-1.

6.4 Nature and Extent of Chemical Constituents in Site Media

Chemical constituents detected in Site media were described in Section 5.0 and potential chemical migration mechanisms were discussed above. Sampling and analysis of Site media concluded that the waste fill contains elevated concentrations of metal COPCs which leached inorganic constituents to the subsurface. The surface soils covering the fill piles contain elevated concentrations of arsenic and chromium compared to background and Region 9 PRGs. Surface water runoff and transport of soil particles down slope to the perimeter surface soils adjacent to the waste fill piles is evident. Surface soil samples collected in the central portion of the area between the fill piles (i.e., Lathe #126, #127, and #128) contain elevated concentrations of metal COPCs. Transport of metal COPCs, most likely from the smaller, isolated waste fill piles near the main entrance road at MW-1 to the surrounding area, has impacted surface soil both east and west of the main entrance road (i.e., Lathe #106, #122, and #123). The impacts continue into the southern end of Wetland A (Lathe #89). The western

edge of Wetland D (Lathe #93) also appears to have been affected by this transport mechanism. Other wetland areas, including the largest labeled wetlands, Wetland B and Wetland F, were not significantly impacted by surface water transport of metal COPCs from the fill piles.

Leaching of inorganic constituents to the unsaturated and saturated zone beneath the fill piles has occurred. Soil sampling from beneath the fill piles and impacted perimeter subsurface soils identified elevated concentrations of metal COPCs. However, metal COPCs were not detected at significantly elevated concentrations in any of the wells (excluding MW-2S). Inorganic constituents such as ammonia, nitrate, and sulfate are elevated at various locations in groundwater downgradient of the fill piles. The fate and transport of inorganic constituents in groundwater is controlled by groundwater flow paths and the subsurface geochemical environmental conditions. Wetland F is the local groundwater discharge area for the site and site related constituents will discharge to the wetland. The surface water quality impacts to Wetland F were limited to one detection of hexavalent chromium (1 of 4 samples) and elevated sulfate (1 of 4 samples above surface water criteria).

7.0 BASELINE RISK ASSESSMENT SUMMARY

Remedial investigation data were used to prepare a baseline risk assessment (BRA) for the Site. The BRA evaluated the potential human health and ecological risks as a result of potential exposure to chemicals in soil, groundwater, soil vapor, and wetland sediments and surface water at the Markhams Site. The risk assessments were provided to the U.S. EPA in two separate documents. The human health risk assessment (HHRA) prepared by Geomatrix was submitted in draft to the U.S. EPA in February 2005, revised and submitted as Final in July 2006. A screening level ecological risk assessment prepared by Environmental Risk Group, Inc. was submitted in March 2005. The risk assessments provide a conservative estimate of the nature and extent of the potential cancer risk for 1×10^{-6} and non cancer human health risks for a hazard index of 1.0 to account for cumulative effects and potential ecological risks from chemicals in Site media.

7.1 HUMAN HEALTH RISK ASSESSMENT SUMMARY

The HHRA is a component of the RI/FS providing both a framework for assessing whether remedial action is necessary and the justification for performing remedial actions. The HHRA was prepared in accordance with the U.S. Environmental Protection Agency (U.S. EPA) risk assessment guidelines, the U.S. EPA approved Pathway Analysis Report (Geomatrix, 2002), and subsequent comments and responses. This section provides a brief summary of the methodologies and the results of the HHRA.

The potential health risks to human health under both current and foreseeable future land uses were considered. Evaluation of the potential health risk at the site involved a four step process; selection of chemicals of concern, exposure assessment, toxicity assessment and risk characterization, as described below:

1. **Data Evaluation and Selection of Chemicals of Potential Concern** – In this step, chemical concentration data were summarized and evaluated to identify chemicals of potential concern (COPCs) for quantitative analysis in the HHRA. Chemicals were selected as COPCs if they were detected above U.S. EPA Region 9 residential preliminary remediation goals (PRGs).

2. **Exposure Assessment -** This step involved the identification of possible exposed populations and quantitative estimates of the magnitude, frequency, and duration of exposure. Based on existing information, the most reasonable future use of the site is one that is essentially consistent with current use. Because the site also is zoned

industrial, a future industrial land use was also evaluated. Receptors evaluated under current uses included unauthorized trespassers as adults and adolescents between the ages of 10 and 18 years. Potential future receptors evaluated included construction workers if site redevelopment is to occur and future on-site industrial workers (outdoor and indoor).

The following exposure pathways for each receptor were quantitatively evaluated:

Current Trespassers - a) incidental soil ingestion; b) dermal contact with soil; c) inhalation of particulates from soil and VOCs released to ambient air from groundwater; d) dermal contact with surface water; and f) incidental ingestion and dermal contact with sediments from the wetland areas.

Future Outdoor Industrial Worker - a) incidental soil ingestion; b) dermal contact with soil; c) inhalation of particulates from soil and VOCs released to ambient air from groundwater; and d) ingestion and dermal contact with COPCs in groundwater if groundwater underlying the Site is used as a potable source of water.

Future Indoor Industrial Worker - a) inhalation of volatile COPCs released to indoor air from underlying groundwater.

Future Construction Worker – a) incidental soil ingestion; b) dermal contact with soil; c) inhalation of particulates from soil and VOCs released to ambient air from groundwater; d) dermal contact with COPCs in surface water and groundwater; and e) incidental ingestion and dermal contact with sediments from the wetland areas.

The overall approach of the HHRA is consistent with the Reasonable Maximum Exposure (RME) approach as defined by U.S. EPA (1989). The RME approach represents the maximum exposure that is reasonably expected to occur under baseline conditions. Exposure point concentrations for COPCs were estimated based on the 95 percent upper confidence limit (UCL) on the mean or the maximum concentration, whichever was lower. COPCs potentially migrating from the subsurface to indoor were estimated using the Johnson & Ettinger model (U.S. EPA, 2003). Daily chemical intakes for receptors from exposure routes, such as ingestion, dermal contact, or inhalation, were quantitatively evaluated based on the exposure point concentrations

and the site-specific, medium-specific, and receptor-specific intake variables (i.e. a person's size, age, intake rate, and length of exposure).

3. **Toxicity Assessment –** In this step, information was collected to assess the potential for a particular chemical to cause adverse health effects in exposed individuals, including cancer and non-cancer health effects. U.S. EPA-approved toxicity criteria were used in the assessment.

4. **Risk Characterization –** This last step described the likelihood and degree of chemical exposure and the possible adverse health effects associated with such exposure. The quantitative analysis was performed in this step. Cancer risks and noncancer hazard indices (HIs) were calculated according to regulatory guidance for each receptor. Because of the number of assumptions required during the risk assessment process, some degree of uncertainty is inevitably associated with the risk and hazard estimates. A summary of these uncertainties are presented in the HHRA.

A summary of the risk assessment results is presented below.

- For adult and adolescent trespassers (potential exposures via incidental ingestion and dermal contact with soil, inhalation of particulates from soil and VOCs released to ambient air from groundwater, dermal contact with surface water, and incidental ingestion and dermal contact with sediments from the wetland areas), the HIs (0.01 and 0.03, respectively) and excess lifetime carcinogenic risk estimates (both $2x10^{-6}$) are below or within the acceptable levels, respectively.

- For the outdoor industrial worker (potential exposures via incidental ingestion and dermal contact with soil, inhalation of particulates from soil and VOCs released to ambient air from groundwater, and ingestion and dermal contact with groundwater), the HI (230) and excess lifetime carcinogenic risk estimate ($3x10^{-4}$) exceed the acceptable levels. The primary chemical contributing the most to the excess lifetime cancer risk is arsenic in groundwater. The primary chemicals contributing to the non-cancer hazard are iron and thallium in groundwater. The calculation of the central tendency or average excess lifetime cancer risk and non-cancer health effects are $5.9x10^{-5}$ (for arsenic) and an HI of 89.5, respectively.

- The excess risk and non-cancer hazard are primarily attributed to the unlikely pathway associated with ingestion of groundwater underlying the Site. In the event that groundwater is not used as a potable source, the HI (0.17) and the excess lifetime carcinogenic risk estimate of $1x10^{-5}$ are below or within the acceptable levels.

As indicated in the RI and HHRA, the results from MW-2S are not considered representative of dissolved groundwater. Potential exposures and resulting health risks were re-evaluated in Appendix F of the HHRA without considering data from MW-2S. Under this scenario, the predicted excess lifetime carcinogenic risk estimate and the HI for the outdoor industrial worker are $7x10^{-5}$ and 8.0, respectively. Although the HI still exceeds the acceptable level, it is approximately 30 times lower than the original RME estimate. Under the central tendency exposure scenario, the non-cancer HI is 1.9 (1.0 for hexavalent chromium and 0.9 for manganese,

- For the indoor industrial worker (potential exposures from inhalation of VOCs in indoor air potentially migrating from the subsurface), the HI (0.00011) and excess lifetime carcinogenic risk estimate ($1x10^{-7}$) are below the acceptable risk levels. Indoor air concentrations were estimated using the Johnson and Ettinger model. It has been documented that the potential migration of soil vapor into indoor air is highly variable and depends on a number of site-specific factors. To account for this uncertainty, the modeling effort incorporated a number of conservative assumptions, which likely resulted in the overestimation of chemical exposures.

- For the construction worker (potential exposures via incidental ingestion and dermal contact with soil, inhalation of particulates from soil and VOCs released to ambient air from groundwater, dermal contact with COPCs in surface water and groundwater; and incidental ingestion and dermal contact with sediments from the wetland areas), the HI (5.2) exceeds the acceptable level while the excess lifetime carcinogenic risk estimate ($3x10^{-6}$) is within the acceptable risk range. Dermal contact of cadmium and thallium in groundwater is the primary exposure pathway contributing to the HI. Potential exposures likely are overestimated. Exposure for the construction worker was related to specific conditions during potential construction over a continuous one-year period and was estimated in the absence of institutional controls that are consistent with U.S. EPA guidance.

- If exposure to groundwater is prevented based on dewatering activities (i.e., the exposure pathway is incomplete), the HI from exposure to soil for the construction worker would be below the acceptable level at 0.4. Without consideration of results from MW-2S in the exposure calculations, the HI for the construction worker is 1 and within the risk range.

As in any risk assessment, the estimates of risk have many associated uncertainties given the many assumptions that must be made about exposure and toxicity. The uncertainties are generally related to the variability in the site-specific environmental data, variability and limitations inherent in the exposure models, and the uncertainty and conservatism build into estimates of chemical toxicity and potency. Site-specific factors were used to the extent possible to decrease uncertainty, although uncertainty may persist in even the most site-specific risk assessments due to the inherent uncertainty in the process. Because the assumptions used

tend to be health-protective and conservative in nature, the estimated risks may exceed the most probable risk posed to potential receptors at the site.

In summary, under the assumptions and conditions presented in the HHRA, the estimated HI and theoretical excess cancer risk are generally below or within the acceptable levels of concern. In those limited instances where the estimated HI and/or theoretical excess cancer risk are outside acceptable levels, the exceedance is attributable to the hypothetical assumption that future groundwater consumption is a complete pathway. Groundwater in the State of New York is classified as "GA", potential potable water supply, unless it has been designated as saline. Groundwater at the Site is not used as a potable water supply and is not likely to be used as such in the future. If the assumptions and/or conditions change, the results of this HHRA may need to be re-evaluated.

7.2 ECOLOGICAL RISK ASSESSMENT SUMMARY

The draft ecological risk assessment report was submitted under separate cover to the U.S. EPA in March 2005. The report is being revised and is anticipated to be submitted as Final to the U.S. EPA in July 2006.

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TABLE 2-1

SUMMARY OF MEDIA AND PARAMETERS ANALYZED DURING PREVIOUS INVESTIGATIONS

Peter Cooper Markham Site
Dayton, New York

Year	*Media*	*Number of Samples Collected*	*Parameters*
1983 [1]	Surface Soil	2	Priority Pollutant Inorganics, total halogenated organics
1983 [1]	Sediment	3	Priority Pollutant Inorganics
1985 [1]	Surface Soil	7	Arsenic, beryllium, total chromium, copper, lead, mercury, silver, zinc, total halogenated organics, and total halogenated VOCs
1985 [1]	Subsurface Soil	8	Arsenic, beryllium, total chromium, copper, lead, mercury, silver, zinc, total halogenated organics, and total halogenated VOCs
1985 [1]	Surface Water	3	Arsenic, beryllium, total chromium, copper, lead, mercury, silver, zinc, total halogenated organics, and total halogenated VOCs
1985 [1]	Sediment	3	Arsenic, beryllium, total chromium, copper, lead, mercury, silver, zinc, total halogenated organics, and total halogenated VOCs
1985 [1]	Groundwater	4	Arsenic, beryllium, total chromium, copper, lead, mercury, silver, zinc, total halogenated organics, and total halogenated VOCs
1989 [2]	Surface Soil/Sediment	53	Total chromium, hexavalent chromium and arsenic; 14 also analyzed for zinc
1989 [2]	Subsurface Soil	19	Total chromium, hexavalent chromium and arsenic
1989 [2]	Surface Water	6	Wetland samples analyzed for total chromium, hexavalent chromium and arsenic. Culvert sample analyzed for total chromium, arsenic, and zinc
1989 [2]	Waste (Direct analysis)	3 discrete locations & 1 composite sample	Discrete samples total chromium, arsenic, zinc. Composite analyzed for HSL organics.
1989 [2]	Waste (EP Tox)	6	EP Toxicity for total chromium, arsenic, and zinc
1989 [2]	Seeps	1	Total and hexavalent chromium, arsenic, zinc, and select leachate indicator parameters (ammonia, BOD, etc.)
1989 [2]	Groundwater	6 pairs of wells on 2-4 occasions	Total and filterable chromium, hexavalent chromium, arsenic, zinc, and select water quality parameters (chloride, sulfate). Wells 1S, 3S, 3D, 6S, and 6D also analyzed for HSL organics during one event.
1993 [3]	Surface Soil/Waste	9 [4]	TCL Organics, TAL Inorganics (no Cr^{+6} analysis)
1993 [3]	Surface Water	3	TCL Organics, TAL Inorganics (no Cr+6 analysis)

Notes:
[1] = Sampling/investigation performed by Recra Research
[2] = Sampling/investigation performed by O'Brien & Gere
[3] = Sampling/investigation performed by Malcolm Pirnie
[4] = Eight locations plus one duplicate

TABLE 3-1

ANALYTICAL SUMMARY

Peter Cooper Markhams Site
Dayton, New York

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Sample Type/Location	Matrix	Parameter [1]	Quantity [2]	Collected Samples
Groundwater (18) (first sampling event only)	water	TCL VOCs[3]	18	Shallow = MW-1S, MW-2S, MW-3SR, MW-4S, MW-5S, MW-6S, MW-7S, MW-8S, MW-9S and Deep = MW-1D, MW-2D, MW-3D2, MW-4D, MW-5D, MW-6D, MW-7D, MW-8D, MW-9D
		TCL SVOCs[3]	18	
		TAL Metals [3][4]	18	
		Hexavalent Chromium[4][5]	18	
		Alk (bi-carb)	18	
		Alk (carb)	18	
		Ammonia	18	
		DOC	18	
		Nitrate	18	
		Sulfate	18	
		Sulfide	18	
		Ferrous Iron[6]	2	
		TDS	18	
		TOC	18	
		pH	18	
		Specific Conductivity	18	
		Dissolved Oxygen	18	
		Turbidity	18	
		Oxidation-Reduction Potential	18	
Groundwater (18) (second sampling event)	water	COPCs as determined[3]	18	Same as above
		Arsenic[4]	18	
		Chromium[4]	18	
		Hexavalent Chromium[4][5]	18	
		Ferrous Iron[6]	2	
		pH	18	
		Specific Conductivity	18	
		Dissolved Oxygen	18	
		Turbidity	18	
		Oxidation-Reduction Potential	18	
Wetland Surface Water (4) (first sampling event)	water	Arsenic[4]	4	Surface Water #1,2,3,and 4
		Chromium[4]	4	
		Hexavalent Chromium[4][5]	4	
		Alk (bi-carb)	4	
		Alk (carb)	4	
		Ammonia	4	
		DOC	4	
		Nitrate	4	
		Sulfate	4	
		Sulfide	4	
		Ferrous Iron[6]	1	
		TDS	4	
		TOC	4	
		Ferrous Iron[6]	4	Surface Water #1,2,3,and 4
		pH	4	
		Specific Conductivity	4	
		Dissolved Oxygen	4	
		Turbidity	4	
		Oxidation-Reduction Potential	4	
Wetland Surface Water (4) (second sampling event)	water	COPCs as determined[3]	to be determ	Surface Water #1,2,3,and 4
		Arsenic[4]	4	
		Chromium[4]	4	
		Hexavalent Chromium[4][5]	4	
		Ferrous Iron[6]	1	
		Ferrous Iron[6]	4	Surface Water #1,2,3,and 4
		pH	4	
		Specific Conductivity	4	
		Dissolved Oxygen	4	
		Turbidity	4	
		Oxidation-Reduction Potential	4	
Fill Piles	soil	Insitu Permeability	3	
		Grain Size Distribution	1	"Fill"
Fill Piles (1-2 feet below cover soil)	soil	SPLP[7] Arsenic	3	B4(4-5 fbgs); B5(4-5fbgs); B6(5.5-6.5 fbgs)
		SPLP[7] Chromium	3	
		SPLP[7] Hexavalent Chromium	3	
		Arsenic	3	
		Chromium	3	
		Hexavalent Chromium	3	

TABLE 3-1

ANALYTICAL SUMMARY

Peter Cooper Markhams Site
Dayton, New York

Sample Type/Location	Matrix	Parameter [1]	Quantity [2]	Collected Samples
Background Surface Soil (0-6 inches bgs)	soil	Arsenic	6	Lathe #50, 51, 52, 53, 54, 55
		Chromium	6	
Cover Soil/Top of Fill Piles Surface Soil	soil	Arsenic	9	Lathe #114,115,116,117,118,119,120,121,and 137
		Chromium	9	
		Hexavalent Chromium	9	
		TOC	9	
		Grain Size Distribution	1	"Fill Pile Cover Soil" - composite of Lathe #120,118,117,114,115,137,119,121
Perimeter Areas of Fill Piles Surface Soil	soil	Arsenic	48	Lathe#56,57,58,59,60,61,62,63,64,65,66,67A,68,69,70,71,72,73,74,95,96,97,98,99,100,101,102A,103, 104,105,106,107,108,109,110,111,112,113,122,123,124,125,126,127,128,129,130,131
		Chromium	48	
		Hexavalent Chromium	48	
		TCL VOCs	10	Lathe # 122,123,124,125,126,127,128,129,130,131
		TCL SVOCs	10	
		TOC	5	Composite 151, 154, 155, 156
		Grain Size Distribution	5	Composite 151, 154, 155, 156, XX
Perimeter Areas of Fill Piles Subsurface Soil	soil	Arsenic	29	Lathe #95,96,97,98,99,100,101,102A,103,104,105A,106,107,108,109,110,111,112,113,122,123,124,125,126 ,127,128,129,130,131
		Chromium	29	
		Hexavalent Chromium	29	
Native Soil Beneath Fill Piles (4 borings; sampled at 3 depths) Subsurface Soil	soil	Arsenic	12	B-1A(9-10fbgs), B-1A(10-11), B-1A(17-19); B-4(15-16fbgs), B-4(16-17), B-4(18-20); B-5(8-9fbgs),B-5(9-10),B-5(14-16); B-6(6.5-7.5fbgs), B-6(7.5-8), B-6(9-11)
		Chromium	12	
		Hexavalent Chromium	12	
Native Soil from Monitoring Well MW-8S (8-10 feet bgs or 2-feet above water table) Subsurface Soil	soil	Arsenic	1	MW-8S (4-6fbgs)
		Chromium	1	
		Hexavalent Chromium	1	
Native Soil from Monitoring Well Borings Subsurface Soil	soil	TOC	7	MW-9D(20-28 fbgs), MW-S9(8-10 fbgs);MW-7D(24-32 fbgs); MW-7S(8-16 fbgs);MW-8D(20-21 fbgs);MW-8S(6-10 fbgs); MW-3SR(8-14 fbgs)
		Cation Exchange Capacity	7	
		Grain Size Distribution	7	
Composite Native Soil Sample from 4 borings and MW-8S (8-10 feet bgs or 2-feet above water table) Subsurface Soil	soil	SPLP[7] Arsenic	1	4 Borings + MW-8S
		SPLP[7] Chromium	1	
		SPLP[7] Hexavalent Chromium	1	
Downgradient Monitoring Wells (4) Subsurface Soil	soil	pH	4	MW-8D(20-26 fbgs); MW-8S(20-26 fbgs),MW-7D(24-32 fbgs); MW-7S(8-16 fbgs)
		Manganese[8]	4	
Wetland Sediment (downstream or adjacent to waste piles)	sediment	Arsenic	14	Lathe # 84A,85,86,87,88,89,90,91,92A,93,94A,150,151,152
		Chromium	14	
		Hexavalent Chromium	14	
		TOC	3	Composite 150, 152, 153
		pH	3	Composite 174, 175, 176
		Grain Size Distribution	3	Composite 150, 152, 153
Background-Wetland Sediment	sediment	Arsenic	9	Lathe # 75,76,77,78,79A,80,81A,82,83
		Chromium	9	
Fill Pile Soil Vapor	air	Carbon Dioxide	1	GPZ-1
		Hydrogen Sulfide	1	
		Methane	1	
		Oxygen	1	

References

(1) Test Methods for Evaluating Solid Wastes, USEPA SW-846, revised 1991
(2) Code of Federal Regulations Chapter 40 Part 136
(3) American Society of Testing and Materials

Notes

1. The list of analytes, laboratory method and the method detection limit for each parameter are included in Tables 1-3 of the QAPP for each matrix.
2. Sample quantity does not include QA/QC samples. Sample frequency of QA/QC samples is detailed in Section 3 and Section 8 of the QAPP
3. The specific analyte list for the second sampling event was established as TCL VOCs, ammonia, sulfate, nitrate plus COPC metals.
4. Metals analysis will be for Total metals. Metals analysis will be for Soluble metals when water turbidity is field measured greater than 50 NTU
5. Per Method 3060A, Mg^{+2} in a phosphate buffer will be added to the alkaline extraction solution to suppress oxidation of soluble Cr (III) to Cr (VI)
6. Ferrous iron analysis will be conducted in the field
7. SPLP: Synthetic Precipitation Leaching Procedure. Extraction by Method 1312
8. Soil samples to be analyzed for Manganese will be require modified extraction method using NH_2OH-HCl in 0.1 molar HNO_3. Leachate will be analyzed by Method 6010B

Acronyms:

Alk (bi-carb) = Bi-carbonate alkalinity
Alk (carb) = Carbonate alkalinity
fbgs = feet below ground surface
ORP = Oxidation Reduction Potential
VOCs = Volatile Organic Compounds
SVOC = Semi-Volatile Organic Compounds
TCL = Target Compound List
TOC = Total Organic Carbon

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TABLE 3-2
MONITORING WELL CONSTRUCTION SUMMARY

Peter Cooper Markhams Site
Dayton, New York

Location:	Installed By / Year	Surface Elevation [1] (famsl)	Top of Riser (famsl)	Total Depth of Boring (ft)	Depth of Well (ft)	Screened Interval		Formation Screened
						Elevation (famsl)	Depth (fbgs)	
Monitoring Wells								
MW-1S	O'Brien & Gere / 1986	1309.61	1311.31	14.0	14.0	1300.61-1295.61	9.0-14.0	Outwash Unit
MW-1D	O'Brien & Gere / 1986	1309.53	1311.52	36.5	30.0	1284.53-1279.53	25.0-30.0	Lacustrine Unit
MW-2S	RECRA Environmental / 1984	1313.39	1313.15	20.0	11.0	1307.39-1302.39	6.0-11.0	Outwash/ Lacustrine Units
MW-2D	O'Brien & Gere / 1986	1313.91	1313.99	36.5	30.0	1288.91-1283.91	25.0-30.0	Lacustrine Unit
MW-3SR	Geomatrix Consultants / 2001	1312.05	1315.27	14.0	14.0	1303.05-1298.05	9.0-14.0	Outwash Unit
MW-3D2	O'Brien & Gere / 1986	1312.78	1314.74	46.0	30.0	1287.78-1282.78	25.0-30.0	Lacustrine Unit
MW-4S	RECRA Environmental / 1984	1311.43	1312.98	11.0	11.0	1306.43-1300.43	5.0-11.0	Outwash Unit
MW-4D	O'Brien & Gere / 1986	1312.87	1314.93	36.5	30.0	1287.87-1282.87	25.0-30.0	Lacustrine Unit
MW-5S	O'Brien & Gere / 1986	1303.05	1302.62	7.0	7.0	1301.05-1306.05	2.0-7.0	Outwash Unit
MW-5D	O'Brien & Gere / 1986	1302.78	1302.62	31.5	25.0	1282.78-1277.78	20.0-25.0	Lacustrine Unit
MW-6S	O'Brien & Gere / 1986	1313.68	1315.36	18.5	18.5	1300.18-1295.18	13.5-18.5	Outwash/ Lacustrine Units
MW-6D	O'Brien & Gere / 1986	1313.79	1314.92	33.0	33.0	1285.79-1280.79	28.0-33.0	Lacustrine Unit
MW-7S	Geomatrix Consultants / 2001	1309.62	1312.52	16.0	16.0	1303.62-1293.62	6.0-16.0	Outwash/ Lacustrine Units
MW-7D	Geomatrix Consultants / 2001	1309.39	1312.35	32.0	32.0	1287.39-1277.39	22.0-32.0	Lacustrine Unit
MW-8S	Geomatrix Consultants / 2001	1301.06	1303.93	10.0	10.0	1296.06-1291.06	5.0-10.0	Outwash/ Lacustrine Units
MW-8D	Geomatrix Consultants / 2001	1300.98	1304.03	28.0	28.0	1282.98-1272.98	18.0-28.0	Lacustrine Unit
MW-9S	Geomatrix Consultants / 2001	1311.49	1313.95	11.0	11.0	1305.49-1300.49	6.0-11.0	Outwash/ Lacustrine Units
MW-9D	Geomatrix Consultants / 2001	1311.64	1314.12	30.0	30.0	1291.64-1281.64	20.0-30.0	Lacustrine Unit

Notes:

(1) Survey completed by E & M Surveyors and Engineers January 2002

famsl: = feet above sea level
fbgs: = feet below ground surface

Table 3-3

Geomatrix

SUMMARY OF QA/QC SAMPLES

Peter Cooper Markhams Site
Dayton, New York

Sample ID	*Sample Media*	*Sample Location*
Matrix Spike/Matrix Spike Duplicates		
110801177	groundwater	MW-7D
42202187	groundwater	MW-9S
120301183	surface water	Surface Water #3
42502214	surface water	Surface Water #3
100401008	soil	MW-8D, 20-26 fbgs
100501012	soil	B-4, 4-5 fbgs
100901018	soil	B-5, 4-5 fbgs
100901022	soil	B-6, 5.5-6.5 fbgs
101001054	soil	Lathe #59
101001055	soil	Lathe #98
101001075	soil	Lathe #103
101001093	soil	Lathe #111
101101096	soil	Lathe #119
101201118	soil	Lathe #122
101501120	sediment	Lathe #94A
101501133	sediment	Lathe #89
101501139	sediment	Lathe #82
Duplicates		
11601165 11601166	groundwater groundwater	MW-8S Duplicate for MW-8S
11801178 11801179	groundwater groundwater	MW-7S Duplicate for MW-7S
42302198 42302199	groundwater groundwater	MW-8S Duplicate for MW-8S
12301184 12301185	surface water surface water	Surface Water #2 Duplicate of Surface Water #2
42502212 42502213	surface water surface water	Surface Water #2 Duplicate of Surface Water #2
100501011 100501012	soil soil	B-4, 4-5 fbgs Duplicate of B-4, 4-5 fbgs
100801015 100801016	soil soil	MW-7S, 8-16 fbgs Duplicate of MW-7S, 8-16 fbgs
101001031 101001032	soil soil	Lathe #63 Duplicate of Lathe #63
101001052 101001053	soil soil	Lathe #60 Duplicate of Lathe #60
101001073 101001074	soil soil	Lathe #103 Duplicate of Lathe #103
101001094 101001095	soil soil	Lathe #111 Duplicate of Lathe #111
101201106 101201107	soil soil	Lathe #130 Duplicate of Lathe #130
101201116 101201117	soil soil	Lathe #123 Duplicate of Lathe #123
101501137 101501138	sediment sediment	Lathe #81A Duplicate of Lathe #81A

