Report For:

FEASIBILITY STUDY FOR
HANCOCK AIR NATIONAL GUARD SITE 15

PREPARED FOR:

AIR NATIONAL GUARD

Environmental Restoration Branch
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Final

FEASIBILITY STUDY FOR HANCOCK AIR NATIONAL GUARD SITE 15

Prepared For:

Air National Guard

Environmental Restoration Branch
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Several site structures were recently removed as part of a removal action for PCB-impacted soils. Six underground tanks and a drainage sump were recently removed from beneath the foundation of the former pump house. Additionally, a transformer pad adjacent to the southeast side of the pumphouse was removed. This removal action was performed in accordance with the Work Plan for the Time Critical Removal Action (Parsons, 2001), which was approved by the NYSDEC before the work was initiated.

1.3 SITE HISTORY

Site 15 was used to transfer and store JP-4 jet fuel until the 1980s when the ANG began using JP-8 jet fuel. The petroleum storage area was constructed in 1951 and used until 1999 when it was decommissioned following completion of a new petroleum storage area. When the area was actively used, it was the site of the Jet Fuel Transfer Pumphouse (Building 602), a transformer pad, various storage tanks, and equipment for transferring jet fuel to the tanks. In 1999, the pumphouse was demolished, the aboveground storage tank was cleaned and removed, and the underground storage tanks were cleaned and filled in place.

Three spills at the site have been documented:

- In the 1980s, PCBs were released, possibly from the transformers located in front of the pumphouse (Radian, 1994).
- In April 1990, 3,850 gallons of JP-4 jet fuel were released inside the pumphouse. Some of the fuel reportedly flowed out of the building before it could be recovered (Radian, 1994, and M&E, 1995).
- In June 1994, 150 gallons of JP-8 jet fuel overflowed onto the ground from beneath the northeast side of the building. The spill was reportedly contained with absorbent pads before it was able to exit through the drainage swale on the east side of the site (M&E, 1995 and Aneptek, 1999).

Following the April 1990 release, impacted surface soil was removed from the area around the pump house and staged on the concrete pad at Site 1. This soil will be included with the management of impacted soil from Site 15. The excavation area was then backfilled with crushed stone. During the cleanup, three area drainage sumps with PCB-impacted sediment were discovered. Spilled fuel had entered the sumps and mixed with the PCB-contaminated sediment, which is believed to have accumulated in the sumps before 1971. According to as-built drawings, an OWS was supposedly installed in the 1950s, but one was never found during the soil excavation (Radian, 1994).

1.4 INVESTIGATION HISTORY

Several investigations/studies and a soil removal action at Site 15 have taken place during the period from June 1990 to December 2001. The following reports have been prepared which describe the field activities and findings of these investigations in detail.

Aneptek, 1999. *Draft Treatability Study/Technical Memorandum for Petroleum, Oil, and Lubricant Facility, Site 15.* 174th Fighter Wing, New York Air National Guard, Hancock

Field, Syracuse, New York. Prepared by Aneptek Corporation for the Air National Guard Readiness Center, Andrews AFB, Maryland. December 1999.

Lockheed, 1997. *Final Remedial Investigation Report for Petroleum, Oil, and Lubricant Facility, Site 15.* Volumes I and II. Prepared by Lockheed Martin for the Air National Guard Readiness Center, Andrews AFB, Maryland. July 1997.

Martin Marietta, 1995. *Final Technical Memorandum*, 174th Fighter Wing, New York Air National Guard, Hancock Field, Syracuse, New York. Prepared by Martin Marietta Energy Systems, Inc. for the Air National Guard Readiness Center, Andrews, AFB, Maryland. February 1995.

M&E, 1995. *Final Technical Memorandum.* 174th Fighter Wing, New York Air National Guard, Hancock Field, Syracuse, New York. Prepared by Metcalf & Eddy for the Air National Guard Readiness Center, Andrews AFB, Maryland. February 1995.

Parsons, 2000. *Work Plan for Data Gap Investigation, Focused Feasibility Study, and Subsequent Pre-Design and Design Tasks for Site 15 at Hancock Field, Syracuse, NY.* Prepared for National Guard Bureau and Air National Guard. December 2000.

Parsons, 2001. *Work Plan for the Time Critical Removal Action at Site 15 at Hancock Field, Syracuse, NY.* Prepared for National Guard Bureau and Air National Guard. October 2001.

Parsons, 2001. *Design Report for the Time Critical Removal Action at Site 15 at Hancock Field, Syracuse, NY.* Prepared for National Guard Bureau and Air National Guard. October 2001.

Radian, 1994. *Management Action Plan.* 174th Fighter Wing, New York Air National Guard, Hancock Field, Syracuse, New York. Prepared by Radian Corporation for the Air National Guard Readiness Center, Andrews AFB, Maryland. July 1994.

Results of these investigations/studies are summarized briefly below. Additionally, a timeline showing spill history and investigation work is presented in Table 1.1.

1.4.1 Spill Investigation (June 1990)

Site 15 was not evaluated in any of the investigations previously conducted at Hancock Field. In June 1990, investigation of the spill that occurred in April 1990 consisted of the installation and sampling of four monitoring wells (MW-1, MW-2, MW-3, MW-4) and the collection of 15 soil samples. PCBs were detected at a maximum concentration of 23 milligram per kilogram (mg/kg) or parts per million (ppm) in the soil. No PCBs were detected in the groundwater samples, but benzene was found at a maximum concentration of 510 microgram per liter (µg/L) or parts per billion (ppb) (Radian, 1994).

1.4.2 First Site Investigation (November and December 1990)

Following a NYSDEC request for further study of Site 15, field work for a Base POL Area Site Investigation Report was conducted in November and December 1990. Six soil borings were drilled and completed as groundwater monitoring wells (MEMW-5 through MEMW-10, later referred to as MW-5 through MW-10), and groundwater samples were collected from these and the four previously-installed monitoring wells. Sixteen shallow soil, several sump seepage water, two surface water, and two sediment samples were also collected. The soil samples were taken from the west, south, and east sides of the pumphouse while the sump seepage water samples came from groundwater allowed to seep into a clean, dry sump in the pumphouse. Sediment and surface water samples were collected from the drainage swale located on the northeast side of the site. All of the samples were analyzed for PCBs and/or petroleum hydrocarbons (Radian, 1994, and M&E, 1995).

Soil and sump seepage water samples were analyzed for PCBs. PCB concentrations in soil samples from the area in front of (on the southeast side of) the pumphouse ranged from “not detectable” to 240 mg/kg. PCB concentrations in the sump seepage water were as high as 120 ppm for Aroclor-1260 and 15 ppm for Arclor-1254 (M&E, 1995).

Groundwater, sump seepage water, surface water, and sediment samples were analyzed for petroleum hydrocarbons. Groundwater samples at the site contained up to 700 ppm of benzene, 520 ppm of ethylbenzene, 1,800 ppm of xylenes, and 2.3 ppm of total petroleum hydrocarbon (TPH). Hydrocarbons did not appear to be present beneath the pumphouse, based on results of the sump seepage water analysis. No benzene, toluene, ethylbenzene and xylene (BTEX) or TPH compounds were detected in surface water or in sediment samples collected near the site (Radian, 1994).

1.4.3 Second Site Investigation (June and July 1994)

In June and July of 1994, another site investigation was performed. Groundwater samples were collected from nine of the ten monitoring wells (MW-5 was damaged) and analyzed for volatile organic compounds (VOCs), TPH, and polychlorinated biphenyls (PCBs). Concentrations in groundwater samples from the monitoring wells had not changed by more than a factor of 2 or 3 since 1990. Petroleum hydrocarbons were detected at increased levels at MW-7 and MW-2, but were not detected at the outermost monitoring wells (MW-8, MW-9, and MW-10). The detection of PCB, Aroclor-1260, in groundwater from MEMW-6 was consistent with the detection of PCBs in shallow soil samples that were collected from the area in front of the pumphouse during the previous investigation (M&E, 1995).

1.4.4 Remedial Investigation (1995 and 1996)

A Remedial Investigation (RI) was performed in 1995 and 1996 with the purpose of defining the nature and extent of PCB and jet fuel-related impacts on the soil and groundwater. During the course of the investigation, phenol was unexpectedly encountered, so the investigation was expanded to evaluate the potential sources of phenol (Lockheed, 1997).

Several new monitoring wells were installed during the RI:

- MW-5R was installed to replace MW-5, which had been found to be damaged. Additionally, new shallow wells were installed: MW-11, MW-12S, and MW-13.
- Two deep monitoring wells were installed: one paired with MW-6S and one paired with MW-12S.

Groundwater samples were collected from all of the previously-installed, intact wells and all of the newly-installed wells. A total of 98 soil samples were collected from across the entire site and in areas around the site. Four sediment samples were also collected: three from the southwestern drainage swale and one from the northeastern drainage swale. Borings for the soil and sediment samples were advanced using a hand auger or a Geoprobe™.

VOCs were observed in the soil at three areas: northeast, southwest, and in front of the pumphouse. VOCs extended from 2 feet bgs to the water table (at 10.5 to 16 feet). Semi-volatile organic compounds (SVOCs) were restricted mainly to an area on the northeast side of the pumphouse (Lockheed, 1997).

VOCs and SVOCs were also present in groundwater. The horizontal extent of the plume is in a downgradient direction extended to the wooded area approximately 100 feet southeast of the site. A localized area of free product, about six inches thick, was found at the leading edge of the plume. Based on samples from two deep wells, product in the groundwater did not appear to have migrated vertically (Lockheed, 1997).

PCBs were found in the soil in front of and on either side of the pumphouse. For the most part, the vertical extent of the PCBs was limited to the top four feet of soil. Groundwater, however, did not appear to have been impacted by PCBs (Lockheed, 1997).

During the RI, phenol was detected in many of the soil samples. The phenol impacts appeared to be random and unrelated to jet fuel; the highest concentrations were found in background samples. According to the RI report, the most likely source of the phenols is an herbicide application that took place in May 1995, three months before the RI sampling began (Lockheed, 1997).

1.4.5 Treatability Study (May 1998 and September-October 1999)

The initial investigation for the treatability study was conducted primarily because of the presence of free product in MW-12S, which had been installed during the RI. Free product had been found during the RI and in August 1997, when MW-12S was checked again. The purpose of the investigation for the treatability study was to delineate the free product plume and to initiate a product recovery program. Four monitoring wells (MW-14 through MW-17) and one recovery well (RW-1) were installed, but no free product was found in any of these wells, in MW-12S, or in any of the pre-existing wells in the area of MW-12S. The recovery well and MW-12S were gauged five more times within a year, and no product was found. Based on these results, no product recovery pump was installed (Aneptek, 1999).

At the request of the NYSDEC, an investigation of BTEX in groundwater was conducted. In May 1998, groundwater samples were collected from the four new monitoring wells and analyzed for VOCs. Benzene and/or ethylbenzene were found in MW-14 and MW-15. In the fall of 1999, 24 temporary groundwater sampling points were installed to delineate the dissolved phase BTEX in the groundwater. Three permanent groundwater monitoring wells (MW-18, MW-19, MW-20) were also installed. Groundwater samples from 21 temporary points, 16 monitoring wells, and RW-1 were screened onsite for VOCs. BTEX compounds were found in 24 of the sample locations.

During the September-October 1999 sampling event, free product was recovered in bailers at three of the temporary sampling points and one of the wells. Product samples from these four locations were analyzed for PCBs, and PCBs were detected in two of the samples (Aneptek, 1999).

Also in September and October of 1999, two rounds of samples were collected from MW-18, MW-19, and MW-20 and were analyzed for VOCs, SVOCs, TPH, PCBs, and metals. The extent of the free product plume and the PCB plume were found to be nearly the same, covering an area from the pumphouse under the concrete pad to the area southeast of the former AST. BTEX compounds, however, were found in groundwater as far south as MW-19 (Aneptek, 1999).

1.4.6 Remedial Investigation (2000 and 2001)

A Data Gap Investigation was conducted at Site 15 during December 2000 and January-March 2001. Field work was conducted in accordance with the work plan for *Data Gap Investigation, Focused Feasibility Study, and Subsequent Pre-Design and Design Tasks for Site 15 at Hancock Field* (Parsons, 2000), as approved prior to investigation activities by the NYSDEC. The investigation included sampling and analysis of surface soil and groundwater water samples.

On December 18, 2000, six surface soil samples were collected southeast of the former pumphouse and concrete pad at Site 15. Surface soil samples were collected from 0 to 1 feet below ground surface (bgs). On December 18, 2000 and January 30, 2001, fourteen surface soil samples were collected from the two swales that originate north and northeast of the former pumphouse and concrete pad. These surface soil samples were collected from 0 to 1 feet bgs. Additionally, one soil sample at each location was collected from the bottom of the swale, and two grab samples were collected from the sidewalls of the swale and composited into one sample. All surface soil samples were submitted to Galson Laboratories of East Syracuse, NY for total PCB analysis using USEPA SW-846 Method 8082.

Twenty surface soil and seventeen groundwater samples were submitted for laboratory analysis as part of this investigation. Analytical results generated during this investigation were stored and managed by Parsons using Paradox™ database software. The analytical results were subsequently adjusted to reflect any changes resulting from data validation results. The results of the investigation are described in detail in the report entitled *2001 Data Gap Investigation Results for Site 15* (Parsons, 2001a). A brief overview of the analytical results is provided below.

PCBs were detected in 19 of the 20 soil samples collected during the Data Gap Investigation. Concentrations of PCBs within the soil ranged from 0.028 ppm at SS-01 (0 to 1 foot) and SS-15 (0 to 1 foot) to 1.6 ppm at SS-19 (0 to 1 foot). The downstream extent of surface soil exceeding one ppm PCBs in the drainage swale west of the concrete pad has not yet been determined.

1.4.7 Fall 2001 Investigation

Additional site investigations were performed during Fall 2001 (October and December) at Hancock Site 15. This additional work was performed in accordance with the October 2001 Work Plan for the Time Critical Removal Action at Site 15 approved by the NYSDEC. The purpose of the additional groundwater investigation work was to more completely define the extent of groundwater impacted at the downgradient portion of Site 15 and also offsite across Molloy Road at the Brooklawn Golf Course. In addition, drainage swale sediment was investigated to better assess the extent of PCBs within sediment west of the pump house on site. A detailed description of the sampling locations, methods, and findings is presented in a letter report submitted to the ANG from Parsons dated January 10, 2002 (see Appendix B of this FS). A brief discussion of the findings is provided below:

- Water levels measured during October 2001 show flow direction and gradient consistent with previous groundwater monitoring efforts at this site. Water levels were approximately 1.3 to 1.8 feet lower during the October 2001 monitoring than during January 2001. Measurable nonaqueous-phase liquid was found only at MW-6S at a thickness of 0.1 foot. Sheens were detected at MW-21 and MW-22 but not at any of the other monitoring wells.

- PCBs were found in groundwater from only one monitoring well sampled (MW-21) at 0.20 part per billion (ppb) of Aroclor-1260. Soil in the area of MW-21 was removed as part of the time-critical removal action (as was MW-21 itself);

- The magnitude of BTEX observed in groundwater at Hancock Site 15 is similar to what was monitored at Site 15 previously;

- Two of the 21 direct push locations (PARGP-3 and PARGP-5) where groundwater was sampled at the Brooklawn golf course (6 locations in October, 15 additional locations in December) across Molloy Road showed BTEX concentrations exceeding State groundwater quality standards. These locations showing elevated BTEX concentrations in groundwater are confined to a small area at the northernmost portion of the golf course, within approximately 130 feet from Molloy Road (see Appendix B of this FS); and

- Two sediment samples collected from the swale and analyzed indicated that PCB concentrations are below 1 ppm.

1.5 NATURE AND EXTENT OF IMPACTED SOIL AND SWALE SEDIMENT

BTEX are relatively mobile and non-persistent in many shallow soil environments, but tend to be more persistent in deeper soils and groundwater. BTEX constituents tend to volatilize relatively rapidly from shallow soil. Half-lives in shallow soil range from several days to several weeks. Persistence in deeper soil and groundwater tends to be much longer, with half-lives ranging from several days to two years (Hunt *et al.*, 1988). BTEX has limited ability to adsorb to soils.

PCBs on the other hand, unlike BTEX, are persistent and not readily mobile in soil. PCBs adsorb onto soil particles and can persist for many years in soil. There is evidence that PCBs can biodegrade, but usually in anaerobic conditions. Soil results indicating PCBs are not being transported significantly through the subsurface matches scientific information about PCB movement within the environment. However, PCBs are more mobile within a carrier fluid such as oil than they are in water; in fact, PCBs are most often associated with the past use of transformer or hydraulic oil.

The approximate extent of surface (0-2 feet) and subsurface (> 2 feet) soil impacted with PCB and/or BTEX is presented in Figures 1.2 - 1.4 of the 2001 Data Gap Investigation Results (Parsons, 2001a)(see Appendix A of this FS). PCB concentrations in soil above 50 ppm are located primarily south and adjacent to the former pump house based on available investigation data. Some of the areas of the concrete pad also likely contain PCBs, based on the locations of surface impacted soil north and south of the pad.

Four soil sampling locations in two distinct areas contain BTEX above a total concentration in soil of 10 ppm. Three of these locations are 4 to 12 feet bgs west of the former pump house, and the fourth location is soil up to 2 feet bgs east of the former pump house. Total VOC concentrations of 10 ppm is a NYSDEC soil cleanup objective as documented within the Technical and Administrative Guidance Memorandum (TAGM) 4046 (NYSDEC, 1994). Total VOCs, instead of individual VOCs, have been used because total concentrations are generally representative of individual compounds, such as BTEX compounds, detected at the site. Additionally, total VOC concentrations are measurable as a single parameter in the field. However, individual VOC concentrations have been compared to their respective cleanup criteria as documented in TAGM 4046. The sum of individual soil cleanup objectives for BTEX is 9 ppm based on TAGM 4046 for protecting groundwater quality (see Table 2.1). At only three of the 25 locations sampled at Site 15 are NYS soil cleanup objectives for individual VOCs exceeded where the guideline of 10 ppm total VOCs is not exceeded. For all three of these locations, the exceedance is only for xylenes at a concentration less than five times the xylene soil cleanup objective.

Total polycyclic aromatic hydrocarbon (PAH) concentrations in the soil do not exceed 50 ppm in any of the samples. Total PAHs were assessed instead of individual PAHs based on 50 ppm being 10 percent of the NYSDEC soil cleanup objective for total SVOCs. Additionally, soil cleanup objectives for individual PAHs were exceeded by more than a factor of 10 (and less than a factor of 50) at only three of the 25 locations that were sampled. At these three locations, exceedances are for carcinogenic PAHs, and only one of these locations has a total carcinogenic PAH concentration over 6 ppm (i.e., 20 ppm).

Sediment PCB concentrations in one of the drainage swales are between 1 and 2 ppm at six sampling locations. Total VOC and PAH concentrations in the drainage swale sediment are less than 5 ppm in the various samples analyzed. PAH concentrations exceed DEC sediment guidance values in four of the sediment samples analyzed. However, the total PAH concentrations in these samples are below 5 ppm, the swales do not support aquatic life due to intermittent flow, and PAHs are ubiquitous in developed areas such as Site 15.

1.6 NATURE AND EXTENT OF IMPACTED GROUNDWATER

Site 15 is located in a coastal plain containing glaciated sediment. Visual observations of soil type indicate, in order from shallow to deep, continuous silty clay for the top 10 to 15 feet followed by 5 to 10 feet of silty sand and then clayey silt and a second silty sand zone. The two deep monitoring wells at the site screened within the deeper silty-sand layer below the clayey silt do not show any impact from site spills. Till underlying these glaciated sediments is reported to be at least 45 feet bgs

The groundwater plume at Site 15 has extended over time from the north-northwest at the former pump house to the south-southeast slightly beyond the Hancock ANG Base boundary along Molloy Road. Total BTEX concentrations at MW-19 adjacent to Molloy Road range from 1,040 ppb in 1999 to 109 ppb in 2001. Shallow groundwater from MW-8, 13, 16, and 20 have not shown any BTEX based on sampling from 1996 - 1999, and from 2001. A summary of the analytical results generated during 1995, 1999, and 2001 monitoring events and the approximate extent of the BTEX plume in 1995 and 2001 is presented in Figure 2.4 of the 2001 Data Gap Investigation Results (Parsons, 2001a)(see Appendix A of this FS). In addition, the groundwater monitoring results generated during October and December 2001 are presented in a letter report dated January 10, 2002 (see Appendix B of this FS).

A total of six slug tests have been conducted by others at five shallow groundwater monitoring wells associated with the site. To date, results from the one slug test at MW-4 are considered useful, and those results show a horizontal hydraulic conductivity of 8 x 10^{-5} feet per minute. Slug test results from MW-10 are not considered useable in the form presented due to the way the data were collected and analyzed. In addition, slug tests results from three of the wells (MW-18, MW-19, and MW-20) are not consistent with visual observations of soil type. This apparent inconsistency between slug test results and visual observations has been noticed at other sites. Slug test results should be relied upon more than visual observations in order to estimate hydraulic conductivity values for soils.

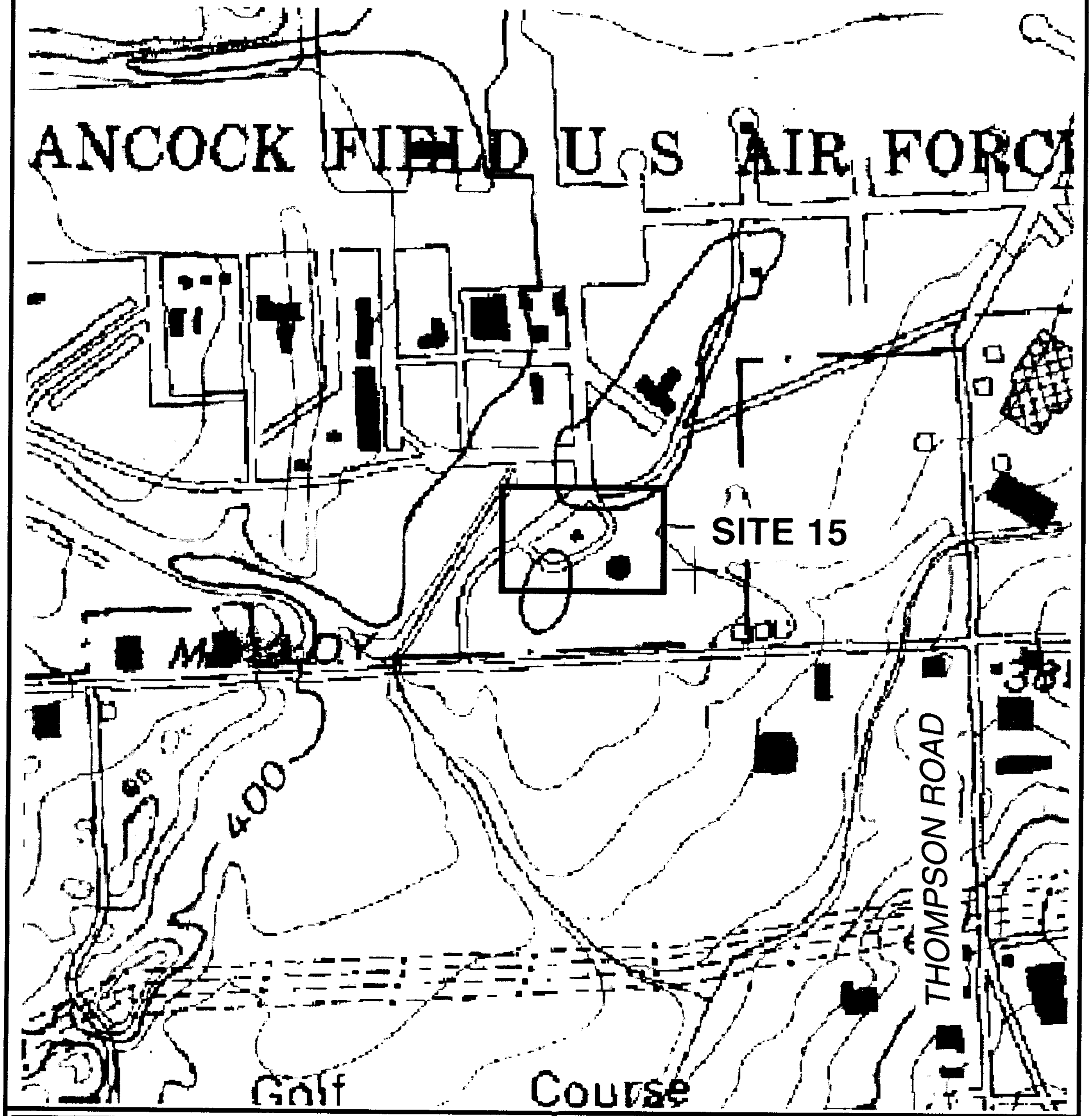
PCBs are not seen within site groundwater at significant distances beyond where they were observed in association with nonaqueous phase liquid (NAPL). The conclusion that PCBs do not move significantly in groundwater matches scientific information about PCB movement. PCBs can migrate within NAPL but not within groundwater to a significant extent. PCBs are insoluble in water, and they readily adsorb onto soil particles rather than solubilizing within groundwater.

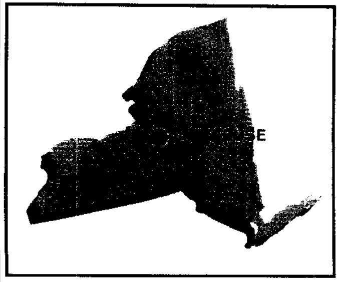
Similar to the groundwater plume, the extent of measurable NAPL in site monitoring wells has declined since 1995. As of 1995, product was measured as far from the pump house as the southern side of the former JP-8 tank berm. However, in 2001, measurable nonaqeous-phase liquid was found only in MW-6S.

1.7 REMOVAL ACTION

A removal action was conducted at Site 15 performed in accordance with the Work Plan for the *Time Critical Removal Action at Site 15 at Hancock Field* (Parsons, 2001c). The removal action commenced in November 2001. The objective of the removal action was to reduce the risk to potential receptors by excavation and removal of the PCB-impacted soil from Site 15. Supplemental objectives included additional investigation of groundwater conditions at and downgradient of Site 15 and selected monitoring well rehabilitation and abandonment. Field work consisted of excavation and offsite disposal of PCB-impacted soil, removal and offsite disposal of steel tanks and associated piping, monitoring well rehabilitation and abandonment, and groundwater investigation. A report that documents the methods and findings of the removal action will be presented separately once the removal action is complete.

The objectives of the removal action were not met as of January 2002 when the tanks were removed. However, the NYSDEC has requested that BTEX-impacted soil within the tank removal area also be removed. This final portion of the removal action can not be completed until the ANG is able to fund removal of soil containing BTEX.





New York
Quadrangle

LATITUDE: N43° 05' 47"
LONGITUED: W76° 06' 06"

N

SOURCE: DeLORME 3-D
TOPOQUAD PROGRAM

FIGURE 1.1

AIR NATIONAL GUARD
HANCOCK FIELD SITE 15
SYRACUSE, NEW YORK

SITE LOCATION MAP

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TABLE 1.1

TIMELINE FOR HANCOCK SITE 15

I. Spills

Before 1980s	PCBs in front of pump house, transformer oil
May 1990	JP-4 (3,850 gallons) inside pump house.
June 1994	JP-8 (150 gallons)

II. Investigations

June 1990	(Spill Investigation)	MW-1 through MW-4 installed and sampled; PCBs, VOCs 15 soil samples; PCBs 23 ppm or less (no BTEX analyses)
December 1990	(First Site Investigation)	Pumphouse area surface soil and seepage water sampled
June 1992	(Second Site Investigation)	MW-5 through MW-10 installed MW-1 through MW-10 sampled for BTEX 16 shallow soil samples for PCBs (no BTEX analyses) Two surface water and two sediment samples for BTEX/TPH – none detected. No BTEX detected in groundwater at MW-4, 8, 9, or 10.
July 1994	(Second Site Investigation)	Groundwater from 9 of 10 MWs (all except MW-5) for VOCs, TPH, PCBs. No BTEX in groundwater at MW-4, 8, 9, or 10.
1996	(Remedial Investigation)	MW-6D and MW-11 through MW-13 installed. All MWs sampled. Four sediment samples. 98 soil samples – GP-6 (10-12 feet), GP-13 (0-2 feet), GP-22 (4-6 feet), GP-26 (10-12 feet) had above 10 ppm BTEX. None had total PAHs over 50 ppm.
May 1998 and Fall 1999	(Treatability)	MW-14 through MW-17 and RW-1 installed and sampled. No product found. 24 temporary groundwater sampling points placed. MW-18, 19, and 20 installed. Groundwater analyzed twice for VOCs, SVOCs, and metals. Product at four locations (two of four product samples had PCBs).

TABLE 1.1 (cont'd)

TIMELINE FOR HANCOCK SITE 15

December 2000 and January 2001	(Data Gap)	Selected locations for PCB analyses of soil and swale sediment. Groundwater sampled and analyzed for VOCs, PCBs, and natural attenuation parameters. MW-21, 22, and 23 installed. Baildown tests not conducted as planned, since no product was found.
October 2001	(Investigation)	Groundwater sampled onsite and at six temporary well points at the golf course south of the site across Molloy Road. Samples analyzed for BTEX and PCBs. 0.2 ppb Aroclor 1260 detected in groundwater at MW-21. BTEX detected in groundwater onsite and at two of the six temporary well points at the golf course.
November 2001	(Time Critical Removal Action)	Time critical removal action initiated.
December 2001	(Investigation)	15 additional temporary well points installed and groundwater sampled at the golf course. Samples analyzed for BTEX. None of the additional well points showed BTEX in groundwater.

SECTION 2

REMEDIAL ACTION OBJECTIVES

2.1 MEDIA AND PARAMETERS TO ADDRESS

The purpose of this subsection is to identify the preliminary remediation goals (PRGs) for the site. PRGs provide part of the basis for the analysis and selection of remedial alternatives in subsequent sections of this report. Under USEPA (1991) guidance, the development of PRGs is an iterative process over the course of a Feasibility Study; hence, there are "potential" PRGs as well as "interim" and "final" PRGs. The interim PRGs are presented herein. The chemicals of concern (COCs) are those identified in the baseline human health risk assessment (HHRA) as posing a potential threat to human health. The site does not contain or impact any significant ecological resources; therefore, there are no PRGs based on potential ecological threats.

2.2 LAND USE

The site is currently owned by the ANG and operated through the 174th Fighter Wing. A security fence encloses the site perimeter. Site access is controlled by staffed entry and exit gates. The site has been used for military purposes since the 1940s. ANG plans to use Site 15 in the future as a military display park.

The surrounding land use is currently a mixture of transportation with the Syracuse Hancock Airport, recreational (golf course), industrial, commercial, and residential (with a handful of residences within one-quarter mile downgradient (south) of the site). Lands to the west, north, and east of the 174th FW are used for military and transportation purposes that have continued for multiple decades. Land directly to the South of Site 15 across Molloy Road is used for a golf course. Overall land use in the site vicinity has not changed significantly in the last 30 to 40 years and is not planned to be changed significantly in the foreseeable future.

The USEPA provides guidance on the selection of appropriate land use assumptions for Superfund sites. Two of the major points of the guidance are as follows:

- Remedial action objectives should be based on reasonably anticipated future use, and
- Land uses appropriate following completion of remedial action are determined based in part on this process of selecting a site remedy.

Site 15 is located at a controlled facility on ANG property. Land use activities are closely monitored. Based on the current condition of the site, the only permissible use of Site 15 land will be for industrial/commercial purposes. If subsurface excavation is required, it will be conducted under the OSHA hazardous waste regulations as found at 29CFR1910.120. Excavated material would be disposed according to the applicable regulations. In addition, installation of water wells onsite will not be allowed.

2.3 EXPOSURE PATHWAYS AND IMPACTED MEDIA

Soil

Current workers may be exposed to onsite surface soil, while future workers may be exposed to mixed onsite surface and subsurface soil.

The interim PRGs for soil are presented in Table 2.1 for those compounds detected in site samples at concentrations exceeding PRGs. Based on site investigation results, the parameters of interest for onsite surface soil are BTEX, PCBs, and PAHs.

Swale Sediment

Future nearby site workers could potentially be exposed to sediment in the drainage swales originating in the northwest and northeast portions of Site 15 near the north end of the former pump house foundation. Based on site investigation results, the parameters of interest for drainage swale sediment are PCBs and PAHs.

Groundwater

Some chemicals present in onsite groundwater can migrate to offsite groundwater, potentially having an adverse impact on downgradient groundwater quality. Irrigation is conducted at the golf course south of Site 15, but the source of irrigation water is not known. The interim PRGs for downgradient groundwater are presented in Table 2.1, along with the samples containing chemicals that exceeded the PRGs. The parameters of interest for downgradient groundwater are BTEX.