Table 3-3

Geomatrix

SUMMARY OF QA/QC SAMPLES

Peter Cooper Markhams Site
Dayton, New York

Sample ID	*Sample Media*	*Sample Location*
Equipment Blanks		
110501159	water	after MW-9S/before MW-4D
110601164	water	after MW-2D/before MW-8S
110701172	water	after MW-1S/before MW-1D
110801182	water	after MW-6S
42202189	water	after MW-9S
42302195	water	after MW-1D/before MW-1S
42302197	water	before MW-8S
42402204	water	after MW-7D
42502210	water	before MW-5D
100801017	soil	after MW-7S, 8-16 fbgs
Trip Blanks		
TB110501	water	--
TB110601	water	--
TB110701	water	--
TB110801	water	--
TB042202	water	--
TB042302	water	--
TB042402	water	--
TB042502	water	--

Table 3-4

Geomatrix

COMPARISON OF QA/QC SAMPLES - GROUNDWATER

Peter Cooper Markhams Site
Dayton, New York

	Sample Location, Identification, and Date Collected [1]								
Constituent [2]	*MW-8S 165 11/6/2001*	*MW-8S DUP 166 11/6/2001*	*Relative Percent Difference*	*MW-7S 178 11/8/2001*	*MW-7S DUP 179 11/8/2001*	*Relative Percent Difference*	*MW-8S 198 4/23/2002*	*MW-8S DUP 199 4/23/2002*	*Relative Percent Difference*
Volatile Organic Compounds, micrograms per liter									
Acetone	10.0 U	10.0 U	NA	10.0 U	NA	NA	5.0 UJ	5.0 UJ	NA
Benzene	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
Bromodichloromethane	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
Bromoform	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
Bromomethane	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
2-Butanone	10.0 U	10.0 U	NA	10.0 U	NA	NA	5.0 UJ	5.0 UJ	NA
Carbon Disulfide	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
Carbon Tetrachloride	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
Chlorobenzene	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
Chloroethane	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
Chloroform	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
Chloromethane	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
Dibromochloromethane	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
1,3-Dichlorobenzene	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
1,4-Dichlorobenzene	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
1,2-Dichlorobenzene	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
1,2-Dibromo-3-chloropropane	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 UJ	1.0 UJ	NA
Dichlorodifluoromethane	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
1,2-Dibromoethane	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
1,1-Dichloroethane	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
1,2-Dichloroethane	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
1,1-Dichloroethene	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
1,2-Dichloropropane	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
cis-1,2-Dichloroethene	10.0 U	1.4 J	NA	10.0 U	NA	NA	0.54 J	0.57 J	5.4
cis-1,3-Dichloropropene	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
trans-1,3-Dichloropropene	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
trans-1,2-Dichloroethene	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
Ethylbenzene	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
2-Hexanone	10.0 U	10.0 U	NA	10.0 U	NA	NA	5.0 U	5.0 U	NA
Isopropylbenzene	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
Methyl tert butyl ether	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
Methylene chloride	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
4-Methyl-2-pentanone	10.0 U	10.0 U	NA	10.0 U	NA	NA	5.0 U	5.0 U	NA
Styrene	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
1,1,2,2-Tetrachloroethane	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
Tetrachloroethene	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
Toluene	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
1,2,4-Trichlorobenzene	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
1,1,1-Trichloroethane	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
1,1,2-Trichloroethane	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA

Table 3-4

Geomatrix

COMPARISON OF QA/QC SAMPLES - GROUNDWATER

Peter Cooper Markhams Site
Dayton, New York

	Sample Location, Identification, and Date Collected [1]								
Constituent [2]	*MW-8S 165 11/6/2001*	*MW-8S DUP 166 11/6/2001*	*Relative Percent Difference*	*MW-7S 178 11/8/2001*	*MW-7S DUP 179 11/8/2001*	*Relative Percent Difference*	*MW-8S 198 4/23/2002*	*MW-8S DUP 199 4/23/2002*	*Relative Percent Difference*
Trichloroethene	4.2 J	4.1 J	2.4	10.0 U	NA	NA	2.8	2.8	0.0
Trichlorofluoromethane	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
1,1,2-Trichloro-1,2,2-trifluoroetha	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
Vinyl chloride	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
Total Xylenes	10.0 U	10.0 U	NA	10.0 U	NA	NA	3.0 U	3.0 U	NA
Cyclohexane	10.0 U	10.0 U	NA	10.0 U	NA	NA	5.0 U	5.0 U	NA
Methyl acetate	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
Methylcyclohexane	10.0 U	10.0 U	NA	10.0 U	NA	NA	1.0 U	1.0 U	NA
SemiVolatile Organic Compounds, micrograms per liter									
Acenaphthene	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Acenaphthylene	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Acetophenone	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Anthracene	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Atrazine	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Benzaldehyde	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Benzo(a)anthracene	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Benzo(b)fluoranthene	0.6 J	10.0 U	177.4	10.0 U	NA	NA	10.0 U	10.0 U	NA
Benzo(k)fluoranthene	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Benzo(ghi)perylene	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Benzo(a)pyrene	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Benzoic acid	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Benzyl alcohol	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Biphenyl	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Bis(2-chloroethoxy) methane	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Bis(2-chloroethyl) ether	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
2,2-Oxybis(1-Chloropropane)	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Bis(2-ethylhexyl) phthalate	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
4-Bromophenyl phenyl ether	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Butyl benzyl phthalate	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Caprolactam	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 UJ	10.0 UJ	NA
Carbazole	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
4-Chloroaniline	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
4-Chloro-3-methylphenol	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
2-Chloronaphthalene	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
2-Chlorophenol	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
4-Chlorophenyl phenyl ether	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Chrysene	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Dibenzo(a,h)anthracene	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Dibenzofuran	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Di-n-butyl phthalate	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
1,2-Dichlorobenzene	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA

Table 3-4

Geomatrix

COMPARISON OF QA/QC SAMPLES - GROUNDWATER

Peter Cooper Markhams Site
Dayton, New York

	Sample Location, Identification, and Date Collected [1]								
Constituent [2]	*MW-8S 165 11/6/2001*	*MW-8S DUP 166 11/6/2001*	*Relative Percent Difference*	*MW-7S 178 11/8/2001*	*MW-7S DUP 179 11/8/2001*	*Relative Percent Difference*	*MW-8S 198 4/23/2002*	*MW-8S DUP 199 4/23/2002*	*Relative Percent Difference*
1,3-Dichlorobenzene	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
1,4-Dichlorobenzene	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
3,3-Dichlorobenzidine	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
2,4-Dichlorophenol	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Diethyl phthalate	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
2,4-Dimethylphenol	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Dimethyl phthalate	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
4,6-Dinitro-2-methylphenol	25.0 U	25.0 U	NA	25.0 U	NA	NA	25.0 U	25.0 U	NA
2,4-Dinitrophenol	25.0 U	25.0 U	NA	25.0 U	NA	NA	25.0 UJ	25.0 UJ	NA
2,4-Dinitrotoluene	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
2,6-Dinitrotoluene	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Di-n-octyl phthalate	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Fluoranthene	0.6 J	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Fluorene	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Hexachlorobenzene	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Hexachlorobutadiene	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Hexachlorocyclopentadiene	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Hexachloroethane	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Indeno(1,2,3-cd)pyrene	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Isophorone	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
2-Methylnaphthalene	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
2-Methylphenol	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
4-Methylphenol	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Naphthalene	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
2-Nitroaniline	25.0 U	25.0 U	NA	25.0 U	NA	NA	25.0 U	25.0 U	NA
3-Nitroaniline	25.0 U	25.0 U	NA	25.0 U	NA	NA	25.0 U	25.0 U	NA
4-Nitroaniline	25.0 U	25.0 U	NA	25.0 U	NA	NA	25.0 U	25.0 U	NA
Nitrobenzene	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
2-Nitrophenol	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
4-Nitrophenol	25.0 U	25.0 U	NA	25.0 U	NA	NA	25.0 U	25.0 U	NA
N-nitrosodiphenylamine	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
N-Nitroso-Di-n-propylamine	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Pentachlorophenol	25.0 U	25.0 U	NA	25.0 U	NA	NA	25.0 U	25.0 U	NA
Phenanthrene	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Phenol	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Pyrene	0.5 J	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
1,2,4-Trichlorobenzene	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
2,4,5-Trichlorophenol	25.0 U	25.0 U	NA	25.0 U	NA	NA	25.0 U	25.0 U	NA
2,4,6-Trichlorophenol	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA

Table 3-4

Geomatrix

COMPARISON OF QA/QC SAMPLES - GROUNDWATER

Peter Cooper Markhams Site
Dayton, New York

	Sample Location, Identification, and Date Collected [1]								
Constituent [2]	*MW-8S 165 11/6/2001*	*MW-8S DUP 166 11/6/2001*	*Relative Percent Difference*	*MW-7S 178 11/8/2001*	*MW-7S DUP 179 11/8/2001*	*Relative Percent Difference*	*MW-8S 198 4/23/2002*	*MW-8S DUP 199 4/23/2002*	*Relative Percent Difference*
Metals, micrograms per liter									
Aluminum	200 U	200 U	NA	382	NA	NA	NA	NA	NA
Antimony	60.0 U	60.0 U	NA	60.0 U	NA	NA	NA	NA	NA
Arsenic	10.0 U	10.0 U	NA	10.0 U	NA	NA	10.0 U	10.0 U	NA
Barium	200 U	200 U	NA	200 U	NA	NA	NA	NA	NA
Beryllium	5.0 U	5.0 U	NA	5.0 U	NA	NA	NA	NA	NA
Cadmium	5.0 U	5.0 U	NA	5.0 U	NA	NA	NA	NA	NA
Calcium	205000 J	207000 J	1.0	310000 J	NA	NA	NA	NA	NA
Chromium	10.0 UJ	10.0 UJ	NA	10.0 UJ	NA	NA	10.0 U	10.0 U	NA
Cobalt	50.0 U	50.0 U	NA	50.0 U	NA	NA	NA	NA	NA
Copper	25.0 U	25.0 U	NA	25.0 U	NA	NA	NA	NA	NA
Iron	218 J	223 J	2.3	11000 J	NA	NA	NA	NA	NA
Lead	3.0 UJ	3.0 UJ	NA	3.0 UJ	NA	NA	NA	NA	NA
Magnesium	30100	30300	0.7	75900	NA	NA	NA	NA	NA
Manganese	4220 J	4220 J	0.0	254 J	NA	NA	NA	NA	NA
Nickel	40.0 UJ	40.0 UJ	NA	40.0 UJ	NA	NA	NA	NA	NA
Potassium	5000 UJ	5000 UJ	NA	5000 UJ	NA	NA	NA	NA	NA
Selenium	5.0 U	5.0 U	NA	5.0 U	NA	NA	NA	NA	NA
Silver	10.0 U	10.0 U	NA	10.0 U	NA	NA	NA	NA	NA
Mercury	0.200 U	0.200 U	NA	0.200 UJ	NA	NA	NA	NA	NA
Sodium	7210	5000 U	NA	27800	NA	NA	NA	NA	NA
Thallium	10.0 UJ	10.0 UJ	NA	10.0 UJ	NA	NA	NA	NA	NA
Vanadium	50.0 U	50.0 U	NA	50.0 U	NA	NA	NA	NA	NA
Zinc	20.0 UJ	20.0 UJ	NA	20.0 UJ	NA	NA	NA	NA	NA
Hexavalent Chromium, micrograms per liter									
Total Hexavalent Chromium	10 UJ	10 UJ	NA	10 UJ	NA	NA	10.0 UJ	10.0 UJ	NA
Other Geochemical Parameters, milligrams per liter									
Ammonia	0.57	NA	NA	0.10 U	0.10 U	NA	0.34	0.37	8.5
Bicarbonate Alkalinity	308	NA	NA	446	438	1.8	NA	NA	NA
Carbonate Alkalinity	5.0 U	NA	NA	5.0 U	5.0 U	NA	NA	NA	NA
Nitrate	32.8	NA	NA	0.50 U	0.50 U	NA	14.6	16.8	14.0
Sulfate	220	NA	NA	760	717	5.8	104	144	32.3
Sulfide	1.0 U	NA	NA	1.0 U	1.0 U	NA	NA	NA	NA

Table 3-4

Geomatrix

COMPARISON OF QA/QC SAMPLES - GROUNDWATER

Peter Cooper Markhams Site
Dayton, New York

	Sample Location, Identification, and Date Collected [1]								
Constituent [2]	*MW-8S 165 11/6/2001*	*MW-8S DUP 166 11/6/2001*	*Relative Percent Difference*	*MW-7S 178 11/8/2001*	*MW-7S DUP 179 11/8/2001*	*Relative Percent Difference*	*MW-8S 198 4/23/2002*	*MW-8S DUP 199 4/23/2002*	*Relative Percent Difference*
Total Dissolved Solids	677	NA	NA	1480	1590	7.2	NA	NA	NA
Total Organic Carbon	7.3	NA	NA	8.8	8.8	0.0	NA	NA	NA
Ferrous Iron	0.10 U	NA	NA	5.2	NA	NA	NA	NA	NA

Notes:

1 Sample locations provided on Plate 1

2 Data qualifications reflect 100% data validation performed by Data Validation Services

3. Groundwater criteria is from Division of Water, Technical and Operational Guidance Series (TOGs), Ambient Water Quality Standards and Guidance Values for Groundwater (June 1998) and U.S. EPA Region 9 Preliminary Remediation Goals (PRGs) for Tap Water (2002)

ORGANIC DATA QUALIFIERS:

U = compound was analyzed for, but not detected, reported with detection limit value

J = an estimated value, either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, or when a compound meets the identification criteria but the result is less than the quantitation limit

INORGANIC DATA QUALIFIERS

U = element was analyzed for, but not detected, reported with the detection limit

J or B = a value greater than or equal to the instrument detection limit, but less than the quantitation limit

E = a value estimated or not reported due to the presence of interferences

Table 3-5

COMPARISON OF QA/QC SAMPLES - SURFACE WATER

Peter Cooper Markhams Site
Dayton, New York

Constituent[2]	*Sample Location, Identification, and Date Collected*[2]					
	Surface Water #2 184 12/3/2001	*Surface Water #2 DUP 185 DUP 12/3/2001*	*Relative Percent Difference*	*Surface Water #3 212 4/25/2002*	*Surface Water #3 DUP 213 DUP 4/25/2002*	*Relative Percent Difference*
Total Metals, micrograms per liter						
Arsenic	10.0 U	10.0 U	NA	10.0 U	10 U	NA
Chromium	10.0 UJ	10.0 UJ	NA	10.0 U	13.8	31.9
Hexavalent Chromium	13.0 J	14.0 J	7.4	10.0 UJ	11.8 J	NA
Other Geochemical Parameters, milligrams per liter						
Ammonia	0.10 U	0.10 U	NA	0.11 J	0.38 J	110.2
Bicarbonate Alkalinity	40.8	38.1	6.8	NA	NA	NA
Carbonate Alkalinity	5.0 U	5.0 U	NA	NA	NA	NA
Nitrate	0.50 U	0.50 U	NA	0.50 U	0.50 U	NA
Sulfate	198	197	0.5	83.2	83.3	0.1
Sulfide	1.0 U	1.0 U	NA	NA	NA	NA
Total Dissolved Solids	432	386	11.2	NA	NA	NA
Total Organic Carbon	26.4	27.1	2.6	NA	NA	NA

Notes:

1. Sample locations provided on Plate 1
2. Data qualifications reflect 100% data validation performed by Data Validation Services (for December sampling event)

NA = not analyzed

INORGANIC DATA QUALIFIERS:

U = element was analyzed for, but not detected; reported with the detection limit value

J or B = a value greater than or equal to the instrument detection limit, but less than the quantitation limit

Table 3-6

COMPARISON OF QA/QC SAMPLES - WASTE FILL/PERIMETER SOILS

Peter Cooper Markhams Site
Dayton, New York

Constituent [2]	Sample Location, Identification, and Date Collected [1]					
	B-4; 4-5 fbgs 011 10/5/2001	*B-4; 4-5 fbgs DUP 012 10/5/2001*	*Relative Percent Difference*	*MW-7S, 8-16 fbgs 015 10/8/2001*	*MW-7S, 8-16 fbgs DUP 016 10/8/2001*	*Relative Percent Difference*
Total Metals, milligrams per kilogram						
Arsenic	9.1 J	10.5 J	14.3	NA	NA	NA
Chromium	8870	11200	23.2	NA	NA	NA
Hexavalent Chromium	(0.65 U) R	(0.69 U) R	NA	NA	NA	NA
Manganese	NA	NA	NA	400	396	1.0
SPLP Metals, micrograms per liter						
Arsenic	10.0 U	10.0 U	NA	NA	NA	NA
Chromium	377 J	737 J	64.6	NA	NA	NA
Hexavalent Chromium	0.022 J	0.01 UJ	NA	NA	NA	NA
Other Parameters						
Total Moisture Content, %	NA	NA	NA	NA	NA	NA
Leachable pH	NA	NA	NA	7.8	7.9	1.3

Constituent [2]	Sample Location, Identification, and Date Collected [1]					
	Lathe #63 031 10/10/2001	*Lathe #63 DUP 032 10/10/2001*	*Relative Percent Difference*	*Lathe #60 052 10/10/2001*	*Lathe #60 DUP 053 10/10/2001*	*Relative Percent Difference*
Total Metals, milligrams per kilogram						
Arsenic	8.1	3.4	81.7	8.6	8.0	7.2
Chromium	8.9	23.5	90.1	13.8	13.8	0.0
Hexavalent Chromium	(0.58 U) R	(0.93 U) R	NA	(0.58 U) R	(0.54 U) R	NA
Manganese	NA	NA	NA	NA	NA	NA
SPLP Metals, micrograms per liter						
Arsenic	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA
Hexavalent Chromium	NA	NA	NA	NA	NA	NA
Other Parameters						
Total Moisture Content, %	NA	NA	NA	NA	NA	NA
Leachable pH	NA	NA	NA	NA	NA	NA

Table 3-6

COMPARISON OF QA/QC SAMPLES - WASTE FILL/PERIMETER SOILS

Peter Cooper Markhams Site
Dayton, New York

Constituent [2]	Sample Location, Identification, and Date Collected [5]					
	Lathe #130 106 10/12/2001	*Lathe #130 DUP 107 10/12/2001*	*Relative Percent Difference*	*Lathe #123 116 10/12/2001*	*Lathe #123 DUP 117 10/12/2001*	*Relative Percent Difference*
Total Metals, milligrams per kilogram						
Arsenic	10.0	NA	NA	9.5	8.2	14.7
Chromium	3050	NA	NA	12600	12800	1.6
Hexavalent Chromium	(0.45 U) R	NA	NA	0.58 UJ	0.69 UJ	NA
Manganese	NA	NA	NA	NA	NA	NA
SPLP Metals, micrograms per liter						
Arsenic	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA
Hexavalent Chromium	NA	NA	NA	NA	NA	NA
Other Parameters						
Total Moisture Content, %	19.6	26.5	29.9	NA	NA	NA
Leachable pH	NA	NA	NA	NA	NA	NA

Constituent [2]	Sample Location, Identification, and Date Collected [5]					
	Lathe #103 073 10/10/2001	**Lathe #103 DUP 074 10/10/2001**	*Relative Percent Difference*	*Lathe #111 094 10/10/2001*	*Lathe #111 DUP 095 10/10/2001*	*Relative Percent Difference*
Total Metals, milligrams per kilogram						
Arsenic	8.1	7.2	11.8	11.5 J	10.9 J	5.4
Chromium	19.5	16.4	17.3	1150 J	1060 J	8.1
Hexavalent Chromium	(0.45 U) R	(0.43 U) R	NA	0.47 UJ	0.47 UJ	NA
Manganese	NA	NA	NA	NA	NA	NA
SPLP Metals, micrograms per liter						
Arsenic	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA
Hexavalent Chromium	NA	NA	NA	NA	NA	NA
Other Parameters						
Total Moisture Content, %	NA	NA	NA	NA	NA	NA
Leachable pH	NA	NA	NA	NA	NA	NA

Table 3-7

Geomatrix

COMPARISON OF QA/QC SAMPLES - SEDIMENT

Peter Cooper Markhams Site
Dayton, New York

Constituent [2]	*Sample Location, Identification, and Date Collected* [1]		
	Lathe # 81A 137 10/15/2001	*Lathe # 81A DUP 138 10/15/2001*	*Relative Percent Difference*
Total Metals, milligrams per kilogram			
Arsenic	10.3	9.3	10.2
Chromium	9.3 J	8.6 J	7.8

Notes:

1. Sample locations provided on Plate 1.
2. Data qualifications reflects 100% data validation performed by Data Validation Services.

J = a value greater than or equal to the instrument detection limit, but less than the quantitation limit

Geomatrix

TABLE 4-1
SOIL BORING and STRATIFICATION SUMMARY

Peter Cooper Markhams Site
Dayton, New York

Boring Number	*Surface Elevation (fmsl)*	*Cover Soil Thickness (ft)*	*Waste-Fill/ Non-Waste Fill Thickness (ft)*	*Glacial Outwash Unit Thickness (ft)*	*Lacustrine Unit Thickness (ft)*
Monitoring Wells					
MW-1D	1309.53	2.0	1.0	12.0	>22.5
MW-2D	1313.91	2.0	0.0	8.0	>26.5
MW-3D2	1312.78	0.0	1.0	10.0	>31.0
MW-4D	1312.87	0.0	0.0	11.0	>23.5
MW-5D	1302.78	0.0	0.0	8.0	>23.5
MW-6D	1313.79	0.0	0.0	18.0	>11.0
MW-7D	1309.39	0.0	0.0	12.0	>20.0
MW-8D	1300.98	0.0	0.0	8.0	>20.0
MW-9D	1311.64	0.0	0.0	9.5	>20.5
Soil Borings					
B-1	1317.4	0.0	(6.0)	>8.0	NA
B-1A	1314.0	4.0	5.5	9.5	>1.0
B-2	1314.9	0.0	(4.0)	0.0	NA
B-3	1314.5	1.0	(3.0)	>6.0	NA
GPZ-1/ B-4	1327.7	2.0	13.0	>7.0	NA
B-5	1311.8	2.0	8.0	7.0	>3.0
B-6	1316.0	5.5	1.0	>6.5	NA

Notes:
Parentheses indicate that only Non-Waste Fill was encountered during the boring
NA- Unit was not encountered during soil boring

ft = feet
fmsl = feet mean sea level
> = greater than

Table 4-2

Geomatrix

SUMMARY OF WATER LEVEL DATA

Peter Cooper Markhams Site
Dayton, New York

Well ID [1]	*Ground Elevation (fmsl)*	*Top of Riser/Staff Gage Zero Elevation* [2] *(fmsl)*	*Date*							*Max.*	*Min.*
			10/23/2001	*11/5/2001*	*12/3/2001*	*1/14/2002*	*2/19/2002*	*3/28/2002*	*4/22/2002*		
MW-1S	1309.61	1311.31	1299.60	1299.82	1300.19	1301.43	1303.64	1304.45	1304.91	1304.91	1299.60
MW-1D	1309.53	1311.52	1299.45	1299.72	1300.10	1301.27	1303.36	1304.12	1304.65	1304.65	1299.45
MW-2S	1313.39	1313.15	1303.57	1303.85	1304.29	1305.46	1307.22	1307.76	1308.30	1308.30	1303.57
MW-2D	1313.91	1313.99	1303.56	1303.54	1303.96	1305.11	1306.59	1307.61	1308.14	1308.14	1303.54
MW-3SR	1312.05	1315.27	1303.06	1303.33	1303.42	1304.59	1307.05	1308.38	1310.07	1310.07	1303.06
MW-3D2	1312.78	1314.74	1303.43	1303.69	1303.80	1304.97	1307.42	1308.72	1308.65	1308.72	1303.43
MW-4S	1311.43	1312.98	1300.93	1300.93	1301.27	1301.47	1304.95	1305.74	1306.17	1306.17	1300.93
MW-4D	1312.87	1314.93	1301.27	1300.88	1301.68	1302.81	1304.82	1305.60	1306.08	1306.08	1300.88
MW-5S	1303.05	1302.62	1298.09	1298.41	1298.95	1299.19	1299.44	1299.67	1299.68	1299.68	1298.09
MW-5D	1302.78	1302.62	1299.01	1299.43	1299.88	1300.70	1302.24	1302.50	1302.62	1302.62	1299.01
MW-6S	1313.68	1315.36	1298.75	1299.04	1299.20	1300.45	1302.81	1303.47	1304.12	1304.12	1298.75
MW-6D	1313.79	1314.92	1298.60	1298.89	1299.05	1300.30	1302.57	1303.21	1303.85	1303.85	1298.60
MW-7S	1309.62	1312.52	1297.55	1298.22	1298.69	1299.02	1301.10	1301.66	1302.12	1302.12	1297.55
MW-7D	1309.39	1312.35	1297.60	1297.56	1298.68	1299.51	1301.17	1301.73	1302.21	1302.21	1297.56
MW-8S	1301.06	1303.93	1297.74	1298.27	1298.78	1299.12	1299.65	1299.83	1299.88	1299.88	1297.74
MW-8D	1300.98	1304.03	1298.38	1298.70	1299.40	1300.15	1301.69	1302.15	1302.51	1302.51	1298.38
MW-9S	1311.49	1313.95	1305.13	1305.27	1305.32	1306.71	1309.17	1309.81	1310.10	1310.10	1305.13
MW-9D	1311.64	1314.12	1305.12	1305.28	1305.31	1306.69	1309.11	1309.76	1310.08	1310.08	1305.12
Staff Gage #1	NA	1299.17	--	--	dry	1297.57	1298.12	1298.12	1298.50	1298.50	dry
Staff Gage #2	NA	1300.19	--	--	dry	dry	1299.28	1299.27	1299.29	1299.29	dry
Staff Gage #3	NA	1311.02	--	--	dry	dry	dry	1309.12	1309.97	1309.97	dry
Staff Gage #4	NA	1309.78	--	--	dry	dry	dry	1309.32	1309.86	1309.86	dry

Notes:

1. Well and staff gage locations are provided on Figure 2-1

2 Top of riser and staff gage zero elevations as measured by E&M Engineers and Surveyors P.C., October, 2001.

fmsl = feet mean sea level

-- means not measured

NA = not applicable

TABLE 4-3
HYDRAULIC CONDUCTIVITY SUMMARY
Peter Cooper Markhams Site
Dayton, New York

Geomatrix

Well I.D.	Screen Interval		Estimated Hydraulic Conductivity [2]	
	Elevation [1] (famsl)	Depth (fbgs)	(cm/sec)	(ft/day)
Outwash Sand & Gravel				
MW-1S	1300.66-1295.66	9.0-14.0	3.69E-02	1.04E+02
MW-2S [3]	1305.45-1300.45	6.0-11.0	3.00E-07	8.51E-04
MW-3S	1303.25-1298.25	9.0-14.0	3.05E-03	8.66E+00
MW-5S	1298.30-1293.30	2.0-7.0	1.24E-03	3.51E+00
MW-6S	1300.29-1295.29	13.5-18.5	4.30E-03	1.22E+01
MW-7S	1303.71-1293.71	6.0-16.0	1.47E-03	4.16E+00
MW-8S	1298.93-1293.93	5.0-10.0	1.75E-02	4.95E+01
MW-9S	1304.86-1299.86	6.0-11.0	9.87E-03	2.80E+01
Geometric Mean Hydraulic Conductivity: [4]			***5.50E-03***	***1.56E+01***
Lacustrine Silt & Sand				
MW-1D	1280.30-1285.30	25.0-30.0	4.49E-03	1.27E+01
MW-2D	1286.97-1281.97	25.0-30.0	1.70E-03	4.83E+00
MW-3D2	1287.94-1282.94	25.0-30.0	6.39E-03	1.81E+01
MW-4D	1287.87-1282.87	25.0-30.0	1.45E-03	4.11E+00
MW-5D	1280.67-1275.67	20.0-25.0	7.16E-03	2.03E+01
MW-6D	1285.68-1280.68	28.0-33.0	5.80E-03	1.64E+01
MW-7D	1284.54-1274.54	22.0-32.0	3.29E-03	9.33E+00
MW-8D	1282.87-1272.87	18.0-28.0	5.29E-03	1.50E+01
MW-9D	1281.17-1291.17	20.0-30.0	1.09E-03	3.09E+00
Geometric Mean Hydraulic Conductivity:			***3.37E-03***	***9.55E+00***

Notes:

(1) Survey completed by E & M Surveyors and Engineers January 2002

(2) Hydraulic conductivity estimated by Geomatrix Consultants, Inc. using Bouwer and Rice Methods.

(3) Hydraulic conductivity estimated by RECRA Environmental, 1984.

(4) MW-2S conductivity is anomalous, and is excluded from geometric mean.

Monitoring well MW-4 was dry during hydraulic conductivity testing.

famsl = feet above mean sea level

fbgs = feet below ground surface

cm/sec = centimeters per second

ft/day = feet per day

TABLE 4-4

Geomatrix

PHYSICAL PROPERTY DATA SUMMARY

Peter Cooper Markhams Site
Dayton, New York

Fill Piles						
Grainsize	**Method**	**Sample ID**	**% gravel**	**% sand**	**% silt**	**% clay**
	ASTM D422	"Fill Pile" (Boring B-4)	7.7	52.7	25.4	14.2
Dry Density	**Method**	**Sample ID**	**pcf Before**		**pcf After**	
	ASTM D3080	ST-2 (Boring B-4)	46.7		46.8	
	ASTM D3080	ST-3 (Boring B-6)	61.1		54.4	
	ASTM D3080	ST-4 (Boring B-5)	51		50.2	
Water Content	**Method**	**Sample ID**	**pcf Before**		**pcf After**	
	ASTM D2216	ST-2 (Boring B-4)	78.2		86.3	
	ASTM D2216	ST-3 (Boring B-6)	82.2		88.5	
	ASTM D2216	ST-4 (Boring B-5)	84.8		88.8	

Cover Soil/Top of Fill Piles - Surface Soil						
Grainsize	**Method**	**Sample ID**	**% gravel**	**% sand**	**% silt**	**% clay**
	ASTM D422	Composite - "Fill Pile Cover Soil"	26.3	44.8	23.7	5.2
Hydraulic Conductivity	**Method**	**Sample ID**	**centimeters per second (cm/s)**			
	ASTM D5084	ST-2 (Boring B-4)	2.9 E-5			
	ASTM D5084	ST-3 (Boring B-6)	5.1 E-6			
	ASTM D5084	ST-4 (Boring B-5)	7.8 E-5			
TOC	**Method**	**Sample ID**	**% Total Organic Carbon**			
	ASTM D422	Lathe #114	13.2 J			
	ASTM D422	Lathe #115	11.2 J			
	ASTM D422	Lathe #116	13.2 J			
	ASTM D422	Lathe #117	2.2 J			
	ASTM D422	Lathe #118	1.1 J			
	ASTM D422	Lathe #119	2.5 J			
	ASTM D422	Lathe #121	4.5 J			
	ASTM D422	Lathe #137	4.2 J			

Perimeter Areas of Fill Piles - Surface Soils						
Grainsize	**Method**	**Sample ID**	**% gravel**	**% sand**	**% silt**	**% clay**
	ASTM D422	Composite 151	21.6	41.5	30.3	6.6
	ASTM D422	Composite 154	3.6	33.9	51.4	11.1
	ASTM D422	Composite 155	25.5	46.9	21.6	6.0
	ASTM D422	Composite 156	15.6	40.5	34.7	9.2
TOC	**Method**	**Sample ID**	**% Total Organic Carbon**			
	Walkey Black	Composite 151	3.6			
	Walkey Black	Composite 154	1.4			
	Walkey Black	Composite 155	1.8			
	Walkey Black	Composite 156	1.2			

TABLE 4-4

Geomatrix

PHYSICAL PROPERTY DATA SUMMARY

Peter Cooper Markhams Site
Dayton, New York

Native Subsurface from Monitoring Well Borings						
Grainsize	**Method**	**Sample ID**	**% gravel**	**% sand**	**% silt**	**% clay**
	ASTM D422	MW-3SR; 8-14 fbgs	27.1	56.4	12.2	4.3
	ASTM D422	MW-7D; 24-32 fbgs	0.0	18.7	74.3	7.0
	ASTM D422	MW-7S; 8-16 fbgs	8.8	61.6	24.1	5.5
	ASTM D422	MW-8D; 20-21 fbgs	0.0	29.4	67.6	3.0
	ASTM D422	MW-8S; 6-10 fbgs	9.8	29.5	55.7	5.0
	ASTM D422	MW-9D; 20-28 fbgs	0.0	5.0	82.8	12.2
	ASTM D422	MW-9S; 8-10 fbgs	10.0	59.9	23.4	6.7
Cation Exchange Capacity	**Method**	**Sample ID**	**meq/100g**			
	9080 or 9081	MW-3SR; 8-14 fbgs	8.1			
	9080 or 9081	MW-7D; 24-32 fbgs	2.3			
	9080 or 9081	MW-7S; 8-16 fbgs	4.0			
	9080 or 9081	MW-8D; 20-21 fbgs	0.9			
	9080 or 9081	MW-8S; 6-10 fbgs	5.0			
	9080 or 9081	MW-9D; 20-28 fbgs	19.2			
	9080 or 9081	MW-9S; 8-10 fbgs	5.3			
TOC	**Method**	**Sample ID**	**% Total Organic Carbon**			
	Walkey Black	MW-3SR; 8-14 fbgs	0.24			
	Walkey Black	MW-7D; 24-32 fbgs	0.48			
	Walkey Black	MW-7S; 8-16 fbgs	0.48			
	Walkey Black	MW-8D; 8-10 fbgs	0.40			
	Walkey Black	MW-8S; 20-21 fbgs	0.28			
	Walkey Black	MW-9D; 20-28 fbgs	1.20			
	Walkey Black	MW-9S; 8-10 fbgs	0.48			
Leachable pH	**Method**	**Sample ID**	**pH**			
	9045	MW-7D; 24-32 fbgs	8.0			
	9045	MW-7S; 8-16 fbgs	7.8			
	9045	MW-8D; 20-26 fbgs	8.2			
	9045	MW-8S; 6-10 fbgs	7.8			
Manganese	**Method**	**Sample ID**	**Milligrams per Kilogram**			
	6010B	MW-7D; 24-32 fbgs	235			
	6010B	MW-7S; 8-16 fbgs	400			
	6010B	MW-8D; 20-26 fbgs	210			
	6010B	MW-8S; 6-10 fbgs	561			

Wetland Sediments						
Grainsize	**Method**	**Sample ID**	**% gravel**	**% sand**	**% silt**	**% clay**
	ASTM D422	Composite 150 - Wetland D	29.7	47.1	17.2	6.0
	ASTM D422	Composite 152 - Wetland F	10.7	37.3	40.6	11.4
	ASTM D422	Composite 153 - Wetlands A, B and G	4.0	42.9	39.0	14.1
Leachable pH	**Method**	**Sample ID**	**pH**			
	9045	Composite 174 - Wetland F	6.5			
	9045	Composite 175 - Wetland B	5.1			
	9045	Composite 176 - Wetland D	5.8			
TOC	**Method**	**Sample ID**	**% Total Organic Carbon**			
	Walkey Black	Composite 150 - Wetland D	1.4			
	Walkey Black	Composite 152 - Wetland F	7.9			
	Walkey Black	Composite 153 - Wetlands A, B and G	1.6			

Table 5-1

Geomatrix

ANALYTICAL RESULTS FOR WASTE FILL SAMPLES FROM FILL PILE BORINGS

Peter Cooper Markhams Site
Dayton, New York

Constituent[2]	Soil Criteria[3]				Sample Location, Sample Identification #, and Date Collected[1]		
	Eastern USA Background	*Region 9 PRG*	*EPA Soil Screening Level*	*Site Background Level*	*B-4, 4-5 fbgs 100501011 10/5/2001*	*B-5, 4-5 fbgs 100901018 10/9/2001*	*B-6, 5.5-6.5 fbgs 100901022 10/9/2001*
Total Metals, milligrams per kilogram							
Arsenic	3 - 12**	1.6	29	ND to 8.1	9.1 J	51.6 J	65.6 J
Chromium	1.5 - 40**	450	38	7.8 to 31.8	8870/31200[5]	4490	6390
Hexavalent Chromium	--	64	38	--	(0.65 U)R/4.7[5]	(0.65 U) R	(0.66 U) R
SPLP Metals, micrograms per liter	*Groundwater Criteria*[4]						
	TOGs	*PRG*					
Arsenic	25	0.045	--	--	10 U	10 UJ	14.2
Chromium	50	55000	--	--	377 J	226	1010
Hexavalent Chromium	50	110	--	--	22 J	10 UJ	10 UJ

Notes:

1. Sample locations provided on Plate 1. indicates concentration is above all soil criteria.
2. Data qualifications reflect 100% data validation performed by Data Validation Services
3. Soil criteria is from NYSDEC Division of Environmental Remediation, Technical and Administrative Guidance Memorandum #4046 for Eastern USA Background Heavy Metals Concentration in Soil (January 1994), U.S. EPA Region 9 Preliminary Remediation Goals (PRGs) for Industrial Soil (October 2004), and U.S. EPA Soil Screening Guidance, Generic Soil Screening Levels for Migration to Groundwater (July 1996) .
4. Groundwater criteria is from NYSDEC Divison of Water, Technical and Operational Guidance Series (TOGs) Ambient Water Quality Standards and Guidanee Values (June 1998) and U.S. EPA Region 9 Preliminary Remediation Goals (PRGs) for Tap Water (2004)
5. Confirmation sample, collected December 2003.

** indicates a New York State background concentration

-- indicates no criteria exists

(value) = concentration reported by the laboratory prior to being rejected by data validation

R = rejected concentration as a result of data validation

ND = non-detect

INORGANIC DATA QUALIFIERS:

J = a value greater than or equal to the instrument detection limit, but less than the quantitation limit

Table 5-2

ANALYTICAL RESULTS FOR BACKGROUND SURFACE SOIL SAMPLES

Peter Cooper Markhams Site
Dayton, New York

	Soil Criteria[3]				*Sample Location, Sample Identification #, and Date Collected*[1]					
Constituent[2]	*Eastern USA Background*	*Region 9 PRG*	*Soil Screening Level*	*Site Background Level*	*Lathe #52 101501134 10/15/2001*	*Lathe #55 101501141 10/15/2001*	*Lathe #54 101501142 10/15/2001*	*Lathe #53 101501143 10/15/2001*	*Lathe #51 101501144 10/15/2001*	*Lathe #50 101501145 10/15/2001*
Total Metals, milligrams per kilogram										
Arsenic	3 - 12**	1.6	29	ND to 8.1	8.1	1.4 U	7.1	5.8	5.2	5.3
Chromium	1.5 - 40**	450	38	7.8 to 31.8	20.7 J	7.8 J	31.8 J	11.1 J	15.6 J	26.4 J

Notes:

1. Sample locations provided on Plate 1
2. Data qualifications reflect 100% data validation performed by Data Validation Services
3. Soil criteria is from NYSDEC Division of Environmental Remediation, Technical and Administrative Guidance Memorandum #4046 for Eastern USA Background Heavy Metals Concentration in Soil (January 1994), U.S. EPA Region 9 Preliminary Remediation Goals (PRGs) for Industrial Soil (October 2004), and U.S. EPA Soil Screening Guidance, Generic Soil Screening Levels for Migration to Groundwater (July 1996)

indicates concentration is above all soil criteria.

** indicates a New York State background concentration

ND = non-detect

INORGANIC DATA QUALIFIERS:

U = element was analyzed for, but not detected; reported with detection limit value

J = a value greater than or equal to the instrument detection limit, but less than the quantitation limit

Table 5-3

ANALYTICAL RESULTS FOR COVER SOIL SAMPLES FROM TOP OF FILL PILES

Peter Cooper Markhams Site
Dayton, New York

Constituent[2]	Soil Criteria[3]				Sample Location, Identification, and Date Collected[1]								
	Eastern USA Background	Region 9 PRG	Soil Screening Level	Site Background Level	Lathe #118 101001037 10/10/2001	Lathe #117 101101064 10/11/2001	Lathe #114 101101065 10/11/2001	Lathe #115 101101066 10/11/2001	Lathe #116 101101067 10/11/2001	Lathe #137 101101068 10/11/2001	Lathe #121 101101092 10/11/2001	Lathe #119 101101096 10/11/2001	Lathe #120 101201097 10/12/2001
Total Metals, milligrams per kilogram													
Arsenic	3 - 12**	1.6	29	ND to 8.1	9.5	5.8	30.2	18.0	10.3	13.1	7.1	16.9	95.5
Chromium	1.5 - 40**	450	38	7.8 to 31.8	2840	35900/20600[4]	28000	18100/13300[4]	13100	1440/1480[4]	65300/28000[4]	2110	29200 J/22800 J[4]
Hexavalent Chromium	--	64	38	--	(0.62 U) R	(0.93 U)R/6.8[4]	(11.6 U) R	(0.6 U)R/51.8[4]	(3.4 U) R	(0.51 U)R/5.4[4]	(0.89 U)R/18.2[4]	(0.48 U) R	(20.3 U)R/63.3 J[4]
Other Parameters													
Leachable Total Organic Carbon, mg/kg	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	1510
Total Organic Carbon, mg/kg	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	18.8
Total Organic Carbon, %	--	--	--	--	1.1 J	2.2 J	13.2 J	11.2 J	13.2 J	4.2 J	4.5 J	2.5 J	NA

Notes:

1. Sample locations provided on Plate 1

2. Data qualifications reflect 100% data validation performed by Data Validation Services

3. Soil criteria is from NYSDEC Division of Environmental Remediation, Technical and Administrative Guidance Memorandum #4046 for Eastern USA Background Heavy Metals Concentration in Soil (January 1994), U.S. EPA Region 9 Preliminary Remediation Goals (PRGs) for Industrial Soil (October 2004), and U.S. EPA Soil Screening Guidance, Generic Soil Screening Levels for Migration to Groundwater (July 1996)

4. Confirmation sample, collected December 2003

shaded indicates concentration is above all soil criteria.

** indicates a New York State background concentration

-- indicates no criteria exists

(value) = concentration reported by the laboratory prior to being rejected by data validation

ND = non-detect

R = rejected concentration as a result of data validation.

NA = not analyzed

INORGANIC DATA QUALIFIERS.

E = value estimated or not reported due to the presence of interferences.

U = compound was analyzed for, but not detected. Reported with detection limit value.

ORGANIC DATA QUALIFIERS:

J = an estimated value, either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, or when a compound meets the identification criteria but the result is less than the quantitation limit

Table 5-4

ANALYTICAL RESULTS FOR SURFACE SOIL SAMPLES FROM PERIMETER OF FILL PILES

Geomatrix

Peter Cooper Markhams Site
Dayton, New York

Constituent [2]	Soil Criteria [3]			Sample Location, Sample Identification #, and Date Collected [1]									
	Eastern USA/ Site Background	Region 9 PRG	Soil Screening Level	Lathe #129 101201098 10/12/2001	Lathe #128 101201100 10/12/2001	Lathe #127 101201102 10/12/2001	Lathe #126 101201104 10/12/2001	Lathe #130 101201106 10/12/2001	Lathe #131 101201109 10/12/2001	Lathe #124 101201111 10/12/2001	Lathe #125 101201113 10/12/2001	Lathe #123 101201115 10/12/2001	Lathe #122 101201118 10/12/2001
Volatile Organic Compounds, micrograms per kilogram [4]													
Chloromethane	--	2.6	--	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
Bromomethane (Methyl bromide)	--	13	0.20	10 UJ	16 UJ	19 UJ	15 UJ	10 UJ	9 UJ	11 UJ	10 UJ	9 UJ	15 UJ
Vinyl chloride	--	0.75	0.010	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
Chloroethane	--	6.5	--	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
Methylene chloride	--	21	0.020	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
Acetone	--	6000	16	10 U	16 U	54 U	15 U	180 U	190 U	250 U	270 U	210 U	550 U
Carbon Disulfide	--	720	32	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	2 J	15 U
1,1-Dichloroethene	--	410	0.060	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
1,1-Dichloroethane	--	1700	23	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
Chloroform	--	12	0.60	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
1,2-Dichloroethane	--	0.60	0.020	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
2-Butanone (Methyl ethyl ketone)	--	27000	--	10 U	16 U	19 U	15 U	20 U	15 U	21 U	19 U	14 U	50 B
1,1,1-Trichloroethane	--	1200	2.0	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
Carbon Tetrachloride	--	0.55	0.070	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
Bromodichloromethane	--	1.8	0.60	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
1,2-Dichloropropane	--	0.74	0.030	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
cis-1,3-Dichloropropene	--	1.8*	0.004*	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
Trichloroethene	--	0.11	0.060	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
Dibromochloromethane	--	2.6	0.40	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
1,1,2-Trichloroethane	--	1.6	0.020	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
Benzene	--	1.3	0.030	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
trans-1,3-Dichloropropene	--	1.8*	0.004*	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
Bromoform	--	220	0.80	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
4-Methyl-2-pentanone (methyl isobutyl ketone)	--	2800	--	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
2-Hexanone (Methyl butyl ketone)	--	--	--	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
Tetrachloroethene	--	3.4	0.060	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
Toluene	--	520	12	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
1,1,2,2-Tetrachloroethane	--	0.93	0.0030	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
Chlorobenzene	--	530	1.0	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
Ethylbenzene	--	20	13	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
Styrene	--	1700	4.0	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
Total Xylenes	--	420	210	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
cis-1,2-Dichloroethene	--	150	0.40	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
trans-1,2-Dichloroethene	--	230	0.70	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
Dichlorodifluoromethane	--	310	--	6 J	6 J	19 U	3 J	10 U	9 U	11 U	10 U	9 U	15 U
Trichlorofluoromethane	--	2000	--	7 J	6 J	19 U	3 J	10 U	9 U	11 U	10 U	9 U	15 U
Methyl tertbutyl ether	--	160	--	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
1,2-Dibromoethane	--	0.028	--	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
Isopropylbenzene (Cumene)	--	2000	--	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
1,3-Dichlorobenzene	--	63	--	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
1,4-Dichlorobenzene	--	7.9	2.0	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
1,2-Dichlorobenzene	--	370	17	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
1,2-Dibromo-3-chloropropane	--	2.0	--	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U
1,2,4-Trichlorobenzene	--	3000	5.0	10 U	16 U	19 U	15 U	10 U	9 U	11 U	10 U	9 U	15 U

Table 5-4

ANALYTICAL RESULTS FOR SURFACE SOIL SAMPLES FROM PERIMETER OF FILL PILES

Peter Cooper Markhams Site
Dayton, New York

Constituent [2]	Soil Criteria [3]			Sample Location, Sample Identification #, and Date Collected [1]									
	Eastern USA/ Site Background	Region 9 PRG	Soil Screening Level	Lathe #129 101201098 10/12/2001	Lathe #128 101201100 10/12/2001	Lathe #127 101201102 10/12/2001	Lathe #126 101201104 10/12/2001	Lathe #130 101201106 10/12/2001	Lathe #131 101201109 10/12/2001	Lathe #124 101201111 10/12/2001	Lathe #125 101201113 10/12/2001	Lathe #123 101201115 10/12/2001	Lathe #122 101201118 10/12/2001
Tentatively Identified Compounds, micrograms per kilogram [4]													
Hexane				(6 BJN) R	(9 BJN) R	(12 BJN) R			(5 BJN) R	(6 BJN) R	(6 BJN) R		(8 BJN) R
Unknown Alcohol									5 J				
Unknown									58 J	19 J	39 J	32 J	92 J
Semi-Volatile Organic Compounds, micrograms per kilogram [4]													
Acenaphthene	--	29000	570	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
Acenaphthylene	--	--	--	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
Acetophenone	--	--	--	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
Anthracene	--	100000	12000	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
Atrazine	--	7.8	--	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
Benzo(a)anthracene	--	2.1	2.0	370 U	470 U	520 U	27 J	20 J	360 U	400 U	370 U	380 U	490 U
Benzo(b)fluoranthene	--	2.1	5.0	370 U	46 J	38 J	82 J	44 J	360 U	400 U	370 U	380 U	43 J
Benzo(k)fluoranthene	--	21	49	370 U	28 J	520 U	41 J	370 U	360 U	400 U	370 U	380 U	490 U
Benzo(ghi)perylene	--	--	--	370 U	31 J	520 U	43 J	370 U	360 U	400 U	370 U	380 U	490 U
Benzo(a)pyrene	--	0.21	8.0	370 U	34 J	31 J	71 J	22 J	360 U	400 U	370 U	380 U	490 U
Benzaldehyde	--	62000	--	370 U	470 U	520 U	460 U	370 U	43 J	140 J	170 J	380 U	490 U
Biphenyl (1,1-Biphenyl)	--	350	--	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
Bis(2-chloroethoxy)methane	--	--	--	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
Bis(2-chloroethyl ether	--	0.55	0.00040	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
2,2'-Oxybis(1-Chloropropane) (Bis(2-chloro-1-methylethyl)ether)	--	7.4	--	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
Bis(2-ethylhexyl) phthalate	--	120	--	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
4-Bromophenyl phenyl ether	--	--	--	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
Butyl benzyl phthalate	--	100000	930	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
4-Chloroaniline	--	2500	0.70	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
4-Chloro-3-methylphenol	--	--	--	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
2-Chloronaphthalene (beta-Chloronaphthalene)	--	23000	--	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
2-Chlorophenol	--	240	4.0	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
4-Chlorophenyl phenyl ether	--	--	--	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
Caprolactam	--	100000	--	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
Carbazole	--	86	0.60	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
Chrysene	--	210	160	370 U	32 J	520 U	34 J	24 J	360 U	400 U	370 U	380 U	490 U
Dibenzo(a,h)anthracene	--	0.21	2.0	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
Dibenzofuran	--	3100	--	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
Di-n-butyl phthalate (Dibutyl phthalate)	--	62000	2300	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
3,3'-Dichlorobenzidine	--	3.8	0.0070	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
2,4-Dichlorophenol	--	1800	1.0	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
Diethyl phthalate	--	100000	--	370 U	1180 U	1300 U	460 U	930 U	360 U	400 U	370 U	380 U	490 U
2,4-Dimethylphenol	--	12000	9.0	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
Dimethyl phthalate	--	100000	--	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
4,6-Dinitro-2-methylphenol	--	--	--	910 U	1180 U	1300 U	1160 U	930 U	900 U	1000 U	930 U	940 U	1210 U
2,4-Dinitrophenol	--	1200	0.30	910 U	1180 U	1300 U	1160 U	930 U	900 U	1000 U	930 U	940 U	1210 U
2,4-Dinitrotoluene	--	1200**	0.0008**	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
2,6-Dinitrotoluene	--	620**	0.0007**	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
Di-n-octyl phthalate	--	25000	10000	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
Fluoranthene	--	22000	4300	370 U	33 J	520 U	40 J	59 J	360 U	400 U	370 U	380 U	51 J
Fluorene	--	26000	560	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
Hexachlorobenzene	--	1.1	2.0	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
Hexachlorobutadiene	--	22	2.0	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
Hexachlorocyclopentadiene	--	3700	400	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
Hexachloroethane	--	120	0.50	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
Indeno(1,2,3-cd)pyrene	--	2.1	14	370 U	470 U	520 U	40 J	370 U	360 U	400 U	370 U	380 U	490 U
Isophorone	--	1800	0.50	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
2-Methylnaphthalene	--	--	--	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
2-Methylphenol	--	31000	15	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
4-Methylphenol	--	3100	--	370 U	40 J	60 J	110 J	370 U	360 U	400 U	370 U	380 U	490 U
Naphthalene	--	190	84	370 U	47 J	46 J	33 J	370 U	360 U	400 U	370 U	380 U	490 U
2-Nitroaniline	--	18	--	910 U	1180 U	1300 U	1160 U	930 U	900 U	1000 U	930 U	940 U	1210 U
3-Nitroaniline	--	--	--	910 U	1180 U	1300 U	1160 U	930 U	900 U	1000 U	930 U	940 U	1210 U

Table 5-4

ANALYTICAL RESULTS FOR SURFACE SOIL SAMPLES FROM PERIMETER OF FILL PILES

Geomatrix

Peter Cooper Markhams Site
Dayton, New York

Constituent [2]	Soil Criteria [3]			Sample Location, Sample Identification #, and Date Collected [1]									
	Eastern USA/ Site Background	Region 9 PRG	Soil Screening Level	Lathe #129 101201098 10/12/2001	Lathe #128 101201100 10/12/2001	Lathe #127 101201102 10/12/2001	Lathe #126 101201104 10/12/2001	Lathe #130 101201106 10/12/2001	Lathe #131 101201109 10/12/2001	Lathe #124 101201111 10/12/2001	Lathe #125 101201113 10/12/2001	Lathe #123 101201115 10/12/2001	Lathe #122 101201118 10/12/2001
4-Nitroaniline	--	--	--	910 U	1180 U	1300 U	1160 U	930 U	900 U	1000 U	930 U	940 U	1210 U
Nitrobenzene	--	100	0.10	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
2-Nitrophenol	--	--	--	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
4-Nitrophenol	--	--	--	910 U	1180 U	1300 U	1160 U	930 U	900 U	1000 U	930 U	940 U	1210 U
N-nitrosodiphenylamine	--	350	1.0	330 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
N-Nitroso-Di-n-propylamine	--	0.25	0.000050	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
Pentachlorophenol	--	9.0	0.030	910 U	1180 U	1300 U	1160 U	930 U	900 U	1000 U	930 U	940 U	1210 U
Phenanthrene	--	--	--	370 U	470 U	520 U	460 U	24 J	360 U	400 U	370 U	380 U	490 U
Phenol	--	100000	100	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
Pyrene	--	29000	4200	370 U	27 J	520 U	35 J	42 J	360 U	400 U	370 U	380 U	35 J
2,4,5-Trichlorophenol	--	62000	270	910 U	1180 U	1300 U	1160 U	930 U	900 U	1000 U	930 U	940 U	1210 U
2,4,6-Trichlorophenol	--	62	0.20	370 U	470 U	520 U	460 U	370 U	360 U	400 U	370 U	380 U	490 U
Total Metals, milligrams per kilogram													
Arsenic	3 - 12**/ND to 8.1	1.6	29	9.2	35.6	55.1	12.4	10.0	8.2	9.0	9.7	9.2	12.7
Chromium	1.5 - 40**/7.8 to 31.8	450	38	66.5	8990/8800[4]	11800/2600[4]	4460	3050	36.3	43.0	13.7	85.6/58.0[4]	1150/11600[4]
Hexavalent Chromium	--	64	38	(0.45 U) R	(0.57 U)R/33.0[4]	(0.64 U)R/3.8	(0.57 U) R	(0.45 U) R	(0.52 U) R	(0.49 U) R	(0.46 U) R	(0.47 U)R/2.5[4]	(2.0 U)R/7.7[4]
Other Parameters													
Total Moisture Content, %	--	--	--	15.3	31.7	45.9	28.7	19.6	16.7	16.6	17.7	18.1	31.2

Notes:

1. Sample locations provided on Plate 1
2. Data qualifications reflect 100% data validation performed by Data Validation Services
3. Soil criteria is from NYSDEC Division of Environmental Remediation. Technical and Administrative Guidance Memorandum #4046 for Eastern USA Background Heavy Metals Concentration in Soil (January 1994) U.S. EPA Region 9 Preliminary Remediation Goals (PRGs) for Industrial Soil (October 2004), and U.S. EPA Soil Screening Guidance: Generic Soil Screening Levels for Migration to Groundwater (July 1996)
4. Confirmation samples, collected December 2003

shaded indicates concentration is above all soil criteria

(value) = concentration reported by the laboratory prior to being rejected by data validation
ND = non-detect
R = rejected concentration as a result of data validation
NA = not analyzed

* indicates criteria is for 1,3-Dichloropropene (no individual criteria exists for cis- or trans-1,3-Dichloropropene)

** PRG and SSL for mixture of 2,4- and 2,6-dinitrotoluene is 2.5 mg/kg and 0.0008 mg/kg respectively
** indicates a New York State background concentration

ORGANIC DATA QUALIFIERS:
U = compound was analyzed for, but not detected; reported with detection limit value
J = an estimated value, either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, or when a compound meets the identification criteria but the result is less than the quantitation limit
B = used when the analyte is found in the associated blank, as well as in the sample
N = presumptive evidence of a compound; used only for tentatively identified compounds (TIC), where the identification is based on the Mass Spectral library search; it is applied to all TIC results

INORGANIC DATA QUALIFIERS
U = element was analyzed for, but not detected; reported with the detection limit

Table 5-5

ANALYTICAL RESULTS FOR SURFACE SOIL SAMPLES FROM PERIMETER OF FILL PILES

Geomatrix

Peter Cooper Markhams Site
Dayton, New York

Constituent [2]	Soil Criteria [3]				Sample Location, Sample Identification #, and Date Collected [1]							
	Eastern USA Background	Region 9 PRG	Soil Screening Level	Site Background Level	Lathe #106 101001028 10/10/2001	Lathe #62 101001030 10/10/2001	Lathe #63 101001031 10/10/2001	Lathe #64 101001033 10/10/2001	Lathe #65 101001034 10/10/2001	Lathe #107 101001035 10/10/2001	Lathe #108 101001038 10/10/2001	Lathe #68 10001040 10/10/2001
Total Metals, milligrams per kilogram												
Arsenic	3 - 12**	1.6	29	ND to 8.1	8.8	8.0	8.1	3.0	9.1	11.7	7.1	7.8
Chromium	1.5 - 40**	450	38	7.8 to 31.8	434	12.4	8.9	24.3	19.0	2260/8970 [4]	13.1	8.5
Hexavalent Chromium	--	64	38	--	(0.47 U) R	(0.57 U) R	(0.58 U) R	(0.91 U) R	(2.8 U) R	(0.51 U)R/29.6 [4]	(2.2 U) R	(0.5 U) R