2.4 STANDARDS, CRITERIA, AND GUIDELINES

The three types of standards, criteria, and guidelines (SCGs) are:

- Chemical-specific SCGs (i.e., action levels applicable to a given substance);
- Action-specific SCGs (i.e., design and performance standards for particular facilities or units); and
- Location-specific SCGs (i.e., siting restrictions due to wetlands, historical structures, and other location-related resources).

2.4.1 Chemical-Specific SCGs

Chemical-specific SCGs are health-based or risk-based concentration limits, goals, or ranges in various environmental media for specific hazardous substances. Chemical-specific SCGs include remediation goals for COCs in designated media (such as soil or sediment), which can be used in the development of remedial action objectives for site media.

The primary residuals detected at Site 15 are BTEX and PCBs. These chemicals have the greatest potential impact at the Site. Additionally, PAHs have also been found at Site 15 in concentrations above background levels. Chemical-specific SCGs for these respective constituents are NYSDEC's soil cleanup objectives and NYS groundwater quality standards.

Soil

NYSDEC has developed soil cleanup objectives and levels to protect human health and the environment from potentially significant impacts. The values in Table 2.1 are based on the TAGM #HWR-94-4046 (NYSDEC, 1994) methodology, protection of groundwater quality, and an average site total organic carbon content of one percent which is typical for local soils. To develop soil cleanup objectives for organics for protecting groundwater quality, the NYSDEC used a procedure based on organic constituent partitioning between the soil and water as a function of organic carbon content (i.e., equilibrium partitioning theory). Correction factors are also applied to account for dilution and other forms of attenuation as constituents migrate into the subsurface.

For compounds found at Site 15, the NYSDEC soil remedial action objectives are the same for surface soils as they are for subsurface soils with the exception of PCBs. For PCBs, the NYSDEC has established a surface soil cleanup objective of 1 ppm. The PCB soil cleanup objective for subsurface soils is 10 ppm.

In addition to soil cleanup objectives for individual organic compounds, NYSDEC has established in the same TAGM total concentration for VOCs and SVOCs. These total concentrations are more implementable during remediation efforts, because total concentrations can be measured using field screening techniques so the remediation job is not slowed substantially while waiting for laboratory results. For VOCs, such as BTEX, the NYSDEC limit is 10 ppm. For SVOCs, such as PAHs, the NYSDEC limit is 500 ppm.

Nationally, the USEPA modified its rule for PCB disposal in 1998 under the Toxic Substances Control Act. Now, under 40 CFR Part 761.61(a)(4)(i)(B), the PCB cleanup level for bulk remediation waste in low occupancy areas, such as Hancock Site 15, is 25 ppm. If a site has a secure fence, is marked with signs, and land use is restricted, material with less than 50 ppm PCBs can remain. With restricted land use and a cap of 10 inches of soil or six inches of either asphalt or concrete, material with up to 100 ppm PCBs can remain. Under 40 CFR Part 761.61(a)(5)(ii), waste with less than 50 ppm PCBs can be managed as municipal solid waste.

Sediment

NYSDEC has developed guidance for evaluating impacts on sediment such as the sediment in the drainage swale (NYSDEC, 1999 update). NYSDEC sediment guidance values are presented in Table 2.1 and are based on one percent carbon content within the sediment. For PCBs, the sediment guidance value implemented by NYSDEC for fresh water sediment is 1 ppm. For total PAHs, NYSDEC typically considers a concentration of up to the range of 4 to 35 ppm to be acceptable to leave in place.

Groundwater

NYSDEC has also developed standards and guidance values to protect groundwater based on Part 703 of Title 6 of the New York State of Rules and Regulations (6 NYSCRR). The State developed these values based on levels of protection human health using Federal drinking water criteria as a starting point. NYSDEC Division of Water's ambient water quality standards and guidance values for chemicals detected at the Site in Class GA groundwater (i.e., for any groundwater) are listed in Table 2.1.

2.4.2 Action-Specific SCGs

Action-specific SCGs are technology- or activity-based requirements or limitations pertaining to waste remediation. These SCGs are prompted by and apply to the implementation of particular remedial activities.

Resource Conservation and Recovery Act and Associated Regulations

The Resource Conservation and Recovery Act (RCRA) and corresponding New York State waste management laws and regulations under 6 NYCRR Parts 370 through 375 provide several potentially applicable action-specific SCGs because these regulations govern the management of hazardous and solid waste in New York State. In general, soil in place is not a waste unless it is excavated and processed by being moved to another site, treated, or disposed. RCRA guidance is available for determining what constitutes generation of a hazardous or solid waste.

Toxicity Characteristic Leaching Procedure (TCLP) limits are specified in 40 CFR Part 261 and 6 NYCRR Part 371. These regulations also define the corrosivity, reactivity, and ignitability characteristics under RCRA. Federal regulations limit the corrosivity RCRA characteristic to liquids (40 CFR Part 261.22). The reactivity characteristic is defined in qualitative terms (see 40 CFR Part 261.23). However, many disposal facilities currently use *de facto* limits of 250 ppm of releasable cyanide (i.e., hydrogen cyanide) and 500 ppm of releasable sulfide (hydrogen sulfide) based on USEPA SW-846 test methods (USEPA, 1994). The ignitability characteristic is defined for a solid material in 40 CFR Part 261.21 as an oxidizer or a material causing fire and, when ignited under standard temperature and pressure, burning vigorously and persistently so as to create a hazard.

In November 1998, New York State adopted a number of federal changes made to RCRA between June 1993 and July 1997, including land disposal restriction rule changes. Federal RCRA requirements established as of July 1997 are now also New York State requirements.

Under New York State rules defining hazardous waste, materials containing PCBs over 50 ppm are defined in New York State as a hazardous waste based on Part 371.4(e) of 6 NYSCRR.

Federal Land Ban Program

The Hazardous and Solid Waste Amendments to RCRA were signed into law on November 8, 1984. These amendments include specific provisions, known as land disposal restrictions (LDRs), restricting the land disposal of RCRA-classified hazardous waste. The specific purpose of the LDRs is to minimize the potential for future human health and environmental risks by requiring treatment of hazardous wastes prior to their disposal on land. The site waste streams anticipated to exceed hazardous waste regulatory standards are coal-based process residuals and petroleum-contaminated residuals.

The LDRs are a complex set of regulations, presented in 40 CFR Part 268, and they are applicable only to remedial actions constituting placement (land disposal) of hazardous waste. If a waste becomes subject to a land disposal restriction, its regulatory status is determined by its regulatory classification at the point of generation. Thus, waste excavated and found to be hazardous is subject to the LDR program even if it is later rendered non-hazardous. To become eligible for land disposal, the waste must be treated to specified concentration levels for each hazardous constituent present in the waste (not merely the constituent(s) that caused the waste to be classified as hazardous) using the best demonstrated available technology, or in some cases, a treatment methodology specified in the rule for a particular class of constituents. Variances have been allowed for this pre-treatment requirement.

Petroleum-Based Residuals

Federal LDRs and Universal Treatment Standards (UTSs) would apply to petroleum-based residuals if they are generated as part of a site remediation, and they exhibit a hazardous characteristic.

New York State Land Disposal Restrictions

New York State adopted federal UTSs as part of the State RCRA modification proposal that was published in November 1998.

Occupational Safety and Health Administration (OSHA) Regulations

OSHA regulations are established in 40 CFR Part 29 for employers and employees engaged in potentially hazardous operations. These regulations include, for Superfund sites, medical surveillance, personal protection, training, and other health and safety requirements.

Toxic Substances Control Act and Related Regulations

Management of materials containing PCBs is also regulated under the Federal Toxic Substances Control Act and associated regulations under 40 CFR Part 761. These regulations specify procedures for managing material containing PCB concentrations over 50 ppm, such as particular land disposal requirements. Certain land disposal facilities, such as Model City in Niagara Falls, NY are permitted to receive materials regulated under this Act. Specific transport requirements for these materials also must be followed.

2.4.3 Location-Specific SCGs

Location-specific SCGs are restrictions placed on the concentration of hazardous substances or the conduct of activities solely because they are in specific locations. Potential location-specific SCGs for the Site include restrictions on certain land development activities in floodplains, federal- or state-delineated wetlands, and navigable waters of the United States; restrictions to protect critical habitats for endangered or threatened species; restrictions on activities in areas designated as wilderness, wildlife refuges, or sole-source aquifers for drinking water; and restrictions to preserve historic structures and properties. Statutes, regulations, and guidelines used in the identification of location-specific SCGs for Site are associated with rare/threatened/endangered species, historic structures, floodplain, wetland, or sole-source aquifer resources (EDR, 2000; NYSDEC, 1986; USFWS, 1978 and 1981; USGS, 1982).

Endangered Species/Critical Habitat

There are no known occurrences of endangered plant or animal species within or near the Site.

Historic Structures

The Site 15 area has not been surveyed for subsurface historical resources that could possibly exist at the site.

Floodplains, Delineated Wetlands, Sole-source Aquifer

None of these potential resources are present at Site 15, based on federal mapping for floodplains and wetlands, state mapping for wetlands, and sole-source aquifer designations (USGS, 1982).

2.5 INTERIM SITE PRGS AND CLEANUP GOALS

PRGs are chemical-specific, long-range target cleanup goals developed to assist in the selection of a preferred site remedy. USEPA risk assessment guidance describes the procedure for determining PRGs (USEPA, 1991). PRGs have the following four attributes:

1. Numeric concentration goals for specific media and land use combinations based on SCGs, quantitative estimates of risk, or reliable background concentrations;
2. Identified at the beginning of the evaluation;
3. Numeric goals that can be modified throughout the course of the investigation and engineering evaluation as site-specific information is accumulated; and
4. In their final form in the Proposed Remedial Action Plan and in the Record of Decision, they will serve as starting objectives for site remediation.

PRGs for Site 15 soil are the recommended soil cleanup objectives from NYSDEC TAGM HWR-94-4046 (NYSDEC, 1994) based on protection of groundwater. For PCBs, the surface soil PRG is 1 ppm, while the subsurface soil PRG is 10 ppm. PRGs for Site 15 sediment are based on NYSDEC sediment technical guidance (NYSDEC, 1999). PRGs for site groundwater are NYSDEC Class GA Water Quality Standards and Guidance Values (NYSDEC, 1998).

2.6 REMEDIAL ACTION OBJECTIVES

Preliminary remedial action objectives were developed for the purpose of evaluating the applicability of remedial technologies and the effectiveness of remedial alternatives. These objectives consist of media-specific goals for protecting human health and the environment and for meeting SCGs to the extent practicable in a cost-effective manner.

The preliminary remedial action objectives were established based on Site-specific information, including the nature and extent of chemical constituents, human health risk assessment results, preliminary remediation goals (PRGs, discussed in detail herein), existing Site conditions, and future land use plans. Remedial action objectives typically focus on controlling exposure of receptors (humans, wildlife, aquatic life) to chemicals of concern via exposure routes such as dermal contact, ingestion, and inhalation. The remedial action objectives also focus on controlling the release of hazardous substances into the environment (soils and groundwater). Technical feasibility and practicality of achieving the PRGs were also considered in developing the preliminary remedial action objectives. Final Remedial action objectives are usually presented, along with the preferred remedy, by the lead agency (NYSDEC) in the upcoming Proposed Remedial Action Plan (PRAP) and the subsequent Record of Decision (ROD).

Over the last several years, the lack of effectiveness of pumping and treating groundwater for the purpose of groundwater remediation has been acknowledged. In 1989, the USEPA, in a directive about groundwater remediation at Superfund sites, stated what had become widely accepted: that pumping groundwater cannot reduce groundwater concentrations to levels that are below typical site PRGs for groundwater (USEPA, 1989a). A study published in 1991 by Oak Ridge National Laboratory further confirmed that groundwater pumping is ineffective for restoring groundwater quality to health-based concentrations. This is due primarily to decreases in desorption of compounds from soil to groundwater, and to the existence of immobile constituents either in the non-aqueous phase or trapped in low hydraulic conductivity subsurface zones (Doty and Travis, 1991). It appears that groundwater has not been remediated at any site to concentrations below PRGs solely using the pump-and-treat form of groundwater remediation.

Achievement of groundwater PRGs at Site 15 will, therefore, not be possible. There are, however, no identified groundwater users at or downgradient of the Site. Therefore, a performance goal of attaining water quality standards at the downgradient property boundary will be used.

Preliminary remedial action objectives for the Site are as follows:

- Maintain the current land use of the property for the foreseeable future and allow the Site to be available for intended future military use and development;
- Eliminate and/or minimize the exposure route hazards posed by the chemical constituents present in different media at the site;
- Remove or control identified sources of significant impacts, if any;
- Control groundwater as needed to reduce or eliminate further migration of site constituents above PRGs; and
- Monitor groundwater, as needed, to evaluate long-term groundwater quality.

TABLE 2.1
SUMMARY OF INTERIM PRGS FOR HANCOCK SITE 15
SOIL, SEDIMENT, AND GROUNDWATER (1)

Site Residual	Soil (ppm) (2) (3)	Sediment (ppm) (2) (5)	Groundwater (ppm) (6)
Volatiles			
Benzene	0.06	0.28	0.001
Ethylbenzene	5.5	0.24	0.005
Toluene	1.5	0.49	0.005
Xylenes	1.2	0.92	0.005
Semivolatiles			
Acenaphthene	50	1.4	0.02
Acenaphthylene	41	-	-
Anthracene	50	1.1	-
Benzo(a)anthracene	0.22	0.12	-
Benzo(a)pyrene	0.061	-	-
Benzo(b)fluoranthene	1.1	-	-
Benzo(g,h,i)perylene	50	-	-
Benzo(k)fluoranthene	1.1	-	-
Chrysene	0.4	-	-
Dibenzo(a,h)anthracene	0.2	-	-
Fluoranthene	50	10.2	-
Fluorene	50	0.08	0.05
Indeno(1,2,3-c,d)pyrene	3.2	-	-
Naphthalene	13	0.3	0.01
Phenanthrene	50	1.2	-
Pyrene	50	9.6	0.05
Polychlorinated Biphenyls (PCBs)	1/10 (4)	1	0.00009

(1) PRG = preliminary remediation goal. A dash ("-") indicates that the chemical is not of concern in this medium or that no standard exists for the chemical.

(2) NYSDEC sediment guidelines and soil cleanup objectives are based on an average organic carbon content of 1%.

(3) NYSDEC has established the following soil cleanup objectives in TAGM 4046 (NYSDEC, 1994):
Total VOCs = 10 ppm
Total SVOCs = 500 ppm

(4) NYSDEC has also established the following soil cleanup objectives in TAGM 4046 (NYSDEC, 1994):
Total PCBs= 1 ppm for surface soil and 10 ppm for subsurface soil

(5) Sediment screening criteria based on NYSDEC's Technical Guidance for Screening Contaminated Sediments (NYSDEC, 1999).

(6) Ambient water quality standards based on NYSDEC's TOGS 1.1.1 (NYSDEC, 1998).

SECTION 3

DEVELOPMENT AND SCREENING OF REMEDIATION ALTERNATIVES

3.1 OVERVIEW

This section describes the following steps needed to develop remedial action alternatives:

- Preliminary screening of the technologies and process options with respect to implementability, effectiveness, and cost; and
- Identification of potentially suitable technologies (including innovative technologies) and/or process options.

The NYSDEC TAGM HWR-90-4030 specifies that individual remedial technologies should be preliminarily screened on their ability to meet media-specific remedial action objectives, their implementability, and their short-term and long-term effectiveness. In addition, the EPA National Oil and Hazardous Substances Pollution Contingency Plan under Superfund states, in 40 CFR Section 300.430, that cost can be used as a criterion to preliminarily screen remedial alternatives. The National Contingency Plan states that grossly excessive costs, compared to the overall effectiveness of alternatives, may be used as one of several factors to eliminate alternatives. In addition, an alternative providing effectiveness and implementability equivalent to that of another alternative, but at a greater cost, may also be eliminated.

Screening for effectiveness considers three important aspects: (1) the ability of the process to handle estimated volumes or areas, and meet the remedial action objectives; (2) the potential for the process to impact human health and the environment during implementation; and (3) the reliability and record of performance for the process. Implementability encompasses technical feasibility, availability of the technologies, and the administrative feasibility of implementing a technology or process (USEPA, 1988). If an alternative requires equipment, specialists, or facilities that are not available within a reasonable period of time, it may be eliminated from further consideration. Screening based on cost focuses on both the costs of construction and long-term operation and maintenance (O&M) costs.

Screening and technology summary information is presented herein. Cost information for screening is provided in the text and tables for each technology considered and represent the technology cost only, not the overall remedial cost to achieve a cleanup objective. Cost rating levels were derived from the USEPA's Remediation Technologies Screening Matrix and Reference Guide (USEPA, 1993a).

Remedial action technologies were evaluated that would facilitate the remedial action objectives and address the soil and groundwater. Both conventional and innovative remediation technologies were evaluated. Innovative treatment technologies, per the USEPA, are alternative treatment technologies (i.e., alternatives to land disposal) with limited full-scale experience and performance and cost data. Innovative technologies were identified where appropriate in the following tables. For the purpose of this FS, technologies were not considered innovative if they have at least one field trial at full-scale.

Tables 3.1 and 3.2 provide a summary of the technology screening process. Technologies were identified as potentially applicable for non-aqueous (soil) and aqueous (groundwater) media, respectively, for implementability and effectiveness as they pertain to Site conditions, and for cost as per NCP guidelines. Technologies were categorized into general response actions, which include no action, institutional controls, capping, containment, removal, dewatering, preparation, treatment, and disposal. The "retained" and "not retained" status of each technology is stated in Tables 3.1 and 3.2 and summarized in Tables 3.3 and 3.4.

3.2 INSTITUTIONAL CONTROLS

One category of general response actions is institutional controls. Institutional controls generally provide readily implementable methods for preventing exposures to site-related residuals. Land use control, runoff controls, and site security via fencing, locked entranceways, and "no trespassing" signs are typically highly effective, especially when used in conjunction with other remediation technologies. Monitoring of groundwater is an effective way to document changes in chemical characteristics over time. The cost to implement institutional controls can vary widely due to site-specific circumstances. For example, costs for groundwater monitoring depend on the size of the area requiring monitoring, the number of parameters being monitored, and the length of time monitoring is required.

3.3 CONTAINMENT TECHNOLOGIES

Soil and sediment covers can reduce potential exposure by preventing direct contact with residuals. An impermeable soil cap can both prevent direct contact and significantly reduce infiltration from precipitation or flooding. Barrier walls were evaluated based on their ability to restrict the potential migration of NAPLs and to contain groundwater from flowing offsite. Also, short-term groundwater pumping was evaluated to achieve steady-state groundwater flow conditions in conjunction with an impermeable cap and to create an inward hydraulic gradient. Barriers for surface water diversion were also considered.

3.3.1 Soil Containment Technologies

A soil cover or an impermeable cap can be covered with a vegetative surface layer, typically grass, or with crushed stone or asphalt. The surface layer of any cover or cap should be graded and maintained to control runoff, prevent flooding impacts, and minimize cap erosion. Various types of materials can be used to place a cover or cap, such as soils or alternate fill materials such as fly ash.

3.3.2 Groundwater Containment Technologies

Containment technologies evaluated included subsurface barriers and groundwater collection, such as wells or trenches.

Subsurface Barriers

Subsurface barrier wall technologies for containment of groundwater include: soil-bentonite, cement-bentonite, soil-attapulgite, cement-attapulgite, plastic concrete, and concrete slurry trenches; vibrating beam; geomembrane (for limited applications); and sheet pile barrier walls. However, barrier walls were not retained because of the limited nature and extent of groundwater impacts and because other technologies were considered more appropriate.

Groundwater Containment Using Collection Wells or Trenches

Extraction trenches and extraction wells are reliable and effective conventional methods for the containment of groundwater. A subsurface collection trench is a trench filled with gravel or permeable sand that would intercept groundwater and direct it to a sump by gravity flow. A collection trench functions essentially as a line of extraction wells. Trenches are generally preferred if the groundwater to be collected extends within an elongated plume and is less than 20 to 25 feet deep. Wells are generally preferred if the groundwater to be collected is in multiple spots, if the area is broad laterally in both dimensions, or if the groundwater is deeper than 20 to 25 feet. Extraction wells are typically vertical wells; however, in recent years horizontal wells have been used, particularly to collect shallow groundwater. The number and location of extraction trenches or wells needs to be determined based on the remedial action selected to maximize collection efficiency. Groundwater flow modeling can be used to provide a basis for optimizing numbers and locations of collection trenches or wells.

Groundwater extraction was retained for further evaluation. Whether extraction wells or a collection trench were installed could be left as a design decision if groundwater collection is part of the recommended alternative.

3.4 SOURCE REMOVAL

Source removal options evaluated for soils include use of conventional equipment such as backhoes and excavators. Odors and volatile organic concentrations would be monitored and controlled, as needed.

3.5 TREATMENT TECHNOLOGIES

Both conventional and less conventional treatment technologies were evaluated for use at Site 15. Conventional treatment technologies are capable of remediating BTEX and PCB residuals. Less conventional technologies are not retained for further evaluation if a site-specific pilot-scale test is needed.

3.5.1 Soil Treatment Technologies

Potential soil treatment technologies consist of onsite treatment, offsite treatment, and recycle/reuse options. Onsite technologies that were evaluated were chemical oxidation, extraction/soil washing, thermal desorption, natural attenuation, passive bioventing, and in-place as well as *ex situ* stabilization. Incineration was considered as an offsite treatment technology, although any technology suitable for use onsite could potentially be used offsite. No recycle and reuse options are viable for the site.

3.5.2 Groundwater Treatment Technologies

Many different treatment technologies were identified for potential use for treating groundwater. These remediation techniques include the following: activated carbon, activated sludge, air stripping, bag filtration, chemical oxidation, physical-chemical treatment, dissolved air/froth flotation, *in situ* air sparging, *in situ* bioremediation, natural attenuation, oil/water separation, sequencing batch reactors, and reactive subsurface barrier walls. Treatment technologies appropriate for treating VOCs and PAHs include activated carbon, air stripping, air sparging, bioremediation, natural attenuation, and reactive subsurface barrier walls. Filtration is also retained because it keeps nuisance solids out of the water being treated. Activated carbon, air stripping, and filtration are standard water treatment processes. Activated carbon is a substance to which many organic compounds readily adsorb as water is passed through the carbon. Air stripping is a physical process by which certain volatile organics are separated from the water into the air and released with or without additional treatment, usually consisting of activated carbon. Filtration is a physical-process for removing solids as the solids pass through filter media. All three of these processes take place within a controlled treatment facility after the groundwater is pumped from the subsurface. Other treatment technologies potentially applicable for managing groundwater in place without pumping are discussed below.

3.5.2.1 Sparging and Intrinsic Bioremediation

Sparging, or biosparging, is the injection of air into the soil below the water table. It is used most commonly in association with soil vapor extraction for managing volatile compounds in groundwater. Monitoring wells can be configured in two ways: centered around the source of contamination, or in a line that is perpendicular to the groundwater flow so that the contamination can be intercepted. Soils with sands and gravel are preferred for sparging, because air that is introduced into heterogeneous soils tends to take preferential flow paths. Sparging can, however, work effectively in even these types of soils. Sparging and soil vapor extraction are retained for further consideration for Hancock Site 15.

Intrinsic bioremediation, or natural attenuation, involves multiple processes working within the subsurface to slow movement of a dissolved plume in groundwater and reduce plume concentrations. The mechanisms of intrinsic bioremediation include biodegradation, abiotic oxidation, and hydrolysis. Numerous studies have documented that many petroleum hydrocarbons, particularly BTEX compounds, readily degrade naturally, and that complete mineralization of BTEX is possible. To demonstrate that intrinsic bioremediation is occurring, site characterization, modeling, and monitoring are all important tools that have been used for

Site 15. Natural attenuation does appear to be occurring at the site as explained in the 2001 Data Gap Investigation Report (Appendix A) and as summarized in Section 1.

Parameters found in groundwater at Site 15 (exceedances of groundwater values for BTEX compounds only) are suitable for soil vapor extraction, sparging, and natural attenuation. These technologies are retained for further evaluation as remedial technologies for treating site groundwater and for limiting groundwater extent and migration.

One specific form of subsurface remediation that has been more widely used in recent years but is not retained for Site 15 is the use of oxygen release or hydrogen release compounds within wells to enhance bioremediation. While these compounds can effectively treat VOCs in groundwater, their penetration to the subsurface away from the wells where they are injected is limited particularly within fine-grained soils such as the soils present at Site 15.

3.5.2.2 Reactive Barrier Wall or In-well Groundwater Treatment

Two options for in-place groundwater treatment are a reactive barrier wall and in-well groundwater treatment. A reactive barrier wall containing activated carbon could be implemented to treat migrating BTEX. Life expectancy of such a wall could be enhanced by selecting carbon type that is most efficient for BTEX removal. However, the carbon would eventually need to be removed before the BTEX desorb from the activated carbon. The reactive barrier wall is retained for further evaluation.

In-well groundwater treatment is an innovative form of treatment where water is treated inside a well casing and then recirculated from the well screen. In-well groundwater treatment has not been shown to effectively address compounds a significant lateral distance in the subsurface away from a well. For this reason, in-well treatment is not retained for further consideration.

3.6 DISPOSAL OPTIONS

Disposal options have been identified for both soil and aqueous streams. Offsite disposal options were considered applicable for media from the Site.

3.6.1 Soil Disposal Options

Offsite disposal options have been identified for the remediation of soils from the Site. Soils can be excavated, transported by truck, and disposed at an approved landfill permitted to receive these materials.

3.6.2 Aqueous Media Disposal Options

Site groundwater can be discharged or transported offsite to a municipal wastewater treatment plant or to an adjacent surface water body. The nearest downstream surface water is Ley Creek which flows through industrial and commercial areas downstream of Site 15 before emptying into Onondaga Lake.

3.7 REMEDIATION ALTERNATIVES

This section presents the development of three remedial alternatives for the onsite soil and groundwater. The remedial alternatives incorporate the elements of institutional controls, removal, containment, treatment, and disposal. The basis for these alternatives consists of the extent of PRG exceedances in the soil and groundwater and the technologies retained for remediating these media.

Soil PRG exceedances are found onsite at depths up to 12 feet bgs. PRG exceedances in onsite soil exist primarily adjacent to the former pump house foundation.

Monitoring wells with groundwater PRG exceedances fall just outside the areas exhibiting onsite soil PRG exceedances. These groundwater exceedances (at MW-12S and MW-19) consist of BTEX compounds only, and as shown in the 2001 Data Gap Investigation Report, BTEX concentrations are declining over time in groundwater near the site boundary.

The potentially applicable technologies for remediating the soil and groundwater associated with the Site have been incorporated into the three alternatives described in this section. Groundwater pumping and treatment alone is not practical at the Site. The soil/groundwater alternatives meet the soil/groundwater remedial action objectives of eliminating contact with surface and subsurface soils exceeding PRGs, removing or controlling the potential impacts of identified sources (if any), monitoring groundwater to evaluate groundwater quality, and maintaining the current land use of the property. A brief description of each alternative is provided below:

Alternative 1 – Monitored Natural Attenuation

1. Continue to restrict access to the site and prevent use of onsite groundwater.
2. Conduct short-term groundwater monitoring onsite and directly southeast of the Site to monitor the performance of natural attenuation mechanisms in reducing BTEX concentrations in groundwater.
3. If natural attenuation is proven ineffective in the long-term, attenuation may be enhanced by adding limiting nutrients or other amendments to groundwater.

Alternative 2 - Soil Removal

Option 2A - Soil Removal Based on Soil PCB Concentrations

1. Remove soil exceeding 1 ppm PCBs in site surface soil and 10 ppm PCBs in site subsurface soil over one foot bgs. Remove drainage swale sediment exceeding 1 ppm PCBs. (see Figure 4.1).
2. Dewater soil in place as needed prior to excavating below the water table.
3. EITHER: Treat excavated soil and sediment using thermal desorption or an equivalent form of soil treatment. Replace treated material onsite or transport and manage excavated material at an offsite facility or hazardous waste landfill. OR Transport excavated material to an offsite facility for treatment or disposal.

4. Replace excavated material with clean fill to pre-excavation grade. Provide proper drainage and vegetate or pave area.

Option 2B - Soil Removal Based on PCB and BTEX Concentrations

1. Remove soil exceeding 1 ppm PCBs in surface soil, 10 ppm PCBs in subsurface soil over one foot bgs, and 10 ppm total BTEX (see Figure 4.1). This removal would also include the soil pile at Site 1.
2. Dewater soil in place as needed prior to excavating below the water table.
3. Treat excavated soil and sediment using thermal desorption or an equivalent form of soil treatment. Replace treated material onsite or transport and manage excavated material at an offsite facility or hazardous waste landfill.
4. Replace excavated material with clean fill to pre-excavation grade. Provide proper drainage and vegetate or pave area.

Alternative 3 – Active Groundwater Control

Option 3A – In-Situ Groundwater Control

1. Install air sparging and soil vapor extraction (AS/SVE) well pairs connected to a common vapor treatment location with a knockout tank to collect incidental water; OR
2. Install subsurface reactive barrier wall perpendicular to groundwater flow within the southeastern (downgradient) portion of the site to treat groundwater as it migrates through the wall.

Option 3B – Ex-Situ Groundwater Control

1. Install extraction wells or collection trench within the southeastern (downgradient) portion of the site to form a hydraulic barrier not allowing impacted groundwater to leave the site.
2. Treat collected groundwater to meet discharge requirements.
3. Discharge treated groundwater directly to Ley Creek or to the nearest sanitary sewer. State discharge requirements would need to be met for a discharge to Ley Creek. County pretreatment requirements would need to be met for a discharge to the local sanitary sewer system.

In developing these three alternatives, two types of technologies retained in Tables 3.3 and 3.4 were not included: soil cover or cap and land application of extracted (and treated) groundwater. Soil cover or cap was not included, because PCB concentrations in subsurface soil adjacent to the former pump house foundation exceed 50 ppm, which is NYSDEC's limit for a material being considered a hazardous waste. In addition, there is a preference under Federal CERCLA regulations to treat and to reduce toxicity, mobility, or volume of impacted soils. Land application of extracted groundwater is more costly than releasing treated groundwater to Ley Creek or to a sanitary sewer with no apparent benefit, unless treatment requirements would be significantly less stringent. Should treatment requirements for land applied groundwater be significantly less stringent and result in significantly lower treatment costs, then land application could be considered again at that time.

For Alternative 1, monitored natural attenuation would be conducted at existing wells and then assessed after a period of five years. Natural attenuation does appear to be occurring at the site as explained in the 2001 Data Gap Investigation Report (Appendix A) and as summarized in Section 1. If site-specific remedial action objectives can not be met within five years based on monitored natural attenuation, then measures to enhance the degradation of BTEX-impacted groundwater would be evaluated and implemented, as warranted. For example, in-situ biodegradation can be enhanced by adding limiting nutrient(s) or other amendments to the subsurface that promote the degradation of a target constituent(s) or by other methods that enhance subsurface biological activity.

For Option 2A, based on investigation results, the quantity of surface soil or drainage swale sediment with PCBs over 1 ppm and subsurface soil with PCBs over 10 ppm is approximately 2,000 cubic yards (cy) (or approximately 3,000 tons). Figures 1.2 and 1.3 in the 2001 Data Gap Investigation Report (Parsons, 2001a) show locations where soils exceed the NYSDEC soil cleanup objectives for PCBs. Some of the areas of the concrete pad also likely contain PCBs, based on the locations of surface impacted soil north and south of the pad. Sediment PCB concentrations in one of the drainage swales is between 1 and 2 ppm at six locations.

For Option 2B, again based on investigation results, the quantity of soil exceeding PCB soil cleanup objectives or 10 ppm BTEX is approximately 10,500 cy (or approximately 15,750 tons). Four soil sampling locations in two distinct areas contain total BTEX concentrations in soil above 10 ppm. Three of these locations are 4 to 12 feet bgs west of the former pump house, and the fourth location is soil up to 2 feet bgs east of the former pump house. Total PAH concentrations do not exceed 50 ppm in any of the soil samples. No additional drainage swale sediment would be removed based on VOC or PAH concentrations found in the sediment. Total VOC and PAH concentrations in the drainage swale sediment are less than 5 ppm in the various samples analyzed. PAH concentrations do exceed DEC sediment guidance values in four of the sediment samples analyzed. However, the total PAH concentrations in these samples are below 5 ppm, the swales do not support aquatic life due to intermittent flow, and PAHs are ubiquitous in developed areas, such as Site 15.

For Option 3A, the number of AS/SVE wells would be approximately 30 to 50, or the length of the subsurface reactive barrier wall would be approximately 500 feet. The AS/SVE wells would be installed throughout the impacted groundwater area downgradient of the area being treated. A subsurface reactive barrier wall would be installed perpendicular to the direction of groundwater flow in the southeast portion of the site.