Constituent [2]	Soil Criteria [3]				Sample Location, Identification, and Date Collected [1]							
	Eastern USA Background	Region 9 PRG	Soil Screening Level	Site Background Level	Lathe #69 101001041 10/10/2001	Lathe #70 101001042 10/10/2001	Lathe #71 101001043 10/10/2001	Lathe #109 101001044 10/10/2001	Lathe #110 101001046 10/10/2001	Lathe #97 101001048 10/10/2001	Lathe #95 101001050 10/10/2001	Lathe #60 101001052 10/10/2001
Total Metals, milligrams per kilogram												
Arsenic	3 - 12**	1.6	29	ND to 8.1	10.8	7.1	9.2	8.1	6.5	10.2	6.6	8.6
Chromium	1.5 - 40**	450	38	7.8 to 31.8	8.7	15.2	7.1	10.6	9.4	12.9	12.5	13.8
Hexavalent Chromium	--	64	38	--	(0.52 U) R	(0.48 U) R	(2.7 U) R	(0.49 U) R	(0.95 U) R	(0.49 U) R	(0.85 U) R	(0.58 U) R

Constituent [2]	Soil Criteria [3]				Sample Location, Identification, and Date Collected [1]							
	Eastern USA Background	Region 9 PRG	Soil Screening Level	Site Background Level	Lathe #59 101001054 10/10/2001	Lathe #98 101001055 10/10/2001	Lathe #61 101001057 10/10/2001	Lathe #58 101001058 10/10/2001	Lathe #57 101001059 10/10/2001	Lathe #96 101001060 10/10/2001	Lathe #99 101001062 10/10/2001	Lathe #105 101001069 10/10/2001
Total Metals, milligrams per kilogram												
Arsenic	3 - 12**	1.6	29	ND to 8.1	1.9	3.7	10.1	7.4	8.1	7.6	7.3	9.0
Chromium	1.5 - 40**	450	38	7.8 to 31.8	11.1	8.8	12.7	14.2	12.8	11.9	333	3520
Hexavalent Chromium	--	64	38	--	(0.54 U) R	(0.53 U) R	(0.48 U) R	(0.45 U) R	(0.52 U) R	(0.48 U) R	(0.63 U) R	(0.52 U) R

Table 5-5

ANALYTICAL RESULTS FOR SURFACE SOIL SAMPLES FROM PERIMETER OF FILL PILES

Geomatrix

Peter Cooper Markhams Site
Dayton, New York

Constituent [2]	Soil Criteria [3]				Sample Location, Identification, and Date Collected [1]							
	Eastern USA Background	Region 9 PRG	Soil Screening Level	Site Background Level	Lathe #104 101001071 10/10/2001	Lathe #103 101001073 10/10/2001	Lathe #102A 101001076 10/10/2001	Lathe #101 101001078 10/10/2001	Lathe #100 101001080 10/10/2001	Lathe #56 101001082 10/10/2001	Lathe #66 101001083 10/10/2001	Lathe #67A 101001084 10/10/2001
Total Metals, milligrams per kilogram												
Arsenic	3 - 12**	1.6	29	ND to 8.1	8.6	8.1	8.6	6.6	4.7	7.5	6.5	8.1
Chromium	1.5 - 40**	450	38	7.8 to 31.8	315	19.5	13.4	13.4	43.4	14.4	18.4	71.9
Hexavalent Chromium	--	64	38	--	(0.47 U) R	(0.45 U) R	(0.46 U) R	(0.53 U) R	(0 5 U) R	(0 57 U) R	(0.49 U) R	(0.5 U) R

Constituent [2]	Soil Criteria [3]				Sample Location, Identification, and Date Collected [1]					
	Eastern USA Background	Region 9 PRG	Soil Screening Level	Site Background Level	Lathe #74 101001085 10/10/2001	Lathe #73 101001086 10/10/2001	Lathe #72 101001087 10/10/2001	Lathe #113 101001088 10/10/2001	Lathe #112 101001090 10/10/2001	Lathe #111 101001093 10/10/2001
Total Metals, milligrams per kilogram										
Arsenic	3 - 12**	1.6	29	ND to 8.1	11.4	6.3	9.0	16.9	12.2	11.4
Chromium	1.5 - 40**	450	38	7 8 to 31.8	32.1	23.3	33.9	7660/4760 [4]	1090 J/1230 [4]	543 J
Hexavalent Chromium	--	64	38	--	(0.51 U) R	(0.54 U) R	(0 47 U) R	(0.64 U)R/19 8 [4]	(0 47 U)R/3.8 [4]	(0.46 U) R

Notes

indicates concentration is above all soil criteria

1 Sample locations provided on Plate 1

2 Data qualifications reflect 100% data validation performed by Data Validation Services

3 Soil criteria is from NYSDEC Division of Environmental Remediation, Technical and Administrative Guidance Memorandum #4046 for Eastern USA Background Heavy Metals Concentration in Soil (January 1994), U S. EPA Region 9 Preliminary Remediation Goals (PRGs) for Industrial Soil (October 2004), and U S EPA Soil Screening Guidance, Generic Soil Screening Levels for Migration to Groundwater (July 1996)

4 Confirmation samples, collected December 2003

(value) = concentration reported by the laboratory prior to being rejected during data validation

R = rejected concentration as a result of data validation

INORGANIC DATA QUALIFIERS

U = element was analyzed for, but not detected; reported with detection limit value

E = value estimated or not reported due to the presence of interferences

Constituent [2]	Sample Type, Sample Identification #, and Date Collected [1]			
	Composite 101501151 10/15/2001	Composite 101501154 10/15/2001	Composite 101501155 10/15/2001	Composite 101501156 10/15/2001
Total Organic Carbon, mg/L	3.6	1.4	1.8	1.2

Notes:

1 Sample locations provided on Plate 1

2 Data qualifications reflect 100% data validation performed by Data Validation Services

Sample 101501151 is a composite of Lathes #62, 72, and 111

Sample 101501154 is a composite of Lathes #108, 68, 70, 109, and 96

Sample 101501155 is a composite of Lathes #106, 104, 56, 129, and 126

Sample 101501156 is a composite of Lathes #63, 64, 65, 66, 69, and 71

Table 5-6

ANALYTICAL RESULTS FOR SUBSURFACE SOIL SAMPLES FROM PERIMETER OF FILL PILES

Geomatrix

Peter Cooper Markhams Site
Dayton, New York

Constituent [2]	Soil Criteria [3] Eastern USA Background	Region 9 PRG	Soil Screening Level	Site Background Level	Sample Location, Sample Identification #, and Date Collected [1] Lathe #106 101001029 10/10/2001	Lathe #107 101001036 10/10/2001	Lathe #108 101001039 10/10/2001	Lathe #109 101001045 10/10/2001	Lathe #110 101001047 10/10/2001	Lathe #97 101001049 10/10/2001	Lathe #95 101001051 10/10/2001	Lathe #98 101001056 10/10/2001
Total Metals, milligrams per kilogram												
Arsenic	3 - 12**	1.6	29	ND to 8.1	8.3 J	10.1 J	8.8 J	10.1 J	6.7 J	9.1 J	7.7 J	3.7 J
Chromium	1.5 - 40**	450	38	7.8 to 31.8	19700 J	652 J	16.4 J	14.0 J	15.8 J	14.2 J	16.2 J	13.9 J
Hexavalent Chromium	--	64	38	--	0.93 UJ	0.48 UJ	0.49 UJ	0.48 UJ	0.50 UJ	0.48 UJ	0.50 UJ	0.53 UJ

Constituent [2]	Soil Criteria [3] Eastern USA Background	Region 9 PRG	Soil Screening Level	Site Backgraund Level	Sample Location, Sample Identification #, and Date Collected [1] Lathe #96 101001061 10/10/2001	Lathe #99 101001063 10/10/2001	Lathe #105A 101001070 10/10/2001	Lathe #104 101001072 10/10/2001	Lathe #103 101001075 10/10/2001	Lathe #102A 101001077 10/10/2001	Lathe #101 101001079 10/10/2001
Total Metals, milligrams per kilogram											
Arsenic	3 - 12**	1.6	29	ND to 8.1	8.8 J	7.4 J	19.0 J	10.9 J	17.6 J	9.9 J	8.1 J
Chromium	1.5 - 40**	450	38	7.8 to 31.8	13.9 J	36.0 J	11000 J	48.0 J	16.6 J	14.8 J	16.7 J
Hexavalent Chromium	--	64	38	--	0.63 UJ	0.51 UJ	0.58 UJ	0.45 UJ	0.45 UJ	0.47 UJ	0.50 UJ

Constituent [2]	Soil Criteria [3] Eastern USA Background	Region 9 PRG	Soil Screening Level	Site Background Level	Sample Location, Sample Identification #, and Date Collected [1] Lathe #100 101001081 10/10/2001	Lathe #113 101001089 10/10/2001	Lathe #112 101001091 10/10/2001	Lathe #111 101001094 10/10/2001	Lathe #129 101201099 10/12/2001	Lathe #128 101201101 10/12/2001	Lathe #127 101201103 10/12/2001
Total Metals, milligrams per kilogram											
Arsenic	3 - 12**	1.6	29	ND to 8.1	7.9 J	12.6 J	9.2 J	11.5 J	8.4	28.9	26.8
Chromium	1.5 - 40**	450	38	7.8 to 31.8	60.1 J	4820 J	398 J	1150 J	36.7	6460	12400
Hexavalent Chromium	--	64	38	--	0.48 UJ	1.3 UJ	0.66 UJ	0.47 UJ	0.45 UJ	0.58 UJ	0.68 UJ

Constituent [2]	Soil Criteria [3] Eastern USA Background	Region 9 PRG	Soil Screening Level	Site Background Level	Sample Location, Identification, and Date Collected [1] Lathe #126 101201105 10/12/2001	Lathe #130 101201108 10/12/2001	Lathe #131 101201110 10/12/2001	Lathe #124 101201112 10/12/2001	Lathe #125 101201114 10/12/2001	Lathe #123 101201116 10/12/2001	Lathe #122 101201119 10/12/2001
Total Metals, milligrams per kilogram											
Arsenic	3 - 12**	1.6	29	ND to 8.1	16.1	8.4	11.1	9.8	7.9	9.5	6.0
Chromium	1.5 - 40**	450	38	7.8 to 31.8	7850	341	30.8	17.3	15.2	12600	126
Hexavalent Chromium	--	64	38	--	0.60 UJ	0.48 UJ	0.45 UJ	0.70 UJ	0.49 UJ	0.58 UJ	0.78 UJ

Notes:

1 Sample locations provided on Plate 1 Sample depth is 6 to 12 inches below ground surface

indicates concentration is above all soil criteria

2 Data qualifications reflect 100% data validation performed by Data Validation Services

3. Soil criteria is from NYSDEC Division of Environmental Remediation, Technical and Administrative Guidance Memorandum #4046 for Eastern USA Background Heavy Metals Concentration in Soil (January 1994), U S EPA Region 9 Preliminary Remediation Goals (PRGs) for Industrial Soil (October 2004), and U.S EPA Soil Screening Guidance Generic Soil Screening Levels for Migration to Groundwater (July 1996)

** indicates a New York State background concentration

-- indicates no criteria exists

ND = non-detect

INORGANIC DATA QUALIFIERS

N = spike sample recovery is not within the quality control limits

J = a value greater than or equal to the instrument detection limit, but less than the quantitation limit

U = element was analyzed for, but not detected, reported with detection limit value

Table 5-7

ANALYTICAL RESULTS FOR NATIVE SUBSURFACE SOIL SAMPLES FROM MONITORING WELLS AND BORINGS

Geomatrix

Peter Cooper Markhams Site
Dayton, New York

Constituent [2]	Soil Criteria [3] Eastern USA Background	Region 9 PRG	Soil Screening Level	Site Background Level	Sample Location, Identification, and Date Collected [1] B-1A; 9-10 fbgs 100201003 10/2/2001	B-1A; 10-11 fbgs 100201004 10/2/2001	B-1A; 17-19 fbgs 100201005 10/2/2001	MW-8S; 4-6 fbgs 100401007 10/4/2001	B-4; 15-16 fbgs 100501009 10/5/2001	B-4; 23-25 fbgs 100501010 10/5/2001	B-4; 16-17 fbgs 100501013 10/5/2001
Total Metals, milligrams per kilogram											
Arsenic	3 - 12**	1.6	29	ND to 8.1	8.1	11.3	9.6	12.7	8.6	4.7	13.4
Chromium	1.5 - 40**	450	38	7.8 to 31.8	32.5	65.1	19.6	12.6	39.2	29.2	1150
Hexavalent Chromium	--	64	38	--	0.44 UJ	0.43 UJ	0.44 UJ	0.46 UJ	0.45 UJ	0.45 UJ	0.48 UJ

Constituent [2]	Soil Criteria [3] Eastern USA Background	Region 9 PRG	Soil Screening Level	Site Background Level	Sample Location, Identification, and Date Collected [1] B-5; 8-9 fbgs 100901019 10/9/2001	B-5; 9-10 fbgs 100901020 10/9/2001	B-5; 14-16 fbgs 100901021 10/9/2001	B-6; 6.5-7.5 fbgs 100901023 10/9/2001	B-6; 7.5-8.5 fbgs 100901024 10/9/2001	B-6; 9-11 fbgs 100901025 10/9/2001
Total Metals, milligrams per kilogram										
Arsenic	3 - 12**	1.6	29	ND to 8.1	9.2	7.6	5.4	8.0	8.9	11.7
Chromium	1.5 - 40**	450	38	7.8 to 31.8	18.4	12.4	9.8	43.9	5860	36.9
Hexavalent Chromium	--	64	38	--	0.43 UJ	0.45 UJ	0.48 UJ	0.46 UJ	0.47 UJ	0.45 UJ

Notes:

indicates concentration is above all soil criteria

1. Sample locations provided on Plate 1
2. Data qualifications reflect 100% data validation performed by Data Validation Services
3. Soil criteria is from NYSDEC Division of Environmental Remediation, Technical and Administrative Guidance Memorandum #4046 for Eastern USA Background Heavy Metals Concentration in Soil (January 1994), U.S. EPA Region 9 Preliminary Remediation Goals (PRGs) for Industrial Soil (October 2004), and U.S. EPA Soil Screening Guidance, Generic Soil Screening Levels for Migration to Groundwater (July 1996)
4. Groundwater criteria is from NYSDEC Divison of Water, Technical and Operational Guidance Series (TOGs) Ambient Water Quality Standards and Guidance Values (June 1998) and U.S. EPA Region 9 Preliminary Remediation Goals (PRGs) for Tap Water (2004)

** indicates a New York State background concentration
-- indicates no criteria exists
NA = not analyzed

INORGANIC DATA QUALIFIERS:
U = element was analyzed for, but not detected; reported with detection limit value
J = a value greater than or equal to the instrument detection limit, but less than the quantitation limit

Table 5-8

ANALYTICAL RESULTS FOR SHALLOW OVERBURDEN GROUNDWATER SAMPLES

Peter Cooper Markhams Site
Dayton, New York

	Groundwater Criteria[3]		Sample Location, Sample Identification #, and Date Collected[1]																	
			MW-1S		MW-2S		MW-3SR		MW-4S		MW-5S		MW-6S		MW-7S		MW-8S		MW-9S	
			110701171	042302196	110701170	042302193	110601161	042202190	dry	042402202	110701168	042502209	110801181	042402208	110801178	042402205	110601165	042302198	110501158	042202187
Constituent[2]	TOG	PRG	11/7/2001	4/23/2002	11/7/2001	4/23/2002	11/6/2001	4/22/2002	11/5/2001	4/24/2002	11/7/2001	4/25/2002	11/8/2001	4/24/2002	11/8/2001	4/24/2002	11/6/2001	4/23/2002	11/5/2001	4/22/2002
Volatile Organic Compounds, micrograms per liter																				
Acetone	50*	610	10 U	5 UJ	NA	21 J	10 U	5 UJ	NA	5 UJ	10 U	5 UJ	10 U	5 UJ	10 U	5 UJ	10 U	5 UJ	10 U	5 UJ
Benzene	1	0.34	10 U	0.22 J	NA	1.8	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Bromodichloromethane	50*	0.18	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Bromoform	50*	8.5	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Bromomethane	5	8.7	10 U	1 U	NA	1 U	10 U	1 U	NA	1 UJ	10 U	1 UJ	10 U	1 UJ	10 U	1 UJ	10 U	1 U	10 U	1 U
2-Butanone (Methyl ethyl ketone)	50*	1900	10 U	5 UJ	NA	3.1 J	10 U	5 UJ	NA	5 UJ	10 U	5 UJ	10 U	5 UJ	10 U	5 UJ	10 U	5 UJ	10 U	5 UJ
Carbon Disulfide	--	1000	10 U	1 U	NA	0.35 J	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	0.28 J	10 U	1 U	10 U	1 U
Carbon Tetrachloride	5	0.17	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Chlorobenzene	5	110	10 U	0.27 J	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Chloroethane	5	4.6	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Chloroform	7	6.2	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Chloromethane (Methyl chloride)	5	1.5	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Dibromochloromethane	50*	0.13	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
1,3-Dichlorobenzene	3	5.5	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
1,4-Dichlorobenzene	3	0.50	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
1,2-Dichlorobenzene	3	370	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
1,2-Dibromo-3-chloropropane	0.04	0.048	10 U	1 UJ	NA	1 UJ	10 U	1 UJ	NA	1 UJ	10 U	1 UJ	10 U	1 UJ	10 U	1 UJ	10 U	1 UJ	10 U	1 UJ
Dichlorodifluoromethane	5	390	10 UJ	1 U	NA	1 U	10 UJ	1 U	NA	1 UJ	10 UJ	1 UJ	10 UJ	1 UJ	10 UJ	1 UJ	10 UJ	1 U	10 U	1 U
1,2-Dibromoethane (Ethylene dibromide)	0.0006	0.00076	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
1,1-Dichloroethane	5	810	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
1,2-Dichloroethane	0.6	0.12	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
1,1-Dichloroethene	5	340	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
1,2-Dichloropropane	1	0.16	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
cis-1,2-Dichloroethene	5	61	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	0.54 J	10 U	1 U
cis-1,3-Dichloropropene	0.4**	0.40	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
trans-1,3-Dichloropropene	0.4**	0.40	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
trans-1,2-Dichloroethene	5	120	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Ethylbenzene	5	2.9	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
2-Hexanone	50*	--	10 U	5 U	NA	5 U	10 U	5 U	NA	5 U	10 U	5 U	10 U	5 U	10 U	5 U	10 U	5 U	10 U	5 U
Isopropylbenzene (Cumene)	5	660	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Methyl tertbutyl ether	--	13	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Methylene chloride	5	4.3	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
4-Methyl-2-pentanone (Methyl isobutyl ketone)	--	160	10 U	5 U	NA	5 U	10 U	5 U	NA	5 U	10 U	5 U	10 U	5 U	10 U	5 U	10 U	5 U	10 U	5 U
Styrene	5	1600	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
1,1,2,2-Tetrachloroethane	5	0.055	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Tetrachloroethene	5	0.66	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Toluene	5	720	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
1,2,4-Trichlorobenzene	5	190	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
1,1,1-Trichloroethane	5	3200	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
1,1,2-Trichloroethane	1	0.20	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Trichloroethene	5	0.028	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	4.2 J	28	10 U	1 U
Trichlorofluoromethane	5	1300	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	5	59000	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Vinyl chloride	2	0.020	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Total Xylenes (1,2-, 1,3-, and 1,4-Xylene)	5	210	10 U	3 U	NA	3 U	10 U	3 U	NA	3 U	10 U	3 U	10 U	3 U	10 U	3 U	10 U	3 U	10 U	3 U
Cyclohexane	--	35000	10 U	5 U	NA	5 U	10 U	5 U	NA	5 U	10 U	5 U	10 U	5 U	10 U	5 U	10 U	5 U	10 U	5 U
Methyl acetate	--	6100	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Methylcyclohexane	--	5200	10 U	1 U	NA	1 U	10 U	1 U	NA	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Semi-Volatile Organic Compounds, micrograms per liter																				
Acenaphthene	20*	370	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Acenaphthylene	--	--	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Acetophenone	--	--	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Anthracene	50*	1800	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Atrazine	7.5	0.30	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Benzaldehyde	--	3600	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Benzo(a)anthracene	0.002*	0.092	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Benzo(b)fluoranthene	0.002*	0.092	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	0.6 J	10 U	10 U	NA
Benzo(k)fluoranthene	0.002*	0.92	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Benzo(ghi)perylene	--	--	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Benzo(a)pyrene	ND	0.0092	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Benzoic acid	--	150000	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Benzyl alcohol	--	11000	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Biphenyl (1,1'-Biphenyl)	5	300	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Bis(2-chloroethoxy)methane	5	--	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Bis(2-chloroethyl)ether	1.0	0.010	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
2,2'-Oxybis(1-chloropropane) (Bis(2-chloro-1-methylethyl)ether)	5	0.27	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Bis(2-ethylhexyl) phthalate	5	4.8	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	5 J	NA	10 U	NA	10 U	10 U	10 U	NA

Table 5-8

ANALYTICAL RESULTS FOR SHALLOW OVERBURDEN GROUNDWATER SAMPLES

Peter Cooper Markhams Site
Dayton, New York

	Groundwater Criteria [3]		Sample Location, Sample Identification #, and Date Collected [1]															
			MW-1S		MW-2S		MW-3SR		MW-4S		MW-5S		MW-6S		MW-7S		MW-8S		MW-9S	
			110701171	042302196	110701170	042302193	110601161	042202190	dry	042402202	110701168	042502209	110801181	042402208	110801178	042402205	110601165	042302198	110501158	042202187
Constituent [2]	TOG	PRG	11/7/2001	4/23/2002	11/7/2001	4/23/2002	11/6/2001	4/22/2002	11/5/2001	4/24/2002	11/7/2001	4/25/2002	11/8/2001	4/24/2002	11/8/2001	4/24/2002	11/6/2001	4/23/2002	11/5/2001	4/22/2002
4-Bromophenyl phenyl ether	--	--	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Butyl benzyl phthalate	50*	7300	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Caprolactam	--	18000	10 U	NA	NA	10 UJ	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 UJ	10 U	NA
Carbazole	--	3.4	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
4-Chloroaniline	5	150	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
4-Chloro-3-methylphenol	--	--	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
2-Chloronaphthalene (beta-Chloronaphthalene)	10*	490	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
2-Chlorophenol	--	30	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
4-Chlorophenyl phenyl ether	--	--	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Chrysene	0.002*	9.2	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Dibenzo(a,h)anthracene	--	0.0092	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Dibenzofuran	--	24	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Di-n-butyl phthalate (Dibutyl phthalate)	50	3600	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
1,2-Dichlorobenzene	3	370	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
1,3-Dichlorobenzene	3	5.5	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
1,4-Dichlorobenzene	3	0.50	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
3,3'-Dichlorobenzidine	5	0.15	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
2,4-Dichlorophenol	5	110	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Diethyl phthalate	50*	29000	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
2,4-Dimethylphenol	50*	730	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Dimethyl phthalate	50*	360000	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
4,6-Dinitro-2-methylphenol	--	--	25 U	NA	NA	25 U	25 U	NA	NA	NA	25 U	NA	25 U	NA	25 U	NA	25 U	25 U	25 U	NA
2,4-Dinitrophenol	10*	73	25 U	NA	NA	25 UJ	25 UJ	NA	NA	NA	25 U	NA	25 U	NA	25 U	NA	25 UJ	25 UJ	25 UJ	NA
2,4-Dinitrotoluene	5	73****	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
2,6-Dinitrotoluene	5	36****	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Di-n-octyl phthalate	50*	1500	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Fluoranthene	50*	1500	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	0.6 J	10 U	10 U	NA
Fluorene	50*	240	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Hexachlorobenzene	0.04	0.042	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Hexachlorobutadiene	0.5	0.86	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Hexachlorocyclopentadiene	5	220	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Hexachloroethane	5	4.8	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Indeno(1,2,3-cd)pyrene	0.002*	0.092	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Isophorone	50*	71	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
2-Methylnaphthalene	--	--	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
2-Methylphenol	--	1800	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
4-Methylphenol	--	180	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Naphthalene	10*	6.2	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
2-Nitroaniline	5	1 0	25 U	NA	NA	25 U	25 U	NA	NA	NA	25 U	NA	25 U	NA	25 U	NA	25 U	25 U	25 U	NA
3-Nitroaniline	5	--	25 U	NA	NA	25 U	25 U	NA	NA	NA	25 U	NA	25 U	NA	25 U	NA	25 U	25 U	25 U	NA
4-Nitroaniline	5	--	25 U	NA	NA	25 UJ	25 U	NA	NA	NA	25 U	NA	25 U	NA	25 U	NA	25 U	25 U	25 U	NA
Nitrobenzene	0.4	3.4	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
2-Nitrophenol	--	--	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
4-Nitrophenol	--	--	25 U	NA	NA	25 UJ	25 U	NA	NA	NA	25 U	NA	25 U	NA	25 U	NA	25 U	25 U	25 U	NA
N-nitrosodiphenylamine	50*	14	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
N-Nitroso-Di-n-propylamine	--	0.010	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Pentachlorophenol	1***	0.56	25 U	NA	NA	25 U	25 U	NA	NA	NA	25 U	NA	25 U	NA	25 U	NA	25 U	25 U	25 U	NA
Phenanthrene	50*	--	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Phenol	1***	22000	10 U	NA	NA	2 J	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Pyrene	50*	180	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	0.5 J	10 U	10 U	NA
1,2,4-Trichlorobenzene	5	190	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
2,4,5-Trichlorophenol	--	3600	25 U	NA	NA	25 U	25 U	NA	NA	NA	25 U	NA	25 U	NA	25 U	NA	25 U	25 U	25 U	NA
2,4,6-Trichlorophenol	--	3.6	10 U	NA	NA	10 U	10 U	NA	NA	NA	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	10 U	NA
Total Metals, micrograms per liter																				
Aluminum	--	36000	200 U	NA	36400 J	536	654	NA	NA	NA	200 U	NA	499	NA	382	NA	200 U	NA	200 U	NA
Antimony	3	15	60.0 U	NA	72.6 J	60.0 U	60.0 U	NA	NA	NA	60.0 U	NA	60.0 U	NA	60.0 U	NA	60.0 U	NA	60.0 U	NA
Arsenic	25	0.045	10.0 U	10 U	133 J	10.0 U	10.0 U	10 U	NA	10 U	10.0 U	10 U	10.0 U	10 U	10.0 U	10 U	10.0 U	10 U	10.0 U	10 U
Barium	1000	2600	200 U	NA	517 J	200 U	200 U	NA	NA	NA	200 U	NA	200 U	NA	200 U	NA	200 U	NA	200 U	NA
Beryllium	3*	73	5.0 U	NA	5.0 U	5.0 U	5.0 U	NA	NA	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA
Cadmium	5	18	5.0 U	NA	50.1 J	5.0 U	5.0 U	NA	NA	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA
Calcium	--	--	318000 J	NA	217000 J	26000	58300 J	NA	NA	NA	250000 J	NA	402000 J	NA	310000 J	NA	205000 J	NA	57500 U	NA
Chromium	50	55000*	10.6	10 U	981 J	17.2	10.0 U	10 U	NA	10 U	10.0 U	10 U	18.8	18.3	10.0 U	10 U	10.0 U	10 U	10.0 U	10 U
Cobalt	--	730	50.0 U	NA	251 J	50.0 U	50.0 U	NA	NA	NA	50.0 U	NA	50.0 U	NA	50.0 U	NA	50.0 U	NA	50.0 U	NA
Copper	200	1500	25.0 U	NA	2220 J	25.0 U	25.0 U	NA	NA	NA	25.0 U	NA	25.0 U	NA	25.0 U	NA	25.0 U	NA	25.0 U	NA
Iron	300**	11000	11100 J	NA	3160000 J	94300	827 J	NA	NA	NA	267 J	NA	1070 J	NA	11000 J	NA	218 J	NA	326 J	NA
Lead	25	15	10.7	NA	1020 J	29.1	3.0 U	NA	NA	NA	3.0 U	NA	9.7	NA	3.0 U	NA	3.0 U	NA	3.0 UJ	NA
Magnesium	35000*	--	42000	NA	39400 J	5000 U	9520	NA	NA	NA	36900	NA	96400	NA	75900	NA	30100	NA	9050	NA
Manganese	300**	880	15000 J	NA	9800 J	804	33.7 J	NA	NA	NA	210 J	NA	13500 J	NA	254 J	NA	4220 J	NA	112 J	NA
Nickel	100	730***	40.0 U	NA	2820 J	83.4	40.0 U	NA	NA	NA	40.0 U	NA	40.0 U	NA	40.0 U	NA	40.0 U	NA	40.0 U	NA
Potassium	--	--	5000 UJ	NA	9290 J	5000 U	5000 UJ	NA	NA	NA	5000 UJ	NA	5000 UJ	NA	5000 UJ	NA	5000 U	NA	5000 U	NA

Table 5-8

ANALYTICAL RESULTS FOR SHALLOW OVERBURDEN GROUNDWATER SAMPLES

Peter Cooper Markhams Site
Dayton, New York

Geomatrix

			Sample Location, Sample Identification #, and Date Collected[1]															
	Groundwater Criteria[3]		MW-1S		MW-2S		MW-3SR		MW-4S		MW-5S		MW-6S		MW-7S		MW-8S		MW-9S	
			110701171	042302196	110701170	042302193	110601161	042202190	dry	042402202	110701168	042502209	110801181	042402208	110801178	042402205	110601165	042302198	110501158	042202187
Constituent[2]	TOG	PRG	11/7/2001	4/23/2002	11/7/2001	4/23/2002	11/6/2001	4/22/2002	11/5/2001	4/24/2002	11/7/2001	4/25/2002	11/8/2001	4/24/2002	11/8/2001	4/24/2002	11/6/2001	4/23/2002	11/5/2001	4/22/2002
Selenium	10	180	5.0 U	NA	39.2 J	7.2	5.0 U	NA	NA	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA
Silver	50	180	10.0 U	NA	10.0 U	10 U	10.0 U	NA	NA	NA	10.0 U	NA	10.0 U	NA	10.0 U	NA	10.0 U	NA	10.0 U	NA
Mercury	0.7	11	0.200 UJ	NA	0.200 U	0.2 U	0.200 UJ	NA	NA	NA	0.200 UJ	NA	0.200 UJ	NA	0.200 UJ	NA	0.200 UJ	NA	0.200 UJ	NA
Sodium	20000	--	5550	NA	8170 J	5000 U	6050	NA	NA	NA	7730	NA	5000 U	NA	27800	NA	7210	NA	11200	NA
Thallium	0.5*	2.4	10.0 U	NA	1300 J	13.5	10.0 U	NA	NA	NA	10.0 U	NA	10.0 U	NA	10.0 U	NA	10.0 U	NA	10.0 U	NA
Vanadium	--	260	50.0 U	NA	50.0 U	50.0 U	50.0 U	NA	NA	NA	50.0 U	NA	50.0 U	NA	50.0 U	NA	50.0 U	NA	50.0 U	NA
Zinc	2000*	11000	20.0 UJ	NA	146000 J	3090	20.0 UJ	NA	NA	NA	20.0 UJ	NA	36.1 N	NA	20.0 UJ	NA	20.0 UJ	NA	20.0 U	NA
Hexavalent Chromium, micrograms per liter																				
Total Hexavalent Chromium	50	110	10 UJ	10 UJ	10 UJ	56 UJ	14 UJ	10 UJ	NA	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
Other Geochemical Parameters, milligrams per liter																				
Ammonia	2 (NH_3 + NH_4^+ as N)	--	2.8	2.0	NA	0.2	0.10 U	0.10 U	NA	0.33	0.10 U	0.10 U	2.9	0.24	0.10 U	0.10 U	0.57	0.34	0.10 U	0.10 U
Bicarbonate Alkalinity	--	--	409	NA	NA	NA	143 J	NA	NA	NA	435	NA	335	NA	446	NA	308	NA	131	NA
Carbonate Alkalinity	--	--	5.0 U	NA	NA	NA	5.0 U	NA	NA	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA
Nitrate	10 (as N)	10	12.4	8.0	NA	0.5 U	4.0	3.1	NA	32.5	3.7	2.8	42.3	50.9	0.50 U	0.5 U	32.8	14.6	2.9	9.3
Sulfate	250	--	602	616	NA	54.3	34.3	25.6	NA	768	392	159	1060	676	760	695	220	104	40.0	31.4
Sulfide	0.05* (as H_2S)	--	1.0 U	NA	NA	NA	1.0 U	NA	NA	NA	1.0 U	NA	1.0 U	NA	1.0 U	NA	1.0 U	NA	1.0 U	NA
Total Dissolved Solids	--	--	1450	NA	NA	NA	185	NA	NA	NA	1080	NA	2100	NA	1480	NA	677	NA	232	NA
Total Organic Carbon	--	--	9.2	NA	NA	NA	1.0	NA	NA	NA	6.3	NA	15.7	NA	8.8	NA	7.3	NA	1.2	NA
Ferrous Iron	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.2	NA	0.10 U	NA	NA	NA
Field Measured Parameters																				
Temperature, °C	--	--	11.6	8.07	12.67	6.28	11.26	6.72	NA	8.33	10.9	7.14	9.99	9.41	10.17	8.77	10.8	7.6	10.97	6.02
pH, standard units	--	--	6.34	6.45	6.64	7.19	6.73	6.92	NA	6.42	6.75	6.81	6.45	6.61	6.7	6.8	6.53	6.9	7.49	7.36
Specific Conductivity, µS/cm	--	--	2620	1929	208	844	413	455	NA	1702	2065	822	4024	2428	3109	1959	1236	755	256	540
Dissolved Oxygen, mg/L	--	--	0.36	0.19	0.59	1.7	4.97	3.53	NA	0.61	2.42	0.07	0.35	0.06	0.55	0.04	0.26	0.1	2.84	8.41
Oxidation-Reduction Potential, mV	--	--	117	32.9	218.3	252.5	155.1	55.3	NA	22.3	119	67.3	34.5	13.9	150	169.6	28.9	4.6	197.8	1.8
Turbidity, NTU	--	--	1.91	10	110	262[4]	21	30	NA	15	7.69	2	2.4	0.2	29.1	12.4	11	17	31	11.2
Ferrous Iron, mg/L	--	--	6	8.6	NA	NA	0	0	NA	0.8	0	NA	0	0	6.8	7.	0	0	0	0

Notes:

1 Sample locations provided on Plate 1

2 Data qualifications reflect 100% data validation performed by Data Validation Services

3. Groundwater criteria is from NYSDEC Division of Water, Technical and Operational Guidance Series (TOGs), Ambient Water Quality Standards and Guidance Values for Groundwater (June 1998) and U S EPA Region 9 Preliminary Remediation Goals (PRGs) for Tap Water (2004)

4 Turbidity was measured in the laboratory

µS/cm = microSiemens per centimeter
mg/L = milligrams per liter
mV = millivolts
NTU = Nephlometric Turbidity Unit
NA = not analyzed
ND means a non-detectable concentration by the approved analytical methods

-- indicates no criteria exists
* indicates a guidance value
** applies to the sum of cis- and trans-1,3-dichloropropene
*** applies to the sum of phenolic compounds (total phenols)
**** PRG for mixture of 2,4- and 2,6-dinitrotoluene is 0.099 ug/L
' PRG for Chromium III (no PRG exists for Total Chromium)
" TOG for sum of Iron and Manganese is 500 ug/L
"' PRG for Nickel (soluble salts)

Indicates exceedance of groundwater criteria or guidance value

ORGANIC DATA QUALIFIERS
U = compound was analyzed for, but not detected; reported with detection limit value
J = an estimated value, either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, or when a compound meets the identification criteria but the result is less than the quantitation limit

INORGANIC DATA QUALIFIERS
U = element was analyzed for, but not detected, reported with the detection limit
J or B = estimated value or value greater than or equal to the instrument detection limit, but less than the quantitation limit

Table 5-9

ANALYTICAL RESULTS FOR DEEP OVERBURDEN GROUNDWATER SAMPLES

Peter Cooper Markhams Site
Dayton, New York

Geomatrix

	Groundwater Criteria[3]		Sample Location, Sample Identification #, and Date Collected[1]															
			MW-1D		MW-2D		MW-3D2		MW-4D		MW-5D		MW-6D		MW-7D		MW-8D		MW-9D	
			110701173	042302194	110601163	042302192	110601162	42202191	110501160	042402201	110701169	042602211	110801180	042402207	110801177	042402203	110601167	042302200	110501157	042202188
Constituent[2]	TOG	PRG	11/7/2001	4/23/2002	11/6/2001	4/23/2002	11/6/2001	4/22/2002	11/5/2001	4/24/2002	11/7/2001	4/26/2002	11/8/2001	4/24/2002	11/8/2001	4/24/2002	11/6/2001	4/23/2002	11/5/2001	4/22/2002
Volatile Organic Compounds, micrograms per liter																				
Acetone	50*	610	10 U	5 UJ	25	5 UJ	10 U	5 UJ	10 U	5 UJ	10 U	5 UJ	10 U	5 UJ	74	5 UJ	10 U	6.3 J	10 U	5 UJ
Benzene	1	0.34	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	0.32 J
Bromodichloromethane	50*	0.18	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Bromoform	50*	8.5	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Bromomethane	5	8.7	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 UJ	10 U	1 U	10 U	1 UJ	10 U	1 UJ	10 U	1 U	10 U	1 U
2-Butanone (Methyl ethyl ketone)	50*	1900	10 U	5 UJ	10 U	5 UJ	10 U	5 UJ	10 U	5 UJ	10 U	5 UJ	10 U	5 UJ	10 U	5 UJ	10 U	5 UJ	10 U	5 UJ
Carbon Disulfide	--	1000	1.1 J	1 U	1.2 J	1 U	10 U	0.24 J	2.6 J	1.1	10 U	1 U	10 U	1 U	1.8 J	0.25 J	10 U	0.22 J	1.7 J	12
Carbon Tetrachloride	5	0.17	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Chlorobenzene	5	110	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Chloroethane	5	4.6	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Chloroform	7	6.2	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Chloromethane (Methyl chloride)	5	1.5	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Dibromochloromethane	50*	0.13	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
1,3-Dichlorobenzene	3	5.5	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
1,4-Dichlorobenzene	3	0.50	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
1,2-Dichlorobenzene	3	370	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
1,2-Dibromo-3-chloropropane	0.04	0.048	10 U	1 UJ	10 U	1 UJ	10 U	1 UJ	10 U	1 UJ	10 U	1 UJ	10 U	1 UJ	10 U	1 UJ	10 U	1 UJ	10 U	1 UJ
Dichlorodifluoromethane	5	390	10 UJ	1 U	10 UJ	1 U	10 UJ	1 U	10 U	1 UJ	10 UJ	1 UJ	10 UJ	1 UJ	10 UJ	1 UJ	10 UJ	1 U	10 U	1 UJ
1,2-Dibromoethane (Ethylene dibromide)	0.0006	0.00076	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
1,1-Dichloroethane	5	810	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
1,2-Dichloroethane	0.6	0.12	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
1,1-Dichloroethene	5	340	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
1,2-Dichloropropane	1	0.16	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
cis-1,2-Dichloroethene	5	61	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
cis-1,3-Dichloropropene	0.4**	0.40	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
trans-1,3-Dichloropropene	0.4**	0.40	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
trans-1,2-Dichloroethene	5	120	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Ethylbenzene	5	2.9	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
2-Hexanone	50*	--	10 U	5 U	10 U	5 U	10 U	5 U	10 U	5 U	10 U	5 U	10 U	5 U	10 U	5 U	10 U	5 U	10 U	5 U
Isopropylbenzene (Cumene)	5	660	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Methyl tertbutyl ether	--	13	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Methylene chloride	5	4.3	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
4-Methyl-2-pentanone (Methyl isobutyl ketone)	--	160	10 U	5 U	10 U	5 U	10 U	5 U	10 U	5 U	10 U	5 U	10 U	5 U	10 U	5 U	10 U	5 U	10 U	5 U
Styrene	5	1600	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
1,1,2,2-Tetrachloroethane	5	0.055	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Tetrachloroethene	5	0.66	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Toluene	5	720	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
1,2,4-Trichlorobenzene	5	190	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
1,1,1-Trichloroethane	5	3200	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
1,1,2-Trichloroethane	1	0.20	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Trichloroethene	5	0.028	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Trichlorofluoromethane	5	1300	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	5	59000	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Vinyl chloride	2	0.020	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Total Xylenes (1,2-, 1,3-, and 1,4-Xylene)	5	210	10 U	3 U	10 U	3 U	10 U	3 U	10 U	3 U	10 U	3 U	10 U	3 U	10 U	3 U	10 U	3 U	10 U	3 U
Cyclohexane	--	35000	10 U	5 U	10 U	5 U	10 U	5 U	10 U	5 U	10 U	5 U	10 U	5 U	10 U	5 U	10 U	5 U	10 U	5 U
Methyl acetate	--	6100	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Methylcyclohexane	--	5200	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U	10 U	1 U
Semi-Volatile Organic Compounds, micrograms per liter																				
Acenaphthene	20*	370	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Acenaphthylene	--	--	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Acetophenone	--	--	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Anthracene	50*	1800	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Atrazine	7.5	0.30	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Benzaldehyde	--	3600	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Benzo(a)anthracene	0.002*	0.092	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Benzo(b)fluoranthene	0.002*	0.092	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Benzo(k)fluoranthene	0.002*	0.92	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Benzo(ghi)perylene	--	--	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Benzo(a)pyrene	ND	0.0092	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Benzoic acid	--	150000	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Benzyl alcohol	--	11000	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Biphenyl (1,1'-Biphenyl)	5	300	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Bis(2-chloroethoxy)methane	5	--	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Bis(2-chloroethyl)ether	1.0	0.010	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
2,2'-Oxybis(1-chloropropane) (Bis(2-chloro-1-methylethyl)ether)	5	0.27	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Bis(2-ethylhexyl) phthalate	5	4.8	0.7 J	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	2 J	NA	2 J	NA	19	NA
4-Bromophenyl phenyl ether	--	--	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Butyl benzyl phthalate	50*	7300	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Caprolactam	--	18000	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Carbazole	--	3.4	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA

Table 5-9

ANALYTICAL RESULTS FOR DEEP OVERBURDEN GROUNDWATER SAMPLES

Peter Cooper Markhams Site
Dayton, New York

	Groundwater Criteria[3]		Sample Location, Sample Identification #, and Date Collected[1]															
			MW-1D		MW-2D		MW-3D2		MW-4D		MW-5D		MW-6D		MW-7D		MW-8D		MW-9D	
			110701173	042302194	110601163	042302192	110601162	42202191	110501160	042402201	110701169	042602211	110801180	042402207	110801177	042402203	110601167	042302200	110501157	042202188
Constituent[2]	TOG	PRG	11/7/2001	4/23/2002	11/6/2001	4/23/2002	11/6/2001	4/22/2002	11/5/2001	4/24/2002	11/7/2001	4/26/2002	11/8/2001	4/24/2002	11/8/2001	4/24/2002	11/6/2001	4/23/2002	11/5/2001	4/22/2002
4-Chloroaniline	5	150	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
4-Chloro-3-methylphenol	--	--	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
2-Chloronaphthalene (beta-Chloronaphthalene)	10*	490	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
2-Chlorophenol	--	30	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
4-Chlorophenyl phenyl ether	--	--	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Chrysene	0.002*	9.2	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Dibenzo(a,h)anthracene	--	0.0092	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Dibenzofuran	--	24	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Di-n-butyl phthalate (Dibutyl phthalate)	50	3600	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	3 J	NA	10 U	NA	10 U	NA
1,2-Dichlorobenzene	3	370	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
1,3-Dichlorobenzene	3	5.5	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
1,4-Dichlorobenzene	3	0.50	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
3,3'-Dichlorobenzidine	5	0.15	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
2,4-Dichlorophenol	5	110	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Diethyl phthalate	50*	29000	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
2,4-Dimethylphenol	50*	730	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Dimethyl phthalate	50*	360000	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
4,6-Dinitro-2-methylphenol	--	--	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA
2,4-Dinitrophenol	10*	73	25 U	NA	25 UJ	NA	25 UJ	NA	25 UJ	NA	25 U	NA	25 U	NA	25 U	NA	25 UJ	NA	25 UJ	NA
2,4-Dinitrotoluene	5	73****	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
2,6-Dinitrotoluene	5	36****	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Di-n-octyl phthalate	50*	1500	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Fluoranthene	50*	1500	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Fluorene	50*	240	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Hexachlorobenzene	0.04	0.042	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Hexachlorobutadiene	0.5	0.86	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Hexachlorocyclopentadiene	5	220	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Hexachloroethane	5	4.8	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Indeno(1,2,3-cd)pyrene	0.002*	0.092	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Isophorone	50*	71	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
2-Methylnaphthalene	--	--	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
2-Methylphenol	--	1800	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
4-Methylphenol	--	180	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Naphthalene	10*	6.2	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
2-Nitroaniline	5	1.0	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA
3-Nitroaniline	5	--	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA
4-Nitroaniline	5	--	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA
Nitrobenzene	0.4	3.4	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
2-Nitrophenol	--	--	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
4-Nitrophenol	--	--	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA
N-nitrosodiphenylamine	50*	14	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
N-Nitroso-Di-n-propylamine	--	0.010	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Pentachlorophenol	1***	0.56	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA
Phenanthrene	50*	--	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	2 J	NA	1 J	NA	10 U	NA
Phenol	1***	22000	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Pyrene	50*	180	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
1,2,4-Trichlorobenzene	5	190	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
2,4,5-Trichlorophenol	--	3600	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA	25 U	NA
2,4,6-Trichlorophenol	--	3.6	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Total Metals, micrograms per liter																				
Aluminum	--	36000	320	NA	5660	NA	200 U	NA	200 U	NA	232	NA	200 U	NA	819	NA	2060	NA	3020	NA
Antimony	3	15	60.0 U	NA	60.0 U	NA	60.0 U	NA	60.0 U	NA	60.0 U	NA	60.0 U	NA	60.0 U	NA	60.0 U	NA	60.0 U	NA
Arsenic	25	0.045	10.0 U	10 U	10.0 U	10 U	10.0 U	10 U	10.0 U	10 U	10.0 U	10 U	10.0 U	10 U	10.0 U	10 U	10.0 U	10 U	10.0 U	10 U
Barium	1000	2600	200 U	NA	519	NA	200 U	NA	200 U	NA	230	NA	200 U	NA	200 U	NA	314	NA	200 U	NA
Beryllium	3*	73	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA
Cadmium	5	18	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA
Calcium	--	--	266000 J	NA	57200 J	NA	52400 J	NA	57300 J	NA	228000 J	NA	356000 J	NA	284000 J	NA	45300 J	NA	55800 U	NA
Chromium	50	55000*	15.1	15.2	15.1	10 U	10.0 U	10 U	10.0 U	10 U	10.0 U	10 U	11.9	13.2	13.3	10 U	10.0 U	10 U	10.0 U	10 U
Cobalt	--	730	50.0 U	NA	50.0 U	NA	50.0 U	NA	50.0 U	NA	50.0 U	NA	50.0 U	NA	50.0 U	NA	50.0 U	NA	50.0 U	NA
Copper	200	1500	25.0 U	NA	25.0 U	NA	25.0 U	NA	25.0 U	NA	25.0 U	NA	25.0 U	NA	25.0 U	NA	25.0 U	NA	25.0 U	NA
Iron	300**	11000	15500 J	NA	7850 J	NA	413 J	NA	1090 J	NA	14100 J	NA	4340 J	NA	10200 J	NA	2660 J	NA	2880 J	NA
Lead	25	15	3.0 U	NA	3.0 U	NA	3.0 U	NA	3.0 UJ	NA	3.0 U	NA	3.0 U	NA	3.1	NA	3.0 U	NA	3.0 UJ	NA
Magnesium	35000*	--	76400	NA	11600	NA	10800	NA	11600	NA	40800	NA	125000	NA	75200	NA	8220	NA	11000	NA
Manganese	300**	880	268 J	NA	299 J	NA	72.1 J	NA	297 J	NA	812 J	NA	2330 J	NA	337 J	NA	114 J	NA	141 J	NA
Nickel	100	730***	40.0 U	NA	40.0 U	NA	40.0 U	NA	40.0 U	NA	40.0 U	NA	40.0 U	NA	40.0 U	NA	40.0 U	NA	40.0 U	NA
Potassium	--	--	19600 J	NA	5000 UN	NA	5000 UJ	NA	5000 U	NA	5000 U	NA	5000 UJ	NA	5000 UJ	NA	5000 UJ	NA	5000 U	NA
Selenium	10	180	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA
Silver	50	180	10.0 U	NA	10.0 U	NA	10.0 U	NA	10.0 U	NA	10.0 U	NA	10.0 U	NA	10.0 U	NA	10.0 U	NA	10.0 U	NA
Mercury	0.7	11	0.200 UJ	NA	0.200 UJ	NA	0.200 UJ	NA	0.200 UJ	NA	0.200 UJ	NA	0.200 UJ	NA	0.200 UJ	NA	0.200 UJ	NA	0.200 UJ	NA
Sodium	20000	--	22300	NA	5000 U	NA	5000 U	NA	5850	NA	15500	NA	7110	NA	20700	NA	11400	NA	5990 U	NA
Thallium	0.5*	2.4	10.0 U	NA	10.0 U	NA	10.0 U	NA	10.0 U	NA	10.0 U	NA	10.0 U	NA	10.0 U	NA	10.0 U	NA	10.0 U	NA
Vanadium	--	260	50.0 U	NA	50.0 U	NA	50.0 U	NA	50.0 U	NA	50.0 U	NA	50.0 U	NA	50.0 U	NA	50.0 U	NA	50.0 U	NA
Zinc	2000*	11000	20.0 UJ	NA	25.9 J	NA	20.0 UJ	NA	20.0 U	NA	20.0 U	NA	20.0 UJ	NA	23.1 J	NA	20.0 UJ	NA	20.0 U	NA
Dissolved Metals, micrograms per liter																				
Aluminum	--	36000	NA	NA	200 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 5-9

ANALYTICAL RESULTS FOR DEEP OVERBURDEN GROUNDWATER SAMPLES

Peter Cooper Markhams Site
Dayton, New York

Geomatrix

	Groundwater Criteria[3]		Sample Location, Sample Identification #, and Date Collected[1]																	
			MW-1D		MW-2D		MW-3D2		MW-4D		MW-5D		MW-6D		MW-7D		MW-8D		MW-9D	
			110701173	042302194	110601163	042302192	110601162	42202191	110501160	042402201	110701169	042602211	110801180	042402207	110801177	042402203	110601167	042302200	110501157	042202188
Constituent[2]	TOG	PRG	11/7/2001	4/23/2002	11/6/2001	4/23/2002	11/6/2001	4/22/2002	11/5/2001	4/24/2002	11/7/2001	4/26/2002	11/8/2001	4/24/2002	11/8/2001	4/24/2002	11/6/2001	4/23/2002	11/5/2001	4/22/2002
Antimony	3	15	NA	NA	60.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	25	0.045	NA	NA	10.0 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	1000	2600	NA	NA	443	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	3*	73	NA	NA	5.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	5	18	NA	NA	5.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	--	--	NA	NA	45800 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	50	55000*	NA	NA	10.0 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	--	730	NA	NA	50.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	200	1500	NA	NA	25.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	300**	11000	NA	NA	351 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	25	15	NA	NA	3.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	35000*	--	NA	NA	8040	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	300**	880	NA	NA	161 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	100	730***	NA	NA	40.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	--	--	NA	NA	5000 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	10	180	NA	NA	10.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	50	180	NA	NA	10.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	0.7	11	NA	NA	0.200 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	20000	--	NA	NA	5000 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	0.5*	2.4	NA	NA	10.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	--	260	NA	NA	50.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	2000*	11000	NA	NA	20.0 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexavalent Chromium, micrograms per liter																				
Total Hexavalent Chromium	50	110	10 UJ	10 UJ	(10000 U) R	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	321 NJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	(10000 U) R	10 UJ	(10000 U) R	10 UJ
Soluble Hexavalent Chromium	50	110	NA	NA	10 UJ	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Other Geochemical Parameters, milligrams per liter																				
Ammonia	2 (NH_3 + NH_4^+ as N)	--	413	150	0.10 U	0.10 U	0.10 U	0.10 U	0.68	0.58	0.17	0.18	6.2	0.53	0.11	0.10 U	0.14	0.10 U	0.10 U	0.10 U
Bicarbonate Alkalinity	--	--	608	NA	143	NA	135	NA	174	NA	450	NA	519	NA	436	NA	146	NA	108	NA
Carbonate Alkalinity	--	--	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA	5.0 U	NA
Nitrate	10 (as N)	10	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.5 U
Sulfate	250	--	748	624	12.6	8.5	48.7	53.6	25.0	12.5	288	243	1640	723	603	584	27.4	13.7	57.3	59.7
Sulfide	0.05* (as H_2S)	--	1.0 U	NA	1.0 U	NA	1.0 U	NA	1.0 U	NA	1.0 U	NA	1.0 U	NA	1.0 U	NA	1.0 U	NA	1.0 U	NA
Total Dissolved Solids	--	--	1490	NA	155	NA	178	NA	210	NA	973	NA	1770	NA	1220	NA	133	NA	223	NA
Total Organic Carbon	--	--	17.8	NA	5.6 J	NA	4.9	NA	6.7	NA	9.3	NA	13.3	NA	12.8	NA	4.1	NA	5.5	NA
Soluble Organic Carbon	--	--	NA	NA	14.1 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Field Measured Parameters																				
Temperature, °C	--	--	10.48	10.65	10.45	8.46	10.01	7.48	9.53	8.99	10.2	8.41	9.85	9.55	9.52	8.61	9.43	8.46	10.08	7.83
pH, standard units	--	--	6.73	6.76	7.32	7.61	7.65	7.91	7.5	7.41	6.91	6.89	6.45	6.55	6.72	6.91	7.5	7.79	7.36	7.71
Specific Conductivity, µS/cm	--	--	3718	2700	340	309	369	544	253	373	2024	1056	3619	2148	2891	1865	341	319	237	541
Dissolved Oxygen, mg/L	--	--	0.46	0.03	0.65	0.11	1.2	0.17	0.59	0.09	0.45	0.03	0.44	0.07	0.29	0.06	0.5	0.04	0.77	0.23
Oxidation-Reduction Potential, mV	--	--	190	199	239.1	211.1	230	259.9	159	218.8	208	226.1	76	42.5	160.6	181.4	211	251.2	32	398.9
Turbidity, NTU	--	--	10.17	16	500	130	1.9	12	3.3	4.54	11.9	11	2.97	12	45.8	19.6	48.5	26.7	43	4.36
Ferrous Iron, mg/L	--	--	6.2	7	1.4	0	0	0.5	1.6	1.2	6	5.8	NA	0	4.6	7	NA	0.8	0	1

Notes:

1. Sample locations provided on Plate 1
2. Data qualifications reflect 100% data validation performed by Data Validation Services
3. Groundwater criteria is from NYSDEC Division of Water, Technical and Operational Guidance Series (TOGs), Ambient Water Quality Standards and Guidance Values for Groundwater (June 1998) and U.S. EPA Region 9 Preliminary Remediation Goals (PRGs) for Tap Water (2004)

µS/cm = microSiemens per centimeter
mg/L = milligrams per liter
mV = millivolts
NTU = Nephlometric Turbidity Unit
NA = not analyzed
ND means a non-detectable concentration by the approved analytical methods
(value) = concentration reported by the laboratory prior to being rejected by data validation
R = rejected concentration as a result of data validation

-- indicates no criteria exists
* indicates a guidance value
** applies to the sum of cis- and trans-1,3-dichloropropene
*** applies to the sum of phenolic compounds (total phenols)
**** PRG for mixture of 2,4- and 2,6-dinitrotoluene is 0.099 ug/L
* PRG for Chromium III (no PRG exists for Total Chromium)
** TOG for sum of Iron and Manganese is 500 ug/L
*** PRG for Nickel (soluble salts)

indicates exceedance of groundwater criteria or guidance value

ORGANIC DATA QUALIFIERS
U = compound was analyzed for, but not detected, reported with detection limit value
J = an estimated value, either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, or when a compound meets the identification criteria but the result is less than the quantitation limit

INORGANIC DATA QUALIFIERS:
U = element was analyzed for, but not detected, reported with the detection limit
J or B = a value greater than or equal to the instrument detection limit, but less than the quantitation limit
E = a value estimated or not reported due to the presence of interference
N = spike sample recovery is not within the quality control limits