For Option 3B, the number of groundwater extractions wells would be two to four, or the length of the groundwater collection trench would be approximately 200 feet. Extraction wells or a collection trench would be installed, like a subsurface reactive barrier wall, in a line perpendicular to the direction of groundwater flow (in approximately an east-west orientation) within the southeast portion of Site 15. Based on hydraulic analyses summarized in Appendix A, the flow of groundwater collected from either extraction wells or the collection trench would be approximately 30 to 100 gallons per minute.

TABLE 3.1
SCREENING OF REMEDIAL TECHNOLOGIES FOR SOIL AND SEDIMENT ASSOCIATED WITH HANCOCK SITE 15

RESPONSE ACTION	TECHNOLOGY TYPE	TECHNOLOGY	EFFECTIVENESS	IMPLEMENTABILITY	RELATIVE COST ①	RETAINED OR NOT RETAINED FOR FURTHER EVALUATION ②
No Action	None	None	Achievement of remedial action objectives is dependent on compounds detected. Allows natural attenuation to occur.	Readily implementable. Not likely to be acceptable to public or regulatory agencies.	None	Retained for Comparative Purposes
Institutional Controls	Access Control	Deed Restrictions, Fencing/Posting	Achievement of remedial action objectives is dependent on compounds detected. Depends on future use and enforcement. Does not reduce contamination. Allows natural attenuation to occur. Prevents exposure to site contaminants from trespassing due to site proximity to public highway and waterway.	Readily implementable. Legal requirements and authority needed.	Variable	Retained
	Runoff Controls	Revegetation, Grading	Effective in minimizing surface water erosion due to runoff. Can be used along the perimeter to keep offsite runoff from migrating onsite and to control onsite runoff on caps.	Readily implementable if it does not interfere with the site's future redevelopment plans.	Variable	Retained
Containment	Soil Capping	Soil Cover	Effective for isolating shallow material from exposure. Limited effectiveness for minimizing infiltration.	Although requires time to implement, still readily implementable.	Low	Retained
		Impermeable Cap	Most effective and reliable as a physical and hydraulic impermeable barrier. Effective at minimizing direct contact and infiltration.	Requires more time to implement than soil cover.	Medium	Retained
Source Removal	Excavation of Soils	Mechanical Excavation	Large scale (heavy equipment) mechanical excavation is reliable and effective. Flow diversion and runon/runoff control often required.	Easily implemented due to use of conventional earth moving equipment.	Low	Retained

TABLE 3.1
SCREENING OF REMEDIAL TECHNOLOGIES FOR SOIL AND SEDIMENT ASSOCIATED WITH HANCOCK SITE 15

RESPONSE ACTION	TECHNOLOGY TYPE	TECHNOLOGY	EFFECTIVENESS	IMPLEMENTABILITY	RELATIVE COST (1)	RETAINED OR NOT RETAINED FOR FURTHER EVALUATION (2)
Treatment	Onsite treatment	Chemical Oxidation *(Innovative)*	An effective and proven technology for converting compounds of concern to less harmful compounds.	Implementable for solids when combined with a liquid to form a slurry. Not cost effective for high concentrations due to large amounts of oxidizing agents required.	Medium	Not Retained
		Composting/Land Farming Prepared Bed Treatment	Generally not effective at obtaining desired cleanup levels at sites as a "stand-alone" process.	Piling of material is implementable. Typically need the addition of a bulking agent.	Medium	Not Retained
		Extraction/Soil Washing	Proven effective for gross contamination. May need to be combined with other technologies to meet cleanup levels.	Implementability can be enhanced by developing a wash solution for complex wastes.	Medium	Not Retained
		Thermal Desorption	Effective form of treatment for sediment and soils with low to high levels of organic contamination. Proven effective at full scale.	Implementable on-site and off-site.	Medium to High	Retained
		IWT-Advanced Chemical Treatment *(Innovative)*	Effective form of *in-situ* "stabilization". Limited testing at full scale.	Potentially implementable. Innovative technology.	Medium	Not Retained
		Slurry Phase Bioremediatio Treatment	Relatively effective at the bench scale for soils.	Potentially implementable.	Medium	Not Retained
		Stabilization	Cement, fly-ash/lime, cement kiln dust, and lime proven effective at stabilizing BTEX and PAHs in soil or sediment.	Potentially implementable either *ex-situ* or *in-situ* using large diameter augers.	Low to Medium	Not Retained
		Sulchem Process (Innovative)	Limited effectiveness at bench scale. Effective at destroying organic compounds with boiling points above 350°C.	Innovative technology. No full-scale data. Potentially implementable.	Medium	Not Retained
	Offsite treatment	Incineration	Effective for destruction of organic compounds. Destruction removal efficiency for inorganics (metals and cyanide) is typically high. Dependent on physical/chemical properties of individual compounds.	Implementable for offsite treatment. Proven technology. Permitting and treatability testing may be time consuming.	High	Not Retained

TABLE 3.1
SCREENING OF REMEDIAL TECHNOLOGIES FOR SOIL AND SEDIMENT ASSOCIATED WITH HANCOCK SITE 15

RESPONSE ACTION	TECHNOLOGY TYPE	TECHNOLOGY	EFFECTIVENESS	IMPLEMENTABILITY	RELATIVE COST (1)	RETAINED OR NOT RETAINED FOR FURTHER EVALUATION (2)
Treatment (Cont'd)	Recycle/Reuse	Thermally Desorbed Soil in Hot/Cold-Mix Asphalt (Bituminous Concrete)	Proven effective. Potential for leaching from asphalt without pretreatment. Asphalt products meet NYSDOT specifications. No long-term data available. Not time- or cost-effective for large quantities of soil due to low solids blending rate relative to asphalt feedstock.	Potentially implementable but BTEX and PAH concentrations are low relative to recycling requirements. A limited number of facilities are technically prepared and permitted to process.	Medium	Not Retained.
		Cold-Mix Asphalt without Thermal Pretreatment (Bituminous Concrete)	Proven effective. TCLP extracts of asphalt mixes do not consistently meet NYSDEC groundwater quality standards. Not time- and cost-effective for large quantities of soil due to low solids blending rate at the inlet. No long-term data available.	Potentially implementable but BTEX and PAH concentrations are low relative to recycling requirements. Not fully proven. Asphalt must be used within one year of generation.	Medium	Not Retained
		Brick or Cement Manufactu	Proven effective. Not time- and cost-effective for large quantities of soil due to low solids blending rate at inlet. No long-term data available.	Potentially implementable, but BTEX and PAH levels are low relative to recycling requirements. Difficult to identify facility that is technically prepared and permitted to process residuals and has systems in place for soil storage and runoff disposal.	Medium	Not Retained
		Co-Burning in a Utility Boile	Proven to be a technically effective method of remediation. No long-term data available. Not time- and cost-effective for large quantities of soil due to low solids blending rate at the inlet.	Potentially implementable, except for PCBs. Acknowledged by EPA at least until Land Ban Phase II is revised (1997). An environmental assessment of the impacts from process residuals may be initiated by the EPA.	Low to Medium	Not Retained
Disposal	Off-Site	Municipal Landfill	Reliable and effective for disposal of non-hazardous material and soil in a permitted landfill. Does not destroy chemicals of concern.	Potentially implementable for disposal of non-hazardous materials.	Low	Retained
		Hazardous Waste or TSCA Landfill	Effective if managed properly at a RCRA- or TSCA-permitted landfill for isolating wastes from exposure to human health or the environment via groundwater.	Implementable for disposal of hazardous or TSCA wastes. Treatement prior to disposal may be needed.	Medium	Retained
	On-Site	Landfill	Effective given proper construction of onsite landill. Compounds are not treated but left on-site.	Time consuming to implement. Requires handling of excavated soils.	Variable	Not Retained

NOTES:

1. The cost presented represents the cost to implement a technology and does not represent the overall remedial cost to achieve a remedial action objective. The relative cost of technologies is presented as follows:
    - "None"
    - "Inadequate Information"
    - "Variable"
    - "Low": Less than $100/ton | Less than $150/CY | Less than $2/SF of land area
    - "Medium": $100-$300/ton | $150 to $450/CY | $2 to $5/SF of land area
    - "High": More than $300/ton | More than $450/CY | More than $5/SF of land area

   A typical conversion factor of 1.5 tons per CY was assumed to generate the cost categories based on CYs.
   Overall cost represents design, construction, and O&M costs of the core process that defines each technology, exclusive of mob/demob, and pre- and post-treatment including transportation. Rating levels based on tonnage are based on EPA/542/B-93/005 document, Remediation Technologies Screening Matrix and Reference Guide, July 1993.
2. Technologies "not retained" will not be considered for further evaluation at the Site.

TABLE 3.2
SCREENING OF REMEDIAL TECHNOLOGIES FOR GROUNDWATER AT HANCOCK SITE 15

RESPONSE ACTION	TECHNOLOGY TYPE	TECHNOLOGY	EFFECTIVENESS	IMPLEMENTABILITY	RELATIVE COST (1)	RETAINED OR NOT RETAINED FOR FURTHER EVALUATION (2)
No Action/ Limited Action	None	None	Achievement of remedial action objectives is dependent on compounds detected. Allows natural attenuation to occur.	Readily implementable.	None	Retained for comparative purposes (with monitoring)
Institutional Controls	Access Control	Alternate Water Supply	Effective at minimizing exposure to the contaminated water source. Allows natural attenuation to occur.	Implementable. There are no public water supply wells located within the vicinity of the Site. Private wells within a 3-mile radius are used for industrial purposes or not used at all.	Variable	Not Retained
		Restricting Land Use	Depends on future site use and enforcement. Does not reduce contamination. Allows natural attenuation to occur.	Readily implementable. Legal requirements and authority needed.	Variable	Retained
	Monitoring	Groundwater Monitoring	Effective in documenting changes in chemical characteristics over time, requires preparation of a monitoring plan. Allows natural attenuation to occur.	Readily implementable.	Variable	Retained
Containment	Barrier Walls	Slurry Trenches or sheetpile barrier wall with perimeter groundwater collection.	Effective in containing contaminant plume. Hydraulic controls can increase effectiveness. Continuity is a concern between separate sheetpiles. Should have a confining layer to tie into.	Implementable. Depth range limited.	Medium	Not Retained
		Vibrating Beam Barrier Wall *(Innovative)*	Effectiveness questioned due to concern with continuity between each injection. Must have a confining layer to tie into.	Depth range limited (less than 30').	Medium	Not Retained
	Extraction	Extraction Wells (Horizontal or Vertical)	Reliable and effective for capture of groundwater.	Readily implementable. Locations need to be predetermined.	Variable	Retained
		Extraction (Collection) Trenches	Effective at collecting groundwater.	Implementable. Locations need to be predetermined. Depth limited to <30 ft.	Variable	Retained
		In-situ Soil Vapor Extraction and Air Sparging	Effective at removing volatile compounds, including BTEX and other VOCs from shallow groundwater.	Implementable.	Low	Retained
Treatment	Physical/Chemical Treatment	Activated Carbon	Proven effective with organic constituents, including BTEX, coal, petroleum, and chlorinated based constituents. Should be used in conjunction with other technologies. Disposal or regeneration of spent carbon required.	Readily implementable.	High	Retained
		Air Stripping	Effective for VOCs, including BTEX, chlorinated VOCs, and low molecular weight PAHs. Pretreatment required. Works well in conjunction with other technologies.	Readily implementable.	Low	Retained

TABLE 3.2
SCREENING OF REMEDIAL TECHNOLOGIES FOR GROUNDWATER AT HANCOCK SITE 15

RESPONSE ACTION	TECHNOLOGY TYPE	TECHNOLOGY	EFFECTIVENESS	IMPLEMENTABILITY	RELATIVE COST [1]	RETAINED OR NOT RETAINED FOR FURTHER EVALUATION [2]
Treatment (Cont'd)	Physical/Chemical Treatment (Cont'd)	Filtration	Effective at filtering out solids from the untreated aqueous stream.	Implementable.	Low	Retained
		Chemical Oxidation	Effective for converting chlorinated, petroleum, and coal-based constituents to less harmful residuals. Not cost effective for high concentrations due to large amounts of oxidizing agents required.	Implementable.	Low	Not Retained
		Physical-Chemical Precipitation	Not effective as a pretreatment for the removal of low molecular-weight organics.	Implementable.	Low	Not Retained
		Dissolved Air/Froth Flotation	Effective as a pretreatment for removal of insolubles so that more expensive downstream operations are not affected. Effective over gravity separation when the specific gravity of the suspended media is very close to that of water.	Implementable.	Inadequate Information	Not Retained
		Ion Exchange	Effective.	Implementable.	Inadequate Information	Not Retained
		Oil/Water Separator	Effective at removing free floating oil, grease, and settleable oily coated solids from oil-water mixtures.	Implementable.	Low	Retained as needed
		Reactive Barrier Wall	Limited proven effectiveness. Constituent-specific based on treatment media used.	Implementable at shallow levels in areas where there is no gross NAPL.	Inadequate Information	Retained
	Biological Treatment	Activated Sludge	Effective when used for treating groundwater containing petroleum constituents. However, site groundwater is too dilute to support an activated sludge system.	Implementable. Influent water typically requires pretreatment for removal of suspende solids and NAPL. High maintenance.	Low to Medium	Not Retained
		In-Situ Bioremediation	Effective for the remediation of BTEX and some PAHs. Not proven effective for carcinogenic PAHs. Innovative.	Readily implementable. May require the introduction of nonindigenous microbes and reagents.	Low	Retained
		Intrinsic Bioremediation	Effectiveness is site-specific and constituent-specific. Best when used at sites with land buffer around source area. Works well in conjunction with other technologies. Proven effective not as source remediation, but for residual plumes.	Readily implementable. Treatment time typically in the order of years.	Low	Retained
		Sequencing Batch Reactor	Effective at resisting fluctuations in the influent. Effective treatment of petroleum constituents.	Implementable. Very high maintenance. Time and labor intensive.	Inadequate Information	Not Retained

TABLE 3.2
SCREENING OF REMEDIAL TECHNOLOGIES FOR GROUNDWATER AT HANCOCK SITE 15

RESPONSE ACTION	TECHNOLOGY TYPE	TECHNOLOGY	EFFECTIVENESS	IMPLEMENTABILITY	RELATIVE COST (1)	RETAINED OR NOT RETAINED FOR FURTHER EVALUATION (2)
Disposal	Offsite Discharge	Municipal Wastewater Treatment Plant	Reliable and effective with proper maintenance and operation. Proven effective for the treatment of groundwaters containing petroleum by using activated sludge units.	Readily implementable. Pretreatment may be required to meet discharge limits. Permit required.	Based on User Fees	Retained
		SPDES Discharge to Ley Creek	Reliable and effective.	Implementatable. Will require a permit. Treatment required to meet SPDES discharge limits.	Variable	Retained
	Onsite Discharge	Land Application	Need a large area of land.	Readily implementable.	Variable	Retained

NOTES:

(1) The cost presented represents the cost to implement a technology and does not represent the overall remedial cost to achieve a remedial action objective. The relative cost of technologies is presented as follows:
- "None"
- "Inadequate Information"
- "Variable"
- "Low": Less than $3.00 / 1,000 gallons | Less than $10 per vertical SF
- "Medium": $3.00-$10.00 / 1,000 gallons | $10 to $20 per vertical SF
- "High": More than $10.00 / 1,000 gallons | More than $20 per vertical SF

Overall cost represents design, construction, and O&M costs of the core process that defines each technology, exclusive of mob/demob, and pre- and post-treatment. Rating levels based on gallons are based on EPA/542/B-93/005 document; Remediation Technologies Screening Matrix and Reference Guide, July 1993.

(2) Technologies "not retained" will not be considered for further evaluation at the Gloversville site. Generally, the "retained" technologies would need to be used in conjunction with one or more of the other retained technologies in the form of a groundwater treatment train to achieve desired cleanup goals.

(3) Considered primarily because workable options for cyanide removal are limited at this time.

TABLE 3.3
POTENTIALLY APPLICABLE TECHNOLOGIES RETAINED FOR REMEDIATING SOILS AND SEDIMENT AT HANCOCK SITE 15

INSTITUTIONAL CONTROLS	CONTAINMENT	SOURCE REMOVAL	PREPARATION/ TREATMENT	DISPOSAL
Access Control - Deed restrictions - Fencing/Posting Runoff Controls - Revegetation - Grading	Soil Capping - Soil cover - Impermeable cap	Excavation of Soils and Sediment - Mechanical excavation	Onsite Treatment - Thermal desorption Recycle/Reuse - Soil Screening	Offsite - Municipal landfill - Hazardous waste landfill - TSCA landfill

TABLE 3.4
POTENTIALLY APPLICABLE TECHNOLOGIES RETAINED FOR REMEDIATING GROUNDWATER AT HANCOCK SITE 15

INSTITUTIONAL CONTROLS

- Access Control
  - Deed restrictions
- Monitoring
  - Groundwater monitoring

CONTAINMENT

- In-Situ Soil Vapor Extraction and Air Sparging
- Extraction Wells
- Extraction (collection) Trenches

TREATMENT

- Physical/Chemical Treatment
  - Oil-water separator (if needed)
  - Activated Carbon
  - Air Stripping
  - Bag FiltrationAir Stripping
  - *In-situ* Air Sparging
- Biological Treatment
  - *In-situ* Bioremediation
- Reactive Barrier Wall

DISPOSAL

- Sanitary Sewer - municipal wastewater treatment
- SPDES discharge to Ley Creek
- Land Application (on-site)

SECTION 4

DETAILED EVALUATON OF SCREENED REMEDIAL ALTERNATIVES

4.1 OVERVIEW

Each of the three alternatives is analyzed using the nine evaluation criteria outlined in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Section 300.430, the USEPA *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (USEPA, 1988), the NYSDEC TAGM 4030, *Selection of Remedial Actions at Inactive Hazardous Waste Sites*, and the Final ANG Installation Restoration Program Investigation Protocol (ANG, 1998).

Each alternative is assessed to determine if it meets the following criteria:

Threshold Criteria

- Overall protection of human health and the environment
- Compliance with SCGs

Primary Balancing Criteria

- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume through treatment
- Short-term effectiveness
- Implementability
- Cost

The criterion of cost is assessed using relative costs for the alternatives. The modifying criteria of state acceptance and community acceptance are not addressed in this analysis. Instead, they will be addressed as part of the upcoming PRAP and the ROD.

For an alternative to be eligible for selection, the NCP requires that it meet the threshold criteria. If these criteria are met, the primary balancing criteria are evaluated to provide the best balance of trade-offs among alternatives. In addition, consideration is given to principal threats and practicable remediation (see 40 CFR Section 300.430(a)(1)(iii)). A "principal threat" is defined in the CFR as having one of two conditions: (1) toxic concentrations several orders of magnitude above levels for unrestricted use or (2) wastes that are both highly mobile and unable to be contained. The term "practicable" is a site-specific, subjective term. The USEPA has defined practicability for specific sites based on cost effectiveness, impacts, implementability, and the extent of SCG compliance.

4.1.1 Overall Protection of Human Health and the Environment

The overall protection of human health and the environment criterion entails determining whether risks from impacts at the site to human health and the environment are eliminated, reduced, or controlled. This assessment is based on the assessment of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with SCGs.

4.1.2 Compliance with SCGs

This evaluation criterion is used to determine whether an alternative complies with the federal and state chemical-specific, location-specific, and action-specific SCGs identified in Section 2.

4.1.3 Long-term Effectiveness and Permanence

The long-term effectiveness and permanence of a remedial action depends on the following aspects:

- Permanence of the remedial alternative
- Magnitude of the risk remaining after remediation
- Adequacy and reliability of controls, if any, used to manage treatment residuals or untreated wastes that remain at the site following remediation

4.1.4 Reduction of Toxicity, Mobility, or Volume

This criterion measures the effectiveness of treatment technologies in eliminating any significant threats at a site via destruction of toxic contaminants, reduction of their total mass, or irreversible reduction of the total volume of contaminated media. The evaluation of the reduction of toxicity, mobility, or volume involves consideration of the following criteria:

- Type of treatment or recycling process and type of materials
- Amount of hazardous materials that would be destroyed or treated, including how principal threats would be addressed
- Degree of expected reduction in toxicity, mobility, or volume estimated wherever reasonably possible as a percent reduction
- Degree to which treatment would be irreversible
- Type and quantity of residuals that would be present following treatment
- Fulfillment of the preference for treatment as a principal element

4.1.5 Short-term Effectiveness

Short-term effectiveness encompasses the effects of an alternative on human health and the environment during the construction and implementation phase until RAOs are met. The following elements are usually considered:

- Protection of the community during remedial construction activities

- Environmental impacts to site employees and remediation workers during remedial construction activities
- Time until remedial response objectives would be achieved
- Protection of workers during remedial construction activities

4.1.6 Implementability

Implementability considers the technical and administrative feasibility of implementing an alternative and the availability of the services and materials required during its implementation. The following issues are usually examined:

- Construction and operation
- Reliability of technology
- Monitoring considerations
- Ease of undertaking additional remedial actions
- Activities needed to coordinate with other offices and agencies
- Availability of adequate off-site treatment, storage capacity, and disposal services
- Availability of necessary equipment, specialists, skilled operators, and provisions to ensure any necessary additional resources

4.1.7 Cost

The cost evaluation assesses estimated capital costs and annual O&M costs. Capital costs consist of present and future and direct and indirect expenses. Direct capital costs include engineering, labor, equipment, and material expenses. Indirect capital costs include expenditures for engineering, licenses, permits, contingency allowances, and other services not part of the actual installation costs. O&M costs are the annual costs incurred after the remedial actions are constructed and may include, but are not limited to, operating labor, energy, chemicals, and sampling and analysis. The approximate accuracy of the costs is minus 30 percent to plus 50 percent, per USEPA guidance (1988).

In this FS, present worth for each alternative was calculated using a service life of 30 years wherever long-term O&M is needed, following remediation and a discount rate of three percent. A three percent discount rate is calculated according to the NYSDEC TAGM 4030, which recommends using a discount rate equivalent to the 30-year U.S. Treasury bond rate (assumed to be 5.77 percent)(Wall Street Journal, 2001) before taxes and after inflation (assumed to be three percent).

4.1.8 Groundwater Restoration Technical Impracticability

The USEPA has issued guidance on addressing sites where restoration of groundwater to background conditions is not feasible or practicable. The guidance is contained in a USEPA memorandum entitled, "Guidance for Evaluating the Technical Impracticability of Groundwater Restoration" (USEPA, 1993). One of the significant points of this guidance is that sources of groundwater impacts need to be removed but only where practicable and, in general, where significant reduction of current or future risk can be realized.

Several factors form the basis for the technical impracticability of remediate site groundwater, as discussed in the USEPA guidance. One factor is that site groundwater is not used and is not reasonably expected to be used in the future. The Onondaga County Water Authority (OCWA) provides water service to the area within and surrounding Hancock Field. The OCWA obtains water from Skaneateles Lake and Lake Ontario, both of which are located more than 20 miles away, outside of the local watershed of Hancock Field. There are no significant existing or anticipated future exposures to groundwater, and continued control of land use by the ANG as needed would prohibit use of site groundwater.

A second factor is the inability of pump-and-treat systems to meet groundwater PRG. Over the past few years, the ineffectiveness of pumping and treating groundwater for the purpose of groundwater remediation has been acknowledged. In a 1989 directive about groundwater remediation at Superfund sites, USEPA stated what had become widely accepted – that pumping groundwater cannot lower groundwater concentrations to levels below typical site PRGs for groundwater (USEPA, 1989).

4.1.9 Evaluation of Maximum Possible Extent of Benzene Plume at Site

A BIOSCREEN model (Newell, McLeod, and Gonzales, 1996) was used to evaluate the maximum possible extent of benzene at Site 15. BIOSCREEN is an analytical solute transport model based on the Domenico (1987) equation. The model is programmed using the Microsoft® Excel spreadsheet and was developed for the Air Force Center for Environmental Excellence (AFCEE) Technology Transfer Division at Brooks Air Force Base by Groundwater Services, Inc., Houston, Texas. BIOSCREEN can simulate advection, dispersion, and adsorption. The model is also designed to simulate biodegradation by both aerobic and anaerobic reactions.

The groundwater flow parameters required by the model were obtained from site data and literature values. The hydraulic conductivity of the saturated soils at the site was estimated using slug test data collected by Lockheed for the Hazardous Waste Remedial Action Program (Lockheed) in 1995 and Aneptek Corporation (Aneptek) in December 1999. Based on the slug test data collected and analyzed by Lockheed and Aneptek, an average hydraulic conductivity of 7.50×10^{-3} cm/sec was estimated. A hydraulic gradient of 0.006 was calculated from water levels measured at the site. The effective porosity of the site soils was not known; therefore, a value of 0.3, a published value for silty sand to fine sand soils, was used.

The chemical source and fate parameters were based on site and published data. In addition, organic carbon partitioning coefficients (K_{oc}) were computed from published octanol-water partitioning coefficients (Macay *et al.*, 1992) and the Lyman and Rosenblatt (1982) conversion formula. No total organic carbon (TOC) analysis was conducted on site soils. A conservative value of 1.0 was also used for the retardation factor (R).

Bioattenuation is now known to occur at practically all petroleum hydrocarbon sites. The reported half-lives of petroleum VOCs range from 4 to 18 months. The biodegradation rates at

Site 15 have not been measured, so a published value of 1 year for benzene was used (Mackay *et al.*, 1993).

During modeling activities, attempts to fit a concentration curve to groundwater analytical data collected in January 2001 were made. However, a concentration curve could not be matched to the most recent groundwater analytical results due to a significant difference in benzene concentrations between two monitoring wells (MW-12S and MW-19) located downgradient from the source area. Monitoring well MW-12S contained a benzene concentration of 0.093 mg/l, while monitoring well MW-19 contained a benzene concentration of 0.011 mg/l. Both wells are located approximately 150 feet apart. In addition, two monitoring wells (MW-8 and MW-17) that are situated between monitoring wells MW-12S and MW-19 contained benzene concentrations that were below the Practical Quantitation Limit (PQL). When attempts were made to fit a concentration curve to the observed benzene concentrations of 0.093 mg/l and 0.011 mg/l, no acceptable match could be obtained for the 0.093 mg/l benzene concentration. Based on this information, it was concluded that the potential of a secondary source near MW-19 could account for the significant difference in benzene concentrations between wells MW-12S and MW-19. This conclusion is based on the fact that a difference in analytical concentrations was observed in two monitoring wells located fairly close together (approximately 150 feet) and that a significant reduction in the concentration of benzene (below PQL) was observed in two wells located between two other wells that exhibited benzene concentrations above the PQL.

The purpose of the BIOSCREEN model was to show the maximum possible extent of the plume if it was not being attenuated. The BIOSCREEN model was run assuming that the source was located approximately 500 feet from monitoring well MW-19. A source concentration of 0.132 mg/l benzene (average benzene concentration observed at source area in 1995) was required to match the 0.011 mg/l concentration of benzene in the monitoring.

Based on these simulations, the maximum length of the plume (the distance at which the concentration of benzene decreased to below the regulatory limit of 0.01 mg/L) was calculated to be between 1,050 to 1,200 feet, which would be approximately 600 feet south of Molloy Road. These results indicate that the BTEX plume is relatively stable and further supports that natural attenuation is occurring at Site 15.

4.1.10 Presentation of Alternatives

The alternatives presented below incorporate various components such as source control, soil treatment, water containment, water treatment, and/or institutional controls. A combination of components from these alternatives can be used as the recommended alternative.

4.2 EVALUATION OF ALTERNATIVE 1 – MONITORED NATURAL ATTENUATION

4.2.1 Description

Alternative 1 consists of the following elements:

- Continue to restrict site access. Prevent use of onsite groundwater.

- Conduct short-term groundwater monitoring onsite, and directly southeast of the site as warranted, to better quantify natural attenuation and monitor its performance.
- If natural attenuation is not effective in the long-term, attenuation could be enhanced by adding limiting nutrients or other amendments to groundwater.

4.2.2 Overall Protection of Human Health and the Environment

Protection of human health and the environmental can be achieved if both of the major elements of Alternative 1 –continuing to restrict site access and natural attenuation – can be successfully implemented. Site 15 is part of a controlled facility. Restricting access to the site continue to reduce the risk of human exposure to site soil and groundwater while the natural attenuation process would reduce, or may eliminate, the risk of exposure by breaking down the BTEX compounds and reducing their concentrations.

Evidence indicates that natural attenuation may already be occurring at Site 15 (see the 2001 Data Gap Investigation report attached to this report). Based on the conservative parameters used in the BIOSCREEN model, the estimated greatest extent of the plume is 600 feet south of Molloy Road. Results from two golf course investigations conducted in 2001, groundwater contamination from Site 15 has spread to approximately 100 feet South of Molloy Road. Groundwater is not currently used at the golf course. Parsons has recommended to the ANG that the impacted groundwater be addressed as part of the groundwater remediation effort at Site 15.

4.2.3 Compliance with SCGs

Soil exceeding PRGs for BTEX and/or PCBs would not be eliminated, but the volume of groundwater exceeding PRGs for BTEX would most likely be reduced, especially given the evidence showing that this may already be occurring. This alternative would not address soil near the former pumphouse, which exceeds PRGs for PCBs and/or VOCs.

4.2.4 Long-term Effectiveness and Permanence

Under Alternative 1, the magnitude of risk could be significantly reduced. Continuing to restrict site access would provide short-term control of risk, while natural attenuation processes would help to control BTEX compounds and thereby reduce long-term impacts to groundwater.

4.2.5 Reduction of Toxicity, Mobility, or Volume

Although natural attenuation can be a slow process, it is a treatment, and not merely a containment process. Furthermore, sufficient data exist to demonstrate that natural attenuation is already occurring at the site. BTEX compounds in the groundwater and saturated soil are degrading via oxygen, nitrate, ferric iron, and sulfate reduction and methane fermentation. Evidence indicates that, under Alternative 1, the toxicity and volume of BTEX-contaminated soil and groundwater would continue to decrease over time.

4.2.6 Short-term Effectiveness

No construction work would be involved in Alternative 1, unless some kind of enhancement of site conditions, such as nutrient or carbon injection, is utilized. However, even this type of work would not involve the disturbance of soil, and site workers and the local community would not be impacted. The time for remedial objectives to be achieved would likely be a few years, except that existing control of land use in turn controls site soil and groundwater use right away.

4.2.7 Implementability

Natural attenuation can be a reliable approach to remediation and appears to already be occurring at the site based on the shrinking BTEX plume and other results from the 2001 Data Gap Investigation. The technology requires little or no construction and/or operation and only minimal monitoring. Vendors and equipment for enhancement techniques, such as nutrient injection, are available, and field staff with natural attenuation monitoring experience are readily available. Under Alternative 1, it would be very easy to undertake additional remedial actions if necessary.

4.2.8 Cost

The estimated present worth of Alternative 1 would be $43,000, including costs for monitoring groundwater annually for five years. This cost includes the delivery of nutrients or other amendments to the subsurface to enhance the degradation of BTEX in groundwater.

4.3 EVALUATION OF ALTERNATIVE 2 – SOIL REMOVAL

4.3.1 Description

Alternative 2 consists of two options with the following components:

Option 2A - Soil Removal Based on Soil PCB Concentrations

- Remove approximately 2,000 cy of soil exceeding 1 ppm PCBs in site surface soil and 10 ppm PCBs in site subsurface soil over one foot bgs. Most of the excavation areas are around the pumphouse, under the concrete pad, and southeast of the concrete pad (see Figure 4.1). The removal would also include the existing soil pile at Site 1.
- Dewater saturated soil in place, as needed, prior to excavating below the water table. Treat extracted water as needed.
- EITHER: Treat excavated soil and sediment using thermal desorption or an equivalent form of onsite soil treatment to reduce PCB concentrations in soil. If a thermal desorber is used, it would be RCRA/TSCA permitted. Replace treated material onsite or transport and manage excavated material offsite (Model City or other hazardous waste landfill), OR Transport excavated soil and sediment and manage at an offsite facility.
- Replace excavated material with clean fill to pre-excavation grade. Provide proper drainage and seed or pave area.

Option 2B - Soil Removal Based on PCB and BTEX Concentrations

- Remove 10,500 cy of soil exceeding 1 ppm PCBs in surface soil, 10 ppm PCBs in subsurface soil over one foot bgs, and 10 ppm total BTEX. The excavation areas would be similar to those of Option A, with additional areas around the pumphouse and south of the concrete pad. Areas around the pumphouse are based on BTEX exceedances in soil. The inclusion of the area south of the concrete pad is based on evidence of BTEX-impacted groundwater. The removal would also include the soil pile at Site 1.

- Dewater saturated soil in place, as needed, prior to excavating below the water table. Treat extracted water as needed.
- EITHER: Treat excavated material via thermal desorption, and replace onsite. OR Transport and manage excavated material offsite (Model City or other hazardous waste landfill).
- Replace excavated material with clean fill to pre-excavation grade. Provide proper drainage and seed or pave area.

4.3.2 Overall Protection of Human Health and the Environment

This alternative would provide overall protection of human health and the environment by eliminating the identified volumes of contaminated soil. Any migration of contaminants from impacted areas into downgradient groundwater and sediment moving downstream into Ley Creek from the drainage swale would be reduced to the maximum extent possible. Onsite soil treatment processes would be controlled, as needed, to limit human exposure to soil, water, and air.

4.3.3 Compliance with SCGs

Soil exceeding PRGs for BTEX (Option A) or PRGs for both BTEX and PCBs (Option B) would be excavated and treated, and the potential for future impacts on groundwater would be eliminated. Air emissions from thermal treatment would also be properly controlled.

4.3.4 Long-term Effectiveness and Permanence

Removal of the identified volumes of contaminated soil would be a permanent remedy and would significantly reduce the magnitude of risk remaining after remediation. Treatment of the excavated soil would be permanent, and treated soil would be managed at an offsite landfill or returned to the site if BTEX and PCB concentrations were below PRGs.

4.3.5 Reduction of Toxicity, Mobility, or Volume

Removal and treatment of the contaminated soil would nearly eliminate the toxicity, mobility, and volume of onsite impacted material. The extent of toxicity reduction would depend on the type of treatment used, but could exceed 99% with thermal desorption. Treatment of the soil would be irreversible.

4.3.6 Short-term Effectiveness

Excavation, treatment, and disposal of the impacted material could be conducted within a time period of approximately two to four months. Mobilization of an onsite treatment unit, such as a thermal desorber, or transport of the treated material to an offsite facility could be the schedule-limiting components of the alternative.

Short-term risks to site workers would be minimized with the use of controls, such as personal protective equipment, dust suppression (e.g., watering of soils), and odor controls (e.g., tarping of stockpiled soil). Air emission controls, as needed, and ambient air monitoring would be performed to monitor volatile and particulate emissions during remediation, and an existing fence surrounding the site would be maintained to control access.

4.3.7 Implementability

Because the site is no longer used as a POL facility, no operations or equipment would have to be re-located prior to excavation work. Alternative 2 does, however, consist of excavation of soil below the water table and would require the excavation of side slopes, dewatering of the excavation, and offsite treatment of the removed water. These types of deep excavations are common, and the location of existing closed underground tanks and other underground structures can be obtained from the base. Based on an initial review of existing utilities at the base, no short-term bypasses would be needed.

Thermal desorption could be implemented as long as the necessary approvals under RCRA and TSCA are obtained. A soil treatment unit pre-approved for remediating RCRA and TSCA materials would be used. At least one such unit has already undergone extensive evaluation of treatment efficiency and control of other impacts, such as air emissions. Transport of treated material could require significant time and coordination, but can be avoided if treated material can be returned to the site. Re-vegetation and paving of the site would be easily implementable.

4.3.8 Cost

The estimated present worth of Alternative 2, Option A, would be $1.0 million with onsite treatment and $889,000 with offsite disposal. The estimated present worth of Alternative 2, Option B, would be $3.0 million with onsite treatment and $4.6 million with offsite disposal. (See Tables 4.1 through 4.4 for assumptions used in estimating these costs.)

The transportation and management of excavated soil at an offsite facility was selected as the preferred soil management option for a time-critical removal action based on a detailed evaluation. A summary of the 'pros' and 'cons' evaluated is presented in Table 4.8.

4.4 EVALUATION OF ALTERNATIVE 3 – ACTIVE GROUNDWATER CONTROL

4.4.1 Description

Alternative 3 consists of two options with the following components:

Option 3A – In-Situ Groundwater Control

- Install AS/SVE well pairs connected to a common vapor treatment location with a knockout tank to collect incidental water, OR
- Install subsurface reactive (activated carbon) barrier wall perpendicular to groundwater flow within the southeastern (downgradient) portion of the site to treat groundwater as it migrates through the wall.

Option 3B – Ex-Situ Groundwater Control

- Install extraction wells or collection trench within the southeastern (downgradient) portion of the site to form a hydraulic barrier not allowing impacted groundwater to leave the site.
- Treat collected groundwater to meet discharge requirements.
- Discharge treated groundwater directly to Ley Creek or to the nearest sanitary sewer. State discharge requirements would need to be met for a discharge to Ley Creek. County pretreatment requirements would need to be met for a discharge to the local sanitary sewer system.

Option 3A. For Option 3A, the number of soil vapor extraction and air sparging wells would be approximately 30 to 50, or the length of the subsurface reactive barrier wall would be approximately 500 feet. The soil vapor extraction and air sparging wells would be installed throughout the impacted groundwater area downgradient of the area being treated. A subsurface reactive barrier wall would be installed perpendicular to the direction of groundwater flow in the southeast portion of the site (see Figure 4.1).

Option 3B. For Option 3B, the number of groundwater extractions wells would be two to four, or the length of the groundwater collection trench would be approximately 200 feet. Extraction wells or a collection trench would be installed, like a subsurface reactive barrier wall, in a line perpendicular to the direction of groundwater flow (in approximately an east-west orientation) within the southeast portion of Site 15. Based on hydraulic analyses summarized in Appendix A, the flow of groundwater collected from either extraction wells or the collection trench would be approximately 30 to 100 gallons per minute.

The analytic element method of Strack (1989), as implemented in the computer program WinFlow (Rumbaugh, 1996), was used to evaluate groundwater capture zones in the overburden. Strack's analytic element solves the groundwater flow equations for the volume of groundwater flowing through a cross-section of unit width, based on the following assumptions:

- The aquifer is unconfined.
- The aquifer is homogeneous, isotropic (no preferred orientation to hydraulic conductivity), and uniform thickness.
- The pre-pumping water table is nearly horizontal.
- Water is released instantly from storage with increasing drawdown.
- The wells are screened across the full saturated thickness of the aquifer.
- The wells are pumped at a constant rate.
- There are no well storage effects.

The capture zone of a well is the area of the aquifer where all water enters the well. Capture zones for groundwater extraction wells included in this alternative were delineated by reverse-particle tracking. Particles were placed in a circle around each extraction well and allowed to move opposite the hydraulic gradient, that is, upgradient. The pumping rates and locations for the extraction wells were then adjusted until overlapping capture zones are achieved. Based on this evaluation, three wells pumping at a combined rate of 30 to 100 gpm would be needed to maintain hydraulic control at the Site 15.

As noted in Section 3, trenches are generally preferred if the groundwater to be collected extends within an elongated plume and is less than 20 to 25 feet deep. Wells are generally preferred if the groundwater to be collected is in multiple spots, if the area is broad laterally in both dimensions, or if the groundwater is deeper than 20 to 25 feet. Because the plume is somewhat elongated and groundwater impacts appear to be restricted to the shallow groundwater (down to 20 to 25 feet bgs), as observed in the results from the RI, a collection trench would be more practical than extraction wells.

4.4.2 Overall Protection of Human Health and the Environment

This alternative would reduce potential risks to human health and the environment by minimizing the discharge of impacts to downgradient, offsite groundwater and Ley Creek. It would not, however, reduce potential risks from onsite impacted soil.

4.4.3 Compliance with SCGs

Under this alternative, the site would not meet soil PRGs because the impacted soil would remain in place. Although groundwater treatment options are incorporated into this alternative, groundwater PRGs may not be met. As the site groundwater is captured and treated, impacted soils will continue to impact groundwater as it passes through the site.

4.4.4 Long-term Effectiveness and Permanence

Although groundwater would be intercepted and treated, this alternative would not be a permanent remedy because impacted soils would remain and would continue to impact the groundwater. It is possible that, under Option A, AS/SVE could address impacts on soils as well, but the process would not be as effective as soil removal in the long term.

4.4.5 Reduction of Toxicity, Mobility, or Volume

Toxicity, mobility, and volume of the impacted groundwater would be reduced. Toxicity would be gradually reduced as a result of treating groundwater. The mobility of impacted groundwater would be restricted with the barrier wall, extraction wells, or collection trench, but not with the AS/SVE system. The volume of groundwater intercepted by the wells or trench would be reduced via pumping.

A small reduction in the toxicity, mobility, or volume of the impacted site soil would also occur with the removal of soil prior to installation of the barrier wall or collection trench.

4.4.6 Short-term Effectiveness

No significant short-term impacts on site workers or the community would be expected under this alternative. Some disturbance of the soil would have to be conducted, but appropriate controls for personal safety and dust and odor suppression. Installation of any one of the groundwater controls would require up to several weeks.

4.4.7 Implementability

The AS/SVE system would require a pilot test and installation of 30 to 50 wells. The subsurface reactive barrier wall would require some excavation. Under Option B, two to four extraction wells or one collection trench would need to be installed. Based on the hydraulic analysis presented in Appendix B, three wells pumping at a combined rate of 30 to 100 gpm would be needed to maintain hydraulic control at the site.

4.4.8 Cost

The estimated present worth of the options under Alternative 3 would be as follows:

- Option A (AS/SVE) - $495,000
- Option B1 (Reactive Barrier Wall) - $1,750,000
- Option B2 (Collection Trench) - $1,020,000

(See Tables 4.5 through 4.7 for assumptions used in estimating these costs.)

4.5 COMPARISON OF ALTERNATIVES

4.5.1 Overall Protection of Human Health and the Environment

Potential exposure to chemical constituents would be substantially reduced with Alternatives 2 and 3. Alternative 2 is most protective because the sources impacting soil and groundwater would be controlled. Both Alternatives 1 and 3 would leave impacted soil essentially unchanged and would not reduce the exposure to site soils.

4.5.2 Compliance with SCGs

Alternative 2 would eliminate onsite soil PRG exceedances and meet the objective of removing or controlling sources of significant impacts. Soil PRG exceedances are found around the pumphouse, at the western drainage swale, and southeast of the concrete pad. Additional areas, such as under and further southeast of the concrete pad are included in the excavation area due to evidence of product and BTEX in groundwater. Although Alternatives 1 and 3 address the groundwater PRG exceedances to varying degrees, they do not address the soil PRG exceedances, which are impacting the groundwater.

4.5.3 Long-term Effectiveness and Permanence

Alternative 1 would not be effective in the long term. The natural attenuation process could be made ineffective by its relatively slow rate and by the fact that impacted soil would continue to be in contact with onsite groundwater. Alternative 2 would be the most effective means of ensuring long-term protection because the source of impacts would be controlled. However, there is also the potential liability of disposing soil at an offsite location. Landfill companies are insured, but each of the parties is potentially liable under CERCLA with no regard to fault. Alternative 3 would result in groundwater treatment, but, as with Alternative 1, soils exceeding PRGs would continue to be in contact with groundwater, so groundwater impacts may not be reduced.

4.5.4 Reduction of Toxicity, Mobility, or Volume

Alternative 1 would reduce the toxicity and volume of impacted groundwater, but would not reduce the toxicity, mobility, or volume of impacts on soil. Alternative 2 would eliminate the toxicity, mobility, and volume of impacted soil and would reduce the impacts from soil on groundwater. Alternative 3 would reduce the toxicity and mobility of constituents in impacted groundwater.

4.5.5 Short-term Effectiveness

There would be no significant short-term risks to the community, the environment, or site workers associated with any of these alternatives, as long as there is proper handling and monitoring of excavated materials and any potential air emissions. The onsite soil treatment unit would be fully proven based on work at other sites and the effort to obtain RCRA and TSCA approvals.

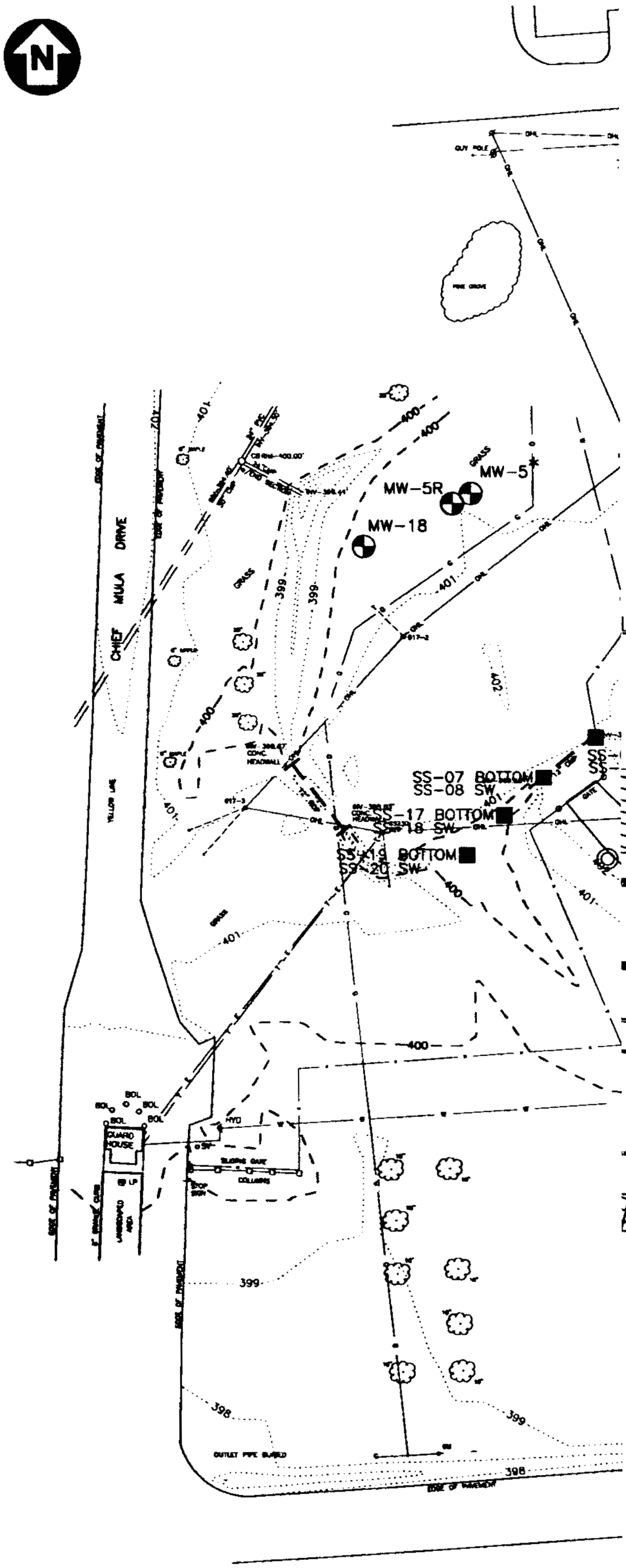
4.5.6 Implementability

Alternative 1 would be very easy to implement. Alternatives 2 and 3 are also implementable, but would require a significant amount of construction in the form of excavation and dewatering for Alternative 2 and a groundwater control and/or treatment system for Alternative 3. Use of the onsite treatment unit would need to be scheduled in advance.

4.5.7 Cost

The estimated present worth of each alternative is presented below:

• Alternative 1, monitored natural attenuation	$43,000
• Alternative 2, Option A1, onsite treatment	$1,001,000
• Alternative 2, Option A2, offsite disposal	$889,000
• Alternative 2, Option B1, onsite treatment	$2,980,000
• Alternative 2, Option B2, offsite disposal	$4,550,000
• Alternative 3, Option A (AS/SVE)	$495,000
• Alternative 3, Option B1 (Reactive Barrier Wall)	$1,750,000
• Alternative 3, Option B2 (Collection Trench)	$1,020,000



LEGEND:

⊕	MW-1	EXISTING MONITORING WELL LOCATION
◎	MW-21	NEWLY INSTALLED AND/OR RE-INSTALLED MONITORING WELL LOCATION (JANUARY 2001)
⊕	RW-1	EXISTING RECOVERY WELL LOCATION
■	SS-01	SHALLOW SOIL OR SEDIMENT SAMPLE LOCATION (DEC 2000)
◎	GP-11	PREVIOUS DIRECT PUSH LOCATIONS
	SW	SIDE WALLS OF SWALE
	BOTTOM	BOTTOM OF SWALE
⊕	MW-6S	SHALLOW MONITORING WELL
⊕	MW-6D	DEEP MONITORING WELL
*		NON-FUNCTIONAL MONITORING WELL (MW-5)

LTERNATIVE 2 EXCAVATION AREAS

	SOIL WITH PRG EXCEEDANCES OF PCBs (>1 PPM IN SURFACE SOIL, >10 PPM IN SUBSURFACE SOIL)
▨	SOIL WITH PRG EXCEEDANCES OF BTEX (10 PPM)
⬚	SOIL SUSPECTED TO BE IMPACTED, ESPECIALLY WITH BTEX (INSUFFICIENT DATA TO DEMONSTRATE CONCLUSIVELY)

TERNATIVE 3 GROUNDWATER CONTROLS

━	REACTIVE BARRIER WALL (OPTION A)
▦	COLLECTION TRENCH (OPTION B)

100 50 0 100 200

SCALE: 1"=100'

FIGURE 4.1

HANCOCK AIR FIELD
SITE 15
SYRACUSE, NEW YORK

ALTERNATIVES 2 AND 3

PARSONS
290 ELWOOD DAVIS ROAD, SUITE 312, LIVERPOOL, N.Y. 13088, PHONE: 315-451-9560

P:\738483\CAD\482C008.dwg, 02/03/02 at 19:20, STEV, 1/100XP
XREFs: NONE

TABLE 4.1

Hancock Site 15
ALTERNATIVE 2
OPTION A: Soil Removal Based on PCB Concentrations
SUBOPTION: Onsite Treatment

CAPITAL COSTS

Item	Unit	Quantity	Unit Cost	Total Cost
1. Remove entire transformer pad and portion of concrete pad.	CY	204	$46	$9,384
2. Remove soil above water table (assumed = 9 feet) or "in the dry."				
a. Surface soil exceeding 1 ppm PCBs	CY	650	$20	$13,000
c. Subsurface soil exceeding 10 ppm PCBs	CY	1,000	$20	$20,000
d. Soil from pile at Site 1	CY	220	$15	$3,300
3. Install pump to remove water from within deep excavation areas.	EA	2	$300	$600
4. Treat water.	LS	1	$5,000	$5,000
5. Mobilization and demobilization for onsite thermal desorption.	LS	1	$100,000	$100,000
6. Permitting	LS	1	$125,000	$125,000
7. Performance Testing	LS	1	$275,000	$275,000
8. Treat excavated soil using onsite thermal desorption.	TON	2,805	$115	$322,575
9. Backfill excavation with treated soil.	CY	1,870	$10	$18,700
10. Seed excavated areas.	SY	2,000	$5	$10,000
11. Miscellaneous (health and safety, etc.)	LS	1	$10,000	$10,000
12. Subtotal Capital Costs				$912,559
13. Engineering, Design, and Construction Oversight				$60,000
TOTAL CAPITAL COSTS				**$973,000**

ANNUAL OPERATING AND MAINTENANCE COSTS

Item	Unit	Quantity	Unit Cost	Total Cost
1. Short-Term Groundwater Monitoring, semi-annually for two years				
a. Field effort (labor, materials, and equipment)	HRS	32	$50	$1,600
b. Sample analyses	TEST	20	$500	$10,000
c. Data analysis and reporting	HRS	40	$80	$3,200
Subtotal				$14,800
2. Present Worth of Groundwater Monitoring [PW O&M=(P/A, 4%, 2) * Groundwater Monitoring Annual O&M]				$28,320
TOTAL O&M PRESENT WORTH				**$28,320**
PRESENT WORTH OF ALTERNATIVE [PW=Total Capital + Total O&M Present Worth Costs]				**$1,001,000**

TABLE 4.2

Hancock Site 15

ALTERNATIVE 2

OPTION A: Soil Removal Based on PCB Concentrations
SUBOPTION: Offsite Disposal

CAPITAL COSTS

Item	Unit	Quantity	Unit Cost	Total Cost
1. Remove entire transformer pad and portion of concrete pad.	CY	204	$46	$9,384
2. Remove soil				
a. Surface soil exceeding 1 ppm PCBs	CY	650	$20	$13,000
c. Subsurface soil exceeding 10 ppm PCBs	CY	1,000	$20	$20,000
d. Soil from pile at Site 1	CY	220	$15	$3,300
3. Install pump to remove water from within deep excavation areas.	EA	2	$300	$600
4. Treat water.	LS	1	$5,000	$5,000
5. Transport soil to a hazardous waste landfill.	TON	2,805	$250	$701,250
6. Backfill excavation with clean fill.	CY	1,870	$15	$28,050
7. Seed excavated areas.	SY	2,000	$5	$10,000
8. Miscellaneous (health and safety, etc.)	LS	1	$10,000	$10,000
9. Subtotal Capital Costs				$800,584
10. Engineering, Design, and Construction Oversight				$60,000
TOTAL CAPITAL COSTS				**$861,000**

ANNUAL OPERATING AND MAINTENANCE COSTS

Item	Unit	Quantity	Unit Cost	Total Cost
1. Short-Term Groundwater Monitoring, semi-annually for two years				
a. Field effort (labor, materials, and equipment)	HRS	32	$50	$1,600
b. Sample analyses	TEST	20	$500	$10,000
c. Data analysis and reporting	HRS	40	$80	$3,200
Subtotal				$14,800
2. Present Worth of Groundwater Monitoring [PW O&M=(P/A, 4%, 2) * Groundwater Monitoring Annual O&M]				$28,320
TOTAL O&M PRESENT WORTH				**$28,320**
PRESENT WORTH OF ALTERNATIVE [PW=Total Capital + Total O&M Present Worth Costs]				**$889,000**

TABLE 4.3

Hancock Site 15

ALTERNATIVE 2

OPTION B: Soil Removal Based on PCB and BTEX Concentrations

SUBOPTION: Onsite Treatment

CAPITAL COSTS

Item	Unit	Quantity	Unit Cost	Total Cost
1. Remove entire transformer pad and portion of concrete pad.	CY	204	$46	$9,384
2. Remove soil above water table (assumed = 9 feet) or "in the dry."				
a. Surface soil exceeding 1 ppm PCBs	CY	650	$20	$13,000
c. Subsurface soil exceeding 10 ppm PCBs	CY	1,000	$20	$20,000
d. Soil exceeding 10 ppm BTEX	CY	8,856	$20	$177,120
e. Soil from pile at Site 1	CY	220	$15	$3,300
3. Install pump to remove water from within deep excavation areas.	EA	2	$300	$600
4. Treat water.	LS	1	$5,000	$5,000
5. Mobilization and demobilization for onsite thermal desorption.	LS	1	$100,000	$100,000
6. Permitting	LS	1	$150,000	$150,000
7. Performance Testing	LS	1	$300,000	$300,000
8. Treat excavated soil using onsite thermal desorption.	TON	16,089	$115	$1,850,235
9. Backfill excavation with treated soil.	CY	10,506	$10	$105,060
10. Seed excavated areas.	SY	4,500	$5	$22,500
11. Miscellaneous (health and safety, etc.)	LS	1	$10,000	$10,000
12. Subtotal Capital Costs				$2,766,199
13. Engineering, Design, and Construction Oversight (20% of subtotal less treatment and disposal costs)				$182,193
TOTAL CAPITAL COSTS				**$2,950,000**

ANNUAL OPERATING AND MAINTENANCE COSTS

Item	Unit	Quantity	Unit Cost	Total Cost
1. Short-Term Groundwater Monitoring, semi-annually for two years				
a. Field effort (labor, materials, and equipment)	HRS	32	$50	$1,600
b. Sample analyses	TEST	20	$500	$10,000
c. Data analysis and reporting	HRS	40	$80	$3,200
Subtotal				$14,800
2. Present Worth of Groundwater Monitoring [PW O&M=(P/A, 4%, 2) * Groundwater Monitoring Annual O&M]				$28,320
TOTAL O&M PRESENT WORTH				**$28,320**
PRESENT WORTH OF ALTERNATIVE [PW=Total Capital + Total O&M Present Worth Costs]				**$2,980,000**

TABLE 4.4

Hancock Site 15

ALTERNATIVE 2

OPTION B: Soil Removal Based on PCB and BTEX Concentrations

SUBOPTION: Offsite Disposal

CAPITAL COSTS

Item	Unit	Quantity	Unit Cost	Total Cost
1. Remove entire transformer pad and portion of concrete pad.	CY	204	$46	$9,384
2. Remove soil above water table (assumed = 9 feet) or "in the dry."				
a. Surface soil exceeding 1 ppm PCBs	CY	650	$20	$13,000
c. Subsurface soil exceeding 10 ppm PCBs	CY	1,000	$20	$20,000
d. Soil exceeding 10 ppm BTEX	CY	8,856	$20	$177,120
e. Soil from pile at Site 1	CY	220	$15	$3,300
3. Install pump to remove water from within deep excavation areas.	EA	2	$300	$600
4. Treat water.	LS	1	$5,000	$5,000
5. Transport soil to a hazardous waste landfill.	TON	16,089	$250	$4,022,250
6. Backfill excavation with clean fill.	CY	10,506	$15	$157,590
7. Seed excavated areas.	SY	4,500	$5	$22,500
8. Miscellaneous (health and safety, etc.)	LS	1	$10,000	$10,000
9. Subtotal Capital Costs				$4,440,744
10. Engineering, Design, and Construction Oversight (20% of subtotal less treatment and disposal costs)				$82,699
TOTAL CAPITAL COSTS				**$4,520,000**

ANNUAL OPERATING AND MAINTENANCE COSTS

Item	Unit	Quantity	Unit Cost	Total Cost
1. Short-Term Groundwater Monitoring, semi-annually for two years				
a. Field effort (labor, materials, and equipment)	HRS	32	$50	$1,600
b. Sample analyses	TEST	20	$500	$10,000
c. Data analysis and reporting	HRS	40	$80	$3,200
Subtotal				$14,800
2. Present Worth of Groundwater Monitoring [PW O&M=(P/A, 4%, 2) * Groundwater Monitoring Annual O&M]				$28,320
TOTAL O&M PRESENT WORTH				**$28,320**
PRESENT WORTH OF ALTERNATIVE [PW=Total Capital + Total O&M Present Worth Costs]				**$4,550,000**

TABLE 4.5

Hancock Site 15

ALTERNATIVE 3, OPTION A
Air Sparging/Soil Vapor Extraction

CAPITAL COSTS

Item	Unit	Quantity	Unit Cost	Total Cost
1. Pilot Test of Air Sparging System				
a. Air sparging well	EA	1	$1,500	$1,500
b. Monitoring points	EA	2	$1,500	$3,000
c. Portable blower rental	WK	1	$255	$255
d. Monitoring and analysis	LS	1	$3,000	$3,000
2. Installation of Air Sparging System				
a. Air sparging wells	EA	50	$1,500	$75,000
b. Monitoring points	EA	25	$1,500	$37,500
c. Blower	LS	1	$1,200	$1,200
d. Vapor extraction wells	EA	50	$1,500	$75,000
e. Vapor recovery system	LS	1	$7,000	$7,000
f. Vapor treatment system	LS	1	$2,400	$2,400
g. Piping, valves, and gauges	LS	1	$2,000	$2,000
h. Building	EA	1	$5,000	$5,000
3. Subtotal Capital Costs				$212,855
4. Engineering, Design, and Construction Oversight (15%)				$31,928
TOTAL CAPITAL COSTS				**$245,000**

ANNUAL OPERATING AND MAINTENANCE COSTS

Item	Unit	Quantity	Unit Cost	Total Cost
1. Annual Site Inspection, Administration, and Reporting	LS	1	$4,000	$4,000
2. Operation and Maintenance of Air Sparging System for Five Years	LS	1	$30,000	$30,000
3. Short-Term Groundwater Monitoring, Annually for Five Years				
a. Field effort (labor, materials, and equipment)	HRS	16	$50	$800
b. Sample analyses	TEST	10	$500	$5,000
c. Data analysis and reporting	HRS	20	$80	$1,600
Subtotal				$7,400
4. Present Worth of Site Inspection, Administration, Reporting [PW O&M=(P/A, 4%, 30) * Site Inspection Annual O&M]				$78,402
5. Present Worth of O&M of Air Sparging System [PW O&M=(P/A, 4%, 5) * Air Sparging System Annual O&M]				$137,391
6. Present Worth of Groundwater Monitoring [PW O&M=(P/A, 4%, 5) * Groundwater Monitoring Annual O&M]				$33,890
TOTAL O&M PRESENT WORTH				**$250,000**
PRESENT WORTH OF ALTERNATIVE [PW=Total Capital Costs + Total O&M Present Worth]				**$495,000**

TABLE 4.6

Hancock Site 15

ALTERNATIVE 3, OPTION A
Reactive Subsurface Barrier Wall

CAPITAL COSTS

Item	Unit	Quantity	Unit Cost	Total Cost
1. Excavate trench.	CY	2,315	$20	$46,300
2. Dispose excavated soil at municipal landfill.	CY	2,315	$100	$231,500
3. Install temporary sheet piling.	SF	12,500	$20	$250,000
4. Install treatment bed of activated carbon.	CY	930	$870	$809,100
5. Place vegetative cap over treatment area.				
a. Place 6-inch layer of soil.	CY	185	$15	$2,775
b. Seed area.	SY	1,200	$5	$6,000
6. Subtotal Capital Costs				$1,345,675
7. Engineering, Design, and Construction Oversight (15%)				$201,851
TOTAL CAPITAL COSTS				**$1,550,000**

ANNUAL OPERATING AND MAINTENANCE COSTS

Item	Unit	Quantity	Unit Cost	Total Cost
1. Annual Site Inspection, Administration, and Reporting	LS	1	$4,000	$4,000
2. Operation and Maintenance of Reactive Barrier Wall for Five Years	LS	1	$20,000	$20,000
3. Short-Term Groundwater Monitoring, Annually for Five Years				
a. Field effort (labor, materials, and equipment)	HRS	16	$50	$800
b. Sample analyses	TEST	10	$500	$5,000
c. Data analysis and reporting	HRS	20	$80	$1,600
Subtotal				$7,400
4. Present Worth of Site Inspection, Administration, Reporting [PW O&M=(P/A, 4%, 30) * Site Inspection Annual O&M]				$78,402
5. Present Worth of O&M of Reactive Barrier Wall [PW O&M=(P/A, 4%, 5) * Air Sparging System Annual O&M]				$91,594
6. Present Worth of Groundwater Monitoring [PW O&M=(P/A, 4%, 5) * Groundwater Monitoring Annual O&M]				$33,890
TOTAL O&M PRESENT WORTH				**$204,000**
PRESENT WORTH OF ALTERNATIVE [PW=Total Capital Costs + Total O&M Present Worth]				**$1,750,000**

TABLE 4.7

Hancock Site 15

ALTERNATIVE 3, Option B
Collection Trench

CAPITAL COSTS

Item	Unit	Quantity	Unit Cost	Total Cost
1. Groundwater Collection				
a. Collection trench (excavation, soil disposal, installation of pipe, gravel, and liner)	LS	1	$600,000	$600,000
b. Pump	EA	1	$1,000	$1,000
c. Pump housing	EA	1	$500	$500
d. Piping and electrical	LF	100	$6	$600
e. Storage tank	EA	1	$2,000	$2,000
2. Groundwater Treatment (prefilter and activated carbon system)	LS	1	$100,000	$100,000
3. Subtotal Capital Costs				$700,000
4. Engineering, Design, and Construction Oversight (10%)				$70,000
5. TOTAL CAPITAL COSTS				**$770,000**

ANNUAL OPERATING AND MAINTENANCE COSTS

Item	Unit	Quantity	Unit Cost	Total Cost
1. Annual Site Inspection, Administration, and Reporting	LS	1	$4,000	$4,000
2. Operation and Maintenance of Collection and Treatment System for Five Years	LS	1	$30,000	$30,000
3. Short-Term Groundwater Monitoring, Annually for Five Years				
a. Field effort (labor, materials, and equipment)	HRS	16	$50	$800
b. Sample analyses	TEST	10	$500	$5,000
c. Data analysis and reporting	HRS	20	$80	$1,600
Subtotal				$7,400
4. Present Worth of Site Inspection, Administration, Reporting [PW O&M=(P/A, 4%, 30) * Site Inspection Annual O&M]				$78,402
5. Present Worth of O&M of Collection and Treatment System [PW O&M=(P/A, 4%, 5) * Air Sparging System Annual O&M]				$137,391
6. Present Worth of Groundwater Monitoring [PW O&M=(P/A, 4%, 5) * Groundwater Monitoring Annual O&M]				$33,890
TOTAL O&M PRESENT WORTH				**$250,000**
PRESENT WORTH OF ALTERNATIVE [PW=Total Capital Costs + Total O&M Present Worth]				**$1,020,000**

TABLE 4.8

PROS AND CONS OF DISPOSAL OPTIONS FOR PCB-IMPACTED SOIL

OPTION	PROS	CONS
Onsite Thermal Desorption	Avoids potential offsite liability associated with landfill disposal	Requires extended schedule due to testing and additional State and potentially public input Can be more costly than offsite disposal and not often implemented Requires national TSCA permit for PCB management Uncertain demonstration test scope, air monitoring, NYSDEC approval, and public input
Onsite Chemical Extraction	Minimizes air emissions	Same as for onsite thermal treatment and less common.
Offsite Thermal Treatment or Chemical Extraction	Treatment done in an area approved in advance for soil treatment	More costly than onsite treatment or offsite disposal
Offsite Landfill Disposal	Least cost option based on soil quantity requiring disposal as hazardous waste and present market value of disposal for non-hazardous and hazardous waste. Most expedient option to implement	Exception required for ANG policy regarding potential liability associated with offsite landfill disposal

SECTION 5

RECOMMENDED REMEDIAL ALTERNATIVE

5.1 DESCRIPTION OF RECOMMENDED ALTERNATIVE

Based on the evaluation presented in Section 4, the recommended alternative consists of the following components, a combination of Alternative 1; Alternative 2, Option A; and Alternative 3, Option A

Alternative 1 – Monitored Natural Attenuation

- Continue to restrict access to the site and prevent use of onsite groundwater.
- Conduct short-term groundwater monitoring semi-annually for five years to further assess natural attenuation within the groundwater plume outside the area containing soil above 10 ppm BTEX.
- If natural attenuation alone is not considered sufficient in a reasonable timeframe, implement remedial measures (e.g., delivery of a limiting nutrient or other amendments to the subsurface) to enhance the attenuation of BTEX.