Table 5-10

Geomatrix

ANALYTICAL RESULTS FOR WETLAND SURFACE WATER SAMPLES

Peter Cooper Markhams Site
Dayton, New York

Compound[4]	Surface Water Criteria[3]	Sample Location, Sample Identification #, and Date Collected[1]							
		Surface Water #1		Surface Water #2		Surface Water #3		Surface Water #4	
		120301186 12/3/2001	042402206 4/24/2002	120301184 12/3/2001	042502212 4/25/2002	120301183 12/3/2001	042502214 4/25/2002	dry 12/3/2001	042502215 4/25/2002
Total Metals, micrograms per liter									
Arsenic	150*	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	NA	10.0 U
Chromium **	48.2	10.0 U	10.0 U	10.0 UJ	10.0 U	10.0 U	10.0 U	NA	10.0 U
Hexavalent Chromium	11*	10 UJ	10.0 UJ	13.0 J	10.0 UJ	10.0 UJ	10.0 J	NA	10.0 UJ
Other Geochemical Parameters, milligrams per liter									
Ammonia	0.08 - 2.5+	0.10 U	0.10 U	0.10 U	0.11 J	0.10 U	0.10 U	NA	0.10 U
Bicarbonate Alkalinity	--	37.9	NA	40.8	NA	10	NA	NA	NA
Carbonate Alkalinity	--	5.0 U	NA	5.0 U	NA	5.0 U	NA	NA	NA
Nitrate	10	0.50 U	5.6	0.50 U	0.50 U	0.50 U	0.50 U	NA	2.1
Sulfate	250	337	190	198	83.2	34.5	18.2	NA	27.8
Sulfide	0.002++	1.0 U	NA	1.0 U	NA	1.0 U	NA	NA	NA
Total Dissolved Solids	1000	603	NA	432	NA	111	NA	NA	NA
Total Organic Carbon	--	17.8	NA	26.4	NA	33.0	NA	NA	NA
Field Measured Parameters									
Temperature, °C	--	NA	16.70	11.30	7.72	10.39	10.54	NA	10.49
pH, standard units	--	NA	7.35	5.85	7.37	3.38	7.16	NA	7.00
Specific Conductivity, µS/cm	--	NA	925	4.44	491	1100	69	NA	242
Dissolved Oxygen, mg/L	--	NA	0.72	7.03	0.66	11.8	1.09	NA	0.85
Oxidation-Reduction Potential, mV	--	NA	-139.8	NA	70.0	NA	-84.6	NA	-34.9
Turbidity, NTU	--	NA	0.30	4.1	11	2.5	NA	NA	NA
Ferrous Iron, mg/L	--	NA	NA	<1	NA	<1	NA	NA	NA

Notes:

indicates concentration above surface water criteria

1. Sample locations provided on Plate 1
2. Data qualifications reflect 100% data validation performed by Data Validation Services
3. Surface water criteria is from NYSDEC Division of Water, Technical and Operational Guidance Series (TOGs), Ambient Water Quality Standards and Guidance Values for Fish Propagation in Fresh Waters (June 1998)

* indicates criteria applies to dissolved form

** indicates criteria is a function of hardness, as follows: (0.86)exp(0.819[ln (ppm hardness)] + 0.6848); applies to dissolved form of trivalent chromium — Maximum alkalinity value substituted for Hardness

+ indicates criteria is dependent upon pH and temperature

-- indicates no criteria exists

++ indicates criteria is for total sulfides, expressed as hydrogen sulfide

NA = not analyzed

INORGANIC DATA QUALIFIERS:

U = element was analyzed for, but not detected; reported with the detection limit value

J = a value greater than or equal to the instrument detection limit, but less than the quantitation limit

ORGANIC DATA QUALIFIERS:

U = compound was analyzed for, but not detected; reported with the detection limit value

J = an estimated value, either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, or when a compound meets the identification criteria but the result is less than the quantitation limit

Table 5-11

ANALYTICAL RESULTS FOR BACKGROUND WETLAND SEDIMENT SAMPLES

Geomatrix

Peter Cooper Markhams Site
Dayton, New York

Constituent [2]	*Sediment Criteria* [3]	*Sample Location, Sample Identification #, and Date Collected* [1]								
		Lathe # 79A 101501135 10/15/2001	*Lathe # 80 101501136 10/15/2001*	*Lathe # 81A 101501137 10/15/2001*	*Lathe #82 101501139 10/15/2001*	*Lathe #83 101501140 10/15/2001*	*Lathe #76 101501146 10/15/2001*	*Lathe #75 101501147 10/15/2001*	*Lathe #77 101501148 10/15/2001*	*Lathe #78 101501149 10/15/2001*
Total Metals, milligrams per kilogram										
Arsenic	6.0/33	9.6	7.1	10.3	8.9	1.4 U	5.2	9.3	6.0	4.2
Chromium	26.0/110	13.2 J	14.1 J	9.3 J	23.1 J	8.3 J	13.9 J	7.8 J	11.8 J	16.4 J

Notes:

1. Sample locations provided on Plate 1
2. Data qualifications reflects 100% data validation performed by Data Validation Services
3. Sediment criteria (Low Effect Level/Severe Effect Level) from NYSDEC Division of Fish, Wildlife and Marine Resources, Technical Guidance for Screening Contaminated Sediments (January 1999)

INORGANIC DATA QUALIFIERS.

U = element was analyzed for, but not detected; reported with the detection limit value

Table 5-12

ANALYTICAL RESULTS FOR WETLAND SEDIMENT SAMPLES

Peter Cooper Markhams Site
Dayton, New York

Constituent [2]	Sediment Criteria [3]	Site Background Range	Sample Location, Sample Identification #, and Date Collected [1]					
			Wetland A	Wetland B				
			Lathe #89 101501133 10/15/2001	Lathe #86 101501124 10/15/2001	Lathe #87 101501126 10/15/2001	Lathe #88 101501127 10/15/2001	Lathe #90 101501128 10/15/2001	Lathe #91 101501129 10/15/2001
Total Metals, milligrams per kilogram								
Arsenic	6.0/33	ND to 10.3	6.4	6.6 U	6.3	6.8 U	5.9 U	6.7 U
Chromium	26.0/110	7.8 to 23.1	215 J /29.0 [4]	6.6 UJ	19.2 J	26.7 J	46.8 J	42.4 J
Hexavalent Chromium	--	NA	(1.3 U) R / 18.3 [4]	(2.8 U) R	(2.4 U) R	(2.6 U) R	(2.4 U) R	(1.6 U) R

Constituent [2]	Sediment Criteria [3]	Site Background Range	Sample Location, Sample Identification #, and Date Collected [1]							
			Wetland D			Wetland F			Wetland G	
			Lathe #94A 101501120 10/15/2001	Lathe #93 101501121 10/15/2001	Lathe #92A 101501122 10/15/2001	Lathe #150 101501130 10/15/2001	Lathe #151 101501131 10/15/2001	Lathe #152 101501132 10/15/2001	Lathe #84A 101501123 10/15/2001	Lathe #85 101501125 10/15/2001
Total Metals, milligrams per kilogram										
Arsenic	6.0/33	ND to 10.3	11.4	8.6	9.0	4.5	3.2 U	3.9	3.8	2.3
Chromium	26.0/110	7.8 to 23.1	75.4 J	136 J /97.8 [4]	51.8 J	24.4 J	14.6 J	23.9 J	9.2 J	87.4 J / 14.2 J [4]
Hexavalent Chromium	--	NA	(0.47 U) R	(0.52 U) R /1.3 [4]	(0.52 U) R	(0.88 U) R	(1.2 U) R	(1.0 U) R	(0.53 U) R	(0.92 U)R /4.0 UJ [4]

Notes:

1 Sample locations provided on Plate 1

indicates concentration is above background range and sediment criterion (severe effect)

2. Data qualifications reflect 100% data validation performed by Data Validation Services

3. Sediment criteria (Low Effect Level/Severe Effect Level) from NYSDEC Division of Fish, Wildlife and Marine Resources, Technical Guidance for Screening Contaminated Sediments (January 1999)

4. Confirmation sample result collected on December 3, 2003.

(value) = concentration reported by the laboratory prior to being rejected during data validation

R = rejected concentration as a result of data validation

ND = non-detect

INORGANIC DATA QUALIFIERS:

U = element was analyzed for, but not detected; reported with the detection limit value

J = a value greater than or equal to the instrument detection limit, but less than the quantitation limit

Table 5-13

Geomatrix

ANALYTICAL RESULTS FOR SOIL VAPOR

Peter Cooper Markhams Site
Dayton, New York

Constituent [2]	Sample Location, Identification, and Date Collected [1]					
	GPZ-1			GPZ-1		
	i	*i + 1 min*	*i + 7 min*	*i*	*i + 5 min*	*Maximum Conc.*
	11/5/2001	*11/5/2001*	*11/5/2001*	*4/22/2002*	*4/22/2002*	*4/22/2002*
Field Measured Parameters						
Carbon monoxide, ppm	6	4	3	103	185	185
Oxygen, %	0.8	0.4	0.9	9.8	8.4	6.1
Hydrogen sulfide, ppm	4	1	3	195	305	305
LEL, %	100	100	100	100	100	100

Notes:

1. Sample location provided on Plate 1

i = initial sample result at time zero

min = minutes

ppm = parts per million

LEL = lower explosive limit (a measurement of methane in air)

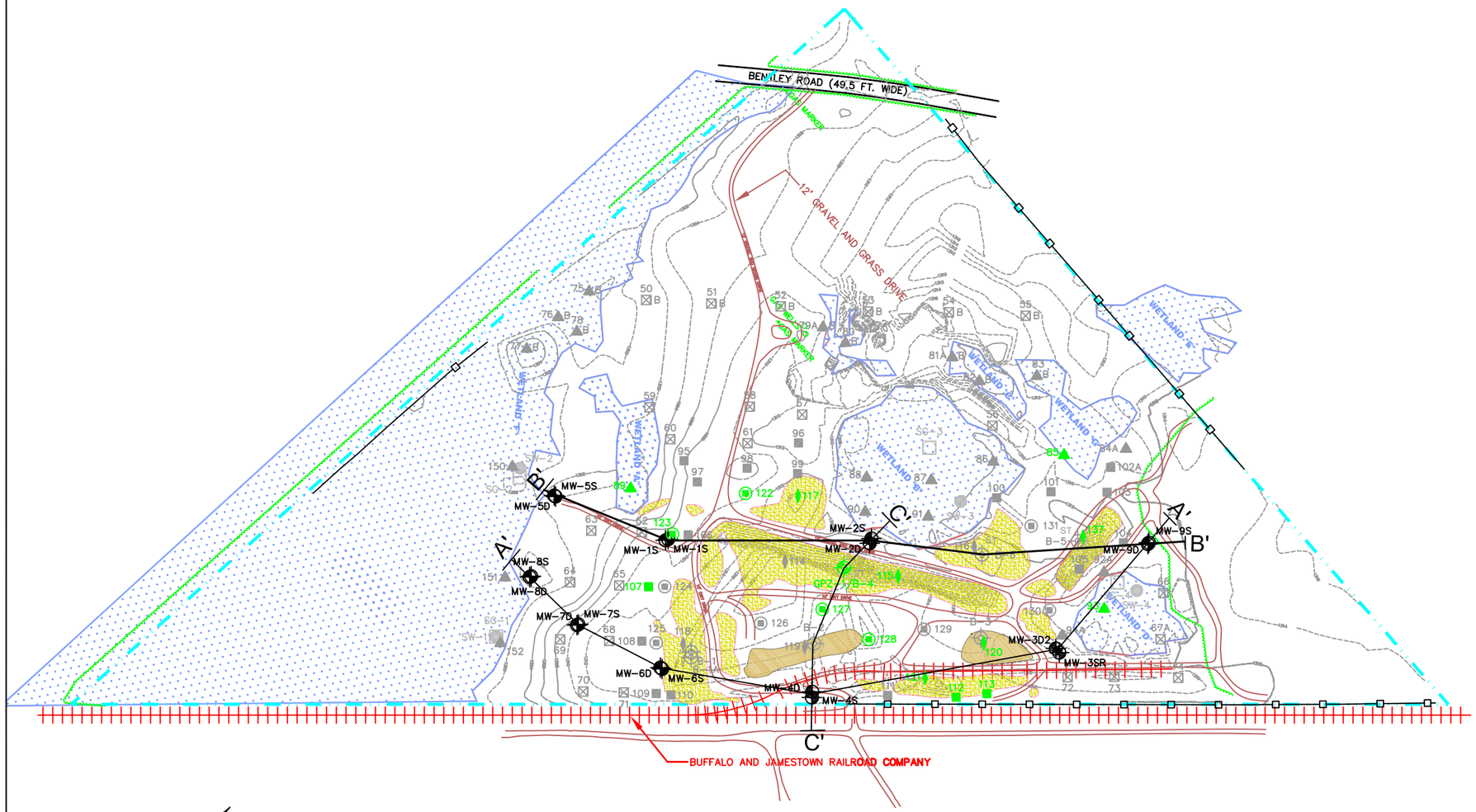
> = greater than

TABLE 6-1

EXPOSURE PATHWAYS

Peter Cooper Markhams Site
Dayton, New York

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/ Future	Soil	Soil	On-site Soil	Trespasser	Adult/ Adolescent	Incidental Ingestion	On-site	Quant.	Inactive facility, current and future trespassers likely at this remote location
						Dermal Contact	On-site	Quant.	
		Ambient Air	Fugitive dust from on-site soil	Trespasser	Adult/ Adolescent	Inhalation	On-site	Quant.	Inactive facility, current and future trespassers likely at this remote location
	Groundwater	Ambient Air	Volatile COPCs from on-site groundwater	Trespasser	Adult/ Adolescent	Inhalation	On-site	Quant.	Inactive facility, current and future trespassers likely at this remote location
	Surface Water	Surface Water	Surface water from wetland	Trespasser	Adult/ Adolescent	Ingestion	On-site	None	Standing surface water only, unlikely to be used for swimming or wading
						Dermal Contact	On-site	Quant.	Inactive facility, current and future trespassers likely at this remote location
	Sediment	Sediment	Sediment from wetland	Trespasser	Adult/ Adolescent	Incidental Ingestion	On-site	Quant.	Inactive facility, current and future trespassers likely at this remote location
						Dermal Contact	On-site	Quant.	
Future	Soil	Soil	On-site Soil	On-site Outdoor Worker	Adult	Incidental Ingestion	On-site	Quant.	Potentially complete if site is redeveloped into industrial/commercial use
						Dermal Contact	On-site	Quant.	
				Construction Worker	Adult	Incidental Ingestion	On-site	Quant	Potentially complete if the site is redeveloped
						Dermal Contact	On-site	Quant	
		Ambient Air	Fugitive dust from on-site soil	On-site Outdoor Worker	Adult	Inhalation	On-site	Quant.	Potentially complete if site is redeveloped into industrial/conunercial use
				Construction Worker	Adult	Inhalation	On-site	Quant.	Potentially complete if the site is redeveloped
	Groundwater	Groundwater	On-site Groundwater	On-site Outdoor Worker	Adult	Ingestion	On-site	Quant.	Although unlikely, groundwater may be a future potable source if site is redeveloped into industrial/commercial use
						Dermal Contact	On-site	Quant.	
				Construction Worker	Adult	Dermal Contact	On-site	Quant.	Potentially complete if the site is redeveloped
		Ambient Air	Volatile COPCs from on-site groundwater	On-site Outdoor Worker	Adult	Inhalation	On-site	Quant.	Potentially complete if site is redeveloped into industrial/conunercial use
				Construction Worker	Adult	Inhalation	On-site	Quant.	Potentially complete if the site is redeveloped
		Indoor Air	Volatile COPCs from on-site groundwater	On-site Indoor Worker	Adult	Inhalation	On-site	Quant.	Potentially complete if site is redeveloped into industrial/commercial use
	Surface Water	Surface Water	Surface water from wetland	Construction Worker	Adult	Dermal Contact	On-site	Quant.	Potentially complete if the site is redeveloped
	Sediment	Sediment	Sediment from wetland	Construction Worker	Adult	Ingestion	On-site	Quant.	Potentially complete if the site is redeveloped
						Dermal Contact	On-site	Quant.	



EXPLANATION

- PROPERTY BOUNDARY
- WETLAND BOUNDARY
- RAILROAD TRACKS
- FENCE LINE
- MW–1S — MONITORING WELL LOCATION
- SG–1 — STAFF GAUGE LOCATION
- SW–1 — SURFACE WATER LOCATION
- 95 — SURFACE/SUBSURFACE SOIL SAMPLE LOCATION
- 56 — SURFACE SOIL SAMPLE LOCATION
- 50 B — BACKGROUND SURFACE SOIL SAMPLE LOCATION
- 122 — SURFACE/SUBSURFACE SOIL SAMPLE LOCATION (SS ANALYZED FOR TCL VOCs/SVOCs AS WELL AS COPCs)
- 84A — SEDIMENT SAMPLE LOCATION
- 75 B — BACKGROUND SEDIMENT SAMPLE LOCATION
- 114 — WASTE PILE SURFACE SOIL SAMPLE LOCATION
- B–1 — BORING LOCATION
- GPZ–1/B–4 — PIEZOMETER/GAS SAMPLING WELL/ BORING LOCATION; "ST" IDENTIFIES LOCATION OF SHELBY TUBE SAMPLE
- APPROXIMATE LOCATION OF WASTE PILE
- NON–WASTE FILL PILE

NOTE: SURFACE SOIL/SEDIMENT RESAMPLE LOCATIONS ARE SHADED GREEN.

A' — GEOLOGIC CROSS–SECTION LINE

APPROXIMATE SCALE IN FEET
0 100 200
0 60 120
APPROXIMATE SCALE IN METERS

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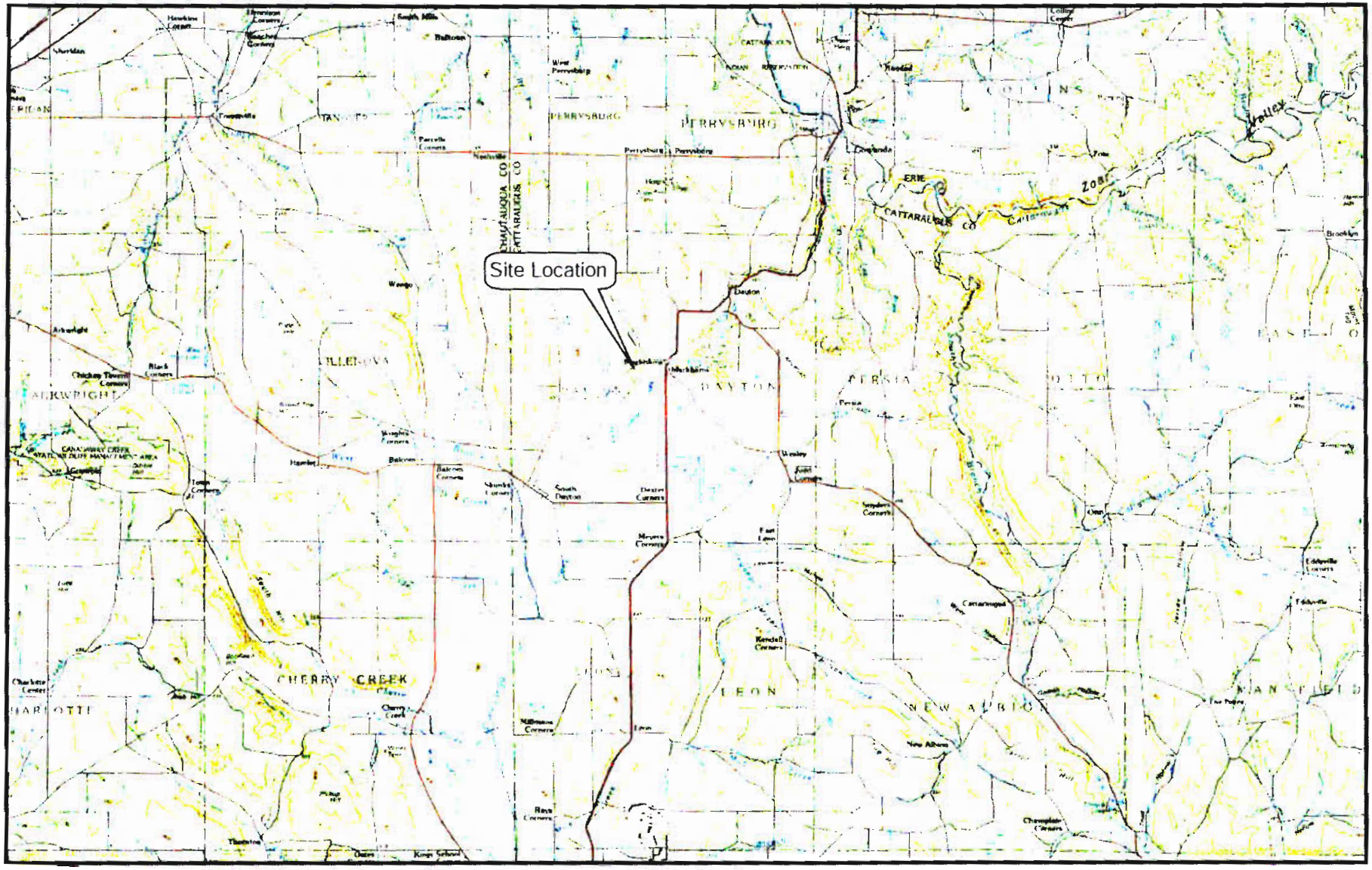
GEOMATRIX

SITE PLAN WITH PROPERTY BOUNDARY

Peter Cooper Markhams Site
Remedial Investigation Report

Figure By	Project No.
dmm	7603.000
Date	Plate
July 2006	1

I:/Project/7603 Peter Cooper Markhams/Draft RI Report/ Report Figures/ Figure 1-1 Site Location Map.pdf

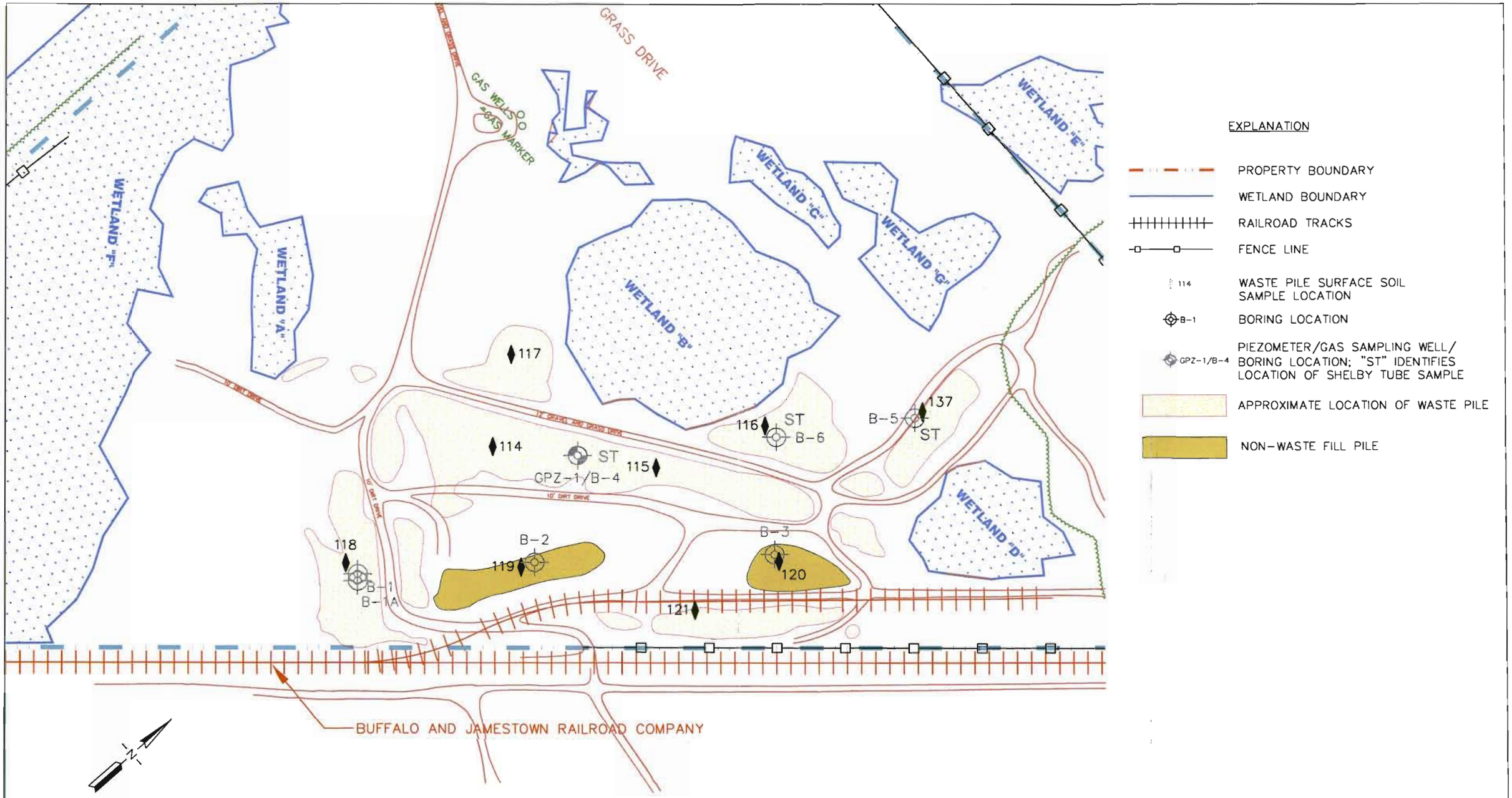


GEOMATRIX

SITE LOCATION
Peter Cooper Markhams Site
Dayton, New York

Project No.
7603

Figure
1-1



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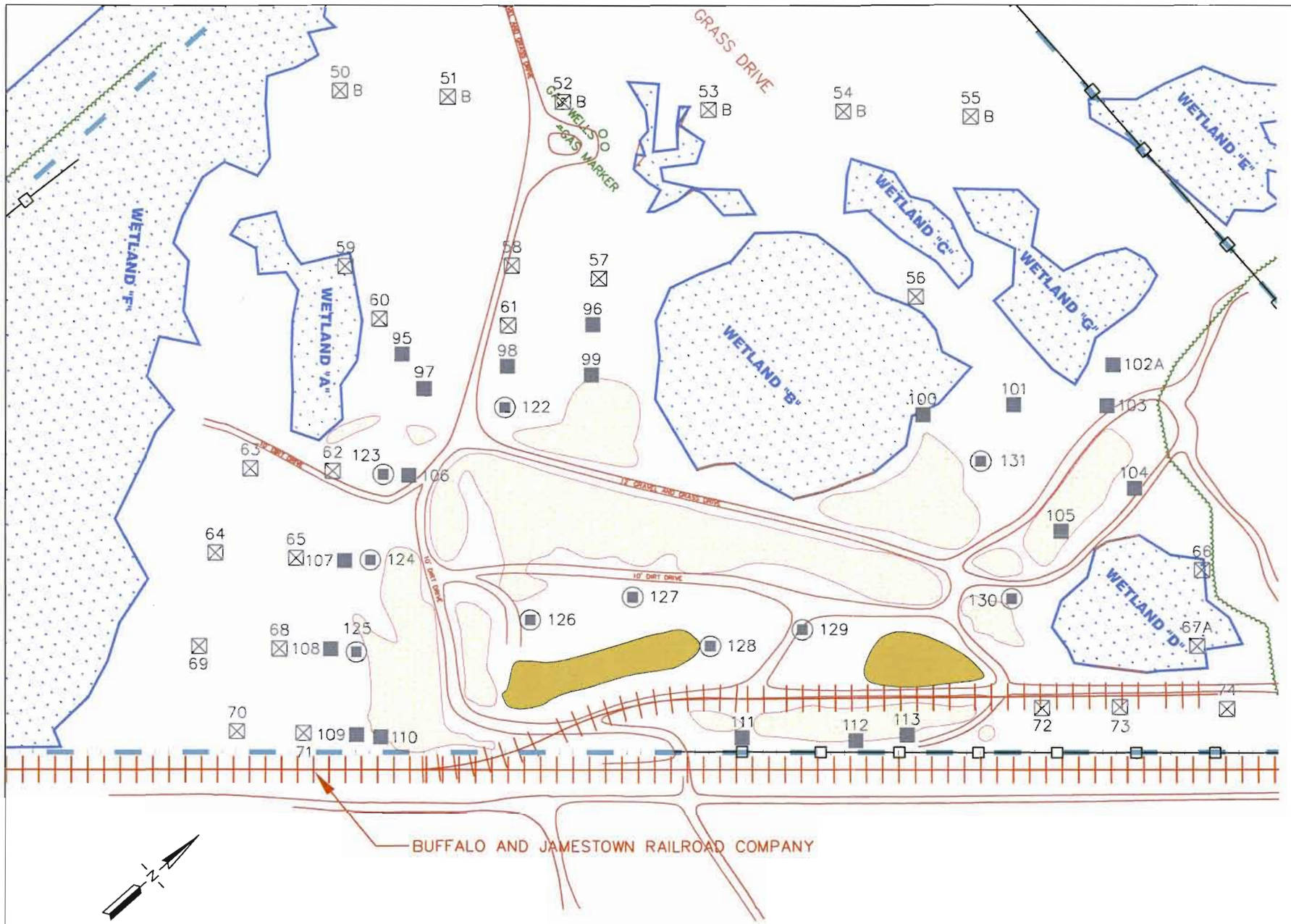
GEOMATRIX