Alternative 2, Option A - Soil Removal Based on Soil PCB Concentrations

- Remove approximately 2,000 cy of soil exceeding 1 ppm PCBs in site surface soil and sediment and 10 ppm PCBs in site subsurface soil over one foot bgs. Most of the excavation areas are around the pumphouse, under the concrete pad, and southeast of the concrete pad (see Figure 4.1).
- Dewater saturated soil in place, as needed, prior to excavating below the water table. Treat extracted water as needed.
- Transport excavated soil and sediment and manage at an offsite facility. Soil containing over 50 ppm PCBs would be managed as a hazardous waste. Soil containing less than 50 ppm PCBs would be managed as a non-hazardous waste.
- Replace excavated material with clean fill to pre-excavation grade. Provide proper drainage and seed or pave area.

Alternative 3, Option A – In-Situ Removal of BTEX

- Install AS/SVE well pairs and operate for a limited period of time within the area showing total soil BTEX levels over 10 ppm and at the Brooklawn Golf Course. Connect the AS/SVE to a common vapor treatment location with a knockout tank to collect incidental water.

The recommended alternative incorporates source control, soil management, BTEX removal from soil via excavation and SVE, BTEX removal from groundwater via air sparging, and long-term groundwater monitoring.

5.2 ASSESSMENT OF RECOMMENDED ALTERNATIVE USING EVALUATION CRITERIA

5.2.1 Overall Protection of Human Health and the Environment

The recommended alternative would provide overall protection of human health and the environment by treating or eliminating the identified volumes of PCB-contaminated soil. Some of this soil would include BTEX-impacted soil as well. Any migration of constituents from impacted areas into downgradient groundwater and Ley Creek would be reduced most effectively in the long term by removing these sources. The AS/SVE system would help treat BTEX-impacted soil and groundwater in place. BTEX in groundwater can also naturally attenuate within the subsurface.

5.2.2 Compliance with SCGs

Soil and sediment exceeding PRGs for PCBs, as well as some soil exceeding PRGs for BTEX, would be excavated and disposed of properly at an offsite facility, and the potential for future impacts on groundwater would be reduced. Removal of the soil and sediment and some of the groundwater containing PRG exceedances would comply with the chemical-specific SCGs. Soil with BTEX impacts over 10 ppm would be treated by the AS/SVE system.

5.2.3 Long-term Effectiveness and Permanence

Removal and proper disposal of the identified volumes of PCB-contaminated soil and sediment, including some BTEX-contaminated soil, would be a permanent remedy and would significantly reduce the magnitude of risk remaining after remediation. Impacts from soil on groundwater and the potential for migration of impacts along the drainage swale downstream of the site would be significantly reduced. The excavated soil would be transported directly to an offsite landfill for proper management. Soil with PCBs over 50 ppm would be transported to a TSCA-approved facility, such as Chemical Waste Management's Model City Landfill in Niagara Falls, New York. Non-hazardous soil with PCBs concentrations less than 50 ppm could be transported to a non-hazardous waste landfill. Liability associated with disposal at an offsite landfill is not expected to be significant.

5.2.4 Reduction of Toxicity, Mobility, or Volume

Removal and disposal of the contaminated soil would nearly eliminate the volume of onsite impacted material. If onsite treatment is also used, the toxicity and mobility of the material would also be reduced. The toxicity of impacted groundwater would be reduced by AS/SVE.

5.2.5 Short-term Effectiveness

Excavation and disposal of the impacted material could be conducted within several months during warm weather. Transport of the treated material to an offsite facility could be the most time-consuming component of the alternative. Very little soil disturbance would be anticipated for installation of the AS/SVE system and could be conducted after excavation of the PCB-impacted soils.

Short-term risks to site workers would be minimized with the use of controls, such as personal protective equipment, dust suppression (e.g., watering of soils), and odor controls (e.g., tarping of stockpiled soil). An existing fence surrounding the site would be maintained to control access. Trucks used to transport the soil for offsite management would possess the necessary controls to prevent spillage.

5.2.6 Implementability

Because the site is no longer in use, no operations or equipment would have to be re-located prior to excavation work. The recommended alternative does, however, consist of excavation of soil below the water table and would require the excavation of side slopes, dewatering of the excavation, and offsite treatment of the removed water. These types of deep excavations are common. In addition, the site is not located within a flood zone, and the location of existing USTs and other underground structures can be obtained from the base.

The transport of excavated material to an offsite facility could require significant time and coordination, but would be implementable. Re-vegetation and paving of the site would be easily implementable.

The AS/SVE system would require a short-term pilot test and installation of 30 to 50 wells. However, testing and installation of such systems is fairly common and easily implementable.

5.2.7 Cost

The estimated present worth of the recommended alternative would be $1.4 million with offsite disposal. Major assumptions were that all of the 2,000 cy of excavated soil would be managed as hazardous waste at the Model City Landfill and that the AS/SVE system would be fully installed.

Given that soil BTEX data are several years old, the extent of soil with BTEX levels over 10 ppm may be lower now than when the soil was most recently sampled and analyzed for BTEX. Depending on the assessment of BTEX impacts remaining at the site after soil removal, natural attenuation alone could be considered sufficient for addressing BTEX. However, costs are based on the assumption that a complete AS/SVE system would be installed. Table 5.1 shows the assumptions used in estimating the costs of the recommended alternative.

5.3 CURRENT ASSESSMENT

Alternative 2, Option A was implemented as a CERCLA removal action, beginning in November 2001. Approximately 2,800 tons of PCB-impacted soil were removed and properly managed at offsite facilities. Of the 2,800 tons of excavated soil, approximately 1,600 tons of soil containing over 50 ppm PCBs were managed at Model City's facility in Niagara Falls, New York. The remaining 1,200 tons of soil containing less than 50 ppm PCBs were managed at High Acres Landfill near Rochester, New York. No groundwater was required to be removed and disposed. Steel tanks, associated piping and other metal debris were disposed properly offsite. Concrete, which was not impacted by PCBs, was crushed into pieces not exceeding three feet in size and placed onsite within the excavated area and covered with clean backfill. The excavation remains open until funds are available from ANG to manage BTEX-impacted soil.

TABLE 5.1

Hancock Site 15

RECOMMENDED ALTERNATIVE WITH OPTION OF OFFSITE DISPOSAL
Soil Removal Based on PCB Concentrations and Offsite Disposal
Air Sparging/Soil Vapor Extraction

CAPITAL COSTS

Item	Unit	Quantity	Unit Cost	Total Cost
1. Remove entire transformer pad and portion of concrete pad.	CY	204	$46	$9,384
2. Remove soil above water table (assumed = 9 feet) or "in the dry."				
a. Surface soil exceeding 1 ppm PCBs	CY	650	$20	$13,000
b. Subsurface soil exceeding 10 ppm PCBs	CY	1,000	$20	$20,000
c. Soil from pile at Site 1	CY	220	$15	$3,300
3. Install pump to remove water from within deep excavation areas.	EA	2	$300	$600
4. Treat water.	LS	1	$5,000	$5,000
5. Transport soil to a hazardous waste landfill.	TON	2,805	$250	$701,250
6. Backfill excavation with clean fill.	CY	1,870	$15	$28,050
7. Seed excavated areas.	SY	2,000	$5	$10,000
8. Pilot Test of AS/SVE System				
a. Air sparging well	EA	1	$1,500	$1,500
b. Monitoring points	EA	2	$1,500	$3,000
c. Portable blower rental	WK	1	$255	$255
d. Monitoring and analysis	LS	1	$3,000	$3,000
9. Installation of AS/SVE System				
a. Air sparging wells	EA	50	$1,500	$75,000
b. Monitoring points	EA	25	$1,500	$37,500
c. Blower	LS	1	$2,000	$2,000
d. Vapor extraction wells	EA	50	$1,500	$75,000
e. Vapor recovery system	LS	1	$10,000	$10,000
f. Vapor treatment system	LS	1	$5,000	$5,000
g. Piping, valves, and gauges	LS	1	$2,000	$2,000
h. Building	EA	1	$5,000	$5,000
10. Miscellaneous (health and safety, etc.)	LS	1	$10,000	$10,000
11. Subtotal Capital Costs				$1,019,839
12. Engineering, Design, and Construction Oversight				$60,000
TOTAL CAPITAL COSTS				$1,080,000

TABLE 5.1

Hancock Site 15

RECOMMENDED ALTERNATIVE WITH OPTION OF OFFSITE DISPOSAL
Soil Removal Based on PCB Concentrations and Offsite Disposal
Air Sparging/Soil Vapor Extraction

ANNUAL OPERATING AND MAINTENANCE COSTS

Item	Unit	Quantity	Unit Cost	Total Cost
1. Annual Site Inspection, Administration, and Reporting	LS	1	$4,000	$4,000
2. O&M of AS/SVE System for Five Years	LS	1	$30,000	$30,000
3. Short-Term Groundwater Monitoring, Semi-annually for Five Years				
a. Field effort (labor, materials, and equipment)	HRS	32	$50	$1,600
b. Sample analyses	TEST	20	$500	$10,000
c. Data analysis and reporting	HRS	40	$80	$3,200
Subtotal				$14,800
4. Present Worth of Site Inspection, Administration, Reporting [PW O&M=(P/A, 4%, 30) * Site Inspection Annual O&M]				$78,402
5. Present Worth of O&M of Air Sparging System [PW O&M=(P/A, 4%, 5) * Air Sparging System Annual O&M]				$137,391
6. Present Worth of Groundwater Monitoring [PW O&M=(P/A, 4%, 5) * Groundwater Monitoring Annual O&M]				$67,780
TOTAL O&M PRESENT WORTH				$284,000
PRESENT WORTH OF ALTERNATIVE [PW=Total Capital Costs + Total O&M Present Worth]				**$1,364,000**

SECTION 6

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APPENDIX A

DATA GAP INVESTIGATION REPORT

2001 DATA GAP INVESTIGATION RESULTS FOR SITE 15

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PARSONS

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SECTION 1

INTRODUCTION

1.1 PROJECT BACKGROUND

The 174th Fighter Wing of the New York Air National Guard is based at Hancock Field, a former Air Force Base located two miles north-northeast of the City of Syracuse in Onondaga County in central New York (see Figure 1.1). The Air National Guard facility is currently operating within the southern portion of the former Hancock Air Force Base located south of the Syracuse airport. The Air National Guard Readiness Center at Andrews AFB in Maryland manages Superfund-related efforts for Air National Guard installations.

Two sites identified at Hancock Field as requiring potential action are Sites 1 and 15, based on previous investigation work. *Site* 1 has been addressed with the exception of removing a remaining soil pile. For *Site* 15, additional investigation work reported herein was warranted as a data gap investigation before evaluating the most appropriate form of remediation. This work was conducted from December 2000 through March 2001, based on a work plan, which was approved by the State of New York Department of Environmental Conservation (Parsons ES, 2000) before the work was initiated.

Site 15 is a 2.5-acre plot of land and the site of a former petroleum, oil, and lubricant storage area near the southern boundary of Hancock Field (see Figure 1.1). Site soil and groundwater have been impacted by past spills associated with fuel storage and with transformers that contained polychlorinated biphenyls (PCBs). Multiple previous investigation efforts have been conducted at this site. These previous investigations have documented the presence of jet fuel-related compounds, PCBs, and a lighter-than-water product on top of the groundwater within a portion of the site (Lockheed, 1997). Benzene, toluene, ethylbenzene, and xylene (BTEX) dissolved in groundwater appear to extend from the northern portion of the site where the spills occurred to East Molloy Road at the southern edge of the site. PCBs and product, on the other hand, appear to be concentrated around the north-central portion of the site.

1.2 SITE LOCATION AND DESCRIPTION

Site 15 is part of land used by the 174th Fighter Wing of the New York Air National Guard at Hancock Field. The Air National Guard facility at Hancock Field is bordered by the Town of Dewitt to the east and south, the Town of Salina to the west, and the Town of Cicero to the north. Syracuse International Airport is located directly to the north of the Air National Guard facility.

Site 15 was used to transfer and store JP-4 jet fuel until the 1980s when the Air National Guard began using JP-8 jet fuel. Figure 1.2 shows site features within the area where past spills occurred. A 215,000-gallon aboveground storage tank, which has been removed, was located within a diked area near the center of the site. A concrete pad is located adjacent to the bermed area. Northwest of the concrete pad is the location of a former pumphouse. The foundation remains, and associated with the foundation are six 25,000-gallon underground storage tanks, which have been closed in-place. Three of the underground tanks are located beneath the northeast side of the pumphouse, and three are beneath the southwest side. Adjacent to the southeast side of the pumphouse was a transformer pad. Most of the site is covered with unmaintained vegetation. One drainage swale borders the site on its north-northeast side, and a second drainage swale is located along the west side of the site. The entire site is enclosed by a barbed wire fence.

1.3 SITE HISTORY

The petroleum storage area at *Site* 15 was constructed in 1951 and used until 1999 when it was decommissioned following completion of a new petroleum storage area. When the area was actively used, it was the site of the Jet Fuel Transfer Pumphouse (Building 602), a transformer pad, various storage tanks described in Section 1.2, and equipment for transferring jet fuel to the tanks. In 1999, the pumphouse was demolished, the above-ground storage tank was cleaned and removed, and the underground storage tanks were cleaned and filled in place.

Three spills at the site have been documented:

- In the 1980s, PCBs were released, possibly from the transformers located in front of the pumphouse (Radian, 1994).
- In April 1990, 3,850 gallons of JP-4 jet fuel were released inside the pumphouse. Some of the fuel reportedly flowed out of the building before it could be recovered (Radian, 1994, and M&E, 1995).
- In June 1994, 150 gallons of JP-8 jet fuel overflowed onto the ground from beneath the northeast side of the building. The spill was reportedly contained with absorbent pads before it was able to exit through the drainage swale on the east side of the site (M&E, 1995, and Aneptek, 1999).

Following the April 1990 release, contaminated surface soil was removed from the area around the pump house and staged on the concrete pad at *Site* 1. This soil will be included with the management of impacted soil from *Site* 15. The excavation area was then backfilled with crushed stone. During the cleanup, three area drainage sumps with PCB-contaminated sediment were discovered. Spilled fuel had entered the sumps and mixed with the PCB-contaminated sediment, which is believed to have accumulated in the sumps before 1971. According to as-built drawings, an oil-water separator was supposedly installed in the 1950s, but one was never found during the soil excavation (Radian, 1994).

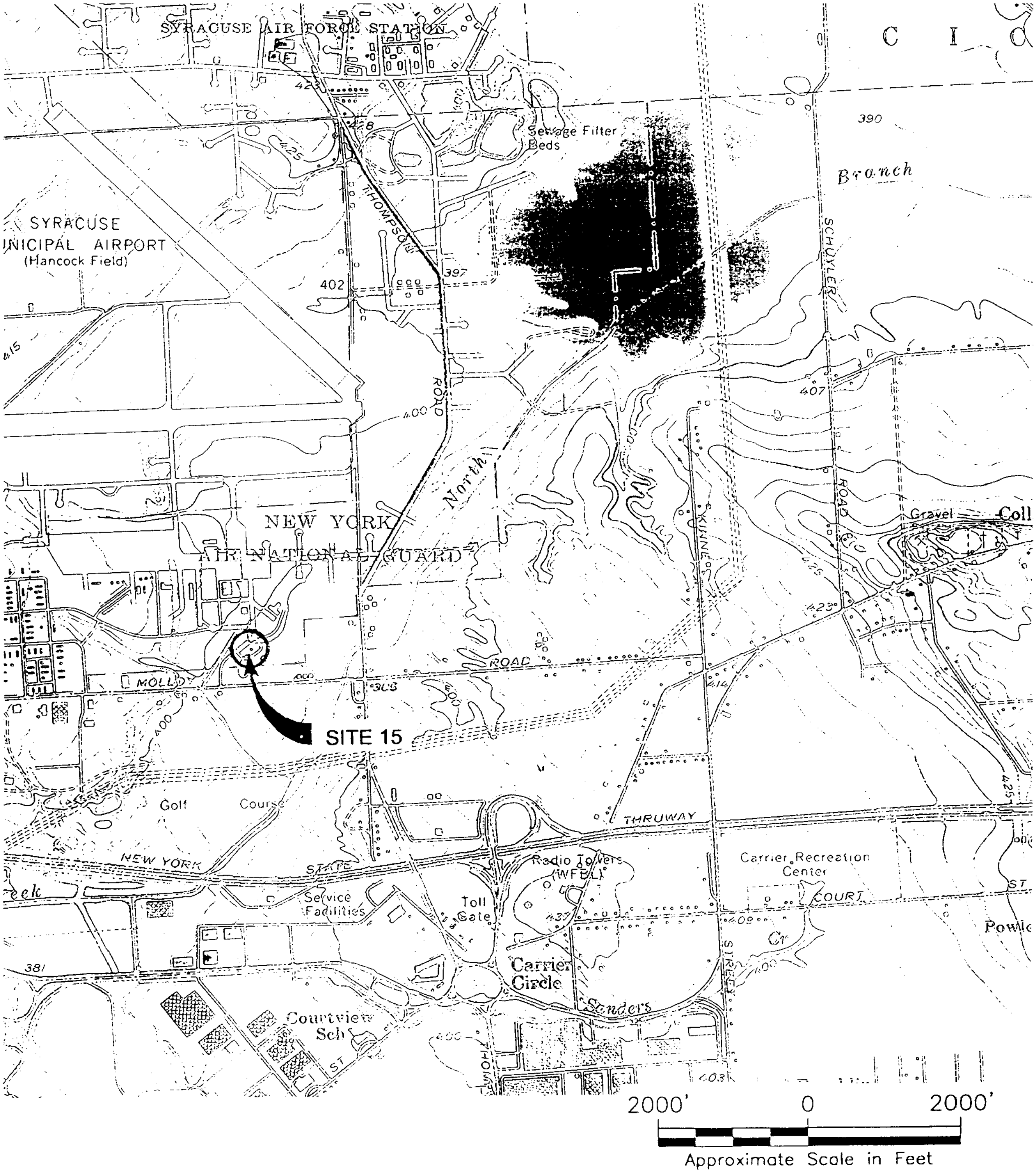
1.4 RESULTS FROM PREVIOUS SITE INVESTIGATIONS

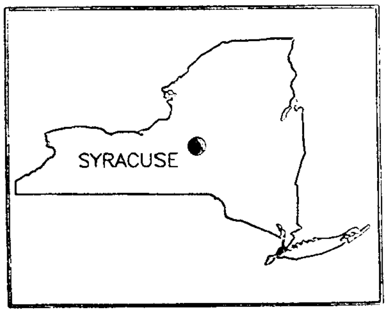
At least five investigations or studies of *Site* 15 have taken place over the years. Locations of the samples that have been collected during these investigations are shown in

Figures 1.2 through 1.5. Results from these investigations are summarized in the December 2000 work plan (Parsons ES, 2000) and will be summarized in the upcoming Focused Feasibility Study.

1.5 ORGANIZATION OF THIS REPORT

In addition to this introduction, the report is presented as three sections and three appendices. Section 2 presents the investigation procedures and results. Section 3 presents observations and conclusions that follow from the results. Section 4 is a list of project references. Appendix A is the soil boring and well completion logs. Appendix B is the data usability report developed as part of the data validation effort that includes detailed results tables from the laboratory work. Appendix C is the plots of results showing natural attenuation indicator parameters as explained in Section 2. Finally, Appendix D is a project photo log.





QUADRANGLE LOCATION
NEW YORK

LATITUDE: N43° 06' 01"
LONGITUDE: W76° 06' 06"

SOURCE: USGS 7.5 MINUTE SERIES (TOPOGRAPHIC) SYRACUSE EAST QUADRANGLE 1957

FIGURE 1.1

NATIONAL GUARD BUREAU
SITE 15 AT HANCOCK FIELD
SYRACUSE, NEW YORK

SITE LOCATION MAP

PARSONS
PARSONS INFRASTRUCTURE & TECHNOLOGY GROUP INC.
PARSONS ENGINEERING SCIENCE, INC.
290 ELWOOD DAVIS ROAD, SUITE 312, LIVERPOOL, N.Y. 13088, PHONE: 315-451-9560

No XREFs
NGB HANCOCK, 738483.02010, 8/23/00 at 9:41, SEH, 1=1

SECTION 2

SCOPE OF WORK AND RESULTS

The Data Gap Investigation was conducted at Site 15 during December 2000 and January-March 2001. Field work was conducted in accordance with the NYSDEC-approved work plan for the site (Parsons ES, 2000). The work plan included a Field Sampling Plan, Quality Assurance Project Plan, and Health and Safety Plan; provisions within these plans were followed when conducting the investigation work described herein.

Field work conducted during the Data Gap Investigation was as follows:

- Sampling of surface soils near the concrete pad and within the two site drainage swales to further assess the extent of PCBs. Drainage swale soil sampling was done in two phases, because laboratory results from the first phase within the western swale showed PCBs to be at or above one part per million;
- Abandoning and reinstalling three existing monitoring wells (MW-8, MW-11, and MW-12D) that were damaged during landscaping activities last year;
- Installing and developing three additional monitoring wells (MW-21, MW-22, and MW-23) within the area where product was seen previously, measuring groundwater levels, and sampling 17 site monitoring wells to further characterize groundwater conditions;
- Field analyzing groundwater for natural attenuation parameters to provide information for assessing the extent of natural attenuation taking place in the site subsurface;
- Subsurface monitoring at selected monitoring wells to further assess the extent that LNAPL could be recovered from the subsurface. Baildown testing and analyses of product samples were not done, because no product was recovered during our efforts;
- Collecting and analyzing 6 surface soil, 14 drainage swale soil, and groundwater samples from 17 monitoring wells to further characterize these media, and to obtain data for the feasibility analyses; and
- Conducting other related work elements consisting of topographic survey update, management of wastes generated during the investigation, quality assurance procedures, and validation of laboratory data.

Investigation procedures are summarized in the following sections.

2.1 SURFACE SOIL SAMPLING

On December 18, 2000, six surface soil samples were collected southeast of the former pumphouse and concrete pad at Site 15. Soil boring locations are shown on Figure 2.1. Each surface soil sample was obtained using a stainless steel hand-driven auger. The hand-driven auger was decontaminated between each soil boring location utilizing an Alconox and distilled water wash and rinse. Each surface soil sample was collected from 0 to 1 feet below ground surface (bgs) and submitted to Galson Laboratory of East Syracuse, New York for total PCB analysis using USEPA SW-846 Method 8082.

In addition, fourteen surface soil samples were collected from the two swales that originate north and northeast of the former pumphouse and concrete pad (see Figure 2.1). These surface soil samples were collected on December 18, 2000 and January 30, 2001. These surface soil samples were collected from 0 to 1 feet below ground surface using the same collection procedure as presented above for the other six soil samples. One soil sample at each location was collected from the bottom of the swale, and two grab samples were collected from the sidewalls of the swale and composited into one sample. Surface soil samples were submitted to Galson Laboratories of East Syracuse, NY for total PCB analysis using USEPA SW-846 Method 8082.

Also, as part of the surface soil sampling program, the quality assurance/quality control samples collected and analyzed in accordance with the approved work plan were a duplicate, matrix spike, matrix spike duplicate, and equipment blank.

2.2 MONITORING WELL ABANDONMENT AND RE-INSTALLATION

In January 2001, existing monitoring wells MW-11 and MW-12D were abandoned following NYSDEC abandonment procedures. The wells were abandoned due to damage sustained during the Summer of 2000 by landscaping crews that compromised the well's integrity. Monitoring well MW-8 also sustained damage, but was covered by clean fill material placed down by landscaping crew. Several attempts to locate the well were made by Parsons, but the well could not be located. Therefore, no abandonment activities were performed on monitoring well MW-8. The damage sustained by each well is listed below.

- MW-8 – The outer protective steel casing and PVC riser had been sheared at ground level, leaving the well open to the atmosphere.
- MW-11 – The outer protective steel casing had been knocked over and set upright. A large dent in the protective casing was also observed and the PVC riser had been pulled up. Upon further inspection, it was determined that the bentonite seal was compromised.
- MW-12D – The outer protective steel casing had a large dent and both the protective casing and PVC riser were at an angle.

MW-11 and MW-12D were abandoned by knocking out the bottom PVC well cap with a stainless steel spilt spoon and associated rods using a All-Terrain-Vehicle (ATV) drill rig. Subsequently, both wells were backfilled by pressure grouting with a cement/bentonite slurry comprised of 92% Portland cement and 8% bentonite and water. The PVC casing and screen were removed from the subsurface, allowing the slurry to fill the void space created as the well material was removed. The PVC casing and screen were removed from well MW-11 because the outer protective casing of well MW-12D cemented into the concrete pad, making it immovable. Additionally, the PVC casing was cracked. Therefore, the outer protective casing and well casing to MW-12D were cut to ground level after the slurry was injected into the well up to ground surface, and a cement patch was placed over the abandoned well.

Following abandonment procedures, monitoring wells MW-8, MW-11, and MW-12D were re-installed following the original construction specifications for these wells established previously by others.

2.3 INSTALLATIONS AT NEW GROUNDWATER MONITORING LOCATIONS

On January 3 through 10, 2001, a total of three soil borings were drilled and two-inch diameter monitoring wells (MW-21 through MW-23) were installed at the locations shown on Figure 2.1. The wells were installed to replace three previous direct push monitoring points (GP-6, GP-16, and GP-17) that had been plugged and covered with soil. The wells were installed between the former location of the pumphouse and concrete pad, between the concrete pad and bermed area, and near the location of GP-6. Prior to advancing each boring, equipment coming into contact with the subsurface was thoroughly decontaminated by steam cleaning. The borings were advanced to a maximum depth of 18 feet. Drilling was conducted using hollow-stem auger and continuous split-spoon sampling techniques in accordance with the approved work plan and ASTM Standard D-1586.

All soil samples were logged in the field by an experienced Parsons geologist. All soil samples retrieved from the borings were visually inspected for signs of staining and screened for the presence of hydrocarbon odors and the evolution of organic vapors with a photoionization detector (PID). No soil samples were collected for chemical analysis during drilling activities.

The monitoring wells were constructed of 2-inch inside diameter, flush-joint, Schedule 40 PVC well screen and casing. The final depth of the borings and screened intervals was determined in the field based upon the data collected at the time the monitoring wells were drilled. The monitoring wells were approximately 18 feet deep and were completed with 10 feet of 0.010-inch slot size well screen. The well screens were positioned to straddle the water table to account for seasonal groundwater fluctuations. The assembled well pipes were installed through the augers and a quartzite sand, of a size compatible with the well screen slot size, was backfilled through the annulus between the well pipe and the auger. The sand pack was placed to extend at least two feet above the top of the well screen. Above the sand pack, bentonite pellets were backfilled to form a minimum two-foot thick seal. A cement/bentonite grout was backfilled from the top of the bentonite seal to ground surface. The PVC casing was completed with a vented locking cap and covered by a flush-mounted steel protective curb box. The protective curb box was grouted into place to limit disturbance to the PVC well pipe. Monitoring well construction details are included on the drilling logs in Appendix A.

After the wells were installed, each well was developed by utilizing dedicated, disposable polyurethane tubing and a Waterra Hydrolift® internal pump equipped with a one-inch foot valve and a 1.875-inch surge block. Removal of water continued until the monitoring wells produced clean, sediment-free samples.

After the wells were installed, groundwater was allowed to reach static conditions. Water levels were taken approximately 24 to 48 hours after the monitoring wells were installed using an electric contact probe. The depth to water was measured from the top edge of the PVC casing. All well locations, including pre-existing wells, were then surveyed and tied to a common, permanent reference datum (U.S. Geological Survey benchmark). Surveying activities were performed by C.T. Male, Inc. of Syracuse, New York, a New York State-licensed surveyor. At each location, the surveyor determined the elevation of the top of the PVC well casing, and the ground surface elevation to within 0.01 foot. The top of the PVC casing was also marked with a permanent marker inside the curb box at the point surveyed so that any future groundwater monitoring events would be based on the same reference elevations.

Based on groundwater table measurements collected on January 23, 2001, and elevation survey data, the groundwater flow direction was determined to be the south to southeast under a approximate hydraulic gradient of 0.006 foot/foot. Depth to groundwater at the site ranged from seven to 12.5 feet below ground surface. A summary of groundwater elevation data is provided in Table 2.1, and groundwater elevations are provided as Figure 2.2.

Investigation-derived waste materials, including soil cuttings, development water, and decontamination water were spread on the ground within the former pumphouse location (Site 15), as instructed by Mr. Tim Sager (Project Engineer for the 174th Fighter Wing). Mr. Sager obtained permission from Mr. Marsden Chen of the NYSDEC prior to spreading the waste materials.

LNAPL Level Measurements

A minimum of three rounds of LNAPL measurements were obtained from the newly-installed monitoring wells, as well as pre-existing monitoring well MW-6S, between January 5, 2001 through April 6, 2001. Measurements were obtained using an electronic interface probe. During each round, no LNAPL was detected in any of the newly-installed or pre-existing monitoring wells. As a result, no baildown testing and no analyses of product could be conducted.

Not seeing LNAPL in late 2000 and early 2001 was unexpected after others noticed LNAPL in 1999. However, 1999 was a moderate drought year and 2000 was a moderately wet year. Rising and falling of the water table over time can spread residual LNAPL over a vertical zone and strand the LNAPL as small blebs and stringers.

When the water table rises, groundwater may displace oil from some pore spaces, and maintain an LNAPL layer. Some oil will remain stranded in small blebs and stringers, cut-off from the continuous oil phase. However, if the volume of LNAPL is small, then practically all of the LNAPL can become stranded and the LNAPL is no longer observed in the monitoring wells. Furthermore, the constant rise and fall of the water table will spread the residual oil over a smear zone. When the water table is low, the residual oil in the vadose zone will be subject to volatilization, and aerobic degradation. Accordingly, over time, the volume of free LNAPL can be reduced.

2.4 NATURAL ATTENUATION PARAMETERS MONITORED WITHIN SITE GROUNDWATER

On January 23 through 28, 2001, 17 site monitoring wells were sampled (MW-1, MW-2, MW-4, MW-5R, MW-8, MW-9, MW-11, MW-12S, MW-12D, MW-13, MW-14, MW-15, MW-16, MW-17, MW-18, MW-19, and MW-20). The wells are located upgradient, within, and downgradient of the known area of groundwater contamination. Monitoring well locations are shown in Figure 2.1.

The monitoring wells were sampled in order from the anticipated least contaminated to the most contaminated. The wells were inspected for integrity-water levels were measured, and groundwater was sampled. The samples were preserved and delivered to the laboratory for analysis in accordance with the procedures specified in the Field Sampling Plan portion of the approved work plan (Parsons, December, 2000).

Groundwater samples from these 17 monitoring wells were analyzed for benzene, toluene, ethylbenzene, and xylenes using USEPA Method 8260, and for indicators of natural attenuation. Temperature, turbidity, pH, conductivity, dissolved oxygen, alkalinity, carbon dioxide, calcium carbonate, ferrous iron, and oxidation-reduction potential were analyzed with field techniques at the site. Nitrate, sulfate, total iron, total organic carbon (TOC), ethane, ethene, and methane were analyzed by off-site laboratories. A summary of natural attenuation parameters results obtained at the site using field techniques is presented on Table 2.2. Laboratory analyses were conducted by Life Science Laboratories of East Syracuse, NY with the exception of methane, ethane, and ethene analyses, which were conducted by OBG Laboratories of East Syracuse, NY.

2.5 PCB SAMPLING

As part of the groundwater sampling activities, groundwater from a total of six monitoring wells (MW-8, MW-12S, MW-12D, MW-16, MW-17 and MW-19) were sampled for PCBs and analyzed using EPA Method 8082. Groundwater from these wells was analyzed for PCBs to further assess whether the lateral extent of PCBs detected in previous site investigations had increased. PCB analyses of groundwater samples were conducted by Galson Laboratories of East Syracuse, NY.

2.6 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

Samples

Field duplicate and matrix spike/matrix spike duplicate (MS/MSD) samples were collected to obtain laboratory QA/QC data that could be used to evaluate the field sampling procedures and laboratory methods. Field duplicates and MS/MSD samples were submitted at a rate of one per 20 field samples submitted, or one per seven days, whichever was more frequent. Field duplicates and MS/MSD samples were analyzed for the same list of parameters as the corresponding field samples.

Equipment blanks were prepared and submitted for analysis to assess the effectiveness of decontamination procedures. Equipment blanks were prepared by pouring laboratory-supplied analyte-free water over decontaminated sampling equipment, and were submitted for each type of sampling equipment used (split-spoon, stainless steel bowl, and polypropylene bailer). The equipment blanks were analyzed for the same list of parameters as the corresponding field samples.

Laboratory-prepared trip blanks, consisting of 40-milliliter vials containing analyte-free water, accompanied the sample containers for volatile analyses during shipment from and back to the laboratory. The trip blanks were analyzed for benzene, toluene, ethylbenzene, and xylenes to confirm that cross-contamination did not occur during sample shipment. Chain-of-custody records and custody seals were used to ensure that sample integrity was not compromised during all sample shipments.

Data Validation

As specified in the work plan, laboratory analytical data were validated by a NYSDEC-approved data validator in accordance with data validation guidelines presented in the quality assurance portion of the work plan. Data qualifiers were adjusted in accordance with the data validator's recommendations. The data usability report (see Appendix B) presents the data validation results and assessment associated with this investigation.

2.7 LABORATORY ANALYTICAL RESULTS

Twenty surface soil and seventeen groundwater samples were submitted for laboratory analysis as part of this investigation. The analytical results are summarized in Tables 2.3, and 2.4 and graphically depicted in Figures 2.3 and 2.4. Historical groundwater analytical data are also provided in Figure 2.4 as a comparison with the most recent (2001) results.

Detailed analytical results generated during this investigation were stored and managed by Parsons ES using Paradox™ database software. Analytical results were provided by the laboratory on diskettes and imported directly into the database. The results were subsequently adjusted to reflect any changes resulting from data validation results. Detailed laboratory results include laboratory reporting limits for each analyzed compound as presented in tables within Appendix B.

Soil Results

PCBs were detected in 19 of the 20 soil samples collected during the Data Gap Investigation. Concentrations of PCBs within the soil ranged from 28 micrograms per kilogram (ug/kg or parts per billion) at SS-01 (0 to 1 foot) and SS-15 (0 to 1 foot)) to 1,600 µg/kg, or 1.6 parts per million, at SS-19 (0 to 1 foot). The downstream extent of surface soil exceeding one part per million PCBs in the drainage swale west of the concrete pad has not yet been determined.

Groundwater Results

BTEXs were detected in 7 of the 17 groundwater samples collected during this Data Gap Investigation. Benzene concentrations ranged from not detected to 93 micrograms per liter (parts per billion) at MW-12S. Total BTEX concentrations ranged from none detected to 2,186 parts per billion (also at MW-12S). No PCBs were detected in groundwater samples.

2.8 NATURAL ATTENUATION EVALUATION WITHIN SITE GROUNDWATER

The four processes occurring in the subsurface that affect movement of BTEX are solubility, adherence to soil particles (called sorption), volatilization, and biodegradation. BTEX in the subsurface can solubilize, adhere to soil particles, and volatilize independent of chemistry within the subsurface. However biodegradation, which can be a significant process reducing concentrations of BTEX moving with groundwater, may or may not be taking place within the subsurface at Site 15 depending on subsurface chemistry conditions. With this investigation, sufficient data now exist to conclude that BTEX compounds are biodegrading in saturated soils and groundwater at the Hancock Site 15 via oxygen reduction, nitrate reduction, ferric iron reduction, sulfate reduction, and methanogensis. Most of the wells within the plume where groundwater was analyzed as part of this data gap investigation show biodegradation is likely occurring. Therefore, biodegradation is likely a significant reason the plume size is shrinking over time.

Solubility is a term for the mechanism by which the compound leaches from a source, dissolves into, and migrates with groundwater. BTEX compounds are soluble to extents that greatly exceed groundwater quality standards.

BTEX compounds are moderately able to adhere to soil particles. Benzene does not sorb readily to soil and is therefore considered the most mobile of the BTEX compounds. Adherence to soil particles (sorption) occurs most readily in soil with high organic carbon content and soil that is fine-grained. The organic carbon content of the soil at Site 15 is approximately 475 mg/kg or less than 0.1 percent (Environmental Management and

Enrichment Facilities, 1997). Site soils are primarily silty clay for the top 8 to 10 feet and fine to medium silty sand below the silty clay layer. Given these soil characteristics, some attenuation of BTEX movement in site groundwater could be occurring due to sorption.

Volatilization generally can be neglected when assessing natural attenuation. Chiang et al. (1989) demonstrated that less than five percent of the mass of dissolved BTEX is lost to volatilization in saturated groundwater. Therefore, volatilization is not considered a significant mass transport mechanism in the Site 15 subsurface.

Documenting and distinguishing the effects of destructive attenuation processes, such as biodegradation, is important in evaluating the potential for natural attenuation. The effectiveness of destructive attenuation processes at reducing BTEX at a site depends on whether the site is characterized by physical, chemical, and biological conditions favorable to such processes. Numerous laboratory and field studies have shown that hydrocarbon-degrading bacteria can participate in the degradation of many of the chemical components of petroleum fuels, including the BTEX compounds, under both aerobic and anaerobic conditions. Biodegradation of fuel hydrocarbons will occur when an indigenous population of hydrocarbon-degrading microorganisms is present in the soil and groundwater, and when sufficient concentrations of electron acceptors and nutrients, including fuel hydrocarbons, are available to these organisms. Soils and groundwater with a history of exposure to BTEX compounds generally contain microbial populations that are able to support biodegradation reactions.

Geochemical Indicators of BTEX Biodegradation

Reductions in the concentrations of certain compounds or elements that are used by microorganisms to facilitate the oxidation of BTEX compounds within groundwater are an indication that contaminants are biodegrading (Table 2.6).

In evaluating geochemical indicators, it is necessary to evaluate analyte levels in the plume to a baseline as measured at a background location, typically upgradient from Site 15. Monitoring wells MW-2, MW-4, MW-8, MW-9, MW-11, MW-12S, MW-13, MW-14, MW-15, MW-16, MW-17, MW-19, and MW-20 were analyzed as possible plume wells. Wells MW-1, MW-5R, and MW-18 are all upgradient from the site (see Figure 2.1), therefore they were selected as background wells.

Figure 2.5 illustrates the sequence of microbially-mediated processes based on the amount of free energy released for microbial use. In general, reactions yielding more energy tend to take precedence over processes that yield less energy. As Figure 2.5 shows, oxygen reduction would be expected to occur in an aerobic environment with microorganisms capable of using oxygen, because oxygen reduction yields significant energy. If the available oxygen is depleted and anaerobic conditions dominate the interior regions of the BTEX plume, anaerobic microorganisms can utilize other electron acceptors in the following order of preference: nitrate, manganese, ferric iron, sulfate, and finally carbon dioxide. The expected sequence of these processes is also a function of the oxidizing potential of the groundwater. The oxidizing potential can be measured at the site as a crude indicator of which reactions may be taking place. This field measurement can then be expressed as pe, which is the hypothetical measure of the electron activity associated with a specific oxidizing potential. High pe means that the solution or redox couple has a relatively high oxidizing potential.

Microorganisms can only facilitate the biodegradation (oxidation) of the BTEX compounds based on reactions that have a higher oxidizing potential than the BTEX. Nitrate, oxygen, manganese, ferric iron, sulfate, and carbon dioxide all have higher oxidizing potentials than the BTEX compounds. This is why these electron acceptors can be used to oxidize the BTEX compounds (Stumm and Morgan, 1981).

Figure 2.5 shows the range of oxidizing potential in the groundwater at the Hancock Site 15, based on oxidizing potential measurements (converted to dimensionless pe values). These data imply that oxygen, nitrate, manganese, ferric iron, and possibly, sulfate may be used to biodegrade BTEX at Site 15. However, field experience at other sites has shown that the oxidizing potential probes used for field measurement are not sensitive to all reactions taking place, so reactions beyond those indicated by oxidizing potential measurement alone may be occurring.

Dissolved oxygen (DO) concentrations were measured at 17 permanent wells, including the designated background and possible plume wells. The average DO level for the background wells was 4.91 mg/L. Possible plume wells with oxygen levels significantly lower than those in the background wells include MW-2, MW-9, MW-12S, MW-14, and MW-20 (see Table 2.7). The average DO in these wells is 0.33 mg/L. Low concentrations of oxygen in site groundwater as compared with background levels indicate that oxygen is functioning as an electron acceptor during microbially-mediated degradation of fuel hydrocarbons. Use of this electron acceptor during microbial degradation of the BTEX compounds is consistent with the measured oxidation potential at the site (see Figure 2.5).

Once anaerobic conditions prevail in the groundwater, nitrate can be used as an electron acceptor by microorganisms to biodegrade BTEX compounds via either denitrification or nitrate reduction processes. However, nitrate can only function as an electron acceptor if the groundwater system has been depleted of oxygen. The average nitrate level detected in the representative background monitoring wells at Site 15 was 1.07 mg/L. Nitrate levels are depressed in all the possible plume wells with the exception of MW-9 (Table 2.2 and Appendix C) in relation to background levels. The average nitrate concentration in these wells was 0.19 mg/L. The low concentrations of nitrate in contaminated groundwater as compared with background levels indicate that nitrate is functioning as an electron acceptor during microbially-mediated degradation of fuel hydrocarbons.

Although relatively little is known about the anaerobic metabolic pathways involving the reduction of ferric iron to ferrous iron (Fe^{2+}), this process has been shown to be a major metabolic pathway for some microorganisms (Lovley and Phillips, 1988; Chapelle, 1993). The average ferrous iron level detected in the representative background monitoring wells was 0.33 mg/L. Possible plume wells with ferrous iron levels significantly higher than the concentrations detected in background wells include MW-2, MW-11, MW-12S, MW-14, MW-15, MW-17, MW-19, and MW-20 (see Table 2.7). The average ferrous iron concentration in these wells was 4.83 mg/L. A correlation between elevated total dissolved hydrocarbon concentrations in the plume and elevated ferrous iron concentration suggests that the iron-reducing microorganisms are using ferric iron to oxidize the contaminants. Because the reduction of ferric iron cannot proceed without microbial intervention, the elevated concentrations of ferrous iron that were measured in contaminated groundwater at the Hancock Site 15 are strong indicators of microbial activity.

Sulfate also may be used as an electron acceptor during microbial degradation of fuel hydrocarbons under anaerobic conditions. The presence of decreased concentrations of sulfate in an area of elevated BTEX relative to background concentrations indicates that sulfate may be participating in redox reactions at a site. The average sulfate level detected in the representative background monitoring wells was 25 mg/L. Site wells with groundwater containing sulfate levels significantly lower than the concentrations detected in groundwater from background wells include MW-2, MW-19, and MW-20 (see Table 2.7). The average sulfate concentration in these wells was 7 mg/L. The low concentrations of sulfate in groundwater at those wells as compared with background levels indicate that sulfate is not functioning as an electron acceptor during microbially-mediated degradation of fuel hydrocarbons.

The presence of methane in groundwater at elevated concentrations relative to background concentrations is a good indicator of methane fermentation. The average methane level detected in the representative background monitoring wells was 0.01 mg/L. Site wells with methane levels significantly higher than the concentrations detected in background wells include MW-2, MW-12S, and MW-19 (Table 2.2 and Appendix C). The average methane concentration in these wells was 5 mg/L. The high levels of methane in site groundwater compared to background levels indicate that methane fermentation is occurring. However, the measured oxidizing potential of groundwater at Site 15 does not correlate with the analytical data for methane. Oxidizing potentials measured at the Hancock Site 15 do not suggest that methane fermentation is occurring. Many authors have noted that measured oxidizing potential data cannot be used alone to reliably predict the electron acceptors that may be operating at a site. Measurements of oxidizing potential cannot accurately distinguish between different processes, such as iron reduction and sulfate reduction. Integrating oxidizing potential measurements with analytical data on reduced and oxidized chemical species provides a more thorough and reasonable interpretation of which electron acceptors are being used to biodegrade site contaminants.

In general, as the amount of total dissolved BTEX that is being oxidized increases, the total alkalinity increases. This is expected because the microbially-mediated reactions causing biodegradation of fuel hydrocarbons produce carbon dioxide. An increase in alkalinity (measured as $CaCO_3$) in an area with elevated BTEX concentrations compared to background conditions can be used to infer the amount of petroleum hydrocarbon destroyed through aerobic respiration, denitrification, iron reduction, and sulfate reduction. The average calcium carbonate level detected in the representative background monitoring wells was 320 mg/L. Site monitoring wells with calcium carbonate levels significantly higher than the concentrations detected in background wells include MW-2, MW-12S, MW-14, MW-19, and MW-20 (see Table 2.7 and Appendix C).

BTEX Loss Over Time As An Indicator

Another line of evidence evaluated to determine whether BTEX compounds are biodegrading in groundwater at the Hancock Site 15 is based on an evaluation of available analytical data collected during various site sampling events starting in 1995. Changes in the nature and extent of contamination at a site over time and distance that cannot be explained by physical processes are a direct indication that BTEX is biodegrading at a site. BTEX results for site groundwater over time are shown in Figure 2.4. Groundwater concentrations of BTEX show decreasing concentrations over time with the exception of MW-11 and MW-2. Verified decreases in groundwater BTEX levels over time indicate that natural attenuation of BTEX contaminants is occurring at the Site 15. These data do not differentiate between effects due to destructive processes (i.e. biodegradation) from those due to nondestructive processes.

Figure 2.5
Sequence of Microbially-
Mediated Redox Processes

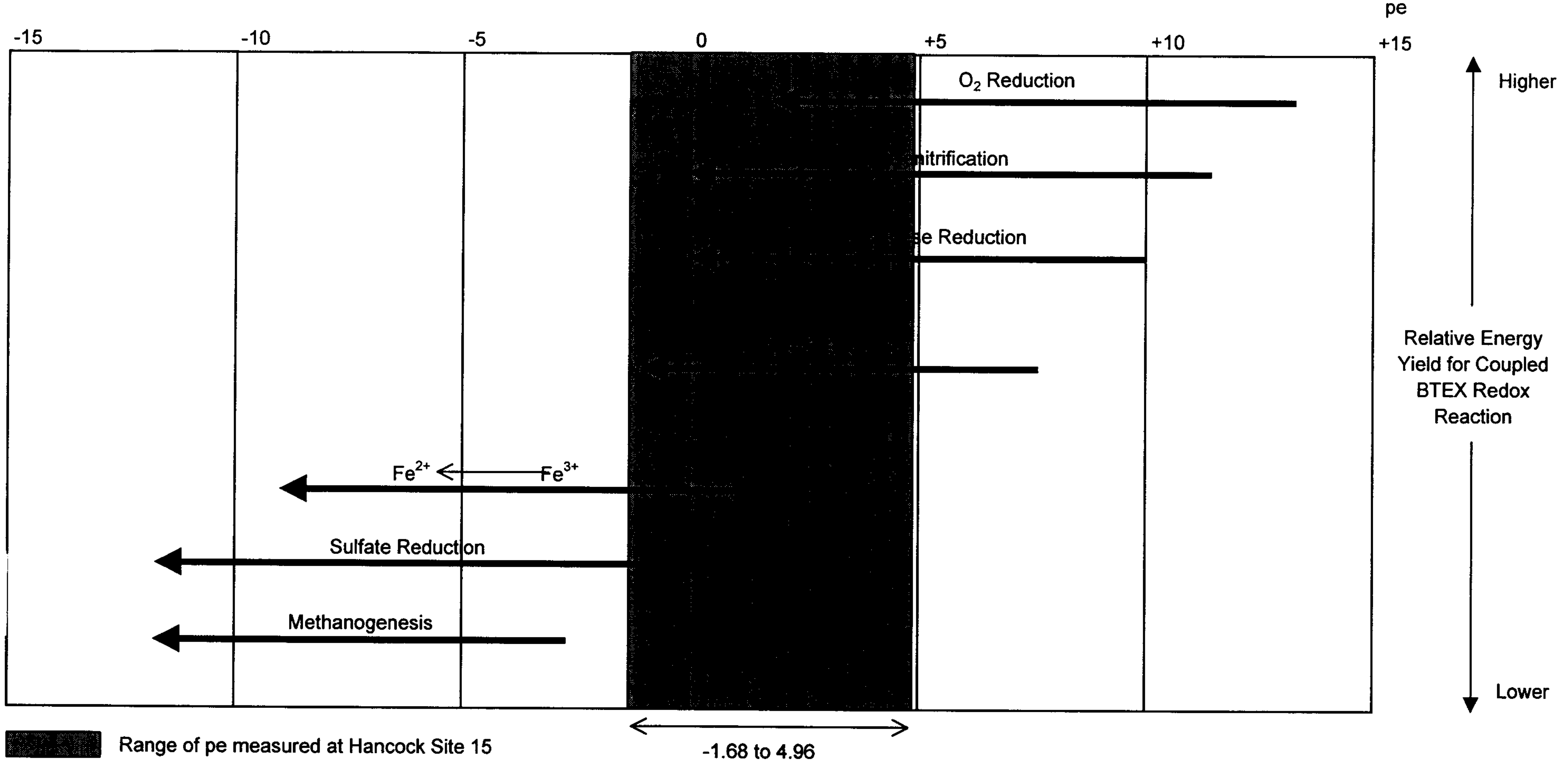


TABLE 2.1
AIR NATIONAL GUARD
HANCOCK AIRFIELD
SITE 15
GROUNDWATER ELEVATION SUMMARY
JANUARY 23, 2001

Well ID	TOC* Elevation (feet)	Depth to Liquid (Feet below TOC)	Depth to Water (Feet below TOC)	Groundwater Elevation (Feet)	Product Thickness
MW-1	NM	8.38	8.38	NM	0
MW-2	399.45	9.40	9.40	390.05	0
MW-3	399.91	9.34	9.34	390.57	0
MW-4	399.80	8.80	8.80	391.00	0
MW-5R	400.36	7.00	7.00	393.36	0
MW-6S	400.62	9.48	9.48	391.14	0
MW-6D	400.28	9.40	9.40	390.88	0
MW-8	398.00	8.83	8.83	389.17	0
MW-9	396.15	6.80	6.80	389.35	0
MW-10**	NM	NM	NM	NM	0
MW-11	399.69	9.76	9.76	389.93	0
MW-12S	400.22	10.54	10.54	389.68	0
MW-12D	398.15	8.44	8.44	389.71	0
MW-13	400.89	10.22	10.22	390.67	0
MW-14	402.92	12.70	12.70	390.22	0
MW-15	402.17	12.72	12.72	389.45	0
MW-16	402.18	12.48	12.48	389.70	0
MW-17	400.33	11.24	11.24	389.09	0
MW-18	400.10	7.04	7.04	393.06	0
MW-19	396.35	7.76	7.76	388.59	0
MW-20	397.81	8.66	8.66	389.15	0
MW-21	402.17	10.31	10.31	391.86	0
MW-22	401.11	9.70	9.70	391.41	0
MW-23	399.93	9.37	9.37	390.56	0
RW-1	400.11	10.40	10.40	389.71	0

NOTES:

TOC - Top of Casing
NM - Not Measured
* Elevations derived from survey map generated by C.T. Male, Inc. (January 2001)
** Monitoring well MW-10 buried under piles of dirt. Not accessible.

TABLE 2.2
AIR NATIONAL GUARD
HANCOCK AIRFIELD
SITE 15
RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
JANUARY 2001

Natural Attenuation Field Parameter*	**units**	**Monitoring Well No. MW-1**								
Time	-	8:36	8:52	8:55	9:00	9:05	9:10	9:20	9:25	9:30
pH	-	7.14	7.27	7.27	7.30	7.31	7.30	7.34	7.35	7.35
Specific Conductivity	ms/cm	0.662	0.701	0.701	0.704	0.700	0.709	0.714	0.718	0.729
Dissolved Oxygen	mg/L	4.99	3.11	3.80	3.36	3.16	3.20	2.35	0.24	0.00
Turbidity	NTU	2.8	0.1	0	0.6	-0.4	-0.4	-0.5	-0.5	-0.6
Temperature	°C	7.5	7.6	7.6	7.9	7.8	7.9	8.0	8.3	8.3
Redox Potential	MV	190	62	58	38	37	40	36	21	22
Phenolphthalien Alkalinity	mg/L	-	-	-	-	-	-	-	-	-
Carbon Dioxide	mg/L	-	-	-	-	-	-	-	-	-
Ferrous Iron	mg/L	-	-	-	-	-	-	-	-	-
Calcium Carbonate	mg/L	-	-	-	-	-	-	-	-	-

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC, Nitrate, and Sulfate results. Specified natural attenuation parameters analyzed by laboratory.

TABLE 2.2
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RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
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Natural Attenuation Field Parameter*	**units**	**Monitoring Well No. MW-1 (continued)**				
Time	-	9:35	9:40	9:45	9:50	-
pH	-	7.36	7.37	7.38	7.39	-
Specific Conductivity	ms/cm	0.742	0.751	0.777	0.776	-
Dissolved Oxygen	mg/L	0.00	0.00	0.00	0.00	-
Turbidity	NTU	-0.7	-0.8	-0.6	-0.7	-
Temperature	°C	8.3	8.5	8.5	8.7	-
Redox Potential	MV	10	19	23	30	-
Phenolphthalien Alkalinity	mg/L	-	-	-	-	0
Carbon Dioxide	mg/L	-	-	-	-	50
Ferrous Iron	mg/L	-	-	-	-	0.2
Calcium Carbonate	mg/L	-	-	-	-	340

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC, Nitrate, and Sulfate results. Specified natural attenuation parameters analyzed by laboratory.

TABLE 2.2
AIR NATIONAL GUARD
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RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
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Natural Attenuation Field Parameter*	**units**	**Monitoring Well No. MW-2**							
Time	-	10:50	10:55	11:05	11:10	11:15	11:20	11:25	11:30
pH	-	7.31	7.41	7.55	7.55	7.54	7.52	7.53	7.54
Specific Conductivity	ms/cm	0.543	0.574	0.828	0.864	0.865	0.885	0.885	0.887
Dissolved Oxygen	mg/L	0.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Turbidity	NTU	0.16	0.8	-0.4	-0.4	-0.4	-0.2	-0.3	-0.2
Temperature	°C	8.8	8.8	9.0	9.2	9.2	9.2	9.2	9.3
Redox Potential	MV	140	-47	-103	-108	-109	-113	-113	-114
Phenolphthalien Alkalinity	mg/L	-	-	-	-	-	-	-	-
Carbon Dioxide	mg/L	-	-	-	-	-	-	-	-
Ferrous Iron	mg/L	-	-	-	-	-	-	-	-
Calcium Carbonate	mg/L	-	-	-	-	-	-	-	-

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC, Nitrate, and Sulfate results. Specified natural attenuation parameters analyzed by laboratory.

TABLE 2.2
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RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
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Natural Attenuation Field Parameter*	**units**	**Monitoring Well No. MW-2 (continued)**		
Time	-	11:35	11:40	-
pH	-	7.53	7.53	-
Specific Conductivity	ms/cm	0.892	0.895	-
Dissolved Oxygen	mg/L	0.00	0.00	-
Turbidity	NTU	-0.2	-0.1	-
Temperature	°C	9.3	9.4	-
Redox Potential	MV	-116	-117	-
Phenolphthalien Alkalinity	mg/L	-	-	0
Carbon Dioxide	mg/L	-	-	30
Ferrous Iron	mg/L	-	-	5.4
Calcium Carbonate	mg/L	-	-	380

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC, Nitrate, and Sulfate results.
Specified natural attenuation parameters analyzed by laboratory.

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RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
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Natural Attenuation Field Parameter*	units	Monitoring Well No. MW-4									
Time	-	9:35	9:40	9:45	9:55	10:00	10:05	10:15	10:20	10:25	10:30
pH	-	6.73	6.73	6.78	6.82	6.85	6.90	6.94	6.96	6.97	6.99
Specific Conductivity	ms/cm	0.532	0.536	0.562	0.584	0.600	0.637	0.667	0.686	0.700	0.720
Dissolved Oxygen	mg/L	10.53	10.39	10.41	10.45	10.44	10.45	10.44	10.50	10.55	10.45
Turbidity	NTU	41.7	43.3	21.0	2.0	7.8	9.2	10.0	20.2	21.2	25.2
Temperature	°C	9.0	8.9	8.8	8.8	9.0	9.0	9.2	9.1	9.1	9.2
Redox Potential	MV	179	152	98	30	11	-9	-20	-27	-32	-32
Phenolphthalien Alkalinity	mg/L	-	-	-	-	-	-	-	-	-	-
Carbon Dioxide	mg/L	-	-	-	-	-	-	-	-	-	-
Ferrous Iron	mg/L	-	-	-	-	-	-	-	-	-	-
Calcium Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC, Nitrate, and Sulfate results. Specified natural attenuation parameters analyzed by laboratory.

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RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
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Natural Attenuation Field Parameter*	**units**	**Monitoring Well No. MW-4 (continued)**						
Time	-	10:35	10:45	10:50	10:55	11:00	11:10	-
pH	-	7.00	7.00	7.01	7.01	7.02	7.01	-
Specific Conductivity	ms/cm	0.730	0.754	0.755	0.756	0.757	0.756	-
Dissolved Oxygen	mg/L	10.24	10.45	10.48	10.38	10.40	10.41	-
Turbidity	NTU	17.2	21.0	22.2	20.2	15.2	16.8	-
Temperature	°C	9.2	9.6	9.6	9.6	9.7	9.7	-
Redox Potential	MV	-33	-34	-33	-34	-34	-33	-
Phenolphthalien Alkalinity	mg/L	-	-	-	-	-	-	0
Carbon Dioxide	mg/L	-	-	-	-	-	-	80
Ferrous Iron	mg/L	-	-	-	-	-	-	1.2
Calcium Carbonate	mg/L	-	-	-	-	-	-	340

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC, Nitrate, and Sulfate results. Specified natural attenuation parameters analyzed by laboratory.

TABLE 2.2
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RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
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Natural Attenuation Field Parameter*	**units**	**Monitoring Well No. MW-5R**									
Time	-	14:19	14:30	14:35	14:40	14:45	14:55	15:00	15:05	15:10	15:15
pH	-	7.06	7.08	7.10	7.12	7.16	7.15	7.16	7.16	7.16	7.16
Specific Conductivity	ms/cm	0.553	0.610	0.518	0.622	0.637	0.644	0.632	0.636	0.619	0.634
Dissolved Oxygen	mg/L	13.26	12.96	13.04	13.01	12.76	12.32	12.21	12.05	12.34	11.92
Turbidity	NTU	670	335	260	126	80.8	299	155	61.0	57.1	39.4
Temperature	°C	8.8	8.9	8.9	8.9	9.0	8.9	8.3	8.6	8.5	8.6
Redox Potential	MV	235	217	210	205	188	183	177	173	170	167
Phenolphthalien Alkalinity	mg/L	-	-	-	-	-	-	-	-	-	-
Carbon Dioxide	mg/L	-	-	-	-	-	-	-	-	-	-
Ferrous Iron	mg/L	-	-	-	-	-	-	-	-	-	-
Calcium Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC, Nitrate, and Sulfate results.
Specified natural attenuation parameters analyzed by laboratory.

TABLE 2.2
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RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
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Natural Attenuation Field Parameter*	**units**	**Monitoring Well No. MW-5R (continued)**									
Time	-	15:20	15:25	15:30	15:35	15:40	15:45	15:50	15:55	16:00	16:05
pH	-	7.17	7.17	7.18	7.18	7.19	7.19	7.19	7.19	7.19	7.20
Specific Conductivity	ms/cm	0.629	0.626	0.624	0.622	0.621	0.624	0.624	0.624	0.623	0.620
Dissolved Oxygen	mg/L	11.97	11.78	11.50	11.22	10.85	10.82	10.64	10.47	10.31	10.04
Turbidity	NTU	37.7	30.8	51.1	23.9	37.6	11.6	20.0	5.1	2.7	84.4
Temperature	°C	8.6	8.6	8.6	8.5	8.5	8.5	8.5	8.5	8.6	8.8
Redox Potential	MV	166	165	164	163	163	162	162	163	163	163
Phenolphthalien Alkalinity	mg/L	-	-	-	-	-	-	-	-	-	-
Carbon Dioxide	mg/L	-	-	-	-	-	-	-	-	-	-
Ferrous Iron	mg/L	-	-	-	-	-	-	-	-	-	-
Calcium Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC, Nitrate, and Sulfate results. Specified natural attenuation parameters analyzed by laboratory.

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RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
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Natural Attenuation Field Parameter*	**units**	**Monitoring Well No. MW-5R (continued)**								
Time	-	16:10	16:15	16:20	16:25	16:30	16:35	16:40	16:45	-
pH	-	7.21	7.21	7.22	7.22	7.23	7.23	7.24	7.24	-
Specific Conductivity	ms/cm	0.620	0.627	0.627	0.621	0.613	0.619	0.617	0.621	-
Dissolved Oxygen	mg/L	10.12	12.26	12.27	11.44	10.32	12.66	12.24	12.45	-
Turbidity	NTU	93.2	92.0	98.1	80.1	81.1	70.0	75.0	80.0	-
Temperature	°C	8.9	9.0	9.0	9.0	9.1	9.2	9.3	9.3	-
Redox Potential	MV	163	163	163	164	164	165	165	165	-
Phenolphthalien Alkalinity	mg/L	-	-	-	-	-	-	-	-	0
Carbon Dioxide	mg/L	-	-	-	-	-	-	-	-	80
Ferrous Iron	mg/L	-	-	-	-	-	-	-	-	0.4
Calcium Carbonate	mg/L	-	-	-	-	-	-	-	-	260

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC, Nitrate, and Sulfate results. Specified natural attenuation parameters analyzed by laboratory.

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RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
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Natural Attenuation Field Parameter*	**units**	**Monitoring Well No. MW-8**								
Time	-	9:10	9:15	9:20	9:25	9:30	9:35	9:40	9:45	9:50
pH	-	6.77	6.68	6.59	6.65	6.63	6.63	6.64	6.68	6.70
Specific Conductivity	ms/cm	1.09	1.03	0.940	0.935	0.925	0.922	0.922	0.917	0.919
Dissolved Oxygen	mg/L	9.16	9.60	9.22	8.91	3.54	10.30	6.51	6.51	9.64
Turbidity	NTU	1.2	-8.0	-10.0	312.0	-10.0	-7.1	-5.1	341.0	-10.0
Temperature	°C	9.0	9.0	9.0	9.1	9.1	9.2	9.2	9.1	9.1
Redox Potential	MV	44	53	54	53	50	45	42	40	43
Phenolphthalien Alkalinity	mg/L	-	-	-	-	-	-	-	-	-
Carbon Dioxide	mg/L	-	-	-	-	-	-	-	-	-
Ferrous Iron	mg/L	-	-	-	-	-	-	-	-	-
Calcium Carbonate	mg/L	-	-	-	-	-	-	-	-	-

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC, Nitrate, and Sulfate results.
Specified natural attenuation parameters analyzed by laboratory.

TABLE 2.2
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RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
JANUARY 2001

Natural Attenuation Field Parameter*	units	Monitoring Well No. MW-8 (continued)				
Time	-	9:55	10:00	10:05	10:10	-
pH	-	6.74	6.77	6.78	6.79	-
Specific Conductivity	ms/cm	0.914	0.917	0.914	0.910	-
Dissolved Oxygen	mg/L	8.90	8.84	8.93	8.87	-
Turbidity	NTU	-10.0	60.1	65.1	-10.0	-
Temperature	°C	9.0	9.1	9.1	9.1	-
Redox Potential	MV	45	42	40	38	-
Phenolphthalien Alkalinity	mg/L	-	-	-	-	0
Carbon Dioxide	mg/L	-	-	-	-	60
Ferrous Iron	mg/L	-	-	-	-	0.6
Calcium Carbonate	mg/L	-	-	-	-	320

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC, Nitrate, and Sulfate results. Specified natural attenuation parameters analyzed by laboratory.