SURFACE AND SUBSURFACE SOIL WASTE FILL PILE SAMPLE LOCATIONS

Peter Cooper Markhams Site
Dayton, New York

Figure By	Project No.
dmh	7603.000
Date	Figure
July 2006	3-1



EXPLANATION

- PROPERTY BOUNDARY
- WETLAND BOUNDARY
- RAILROAD TRACKS
- FENCE LINE
- 95 — SURFACE/SUBSURFACE SOIL SAMPLE LOCATION
- 56 — SURFACE SOIL SAMPLE LOCATION
- 50 B — BACKGROUND SURFACE SOIL SAMPLE LOCATION
- 122 — SURFACE/SUBSURFACE SOIL SAMPLE LOCATION (SS ANALYZED FOR TCL VOCs/SVOCs AS WELL AS COPCs)
- APPROXIMATE LOCATION OF WASTE PILE
- NON-WASTE FILL PILE

APPROXIMATE SCALE IN FEET
0 100 200
0 60 120
APPROXIMATE SCALE IN METERS

BASEMAP PROVIDED BY:
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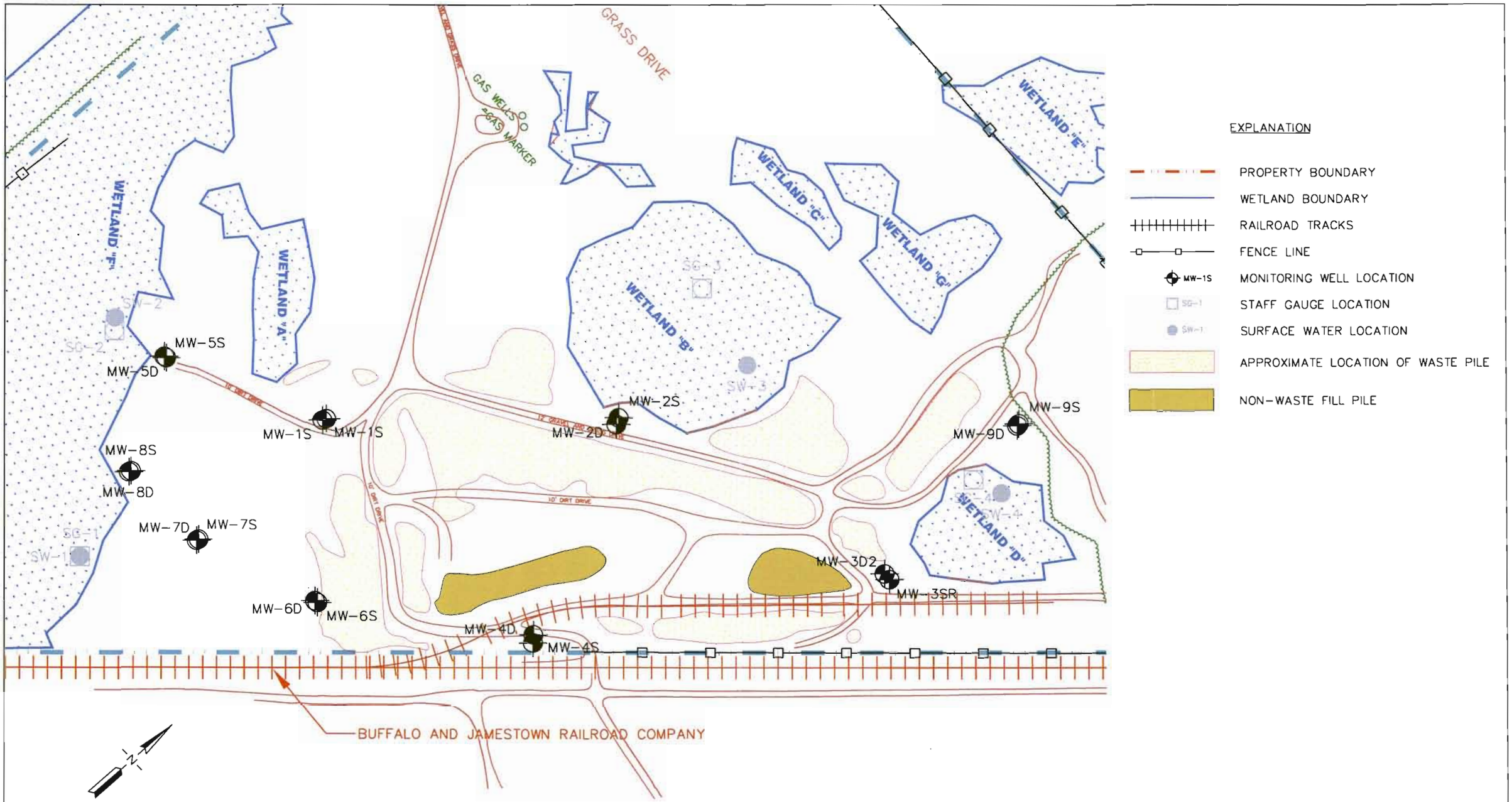
GEOMATRIX

PERIMETER AND BACKGROUND SURFACE AND SUBSURFACE SOIL SAMPLE LOCATIONS

Peter Cooper Markhams Site
Dayton, New York

Figure By	Project No.
dmh	7603.000
Date	Figure
February 2005	3-2



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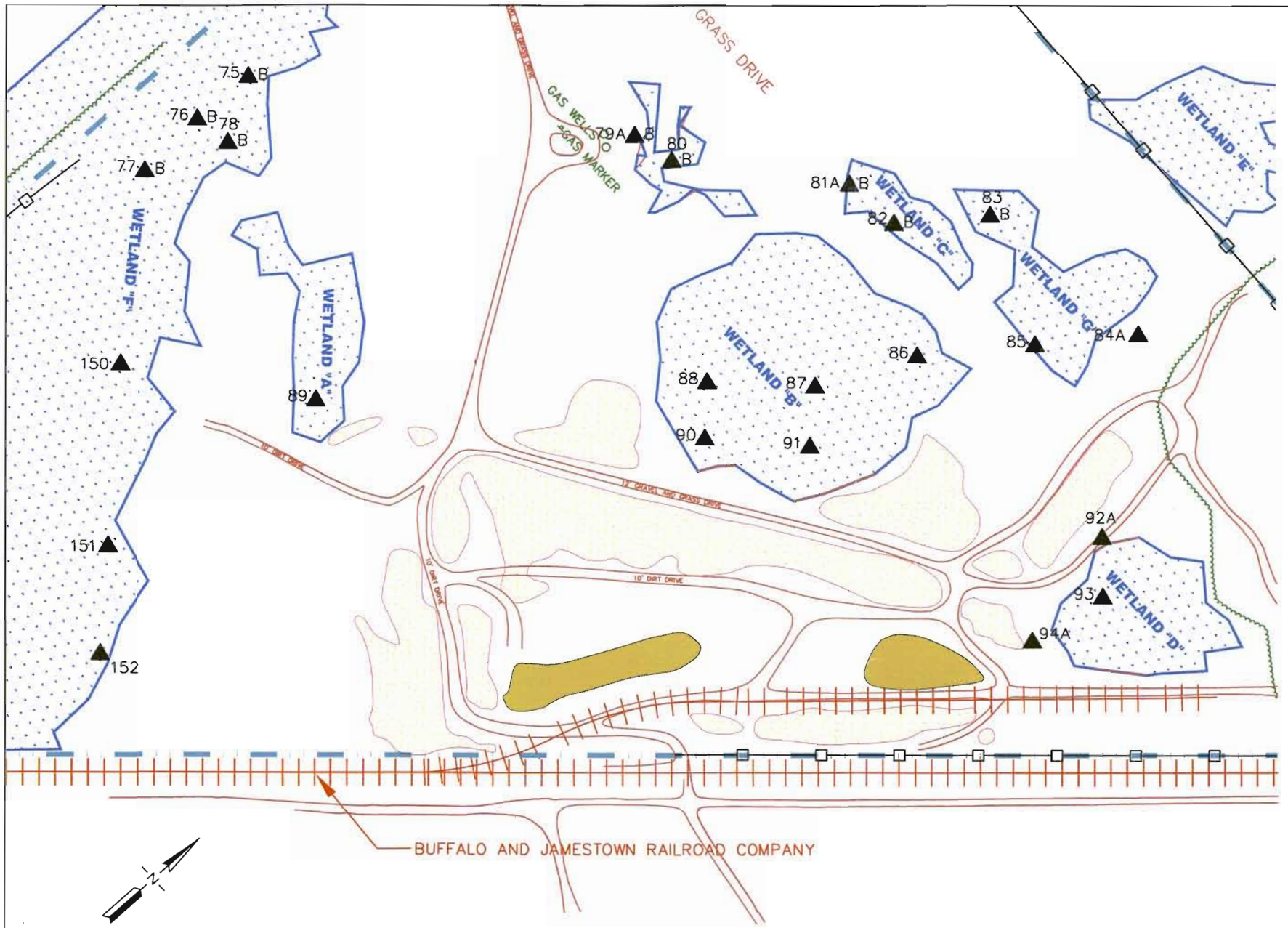
ENGINEERING & SCIENCE, PLLC.

GEOMATRIX

MONITORING WELL, STAFF GAUGE, AND SURFACE WATER LOCATIONS

Peter Cooper Markhams Site
Dayton, New York

Figure By	Project No.
dmh	7603.000
Date	Figure
February 2005	3-3



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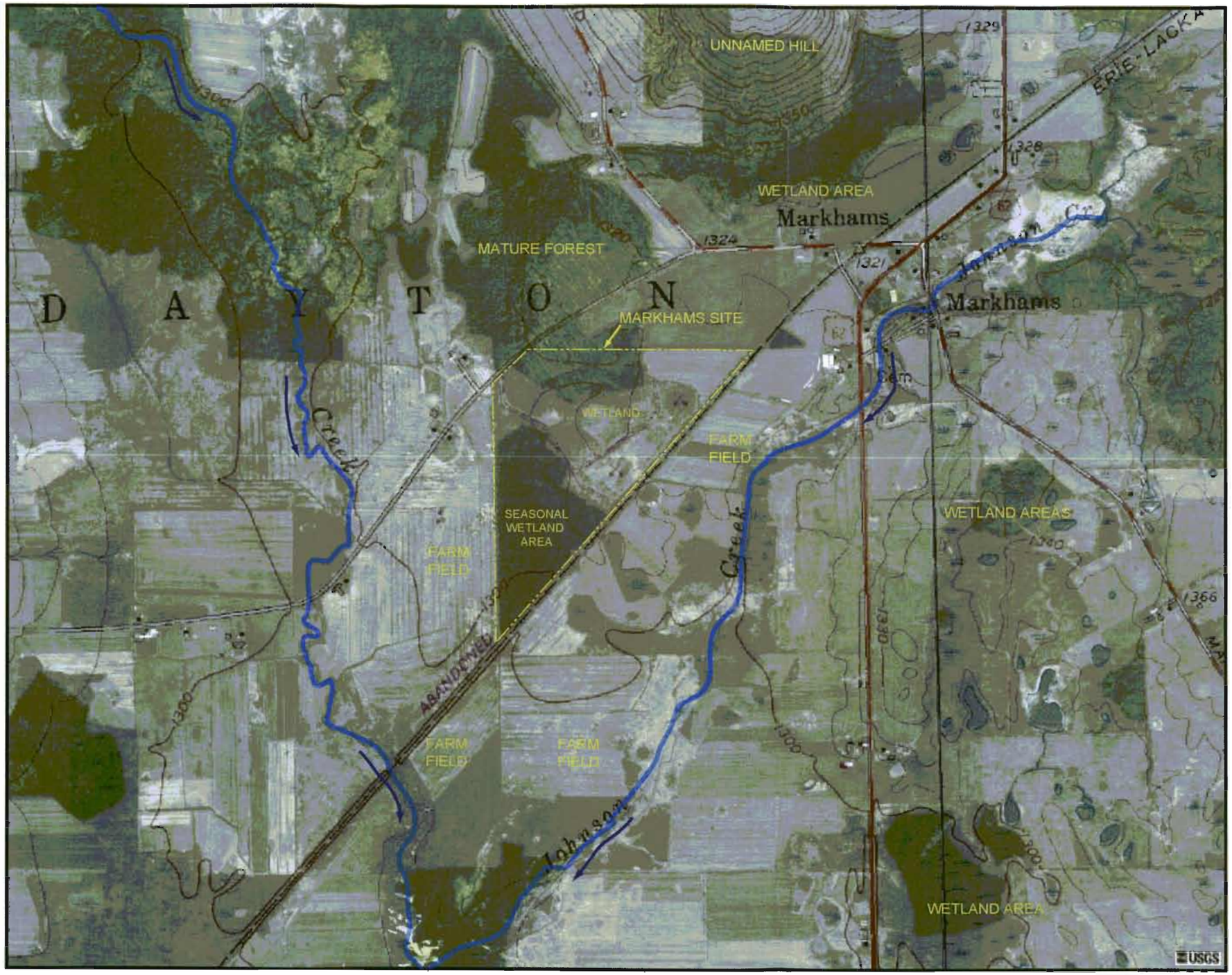
GEOMATRIX

SEDIMENT AND BACKGROUND SEDIMENT SAMPLE LOCATIONS
Peter Cooper Markhams Site
Dayton, New York

Figure By	Project No.
dmh	7603.000
Date	Figure
January 2005	3-4



*Aerial photography from USGS Aerial Imagery 4/15/1995
Topography from USGS Topographic Map dated 7/1/1990

EXPLANATION

Site Boundary

Flow Direction

N

0 2000

SCALE
(ft, approximate)

HYDROLOGY MAP
Peter Cooper Markhams Site
Remedial Investigation Report

GEOMATRIX	Project No. 7603	Figure 4-1

Put network path and drawing No. information here

A

SOUTHWEST

A'

NORTHEAST

Bend in Section

Bend in Section

MW-8S
MW-8D
MW-7S
MW-7D
MW-6S
MW-6D
B-1A (projected)
MW-4S
MW-4D
B-3 (projected)
MW-3D2
MW-3SR
MW-9D
MW-9S

Waste-Fill Pile

Non-waste Fill

Wetland "F"

Wetland "D"

SG-2 (projected)

SG-4

Sand, Silt and Gravel (Glacial Outwash unit)

Lacustrine Sand and Silt (Lacustrine Unit)

1299.88
1299.29
1297.74
1302.51
1302.12
1298.38
1297.55
1302.21
1297.60
1304.12
1298.75
1303.85
1298.60
1306.17
1300.93
1306.08
1301.27
1308.65
1303.43
1310.07
1303.06
1309.82
1310.10
1305.13
1310.08
1305.12

Elevation, feet

1320
1310
1300
1290
1280
1270
1260

0
400
800
1200
1600
2000
2400
2600

Distance, feet

Monitoring Well

High Groundwater Elevation (April 2002 data)

Low Groundwater Elevation (October 2001 data)

Screened interval

If present, indicates steel well screen

Groundwater Flowpath

GEOLOGIC CROSS SECTION A-A'
Peter Cooper Markhams Site
Dayton, New York

GEOMATRIX

Project No. 7603

Figure 4-2

S:\7600s\7603\7603.001\task_2\05_0120_xs_fig_a.ai (2005-01-20, 18:33)

B

SOUTHWEST

B-4 (projected 300' SW)

Access road

Waste-Fill Pile

MW-1S

MW-1D

MW-2S

MW-2D

B-6

Access road

B-5

MW-9S

MW-9D

B'

NORTHEAST

Wetland "F"

MW-5S

MW-5D

SG-2

Cover soil (Silt, sand and gravel)

Sand, Silt and Gravel (Glacial Outwash unit)

Waste-Fill

Lacustrine Sand and Silt (Lacustrine Unit)

1299.68
1299.29
1298.09
1302.62
1299.01
1304.91
1299.60
1304.65
1299.45
1308.30
1303.57
1308.14
1303.56
1310.10
1305.13
1310.08
1305.12

Elevation, feet

1320
1310
1300
1290
1280
1270
1260

0 200 400 600 800 1000 1200 1400 1600 1800 2000 2200

Distance, feet

Monitoring Well

High Groundwater Elevation (April 2002 data)

Low Groundwater Elevation (October 2001 data)

Screened interval

If present, indicates steel well screen

Groundwater Flowpath

GEOLOGIC CROSS SECTION B-B'
Peter Cooper Markhams Site
Dayton, New York

GEOMATRIX

Project No. 7603

Figure 4-3

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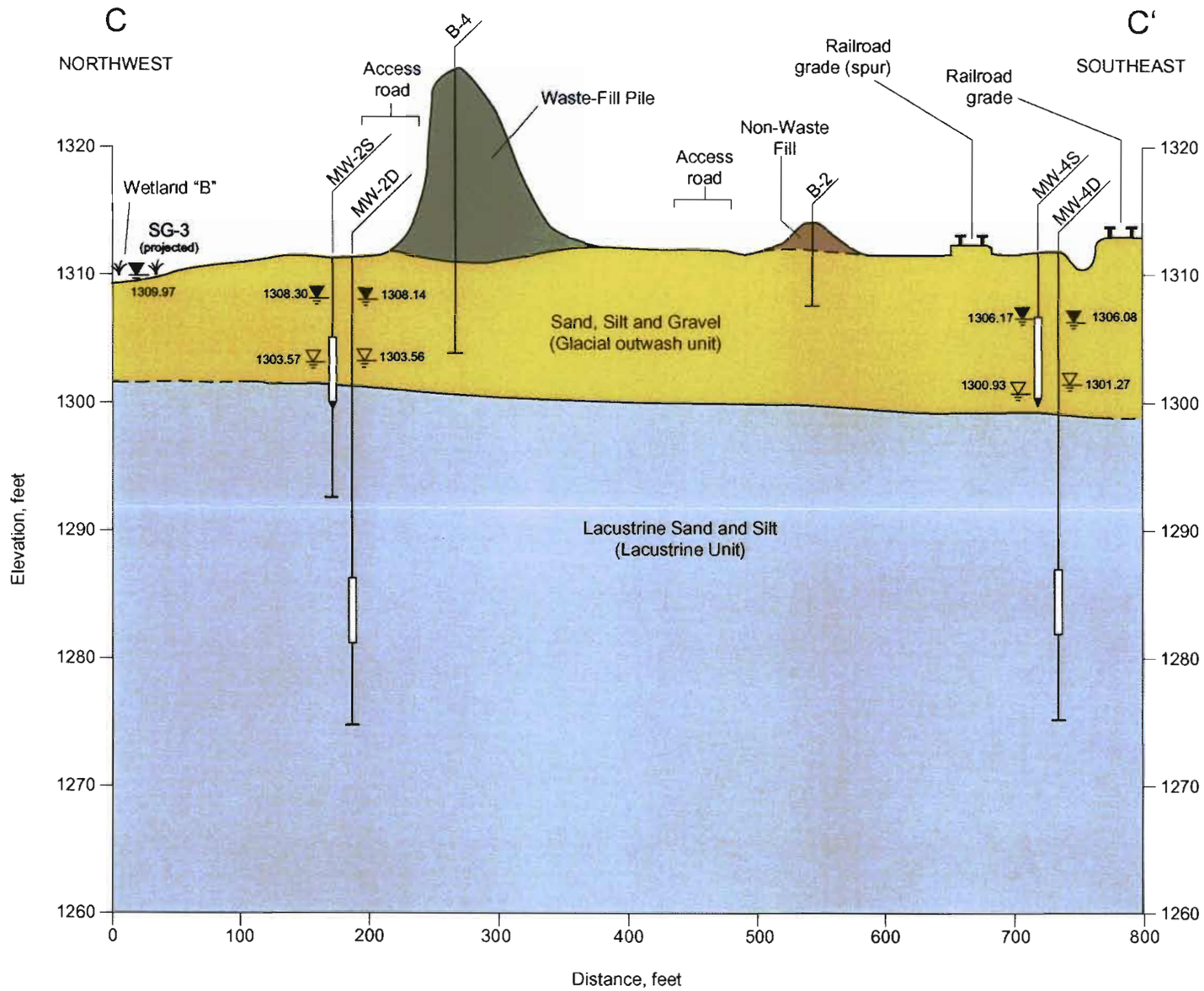

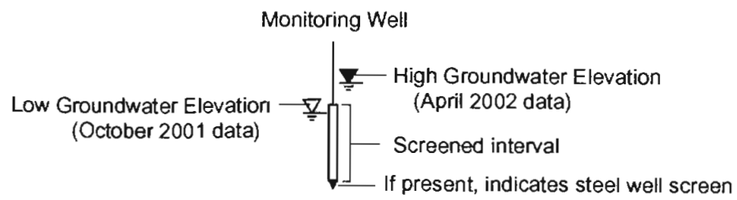

GEOLOGIC CROSS SECTION C-C'
Peter Cooper Markhams Site
Dayton, New York

GEOMATRIX

Project No.	Figure
7603	4-4

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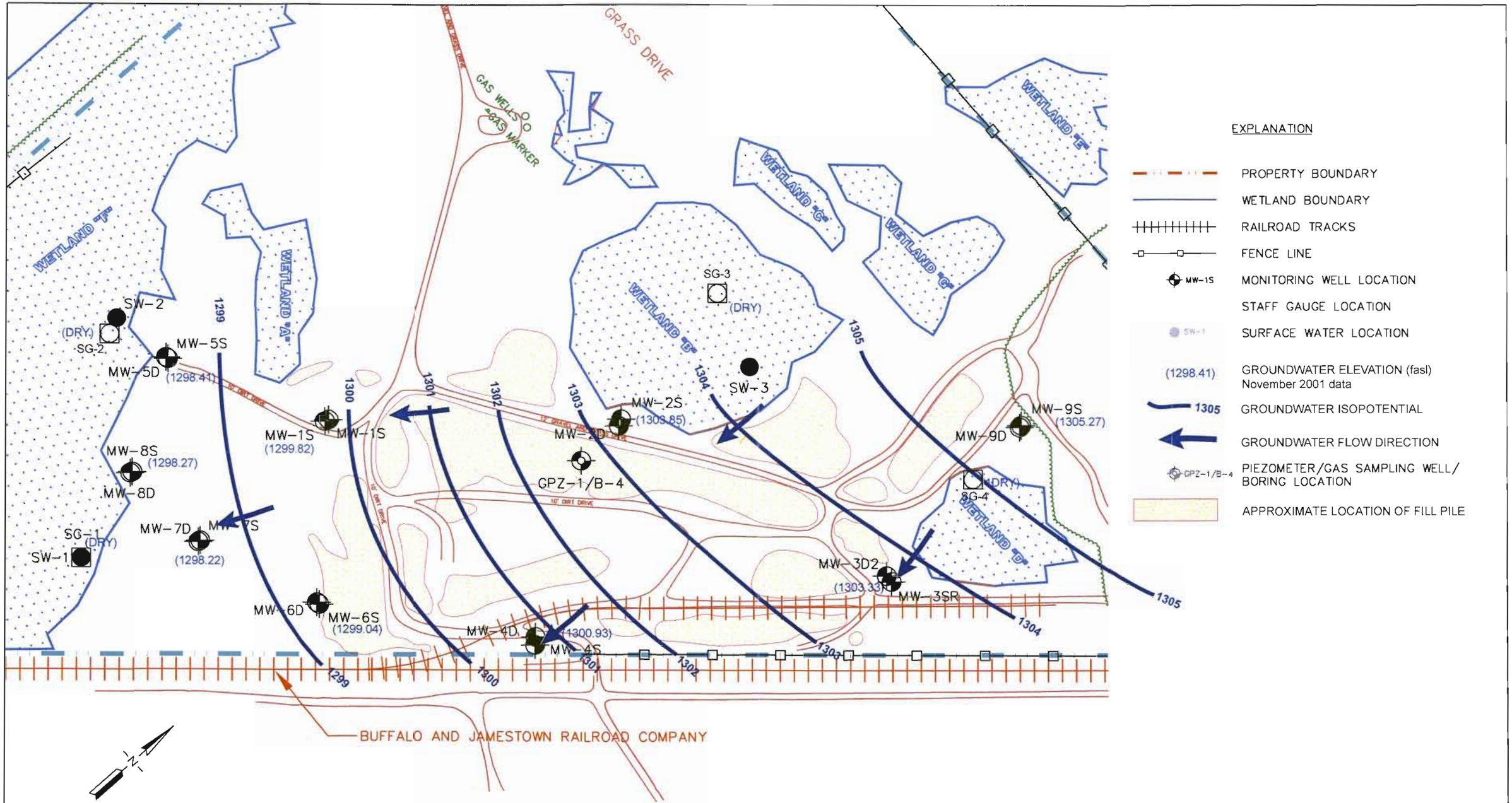

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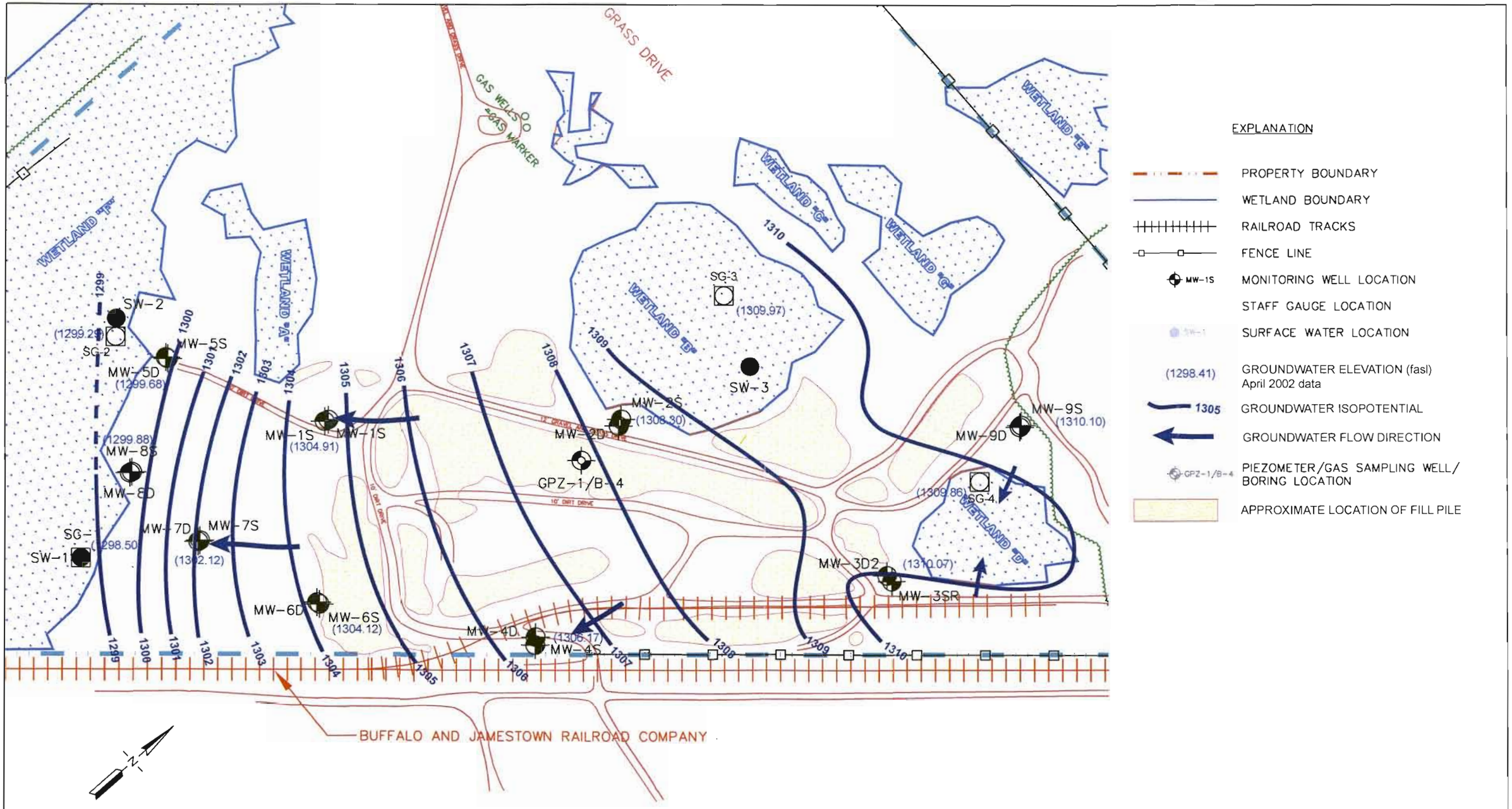
GEOMATRIX

GROUNDWATER ISOPOTENTIAL MAP - NOVEMBER 2001
Peter Cooper Markhams Site
Dayton, New York