TABLE 2.2
AIR NATIONAL GUARD
HANCOCK AIRFIELD
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RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
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Natural Attenuation Field Parameter*	**units**	**Monitoring Well No. MW-9**								
Time	-	9:30	9:35	9:40	9:45	9:50	9:55	10:05	10:10	-
pH	-	6.24	6.28	6.35	6.41	6.48	7.00	6.54	6.50	-
Specific Conductivity	ms/cm	6.01	5.88	5.81	6.10	6.50	6.65	6.51	6.78	-
Dissolved Oxygen	mg/L	1.03	0.00	0.49	0.00	0.00	0.00	0.80	0.81	-
Turbidity	NTU	4.2	7.3	7.0	4.1	2.7	1.3	3.5	3.2	-
Temperature	°C	6.3	6.1	6.2	6.6	6.8	6.8	7.5	6.4	-
Redox Potential	MV	102	102	99	97	94	92	92	92	-
Phenolphthalien Alkalinity	mg/L	-	-	-	-	-	-	-	-	0
Carbon Dioxide	mg/L	-	-	-	-	-	-	-	-	40
Ferrous Iron	mg/L	-	-	-	-	-	-	-	-	0.2
Calcium Carbonate	mg/L	-	-	-	-	-	-	-	-	140

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC, Nitrate, and Sulfate results. Specified natural attenuation parameters analyzed by laboratory.

TABLE 2.2
AIR NATIONAL GUARD
HANCOCK AIRFIELD
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RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
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Natural Attenuation Field Parameter*	**units**	**Monitoring Well No. MW-11**							
Time	-	13:40	13:45	13:50	13:55	14:00	14:05	14:10	14:15
pH	-	7.19	7.22	7.23	7.21	7.20	7.18	7.15	7.13
Specific Conductivity	ms/cm	1.07	1.08	1.08	1.08	1.08	1.06	1.07	1.08
Dissolved Oxygen	mg/L	10.82	11.58	11.12	10.58	10.72	10.87	11.22	11.41
Turbidity	NTU	166.0	131.0	124.0	105.0	82.0	69.4	23.9	11.6
Temperature	°C	8.4	7.8	7.5	7.3	8.2	8.5	8.8	8.6
Redox Potential	MV	-104	-102	-101	-95	-95	-97	-94	-95
Phenolphthalien Alkalinity	mg/L	-	-	-	-	-	-	-	-
Carbon Dioxide	mg/L	-	-	-	-	-	-	-	-
Ferrous Iron	mg/L	-	-	-	-	-	-	-	-
Calcium Carbonate	mg/L	-	-	-	-	-	-	-	-

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC, Nitrate, and Sulfate results.

Specified natural attenuation parameters analyzed by laboratory.

TABLE 2.2
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RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
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Natural Attenuation Field Parameter*	units	Monitoring Well No. MW-12S							
Time	-	9:10	9:18	9:25	9:30	9:38	9:44	9:51	10:07
pH	-	6.91	6.94	6.95	6.94	6.95	6.97	7.03	7.17
Specific Conductivity	ms/cm	0.817	0.817	0.821	0.819	0.825	0.821	0.829	0.834
Dissolved Oxygen	mg/L	7.71	0.00	0.00	0.00	0.23	0.00	0.00	4.06
Turbidity	NTU	1.4	1.1	8.6	1.0	0.6	-1.4	-1.9	-2.2
Temperature	°C	8.8	8.8	8.9	9.0	8.8	8.9	8.9	9.0
Redox Potential	MV	27	33	35	37	39	40	40	34
Phenolphthalien Alkalinity	mg/L	-	-	-	-	-	-	-	-
Carbon Dioxide	mg/L	-	-	-	-	-	-	-	-
Ferrous Iron	mg/L	-	-	-	-	-	-	-	-
Calcium Carbonate	mg/L	-	-	-	-	-	-	-	-

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC, Nitrate, and Sulfate results. Specified natural attenuation parameters analyzed by laboratory.

TABLE 2.2
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HANCOCK AIRFIELD
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RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
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Natural Attenuation Field Parameter*	**units**	**Monitoring Well No. MW-12S (continued)**				
Time	-	10:12	10:16	10:26	10:35	-
pH	-	7.19	7.20	7.22	7.23	-
Specific Conductivity	ms/cm	0.837	0.836	0.839	0.836	-
Dissolved Oxygen	mg/L	2.34	0.00	0.00	0.00	-
Turbidity	NTU	-2.5	-2.5	-2.7	0.7	-
Temperature	°C	8.9	9.0	9.0	9.2	-
Redox Potential	MV	32	29	28	22	-
Phenolphthalien Alkalinity	mg/L	-	-	-	-	0
Carbon Dioxide	mg/L	-	-	-	-	110
Ferrous Iron	mg/L	-	-	-	-	5.6
Calcium Carbonate	mg/L	-	-	-	-	380

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC,
Nitrate, and Sulfate results.
Specified natural attenuation
parameters analyzed by laboratory.

TABLE 2.2
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RESULTS FROM GROUNDWATER FIELD MEASUREMENTS
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Natural Attenuation Field Parameter*	**units**	**Monitoring Well No. MW-12D**								
Time	-	12:15	12:45	12:53	13:00	13:05	13:13	13:20	13:30	13:38
pH	-	8.85	8.78	8.69	8.67	8.62	8.61	8.59	8.58	8.57
Specific Conductivity	ms/cm	0.448	0.446	0.447	0.447	0.446	0.450	0.453	0.452	0.454
Dissolved Oxygen	mg/L	2.56	8.15	7.09	6.07	0.93	0.15	0.00	0.00	5.24
Turbidity	NTU	1.8	2.6	2.7	3.5	3.7	4.7	4.8	4.4	5.5
Temperature	°C	9.3	9.1	9.3	9.1	9.2	9.2	9.2	9.2	9.2
Redox Potential	MV	-39	-27	-16	-7	-1	-1	-8	-15	-31
Phenolphthalien Alkalinity	mg/L	-	-	-	-	-	-	-	-	-
Carbon Dioxide	mg/L	-	-	-	-	-	-	-	-	-
Ferrous Iron	mg/L	-	-	-	-	-	-	-	-	-
Calcium Carbonate	mg/L	-	-	-	-	-	-	-	-	-

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC,
Nitrate, and Sulfate results.
Specified natural attenuation
parameters analyzed by laboratory.

TABLE 2.2
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RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
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Natural Attenuation Field Parameter*	units	Monitoring Well No. MW-12D (continued)									
Time	-	13:45	13:53	14:06	14:12	14:19	14:25	14:31	14:36	14:40	14:45
pH	-	8.56	8.58	8.58	8.57	8.56	8.56	8.55	8.55	8.55	8.55
Specific Conductivity	ms/cm	0.453	0.451	0.450	0.452	0.450	0.451	0.450	0.449	0.449	0.449
Dissolved Oxygen	mg/L	0.00	0.53	6.10	5.11	3.68	3.28	2.59	2.24	1.82	1.40
Turbidity	NTU	8.0	15.5	15.3	16.8	17.3	17.3	17.9	19.0	19.4	20.8
Temperature	°C	9.2	9.1	9.2	9.2	9.3	9.1	9.1	9.1	9.2	9.1
Redox Potential	MV	-27	-23	-20	-20	-20	-21	-20	-20	-20	-21
Phenolphthalien Alkalinity	mg/L	-	-	-	-	-	-	-	-	-	-
Carbon Dioxide	mg/L	-	-	-	-	-	-	-	-	-	-
Ferrous Iron	mg/L	-	-	-	-	-	-	-	-	-	-
Calcium Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC, Nitrate, and Sulfate results. Specified natural attenuation parameters analyzed by laboratory.

TABLE 2.2
AIR NATIONAL GUARD
HANCOCK AIRFIELD
SITE 15
RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
JANUARY 2001

Natural Attenuation Field Parameter*	units	Monitoring Well No. MW-12D (continued)							
Time	-	14:50	15:04	15:10	15:18	15:25	15:30	15:35	15:40
pH	-	8.55	8.55	8.54	8.54	8.54	8.54	8.53	8.53
Specific Conductivity	ms/cm	0.448	0.447	0.450	0.450	0.449	0.449	0.449	0.448
Dissolved Oxygen	mg/L	1.18	0.00	0.00	4.75	0.00	0.00	0.00	0.00
Turbidity	NTU	21.8	5.1	9.1	8.0	8.0	8.1	8.1	8.4
Temperature	°C	9.2	9.2	9.1	9.0	9.1	9.1	9.1	9.0
Redox Potential	MV	-21	-25	-22	-21	-20	-20	-19	-18
Phenolphthalien Alkalinity	mg/L	-	-	-	-	-	-	-	-
Carbon Dioxide	mg/L	-	-	-	-	-	-	-	-
Ferrous Iron	mg/L	-	-	-	-	-	-	-	-
Calcium Carbonate	mg/L	-	-	-	-	-	-	-	-

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC, Nitrate, and Sulfate results. Specified natural attenuation parameters analyzed by laboratory.

TABLE 2.2
AIR NATIONAL GUARD
HANCOCK AIRFIELD
SITE 15
RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
JANUARY 2001

Natural Attenuation Field Parameter*	units	Monitoring Well No. MW-12D (continued)				
Time	-	15:45	15:50	15:55	16:00	
pH	-	8.53	8.53	8.53	8.53	-
Specific Conductivity	ms/cm	0.448	0.449	0.449	0.447	-
Dissolved Oxygen	mg/L	0.00	0.00	0.00	0.00	-
Turbidity	NTU	8.7	8.7	8.9	9.2	-
Temperature	°C	9.0	9.0	9.0	9.0	-
Redox Potential	MV	-17	-17	-16	-15	-
Phenolphthalien Alkalinity	mg/L	-	-	-	-	0
Carbon Dioxide	mg/L	-	-	-	-	24
Ferrous Iron	mg/L	-	-	-	-	0.2
Calcium Carbonate	mg/L	-	-	-	-	120

Notes:

\- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC, Nitrate, and Sulfate results. Specified natural attenuation parameters analyzed by laboratory.

TABLE 2.2
AIR NATIONAL GUARD
HANCOCK AIRFIELD
SITE 15
RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
JANUARY 2001

Natural Attenuation Field Parameter*	units	Monitoring Well No. MW-13								
Time	-	7:50	7:55	8:00	8:05	8:15	8:20	8:25	8:30	8:35
pH	-	6.91	7.03	7.05	7.05	7.07	7.07	7.07	7.06	7.06
Specific Conductivity	ms/cm	0.779	0.818	0.875	0.863	0.875	0.877	0.879	0.881	0.880
Dissolved Oxygen	mg/L	10.27	10.38	10.02	10.18	10.37	10.21	10.30	9.72	8.35
Turbidity	NTU	19.4	40.2	5.4	4.7	3.2	1.6	2.0	1.2	2.0
Temperature	°C	9.3	9.5	9.0	9.3	9.4	9.6	9.8	9.8	9.9
Redox Potential	MV	256	247	224	225	216	213	211	209	205
Phenolphthalien Alkalinity	mg/L	-	-	-	-	-	-	-	-	-
Carbon Dioxide	mg/L	-	-	-	-	-	-	-	-	-
Ferrous Iron	mg/L	-	-	-	-	-	-	-	-	-
Calcium Carbonate	mg/L	-	-	-	-	-	-	-	-	-

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC, Nitrate, and Sulfate results.
Specified natural attenuation parameters analyzed by laboratory.

TABLE 2.2
AIR NATIONAL GUARD
HANCOCK AIRFIELD
SITE 15
RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
JANUARY 2001

Natural Attenuation Field Parameter*	units	Monitoring Well No. MW-13 (continued)					
Time	-	8:40	8:45	8:50	8:55	9:00	-
pH	-	7.06	7.06	7.07	7.07	7.07	-
Specific Conductivity	ms/cm	0.884	0.883	0.882	0.883	0.882	-
Dissolved Oxygen	mg/L	10.26	10.22	10.25	10.27	10.26	-
Turbidity	NTU	1.8	1.6	1.5	0.8	0.7	-
Temperature	°C	9.9	9.9	9.9	9.9	9.9	-
Redox Potential	MV	200	200	199	197	196	-
Phenolphthalien Alkalinity	mg/L	-	-	-	-	-	0
Carbon Dioxide	mg/L	-	-	-	-	-	50
Ferrous Iron	mg/L	-	-	-	-	-	0.0
Calcium Carbonate	mg/L	-	-	-	-	-	300

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC, Nitrate, and Sulfate results. Specified natural attenuation parameters analyzed by laboratory.

TABLE 2.2
AIR NATIONAL GUARD
HANCOCK AIRFIELD
SITE 15
RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
JANUARY 2001

Natural Attenuation Field Parameter*	**units**	**Monitoring Well No. MW-14**								
Time	-	13:45	13:50	13:55	14:00	14:05	14:10	14:15	14:20	14:25
pH	-	7.32	7.45	7.53	7.54	7.52	7.54	7.58	7.63	7.65
Specific Conductivity	ms/cm	0.794	0.789	0.786	0.784	0.788	0.786	0.781	0.779	0.779
Dissolved Oxygen	mg/L	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Turbidity	NTU	3.1	0.9	0.1	-0.4	-0.4	-0.6	-0.6	-0.7	-0.6
Temperature	°C	7.7	7.7	8.0	8.1	7.9	8.0	8.0	8.3	8.2
Redox Potential	MV	129	9	-12	-26	-32	-41	-45	-53	-50
Phenolphthalien Alkalinity	mg/L	-	-	-	-	-	-	-	-	-
Carbon Dioxide	mg/L	-	-	-	-	-	-	-	-	-
Ferrous Iron	mg/L	-	-	-	-	-	-	-	-	-
Calcium Carbonate	mg/L	-	-	-	-	-	-	-	-	-

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC,
Nitrate, and Sulfate results.
Specified natural attenuation
parameters analyzed by laboratory.

TABLE 2.2
AIR NATIONAL GUARD
HANCOCK AIRFIELD
SITE 15
RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
JANUARY 2001

Natural Attenuation Field Parameter*	units	Monitoring Well No. MW-14 (continued)				
Time	-	14:30	14:35	14:40	14:45	-
pH	-	7.64	7.65	7.65	7.69	-
Specific Conductivity	ms/cm	0.780	0.782	0.782	0.779	-
Dissolved Oxygen	mg/L	0.00	0.00	0.00	0.00	-
Turbidity	NTU	-0.6	-0.9	-0.9	-0.9	-
Temperature	°C	8.3	8.2	8.1	8.2	-
Redox Potential	MV	-55	-56	-63	-63	-
Phenolphthalien Alkalinity	mg/L	-	-	-	-	0
Carbon Dioxide	mg/L	-	-	-	-	50
Ferrous Iron	mg/L	-	-	-	-	0.8
Calcium Carbonate	mg/L	-	-	-	-	340

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC, Nitrate, and Sulfate results. Specified natural attenuation parameters analyzed by laboratory.

TABLE 2.2
AIR NATIONAL GUARD
HANCOCK AIRFIELD
SITE 15
RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
JANUARY 2001

Natural Attenuation Field Parameter*	units	Monitoring Well No. MW-15							
Time	-	11:50	11:55	12:00	12:10	12:15	12:20	12:25	12:30
pH	-	6.81	6.92	7.05	7.05	7.08	7.07	7.11	7.11
Specific Conductivity	ms/cm	0.921	0.893	0.850	0.850	0.841	0.838	0.832	0.829
Dissolved Oxygen	mg/L	10.92	11.63	11.34	11.48	9.29	10.94	10.34	10.03
Turbidity	NTU	87.7	54.0	19.6	21.8	26.2	34.3	30.0	31.5
Temperature	°C	8.3	8.4	8.3	8.3	8.2	8.3	8.4	8.5
Redox Potential	MV	-47	-70	-93	-100	-106	-105	-113	-114
Phenolphthalien Alkalinity	mg/L	-	-	-	-	-	-	-	-
Carbon Dioxide	mg/L	-	-	-	-	-	-	-	-
Ferrous Iron	mg/L	-	-	-	-	-	-	-	-
Calcium Carbonate	mg/L	-	-	-	-	-	-	-	-

Notes:
- No Units and/or data specified
* Refer to Table 2.4 for Ferric Iron, TOC, Nitrate, and Sulfate results. Specified natural attenuation parameters analyzed by laboratory.

TABLE 2.2
AIR NATIONAL GUARD
HANCOCK AIRFIELD
SITE 15
RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
JANUARY 2001

Natural Attenuation Field Parameter*	**units**	**Monitoring Well No. MW-15 (continued)**			
Time	-	12:35	12:40	12:45	-
pH	-	7.13	7.15	7.14	-
Specific Conductivity	ms/cm	0.828	0.824	0.827	-
Dissolved Oxygen	mg/L	11.40	11.46	11.45	-
Turbidity	NTU	28.2	30.1	30.5	-
Temperature	°C	8.4	8.3	8.3	-
Redox Potential	MV	-112	-110	-109	-
Phenolphthalien Alkalinity	mg/L	-	-	-	0
Carbon Dioxide	mg/L	-	-	-	90
Ferrous Iron	mg/L	-	-	-	4.2
Calcium Carbonate	mg/L	-	-	-	320

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC, Nitrate, and Sulfate results. Specified natural attenuation parameters analyzed by laboratory.

TABLE 2.2
AIR NATIONAL GUARD
HANCOCK AIRFIELD
SITE 15
RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
JANUARY 2001

Natural Attenuation Field Parameter*	**units**	**Monitoring Well No. MW-16**								
Time	-	9:20	9:25	9:30	9:40	9:45	9:55	10:00	10:05	10:10
pH	-	6.58	6.56	6.57	6.58	6.60	6.63	6.78	6.83	6.88
Specific Conductivity	ms/cm	1.07	1.06	0.995	0.972	0.983	0.987	0.988	0.988	0.986
Dissolved Oxygen	mg/L	10.67	9.49	8.10	10.89	10.06	10.10	10.16	10.02	10.32
Turbidity	NTU	44.2	124.0	228.0	239.0	256.0	190.0	135.0	298.0	293.0
Temperature	°C	7.1	6.9	6.9	7.5	8.0	8.1	8.4	8.4	8.6
Redox Potential	MV	250	241	186	144	133	102	59	19	6
Phenolphthalien Alkalinity	mg/L	-	-	-	-	-	-	-	-	-
Carbon Dioxide	mg/L	-	-	-	-	-	-	-	-	-
Ferrous Iron	mg/L	-	-	-	-	-	-	-	-	-
Calcium Carbonate	mg/L	-	-	-	-	-	-	-	-	-

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC, Nitrate, and Sulfate results. Specified natural attenuation parameters analyzed by laboratory.

TABLE 2.2
AIR NATIONAL GUARD
HANCOCK AIRFIELD
SITE 15
RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
JANUARY 2001

Natural Attenuation Field Parameter*	**units**	**Monitoring Well No. MW-16 (continued)**		
Time	-	10:15	10:20	-
pH	-	6.92	6.73	-
Specific Conductivity	ms/cm	0.985	0.995	-
Dissolved Oxygen	mg/L	9.29	9.90	-
Turbidity	NTU	34.4	17.2	-
Temperature	°C	8.6	8.3	-
Redox Potential	MV	-1	-1	-
Phenolphthalien Alkalinity	mg/L	-	-	0
Carbon Dioxide	mg/L	-	-	94
Ferrous Iron	mg/L	-	-	0.0
Calcium Carbonate	mg/L	-	-	360

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC, Nitrate, and Sulfate results. Specified natural attenuation parameters analyzed by laboratory.

TABLE 2.2
AIR NATIONAL GUARD
HANCOCK AIRFIELD
SITE 15
RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
JANUARY 2001

Natural Attenuation Field Parameter*	**units**	**Monitoring Well No. MW-17**										
Time	-	11:30	11:35	11:40	11:45	11:50	11:55	12:00	12:05	12:10	12:15	12:20
pH	-	6.61	6.62	6.66	6.76	6.77	6.83	6.87	6.89	6.90	6.93	6.95
Specific Conductivity	ms/cm	0.896	0.895	0.892	0.884	0.882	0.875	0.868	0.865	0.864	0.855	0.858
Dissolved Oxygen	mg/L	7.97	8.68	9.05	9.37	9.46	9.15	8.33	9.18	9.14	9.26	9.30
Turbidity	NTU	63.1	29.9	23.9	6.0	8.4	7.4	-2.3	-3.4	-6.6	-9.4	-10.0
Temperature	°C	7.6	7.9	8.1	8.3	8.3	8.2	8.2	8.4	8.4	8.4	8.4
Redox Potential	MV	49	29	12	-14	-16	-29	-37	-43	-45	-52	-55
Phenolphthalien Alkalinity	mg/L	-	-	-	-	-	-	-	-	-	-	-
Carbon Dioxide	mg/L	-	-	-	-	-	-	-	-	-	-	-
Ferrous Iron	mg/L	-	-	-	-	-	-	-	-	-	-	-
Calcium Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-

Notes:
- No Units and/or data specified
* Refer to Table 2.4 for Ferric Iron, TOC, Nitrate, and Sulfate results.
Specified natural attenuation parameters analyzed by laboratory.

TABLE 2.2
AIR NATIONAL GUARD
HANCOCK AIRFIELD
SITE 15
RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
JANUARY 2001

Natural Attenuation Field Parameter*	units	Monitoring Well No. MW-17 (continued)									
Time	-	12:25	12:30	12:35	12:40	12:45	12:50	12:55	13:00	13:05	-
pH	-	6.96	6.97	6.98	6.99	6.99	6.99	7.00	7.02	7.02	-
Specific Conductivity	ms/cm	0.850	0.846	0.843	0.841	0.839	0.839	0.840	0.832	0.830	-
Dissolved Oxygen	mg/L	9.33	9.26	9.39	9.30	9.25	9.51	8.27	8.52	8.71	-
Turbidity	NTU	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0	16.6	-
Temperature	°C	8.4	8.4	8.4	8.3	8.4	8.5	8.6	8.5	8.3	-
Redox Potential	MV	-57	-59	-61	-63	-64	-66	-67	-68	-68	-
Phenolphthalien Alkalinity	mg/L	-	-	-	-	-	-	-	-	-	0
Carbon Dioxide	mg/L	-	-	-	-	-	-	-	-	-	58
Ferrous Iron	mg/L	-	-	-	-	-	-	-	-	-	3.4
Calcium Carbonate	mg/L	-	-	-	-	-	-	-	-	-	360

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC
Nitrate, and Sulfate results.
Specified natural attenuation
parameters analyzed by laboratory.

TABLE 2.2
AIR NATIONAL GUARD
HANCOCK AIRFIELD
SITE 15
RESULTS FROM GROUNDWATER FIELD MEASUREMENTS
OF NATURAL ATTENUATION PARAMETERS
JANUARY 2001

Natural Attenuation Field Parameter	units	Monitoring Well No. MW-18								
Time	-	14:55	15:03	15:11	15:15	15:21	15:27	15:35	15:41	15:48
pH	-	7.58	7.59	7.59	7.59	7.59	7.58	7.56	7.56	7.55
Specific Conductivity	ms/cm	0.717	0.717	0.714	0.715	0.719	0.733	0.762	0.793	0.817
Dissolved Oxygen	mg/L	2.14	2.07	1.77	1.68	1.50	1.19	1.10	0.87	0.69
Turbidity	NTU	-1.0	-1.0	-2.2	-2.5	-2.7	-2.8	-2.9	-3.0	-3.0
Temperature	°C	9.7	9.5	9.9	9.7	9.8	9.8	9.9	9.9	9.8
Redox Potential	MV	305	300	298	298	297	298	294	292	291
Phenolphthalien Alkalinity	mg/L	-	-	-	-	-	-	-	-	-
Carbon Dioxide	mg/L	-	-	-	-	-	-	-	-	-
Ferrous Iron	mg/L	-	-	-	-	-	-	-	-	-
Calcium Carbonate	mg/L	-	-	-	-	-	-	-	-	-

Notes:
- No Units and/or data specified
* Refer to Table 2.4 for Ferric Iron, TOC,
Nitrate, and Sulfate results.
Specified natural attenuation
parameters analyzed by laboratory.

TABLE 2.2
AIR NATIONAL GUARD
HANCOCK AIRFIELD
SITE 15
RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
JANUARY 2001

Natural Attenuation Field Parameter	**units**	**Monitoring Well No. MW-18 (continued)**					
Time	-	15:55	16:00	16:07	16:13	16:20	-
pH	-	7.55	7.55	7.55	7.54	7.55	-
Specific Conductivity	ms/cm	0.837	0.855	0.897	0.920	0.931	-
Dissolved Oxygen	mg/L	0.64	0.62	0.53	0.39	0.30	-
Turbidity	NTU	-3.0	-2.9	-3.0	-3.0	-3.0	-
Temperature	°C	9.8	10.0	9.9	9.9	9.8	-
Redox Potential	MV	290	288	287	285	284	-
Phenolphthalien Alkalinity	mg/L	-	-	-	-	-	0
Carbon Dioxide	mg/L	-	-	-	-	-	140
Ferrous Iron	mg/L	-	-	-	-	-	0.4
Calcium Carbonate	mg/L	-	-	-	-	-	360

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC, Nitrate, and Sulfate results. Specified natural attenuation parameters analyzed by laboratory.

TABLE 2.2
AIR NATIONAL GUARD
HANCOCK AIRFIELD
SITE 15
RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
JANUARY 2001

Natural Attenuation Field Parameter*	**units**	**Monitoring Well No. MW-19**										
Time	-	14:26	14:30	14:35	14:40	14:45	14:50	14:55	15:05	15:10	15:15	-
pH	-	6.70	6.68	6.71	6.71	6.71	6.71	6.72	6.72	6.72	6.72	-
Specific Conductivity	ms/cm	1.09	1.06	1.09	1.10	1.10	1.09	1.08	1.07	1.07	1.07	-
Dissolved Oxygen	mg/L	3.17	8.66	8.32	8.73	8.95	9.00	8.80	8.58	8.33	7.94	-
Turbidity	NTU	179.0	76.4	37.9	40.9	32.4	28.8	23.3	21.2	20.9	21.1	-
Temperature	°C	7.6	8.2	8.4	8.5	8.4	8.5	8.5	8.6	8.5	8.5	-
Redox Potential	MV	-28	-38	-47	-49	-50	-51	-56	-58	-60	-62	-
Phenolphthalien Alkalinity	mg/L	-	-	-	-	-	-	-	-	-	-	0
Carbon Dioxide	mg/L	-	-	-	-	-	-	-	-	-	-	150
Ferrous Iron	mg/L	-	-	-	-	-	-	-	-	-	-	5.6
Calcium Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-	460

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC, Nitrate, and Sulfate results.
Specified natural attenuation parameters analyzed by laboratory.

TABLE 2.2
AIR NATIONAL GUARD
HANCOCK AIRFIELD
SITE 15
RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
JANUARY 2001

Natural Attenuation Field Parameter*	**units**	**Monitoring Well No. MW-20**								
Time	-	11:35	11:40	11:45	11:50	12:00	12:05	12:10	12:15	12:20
pH	-	7.23	7.23	7.22	7.19	7.19	7.20	7.17	7.18	7.18
Specific Conductivity	ms/cm	1.00	0.94	0.98	0.97	0.93	0.93	0.93	0.91	0.91
Dissolved Oxygen	mg/L	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Turbidity	NTU	1.3	0.0	3.1	0.6	0.7	0.6	1.1	1.7	1.7
Temperature	°C	7.4	7.8	8.0	8.1	8.2	8.2	8.1	8.1	8.1
Redox Potential	MV	146	123	72	46	-72	-77	-80	-82	-82
Phenolphthaleon Alkalinity	mg/L	-	-	-	-	-	-	-	-	-
Carbon Dioxide	mg/L	-	-	-	-	-	-	-	-	-
Ferrous Iron	mg/L	-	-	-	-	-	-	-	-	-
Calcium Carbonate	mg/L	-	-	-	-	-	-	-	-	-

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC, Nitrate, and Sulfate results.
Specified natural attenuation parameters analyzed by laboratory.

TABLE 2.2
AIR NATIONAL GUARD
HANCOCK AIRFIELD
SITE 15
RESULTS FROM GROUNDWATER FIELD MEASUREMENTS OF NATURAL ATTENUATION PARAMETERS
JANUARY 2001

Natural Attenuation Field Parameter*	units	Monitoring Well No. MW-20 (continued)			
Time	-	12:25	12:30	12:35	-
pH	-	7.20	7.20	7.21	-
Specific Conductivity	ms/cm	0.871	0.864	0.857	-
Dissolved Oxygen	mg/L	0.00	0.00	0.00	-
Turbidity	NTU	2.0	2.5	2.3	-
Temperature	°C	8.2	8.2	8.3	-
Redox Potential	MV	-86	-88	-91	-
Phenolphthaleon Alkalinity	mg/L	-	-	-	0
Carbon Dioxide	mg/L	-	-	-	90
Ferrous Iron	mg/L	-	-	-	5.6
Calcium Carbonate	mg/L	-	-	-	400

Notes:

- No Units and/or data specified

* Refer to Table 2.4 for Ferric Iron, TOC, Nitrate, and Sulfate results. Specified natural attenuation parameters analyzed by laboratory.

Table 2.3

Air National Guard
Hancock Airfield
Site 15
Validated Soil Analytical Results

								Dup of SS-05 (0-1)					
		Sample ID:	SS-01 (0-1')	SS-02 (0-1')	SS-03 (0-1')	SS-04 (0-1')	SS-05 (0-1')	SS-17 (0-1')	SS-06 (0-1')	SS-07 (0-1')	SS-08 (0-1')	SS-09 (0-1')	SS-10 (0-1')
		Lab Sample Id:	L66879-1	L66879-2	L66879-5	L66879-6	L66879-7	L66879-19	L66879-8	L66879-9	L66879-10	L66879-11	L66879-12
		Source:	GALSON	GALSON	GALSON	GALSON	GALSON	GALSON	GALSON	GALSON	GALSON	GALSON	GALSON
		SDG:	L66879	L66879	L66879	L66879	L66879	L66879	L66879	L66879	L66879	L66879	L66879
		Matrix:	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
		Sampled:	12/18/2000	12/18/2000	12/18/2000	12/18/2000	12/18/2000	12/18/2000	12/18/2000	12/18/2000	12/18/2000	12/18/2000	12/18/2000
		Validated:	1/25/2001	1/25/2001	1/25/2001	1/25/2001	1/25/2001	1/25/2001	1/25/2001	1/25/2001	1/25/2001	1/25/2001	1/25/2001
CasNo	Parameter	Units											
	PCBs (*)												
12674-11-2	Aroclor-1016	ug/kg	21 U	22 U	22 U	21 U	19 U	19 U	20 U	110 U	21 U	20 U	21 U
11104-28-2	Aroclor-1221	ug/kg	21 U	22 U	22 U	21 U	19 U	19 U	20 U	110 U	21 U	20 U	21 U
11141-16-5	Aroclor-1232	ug/kg	21 U	22 U	22 U	21 U	19 U	19 U	20 U	110 U	21 U	20 U	21 U
53469-21-9	Aroclor-1242	ug/kg	21 U	22 U	22 U	21 U	19 U	19 U	20 U	110 U	21 U	20 U	21 U
12672-29-6	Aroclor-1248	ug/kg	21 U	22 U	22 U	21 U	19 U	19 U	20 U	110 U	21 U	20 U	21 U
11097-69-1	Aroclor-1254	ug/kg	21 U	22 U	22 U	21 U	19 U	19 U	20 U	110 U	21 U	20 U	21 U
11096-82-5	Aroclor-1260	ug/kg	28	140	240	81	290	350	160	1500	390	110	190

U - Not detected.
* PCBs analyzed by EPA method 8082.

Table 2.3

Air National Guard
Hancock Airfield
Site 15
Validated Soil Analytical Results

		Sample ID:	SS-11 (0-1')	SS-12 (0-1')	SS-13 (0-1')	SS-14 (0-1')	SS-15 (0-1')	SS-16 (0-1')	SS-17 (0-1)	SS-18 (0-1)	SS-19 (0-1)	SS-20 (0-1)	EQUIP BLANK #1
		Lab Sample Id:	L66879-17	L66879-18	L66879-13	L66879-14	L66879-15	L66879-16	L67948-1	L67948-2	L67948-5	L67948-6	L66879-20
		Source:	GALSON	GALSON	GALSON	GALSON	GALSON	GALSON	GALSON	GALSON	GALSON	GALSON	GALSON
		SDG:	L66879	L66879	L66879	L66879	L66879	L66879	L67948	L67948	L67948	L67948	L66879
		Matrix:	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Water
		Sampled:	12/18/2000	12/18/2000	12/18/2000	12/18/2000	12/18/2000	12/18/2000	1/30/2001	1/30/2001	1/30/2001	1/30/2001	12/18/2000
		Validated:	1/25/2001	1/25/2001	1/25/2001	1/25/2001	1/25/2001	1/25/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	1/25/2001
CasNo	Parameter	Units											ug/L
	PCBs (*)												
12674-11-2	Aroclor-1016	ug/kg	40 U	21 U	25 U	21 U	23 U	21 U	44 U	44 U	120 U	20 U	0.5 U
11104-28-2	Aroclor-1221	ug/kg	40 U	21 U	25 U	21 U	23 U	21 U	44 U	44 U	120 U	20 U	0.5 U
11141-16-5	Aroclor-1232	ug/kg	40 U	21 U	25 U	21 U	23 U	21 U	44 U	44 U	120 U	20 U	0.5 U
53469-21-9	Aroclor-1242	ug/kg	40 U	21 U	25 U	21 U	23 U	21 U	44 U	44 U	120 U	20 U	0.5 U
12672-29-6	Aroclor-1248	ug/kg	40 U	21 U	25 U	21 U	23 U	21 U	44 U	44 U	120 U	20 U	0.5 U
11097-69-1	Aroclor-1254	ug/kg	40 U	21 U	25 U	21 U	23 U	21 U	44 U	44 U	120 U	20 U	0.5 U
11096-82-5	Aroclor-1260	ug/kg	450	69	160	46	28	21 U	590	520	1600	330	0.5 U

U - Not detected.
* PCBs analyzed by EPA method 8082.