Figure By	Project No.
dmh	7603.000
	Figure 4-5



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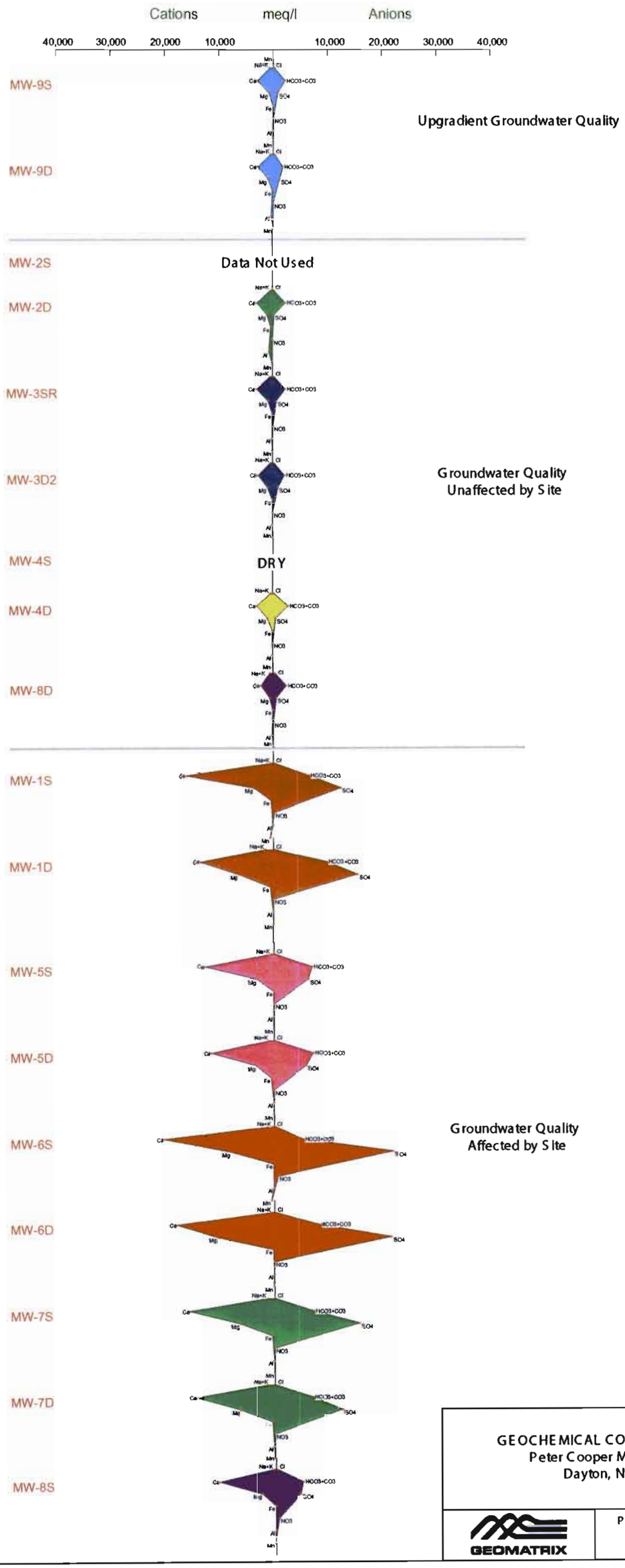
GEOMATRIX

GROUNDWATER ISOPOTENTIAL MAP - APRIL 2002
Peter Cooper Markhams Site
Dayton, New York

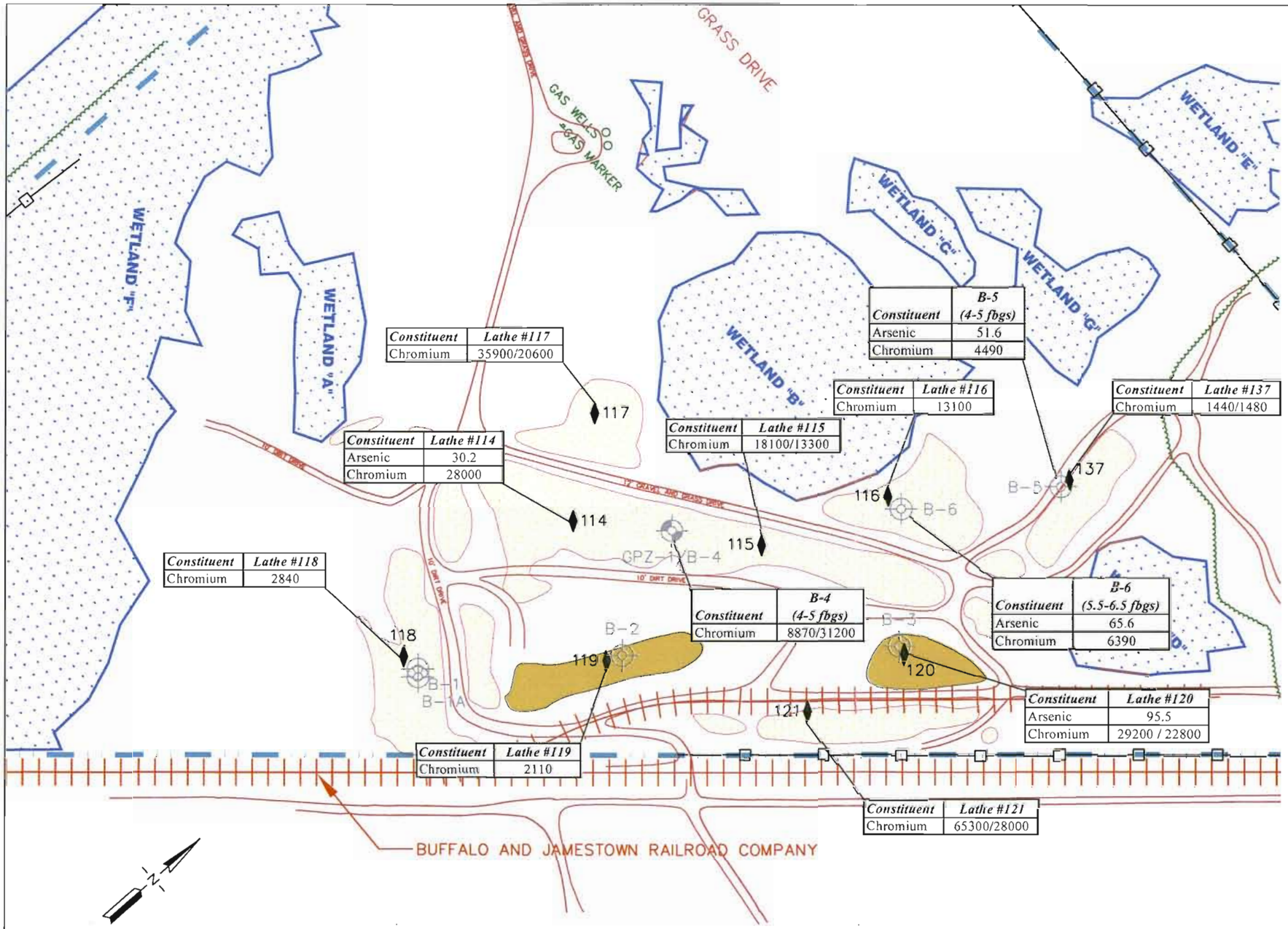
Figure By	Project No.
dmh	7603.000
	Figure 4-6

Put network path and drawing No. information here



GEOCHEMICAL COMPARISON PLOT
Peter Cooper Markhams Site
Dayton, New York

GEOMATRIX	Project No. 7603	Figure 4-7



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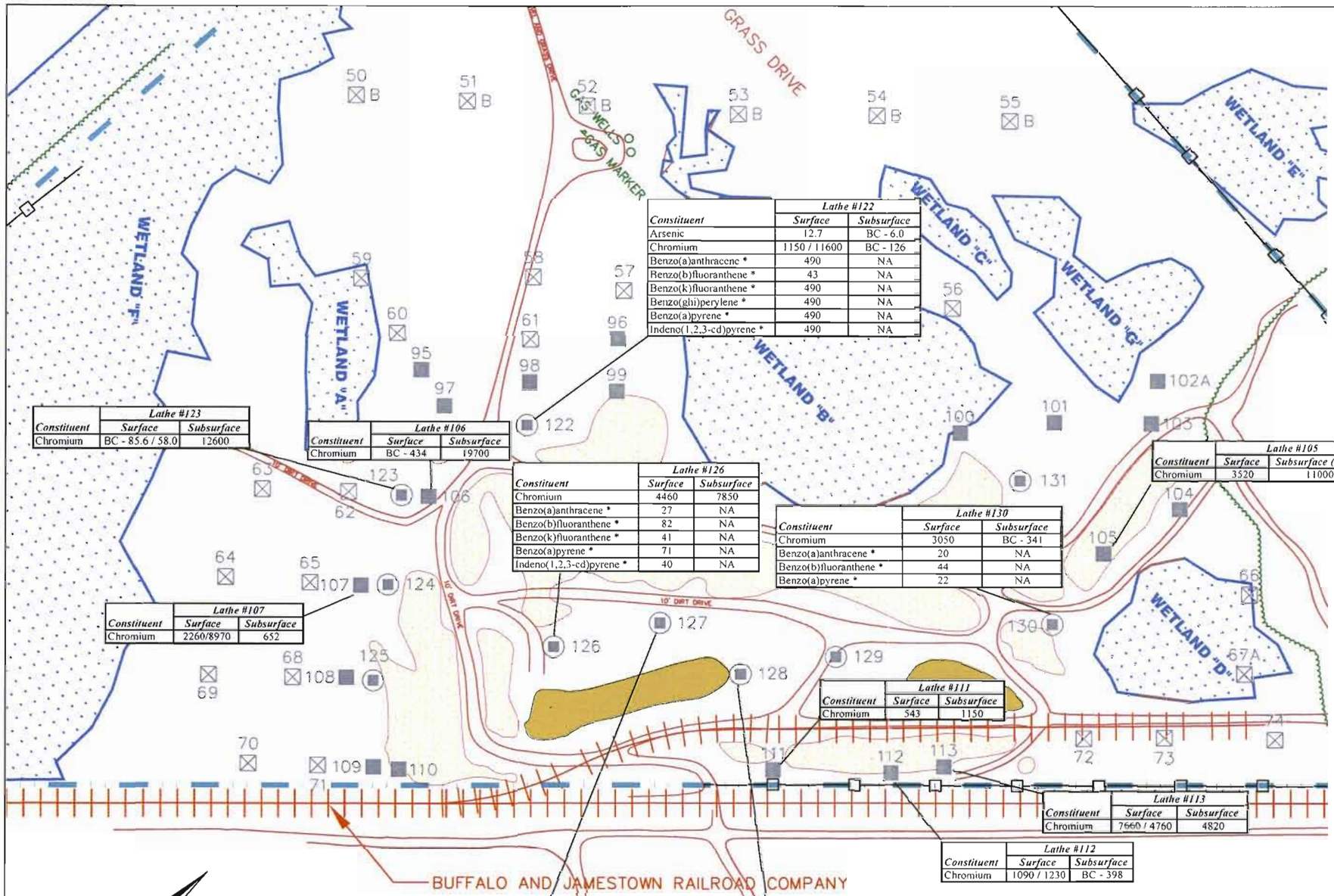
GEOMATRIX

SUMMARY OF ANALYTES DETECTED ABOVE SOIL CRITERIA:
SURFACE AND SUBSURFACE SOIL WASTE FILL PILE SAMPLE LOCATIONS
Peter Cooper Markhams Site
Dayton, New York

Figure By	Project No.
dmh	7603.000
Date	Figure
February 2005	5-1



Constituent	Lathe #122 Surface	Lathe #122 Subsurface
Arsenic	12.7	BC - 6.0
Chromium	1150 / 11600	BC - 126
Benzo(a)anthracene *	490	NA
Benzo(b)fluoranthene *	43	NA
Benzo(k)fluoranthene *	490	NA
Benzo(ghi)perylene *	490	NA
Benzo(a)pyrene *	490	NA
Indeno(1,2,3-cd)pyrene *	490	NA

Constituent	Lathe #123 Surface	Lathe #123 Subsurface
Chromium	BC - 85.6 / 58.0	12600

Constituent	Lathe #106 Surface	Lathe #106 Subsurface
Chromium	BC - 434	19700

Constituent	Lathe #126 Surface	Lathe #126 Subsurface
Chromium	4460	7850
Benzo(a)anthracene *	27	NA
Benzo(b)fluoranthene *	82	NA
Benzo(k)fluoranthene *	41	NA
Benzo(a)pyrene *	71	NA
Indeno(1,2,3-cd)pyrene *	40	NA

Constituent	Lathe #130 Surface	Lathe #130 Subsurface
Chromium	3050	BC - 341
Benzo(a)anthracene *	20	NA
Benzo(b)fluoranthene *	44	NA
Benzo(a)pyrene *	22	NA

Constituent	Lathe #105 Surface	Lathe #105 Subsurface (105A)
Chromium	3520	11000

Constituent	Lathe #107 Surface	Lathe #107 Subsurface
Chromium	2260/8970	652

Constituent	Lathe #111 Surface	Lathe #111 Subsurface
Chromium	543	1150

Constituent	Lathe #113 Surface	Lathe #113 Subsurface
Chromium	7660 / 4760	4820

Constituent	Lathe #112 Surface	Lathe #112 Subsurface
Chromium	1090 / 1230	BC - 398

Constituent	Lathe #128 Surface	Lathe #128 Subsurface
Arsenic	35.6	BC - 28.9
Chromium	8990 / 8800	6460
Benzo(b)fluoranthene *	46	NA
Benzo(k)fluoranthene *	28	NA
Benzo(a)pyrene *	34	NA

Constituent	Lathe #127 Surface	Lathe #127 Subsurface
Arsenic	55.1	BC - 26.8
Chromium	11800 / 2600	12400
Benzo(b)fluoranthene *	38	NA
Benzo(a)pyrene *	31	NA

EXPLANATION

- PROPERTY BOUNDARY
- WETLAND BOUNDARY
- RAILROAD TRACKS
- FENCE LINE
- 95 — SURFACE/SUBSURFACE SOIL SAMPLE LOCATION
- 56 — SURFACE SOIL SAMPLE LOCATION
- 52 B — BACKGROUND SURFACE SOIL SAMPLE LOCATION
- 122 — SURFACE/SUBSURFACE SOIL SAMPLE LOCATION (SS ANALYZED FOR TCL VOCs/SVOCs AS WELL AS COPCs)
- APPROXIMATE LOCATION OF WASTE PILE
- NON-WASTE FILL PILE

CONSTITUENT DETECTED ABOVE SOIL CRITERIA (1)

Constituent	Lathe ## Surface	Lathe ## Subsurface
Arsenic	35.6	NA
Chromium	8990	6460
Benzo(b)fluoranthene *	46	BC - 19.0
Benzo(k)fluoranthene *	28	NA
Benzo(a)pyrene *	34	NA

- SAMPLE NAME
- SAMPLE LOCATION
- "BC" INDICATES COMPOUND WAS DETECTED BELOW SOIL CRITERIA; THE REPORTED VALUE FOLLOWS.
- NA = NOT ANALYZED

CONCENTRATION IS IN MILLIGRAMS PER KILOGRAM; "*" DENOTES CONCENTRATION FOR THIS COMPOUND IS IN MICROGRAMS PER KILOGRAM

(1) CONSTITUENTS IDENTIFIED ON THIS FIGURE WERE DETECTED AT CONCENTRATIONS EXCEEDING ALL COMPARISON SOIL CRITERIA DESCRIBED IN SECTION 5.

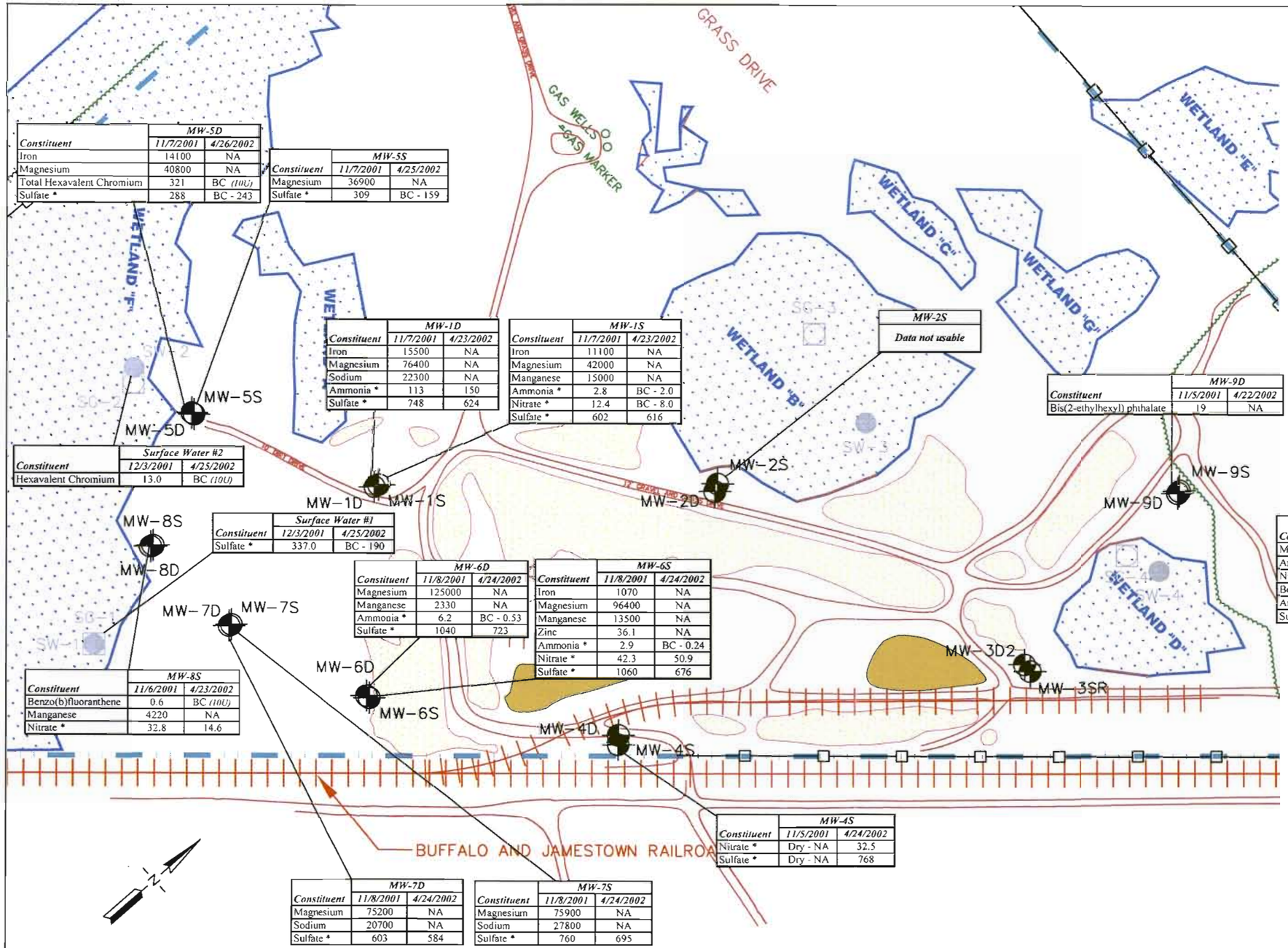
APPROXIMATE SCALE IN FEET
0 100 200
0 60 120
APPROXIMATE SCALE IN METERS

BASEMAP PROVIDED BY:
BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC.

GEOMATRIX

SUMMARY OF ANALYTES DETECTED ABOVE SOIL CRITERIA:
PERIMETER AND BACKGROUND SURFACE AND SUBSURFACE SOIL SAMPLE LOCATIONS
Peter Cooper Markhams Site
Dayton, New York

Figure By	Project No.
dmh	7603.000
Date: July 2006	Figure: 5-2



Constituent	MW-5D 11/7/2001	MW-5D 4/26/2002
Iron	14100	NA
Magnesium	40800	NA
Total Hexavalent Chromium	321	BC *(10U)*
Sulfate *	288	BC - 243

Constituent	MW-5S 11/7/2001	MW-5S 4/25/2002
Magnesium	36900	NA
Sulfate *	309	BC - 159

Constituent	MW-1D 11/7/2001	MW-1D 4/23/2002
Iron	15500	NA
Magnesium	76400	NA
Sodium	22300	NA
Ammonia *	113	150
Sulfate *	748	624

Constituent	MW-1S 11/7/2001	MW-1S 4/23/2002
Iron	11100	NA
Magnesium	42000	NA
Manganese	15000	NA
Ammonia *	2.8	BC - 2.0
Nitrate *	12.4	BC - 8.0
Sulfate *	602	616

MW-2S
Data not usable

Constituent	MW-9D 11/5/2001	MW-9D 4/22/2002
Bis(2-ethylhexyl) phthalate	19	NA

Constituent	Surface Water #2 12/3/2001	Surface Water #2 4/25/2002
Hexavalent Chromium	13.0	BC *(10U)*

Constituent	Surface Water #1 12/3/2001	Surface Water #1 4/25/2002
Sulfate *	337.0	BC - 190

Constituent	MW-6D 11/8/2001	MW-6D 4/24/2002
Magnesium	125000	NA
Manganese	2330	NA
Ammonia *	6.2	BC - 0.53
Sulfate *	1040	723

Constituent	MW-6S 11/8/2001	MW-6S 4/24/2002
Iron	1070	NA
Magnesium	96400	NA
Manganese	13500	NA
Zinc	36.1	NA
Ammonia *	2.9	BC - 0.24
Nitrate *	42.3	50.9
Sulfate *	1060	676

Constituent	MW-8S 11/6/2001	MW-8S 4/23/2002
Benzo(b)fluoranthene	0.6	BC *(10U)*
Manganese	4220	NA
Nitrate *	32.8	14.6

Constituent	MW-4S 11/5/2001	MW-4S 4/24/2002
Nitrate *	Dry - NA	32.5
Sulfate *	Dry - NA	768

Constituent	MW-7D 11/8/2001	MW-7D 4/24/2002
Magnesium	75200	NA
Sodium	20700	NA
Sulfate *	603	584

Constituent	MW-7S 11/8/2001	MW-7S 4/24/2002
Magnesium	75900	NA
Sodium	27800	NA
Sulfate *	760	695

EXPLANATION

- PROPERTY BOUNDARY
- WETLAND BOUNDARY
- RAILROAD TRACKS
- FENCE LINE
- MW-1S — MONITORING WELL LOCATION
- SG-1 — STAFF GAUGE LOCATION
- SW-1 — SURFACE WATER LOCATION
- APPROXIMATE LOCATION OF WASTE PILE
- NON-WASTE FILL PILE

CONSTITUENT DETECTED ABOVE GROUNDWATER CRITERIA (1)

SAMPLE NAME

Constituent	MW-## 11/7/2001	MW-## 4/23/2002
Manganese	15000	NA
Ammonia	2.8	NA
Nitrate	12.4	NA
Benzo(b)fluoranthene	0.6	BC - 8.0
Ammonia *	113	BC - 2.0
Sulfate *	BC *(10U)*	624

DATE OF SAMPLE COLLECTION

NA = NOT ANALYZED.

"BC" INDICATES COMPOUND WAS DETECTED BELOW GROUNDWATER CRITERIA; THE REPORTED VALUE FOLLOWS.

"U" INDICATES THE CONCENTRATION FOR THIS COMPOUND WAS DETECTED BELOW THE LABORATORY REPORTING LIMIT, WHICH IS DISPLAYED IN ITALICS.

CONCENTRATION IS IN MICROGRAMS PER LITER; "*" DENOTES CONCENTRATION FOR THIS COMPOUND IS IN MILLIGRAMS PER LITER

(1) CONSTITUENTS IDENTIFIED ON THIS FIGURE WERE DETECTED AT CONCENTRATIONS EXCEEDING ALL COMPARISON SOIL CRITERIA DESCRIBED IN SECTION 5.

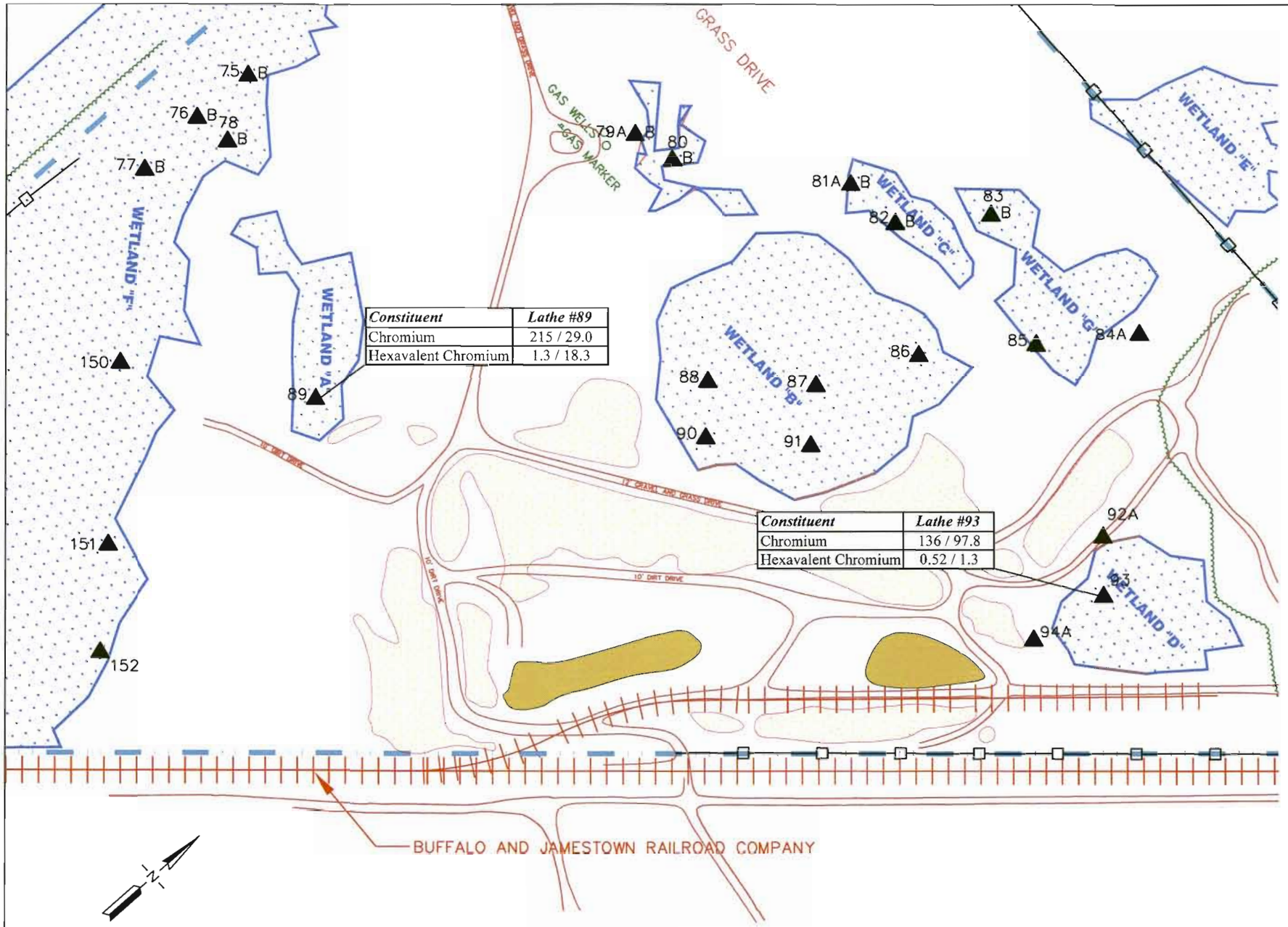
BASEMAP PROVIDED BY: BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC.

GEOMATRIX

SUMMARY OF ANALYTES DETECTED ABOVE GROUNDWATER/SURFACE WATER CRITERIA

Peter Cooper Markhams Site
Dayton, New York

Figure By	Project No.
dmh	7603.000
Date: July 2006	Figure: 5-3



EXPLANATION

- PROPERTY BOUNDARY
- WETLAND BOUNDARY
- RAILROAD TRACKS
- FENCE LINE
- 84A — SEDIMENT SAMPLE LOCATION
- 75 B — BACKGROUND SEDIMENT SAMPLE LOCATION
- APPROXIMATE LOCATION OF WASTE PILE
- NON-WASTE FILL PILE

CONSTITUENT DETECTED ABOVE SEDIMENT CRITERIA (1)

Constituent	Lathe #93
Chromium	136 / 97.8
Hexavalent Chromium	0.52 / 1.3

SAMPLE NAME

CONCENTRATION IS IN MILLIGRAMS PER KILOGRAM

(1) CONSTITUENTS IDENTIFIED ON THIS FIGURE WERE DETECTED AT CONCENTRATIONS EXCEEDING ALL COMPARISON SOIL CRITERIA DESCRIBED IN SECTION 5.

BASEMAP PROVIDED BY:
BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC.

GEOMATRIX

SUMMARY OF ANALYTES DETECTED ABOVE SEDIMENT CRITERIA:
SEDIMENT AND BACKGROUND SEDIMENT SAMPLE LOCATIONS
Peter Cooper Markhams Site
Dayton, New York

Figure By	Project No.
dmh	7603.000
Date: July 2006	Figure: 5-4