Table 2.4
Air National Guard
Hancock Airfield
Site 15
Validated Groundwater Analytical Results

								Dup of MW-8				
		Sample ID:	MW-1	MW-2	MW-4	MW-5R	MW-8	MW-80	MW-9	MW-11	MW-12D	MW-12S
		Matrix:	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water
		Sampled:	1/26/2001	1/26/2001	1/26/2001	1/23/2001	1/24/2001	1/24/2001	1/25/2001	1/25/2001	1/24/2001	1/24/2001
		Validated:	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001
CasNo	Parameter	Units										
	BTEX (1)											
71-43-2	Benzene	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	93
108-88-3	Toluene	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	13
100-41-4	Ethylbenzene	ug/l	1 U	320	1 U	1 U	1 U	1 U	1 U	1 U	0.6 J	360
108-38-3	m/p-Xylene	ug/l	1 U	900	0.6 J	1 U	1 U	1 U	1 U	1 U	1 U	1300
95-47-6	o-Xylenes	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	420
	Total BTEX		1U	1220	0.6 J	1 U	1 U	1 U	1 U	1 U	0.6 J	2186
	VOLATILES (2)											
74-82-8	Methane	mg/L	0.02	9	0.1	0.002 U	0.02	0.01	0.002 U	0.08	0.003	5
74-84-0	Ethane	mg/L	0.004 U	0.8 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.4 U
74-85-1	Ethene	mg/L	0.004 U	0.8 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.4 U
	PCBs (3)											
12674-11-2	Aroclor-1016	ug/l	NA	NA	NA	NA	0.05 U	0.05 U	NA	NA	0.05 U	0.05 U
11104-28-2	Aroclor-1221	ug/l	NA	NA	NA	NA	0.05 U	0.05 U	NA	NA	0.05 U	0.05 U
11141-16-5	Aroclor-1232	ug/l	NA	NA	NA	NA	0.05 U	0.05 U	NA	NA	0.05 U	0.05 U
53469-21-9	Aroclor-1242	ug/l	NA	NA	NA	NA	0.05 U	0.05 U	NA	NA	0.05 U	0.05 U
12672-29-6	Aroclor-1248	ug/l	NA	NA	NA	NA	0.05 U	0.05 U	NA	NA	0.05 U	0.05 U
11097-69-1	Aroclor-1254	ug/l	NA	NA	NA	NA	0.05 U	0.05 U	NA	NA	0.05 U	0.05 U
11096-82-5	Aroclor-1260	ug/l	NA	NA	NA	NA	0.05 U	0.05 U	NA	NA	0.05 U	0.05 U
	INORGANICS (4)											
	Iron	ug/l	86 UJ	11000	780 U	416 U	170 U	177 U	1140 U	3350	19.7 UJ	20200
	TOC	mg/l	4	3.3	2.7	8	2.1	2.2	3	2.4	1 U	10
	Nitrate as N	mg/l	0.4	0.5	0.2	2	0.3	0.3	2.6	0.2	0.2	0.2
	Sulfate	mg/l	28	3	49	20	33	33	54	27	101	24

U - Not detected.
J - Estimated value.
NA - Not Analyzed.
(1) BTEX analysis performed by EPA method 8260.
(2) Methane, ethane, ethene analysis performed by approved method for dissolved gases (RSK175).
(3) PCB analysis performed by EPA method 8082.
(4) Iron analysis performed by EPA method 6010.
TOC analysis performed by EPA method 415.2.
Nitrate and Sulfide analysis performed by EPA method 300.0.

Table 2.4

Air National Guard
Hancock Airfield
Site 15
Validated Groundwater Analytical Results

		Sample ID:	MW-13	MW-14	MW-15	MW-16	MW-17	MW-18	MW-19	MW-20	Equip Blank	Trip Blank-1
		Matrix:	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water
		Sampled:	1/26/2001	1/25/2001	1/25/2001	1/25/2001	1/24/2001	1/23/2001	1/24/2001	1/25/2001	1/25/2001	1/26/2001
		Validated:	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001
CasNo	Parameter	Units										
	BTEX (1)											
71-43-2	Benzene	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	11	1 U	1 U	1 U
108-88-3	Toluene	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
100-41-4	Ethylbenzene	ug/l	1 U	1 U	1 U	1.5	1.4	1 U	82	1 U	1 U	1 U
108-38-3	m/p-Xylene	ug/l	1 U	1 U	1 U	5.5	1 U	1 U	16	1 U	1 U	1 U
95-47-6	o-Xylenes	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
	Total BTEX		1 U	1 U	1 U	7	1.4	1 U	109	1 U	1 U	1 U
	VOLATILES (2)											
74-82-8	Methane	mg/L	0.002 U	0.02	0.02	0.08	0.6	0.002 U	1	0.03	0.002 U	0.002 U
74-84-0	Ethane	mg/L	0.004 U	0.004 U	0.004 U	0.004 U	0.04 U	0.004 U	0.04 U	0.004 U	0.004 U	0.004 U
74-85-1	Ethene	mg/L	0.004 U	0.004 U	0.004 U	0.004 U	0.04 U	0.004 U	0.04 U	0.004 U	0.004 U	0.004 U
	PCBs (3)											
12674-11-2	Aroclor-1016	ug/l	NA	NA	NA	0.05 U	0.05 U	NA	0.05 U	NA	0.05 U	NA
11104-28-2	Aroclor-1221	ug/l	NA	NA	NA	0.05 U	0.05 U	NA	0.05 U	NA	0.05 U	NA
11141-16-5	Aroclor-1232	ug/l	NA	NA	NA	0.05 U	0.05 U	NA	0.05 U	NA	0.05 U	NA
53469-21-9	Aroclor-1242	ug/l	NA	NA	NA	0.05 U	0.05 U	NA	0.05 U	NA	0.05 U	NA
12672-29-6	Aroclor-1248	ug/l	NA	NA	NA	0.05 U	0.05 U	NA	0.05 U	NA	0.05 U	NA
11097-69-1	Aroclor-1254	ug/l	NA	NA	NA	0.05 U	0.05 U	NA	0.05 U	NA	0.05 U	NA
11096-82-5	Aroclor-1260	ug/l	NA	NA	NA	0.05 U	0.05 U	NA	0.05 U	NA	0.05 U	NA
	[illegible]											
	Iron	ug/l	18.3 UJ	527 U	7110	2540	4010	51.8 UJ	10900	9530	4.4 U	NA
	TOC	mg/l	1.2	2.3	3.2	3.1	3.3	3.4	3.6	4	1 U	NA
	Nitrate as N	mg/l	0.5	0.1 U	0.1 U	0.1 U	0.1 U	0.8	0.2	0.2	0.1 U	NA
	Sulfate	mg/l	19	45	33	36	38	27	8	10	1 U	NA

U - Not detected.
J - Estimated value.
NA - Not Analyzed.
(1) BTEX analysis performed by EPA method 8260.
(2) Methane, ethane, ethene analysis performed by approved method for dissolved gases (RSK175).
(3) PCB analysis performed by EPA method 8082.
(4) Iron analysis performed by EPA method 6010.
TOC analysis performed by EPA method 415.2.
Nitrate and Sulfide analysis performed by EPA method 300.0.

Table 2.4

Air National Guard
Hancock Airfield
Site 15
Validated Groundwater Analytical Results

		Sample ID:	Trip Blank-2	Trip Blank-3
		Matrix:	Water	Water
		Sampled:	1/26/2001	1/26/2001
		Validated:	3/4/2001	3/4/2001
CasNo	Parameter	Units		
	BTEX (1)			
71-43-2	Benzene	ug/l	1 U	1 U
108-88-3	Toluene	ug/l	1 U	1 U
100-41-4	Ethylbenzene	ug/l	1 U	1 U
108-38-3	m/p-Xylene	ug/l	1 U	1 U
95-47-6	o-Xylenes	ug/l	1 U	1 U
	Total BTEX		1 U	1 U
	VOLATILES (2)			
74-82-8	Methane	mg/L	NA	NA
74-84-0	Ethane	mg/L	NA	NA
74-85-1	Ethene	mg/L	NA	NA
	PCB (3)			
12674-11-2	Aroclor-1016	ug/l	NA	NA
11104-28-2	Aroclor-1221	ug/l	NA	NA
11141-16-5	Aroclor-1232	ug/l	NA	NA
53469-21-9	Aroclor-1242	ug/l	NA	NA
12672-29-6	Aroclor-1248	ug/l	NA	NA
11097-69-1	Aroclor-1254	ug/l	NA	NA
11096-82-5	Aroclor-1260	ug/l	NA	NA
	[illegible]			
	Iron	ug/l	NA	NA
	TOC	mg/l	NA	NA
	Nitrate as N	mg/l	NA	NA
	Sulfate	mg/l	NA	NA

U - Not detected.
J - Estimated value.
NA - Not Analyzed.
(1) BTEX analysis performed by EPA method 8260.
(2) Methane, ethane, ethene analysis performed by approved method for dissolved gases (RSK175).
(3) PCB analysis performed by EPA method 8082.
(4) Iron analysis performed by EPA method 6010.
TOC analysis performed by EPA method 415.2.
Nitrate and Sulfide analysis performed by EPA method 300.0.

Table 2.5
Hancock Airfield Site 15
Field Groundwater Measurements

Natural Attenuation* Field Parameter	units	[illegible]	MW-2	MW-4	[illegible]	MW-8	MW-9	MW-11	MW-12S	MW-12D	MW-13
pH	-	[illegible]	7.50	6.92	[illegible]	6.70	6.48	7.16	7.06	8.58	7.05
Specific Conductivity	us/cm	[illegible]	0.81	0.67	[illegible]	0.94	6.28	1.08	0.83	0.45	0.87
Dissolved Oxygen	mg/L	[illegible]	0.06	10.44	[illegible]	8.38	0.39	10.07	1.20	2.03	10.08
Turbidity	NTU	[illegible]	-0.12	19.64	[illegible]	54.55	4.16	60.37	0.02	10.07	6.15
Temperature	°C	[illegible]	9.14	9.22	[illegible]	9.08	6.59	15.07	8.93	9.14	15.63
Redox Potential	MV	[illegible]	-80.00	9.31	[illegible]	45.31	96.25	-95.58	33.00	-18.97	214.14
Phenolphthalion Alkalinity	mg/L	[illegible]	0	0	[illegible]	0	0	0	0	0	0
Carbon Dioxide	mg/L	[illegible]	30	80	[illegible]	60	40	126	110	24	50
Ferrous Iron	mg/L	[illegible]	5.40	1.20	[illegible]	0.60	0.20	3.20	5.60	0.20	0.00
Calcium Carbonate	mg/L	[illegible]	380	340	[illegible]	320	140	340	380	120	300

Natural Attenuation* Field Parameter	MW-14	MW-15	MW-16	MW-17	[illegible]	MW-19	MW-20	Average Background
pH	7.57	7.06	6.70	6.89	[illegible]	6.71	7.2	7.35
Specific Conductivity	0.78	0.85	1.00	0.86	[illegible]	2.04	0.92	0.71
Dissolved Oxygen	0.00	10.93	9.91	9.02	[illegible]	8.02	0	4.91
Turbidity	-0.10	35.81	164.44	2.18	[illegible]	47.39	1.47	35.50
Temperature	8.05	8.34	7.89	8.3	[illegible]	8.37	8.06	8.89
Redox Potential	-27.54	-98.09	103.45	-38.7	[illegible]	-51.22	-22.75	170.80
Phenolphthalion Alkalinity	0	0	0	0	[illegible]	0	0	0
Carbon Dioxide	90	90	94	58	[illegible]	150	90	90
Ferrous Iron	5.60	4.20	0	3.4	[illegible]	5.6	5.6	0.33
Calcium Carbonate	400	320	360	360	[illegible]	460	400	320

Notes:
- No units and/or data specified
* Refer to Table 1.2 For Ferric Iron, TOC, Nitrate, and Sulfate results.
Specified natural attenuation parameters analyzed by laboratory.
▨ =Background wells

Table 2.6
Indications of BTEX Biodegradation In Groundwater
Hancock Air National Guard Base - Site 15

			Possible Biodegradation Mechanism Based On January 2001 Measurements Within Plume						
Plume MWs Analyzed In January 2001	Decreasing BTEX With Time	Janurary 2001 BTEX Concentration	Oxidation Reduction Potential	Oxygen	Nitrate	Ferrous Iron	Sulfate	Methane	Alkalinity
MW-2	No	1220	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MW-4	No	1	Yes	No	Yes	Yes	No	Yes	Yes
MW-8	No	<1	Yes	No	Yes	Yes	No	No	No
MW-9	No	<1	Yes	Yes	No	No	No	No	No
MW-11	Yes (1999 to 2001)	<1	Yes	No	Yes	Yes	No	No	Yes
MW-12S	Yes	2190	Yes	Yes	Yes	Yes	No	Yes	Yes
MW-13	No	<1	No	No	Yes	No	Yes	No	No
MW-14	Yes	<1	Yes	Yes	Yes	Yes	No	No	Yes
MW-15	Yes	<1	Yes	No	Yes	Yes	No	No	No
MW-16	No	7	Yes	No	Yes	No	No	No	Yes
MW-17	Yes	1.4	Yes	No	Yes	Yes	No	Yes	Yes
MW-19	Yes	110	Yes	No	Yes	Yes	Yes	Yes	Yes
MW-20	No	<1	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 2.7
Hancock Airfield Site 15
Measured Levels of BTEX Biodegradation Indicators

Natural Attenuation* Parameter	Average Background	MW-2	MW-4	MW-8	MW-9	MW-11	MW-12S	MW-13	MW-14	MW-15	MW-16	MW-17	MW-19	MW-20
Redox Potential (MV)	170.80	-80.00	9.31	45.31	96.25	-95.58	33.00	214.14	-27.54	-98.09	103.45	-38.7	-51.22	-22.75
Calcium Carbonate (mg/l)	320	380	340	320	140	340	380	300	400	320	360	360	460	400
Sulfate (mg/l)	25	3	49	33	54	27	24	19	45	33	36	38	8	10
Carbon Dioxide (mg/l)	90	30	80	60	40	126	110	50	90	90	94	58	150	90
Ferrous Iron (mg/l)	0.33	5.40	1.20	0.60	0.20	3.20	5.60	0.00	5.60	4.20	0	3.4	5.6	5.6
Methane (mg/l)	0.01	9	0.1	0.02	.002 U	0.08	5	.002 U	0.02	0.02	0.08	0.6	1	0.03
Nitrate (mg/l)	1.07	0.5	0.2	0.3	2.6	0.2	0.2	0.5	0.1 U	0.1 U	0.1 U	0.1 U	0.2	0.2
Dissolved Oxygen (mg/l)	4.91	0.06	10.44	8.38	0.39	10.07	1.20	10.08	0.00	10.93	9.91	9.02	8.02	0

SECTION 3

CONCLUSIONS

Surface soil samples were collected in the vicinity of the previous spills and in the two site drainage swales. PCBs were found in these samples at concentrations of less than one part per million, except within the bottom samples from the west swale, where PCB concentrations up to 1.6 part per million were detected. The downstream extent of surface soil in the west swale containing above one part per million PCBs has not been determined.

As a result of drilling efforts during this investigation, the site was found to be underlain by silt with clay deposits approximately 8 to 10 feet below ground surface and by fine to medium sand with silt from 8 to 10 feet to a minimum depth of 18 feet. Groundwater was encountered at a depth of 7 to 12.5 feet below grade. Local groundwater flow is toward the south-southeast under a average hydraulic gradient of 0.006 feet/foot.

Analyses of groundwater in monitoring wells were conducted. Conclusions from the groundwater portion of the investigation are as follows:

- Sufficient data now exist to conclude that BTEX compounds are biodegrading in saturated soils and groundwater at the Hancock Site 15 via oxygen reduction, nitrate reduction, ferric iron reduction, sulfate reduction, and methane fermentation.
- Groundwater data for 2001 shows biodegradation of BTEX is likely occurring. In addition, the plume appears to be getting smaller in size over time (see Figure 2.4). Biodegradation is likely a significant reason the plume size is shrinking over time.
- Analysis of groundwater samples from downgradient wells (MW-12S, MW-12D, MW-16, MW-17, MW-8, and MW-19) was performed to assess the lateral movement of the PCB plume. No detectable PCB concentrations were found in groundwater any of these monitoring wells.
- Baildown tests were not conducted as anticipated, because no free product was observed in any of the monitoring wells within the area where product was encountered previously (MW-6S, MW-21, MW-22, MW-23). The most likely reason for not detecting product now even though product was detected in 1999 is rising and falling of the water table over time; for example, from a moderate drought year (1999) to a moderately wet year (2000) allowing the LNAPL to be naturally spread vertically as well as laterally over time.
- The model simulation predicts that the groundwater plume has reached steady state, no detected concentrations of BTEX compounds will migrate beyond their current extent, and the plume will continue to shrink over time.

SECTION 4

REFERENCES

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APPENDIX A

SOIL BORING AND WELL CONSTRUCTION LOGS

SAA - same as above

SM - silty-sand and sandy-silt mixture

SC - clayey-sand and sandy-clay mixture

C - coarse

Br - brown

Gr - grey

f-m - fine to medium

bgs - below ground surface

Contractor:	Northstar Drilling
Driller:	S. Laramer
Inspector:	E. Ashton
Rig Type:	CME-45C

PARSONS ENGINEERING SCIENCE, INC.
DRILLING RECORD

BORING/ WELL NO. MW-8 **Sheet** 1 **of** 1

PROJECT NAME: Site 15, Hancock Airfield
PROJECT NUMBER 738483

Location Description:
SEE SITE PLAN

GROUNDWATER OBSERVATIONS

Water Level	8.83'			
Date	######			
Time	1208			
Meas. From	TOC			

Weather: Cloudy - 25'f

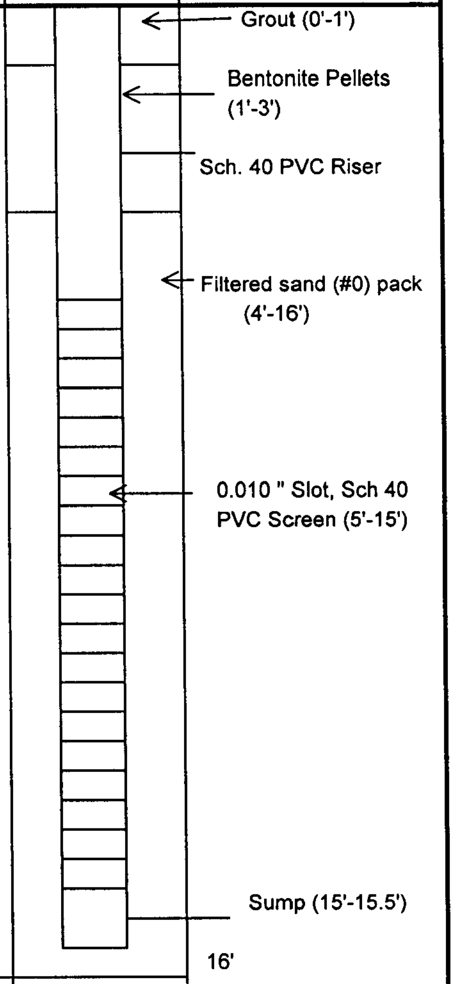
Date/Time Start: 1/5/01 - 0845

Date/Time Finish: 1/5/01 - 1115

Location Plan
SEE SITE PLAN

Sampl Depth	Sample I.D.	SPT	% Rec.	PID (ppm)	FIELD IDENTIFICATION OF MATERIAL
0		2/3/7/7	90	0	(0'-2') - Br, silt with clay, trace f-sand, moist. - SC
1					
2		4/6/8/7	90	0	(2'-4') - SAA . - SC
3					
4		4/5/6/7	100	0	(4'-6') - SAA, except moist to wet. - SC
5					
6		4/4/4/4	90	0	(6'-7.5') - SAA.- SC
					(7.5'-8') - Br, f-m sand, silt, moist. - SM
7					
8		3/1/1/2	90	0	(8'-10') - SAA. - SM
9					
10		1/1/1/2	100	0	(10'-12') - SAA, except wet. - SM
11					
12		2/3/5/5	100	0	(12'-14') - SAA. - SM
13					
14		2/4/4/4	100	0	(14'-16') - SAA. - SM
15					
16					
					Boring Terminated at a depth of 16 ' bgs.

SCHEMATIC **COMMENTS**



SAMPLING METHOD
SS = SPLIT SPOON
A = AUGER CUTTINGS
C = CORED

COMMENTS:
Installed 2-inch monitoring well.

PARSONS ENGINEERING SCIENCE, INC.
DRILLING RECORD

BORING/ WELL NO. MW-21 **Sheet** 1 **of** 1

Contractor: Northstar Drilling
Driller: S. Laramer
Inspector: E. Ashton
Rig Type: CME-45C

PROJECT NAME: Site 15, Hancock Airfield
PROJECT NUMBER 738483

Location Description: SEE SITE PLAN

Location Plan

SEE SITE PLAN

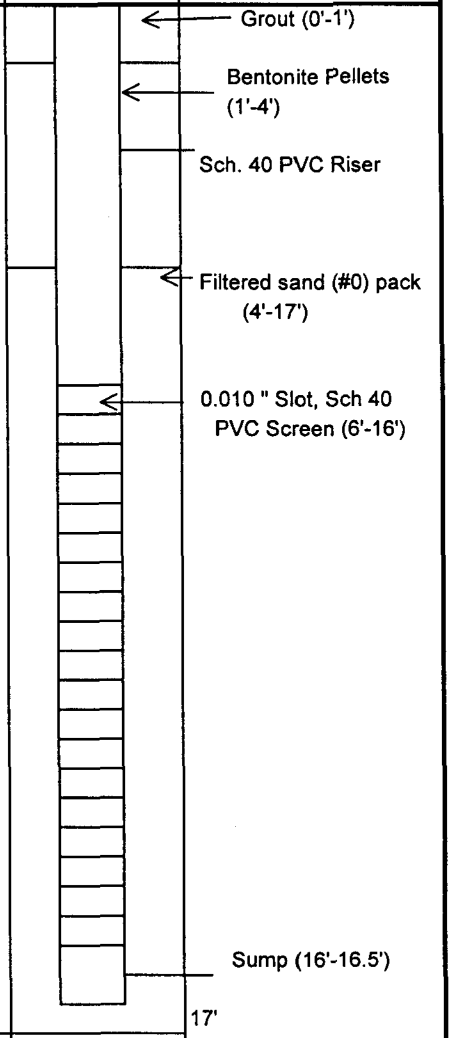
Weather: Cloudy - 30'f
Date/Time Start: 1/3/01 - 1250
Date/Time Finish: 1/3/01 - 1535

GROUNDWATER OBSERVATIONS

Water Level	10.31			
Date	######			
Time	1255			
Meas. From	TOC			

Sampl Depth	Sample I.D.	SPT	% Rec.	PID (ppm)	FIELD IDENTIFICATION OF MATERIAL
0		1/2/3/5	50	8.5	(0'-2') - Br, clay with silt, trace f-gravel and f-sand, moist. - SM/SC
1					
2		5/4/4/6	70	12	(2'-4') - Br, silt with clay, f-sand, moist. - SM/SC
3					
4		6/3/4/4	90	350	(4'-6') - Br, silt with clay, f-sand, petroleum odor, moist to wet.
					SM/SC
5					
6		2/3/2/3	90	363	(6'-8) - Br to light Gr, silt, f-m sand with clay, petroleum odor, wet.
					SM/SC
7					
8		3/2/3/2	100	1045	(8'-10') - SAA. - SM/SC
9					
10		2/1/2/3	NR	0	(10'-12') - No recovery. C-gravel at tip of spoon.
11					
12		2/2/3/5	100	3064	(12'-14') - Br to Gr, f-m sand, silt, petroleum odor, wet. - SM
13					
14		3/2/1/4	100	2064	(14'-17') - Br to Gr, f-m sand, silt, petroleum odor, wet. - SM
					Note: Seam approx. 4-inches thick from 15'-15.4' bgs of
15					solid Gr, f-m sand with black stain present.
16					
17					
					Boring Terminated at a depth of 17 ' bgs.

SCHEMATIC **COMMENTS**



SAMPLING METHOD
SS = SPLIT SPOON
A = AUGER CUTTINGS
C = CORED

COMMENTS:
Installed 2-inch monitoring well.

PARSONS ENGINEERING SCIENCE, INC.
DRILLING RECORD

BORING/ WELL NO. MW-22
Sheet 1 **of** 1

Contractor: Northstar Drilling
Driller: S. Laramer
Inspector: E. Ashton
Rig Type: CME-45C

PROJECT NAME: Site 15, Hancock Airfield
PROJECT NUMBER 738483

Location Description:
SEE SITE PLAN

Location Plan
SEE SITE PLAN

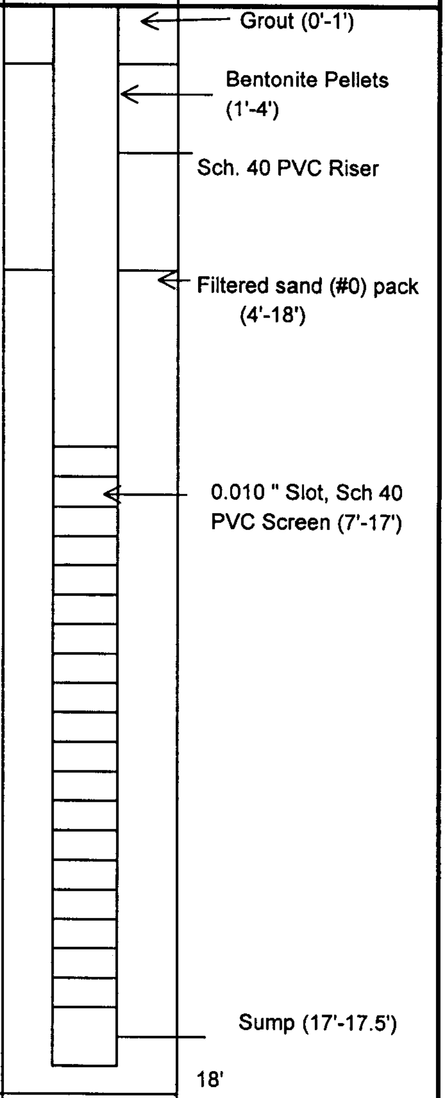
GROUNDWATER OBSERVATIONS

Water Level	9.7			
Date	######			
Time	1300			
Meas. From	TOC			

Weather: Cloudy - 25'f
Date/Time Start: 1/4/01 - 0937
Date/Time Finish: 1/4/01 - 1135

Sampl Depth	Sample I.D.	SPT	% Rec.	PID (ppm)	FIELD IDENTIFICATION OF MATERIAL
0		1/2/2/5	50	8.1	(0'-2') - Br, clay with silt, trace f-sand, roots, moist. - SC
1					
2		4/4/5/5	50	14.1	(2'-4') - SAA with the exception of no roots and moist to wet. - SC
3					
4		5/5/3/4	80	19.9	(4'-6') - SAA. - SC
5					
6		2/2/2/2	90	21.2	(6'-8) - SAA, moist to wet.- SC
7					
8		2/2/2/2	90	20	(8'-10') - SAA, wet. - SC
9					
10		4/4/3/5	60	20	(10'-12') - SAA. - SC
11					
12		5/3/4/1	60	261	(12'-13.6') - SAA. - SC (13.6'-14') - Br to Gr, f-m sand, silt,petroleum odor, black staining, wet. - SM
13					
14		2/1/2/3	60	190	(14'-14.3') - Br, clay with silt, trace of f-sand, wet. - SC (14.3'-16') - Br to Gr, f-m sand, silt, petroleum odor, wet, interbedded with seams of f-m sand with black staining. - SM
15					
16		3/4/4/5	80	650	(16'-18) - Br to Gr, f-m sand, silt, seams of black staining soil, petroleum odor, wet. - SM
17					
18					
					Boring Terminated at a depth of 18 ' bgs.

SCHEMATIC **COMMENTS**



COMMENTS:
Installed 2-inch monitoring well.

SAMPLING METHOD
SS - SPLIT SPOON
A - AUGER CUTTINGS
C - CORED

Contractor: Northstar Drilling
Driller: S. Laramer
Inspector: E. Ashton
Rig Type: CME-45C

PARSONS ENGINEERING SCIENCE, INC.
DRILLING RECORD

PROJECT NAME: Site 15, Hancock Airfield
PROJECT NUMBER 738483

BORING/ WELL NO. MW-23
Sheet 1 **of** 1

Location Description:
SEE SITE PLAN

Location Plan
SEE SITE PLAN

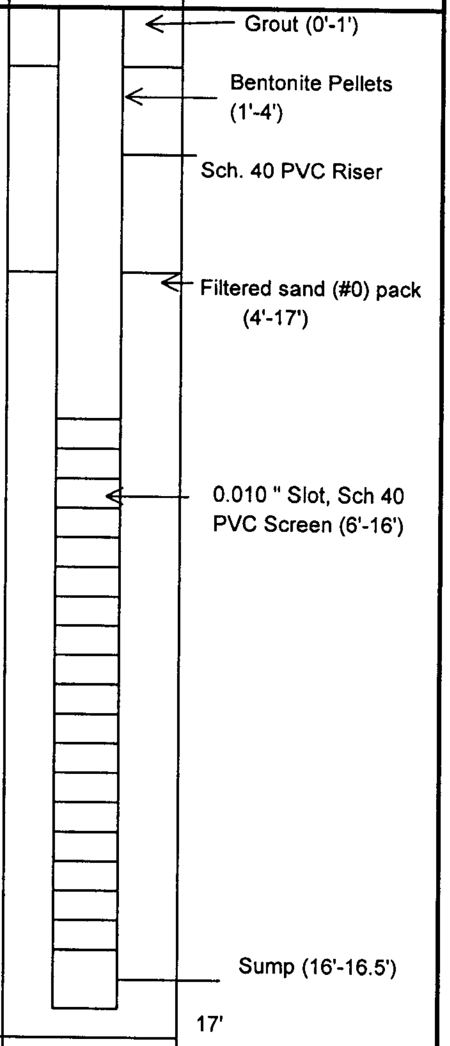
GROUNDWATER OBSERVATIONS

Water Level	9.37			
Date	######			
Time	1318			
Meas. From	TOC			

Weather: Cloudy - 25'f
Date/Time Start: 1/4/01 - 1252
Date/Time Finish: 1/4/01 - 1454

Sampl Depth	Sample I.D.	SPT	% Rec.	PID (ppm)	FIELD IDENTIFICATION OF MATERIAL
0		1/1/3/2	80	16.4	(0'-2') - Br, silt with clay, trace f-sand, roots, moist to wet. - SC
1					
2		2/3/4/6	80	23	(2'-4') - SAA with the exception of no roots and moist. - SC
3					
4		2/3/3/4	90	33.1	(4'-6') - SAA. - SC
5					
6		2/2/2/2	80	31.7	(6'-8) - SAA.- SC
7					
8		3/3/3/2	50	690	(8'-10') - Gr to Br, f-m sand, silt, petroleum odor, moist. - SM
9					
10		2/1/1/3	80	643	(10'-12') - SAA. - SM
11					
12		4/3/4/6	90	3422	(12'-14') - SAA. - SM
13					
14		2/3/4/4	90	100	(14'-17) - Br to Gr, f-m sand, silt, wet. - SM
15					
16					
17					
					Boring Terminated at a depth of 17 ' bgs.

SCHEMATIC **COMMENTS**



SAMPLING METHOD
SS - SPLIT SPOON
A - AUGER CUTTINGS
C - CORED

COMMENTS:
Installed 2-inch monitoring well.

APPENDIX B

DATA USABILITY REPORT

DATA USABILITY REPORT
FOR HANCOCK AIRFIELD – SITE 15

Prepared For:

174th Fighter Wing of the Air National Guard

6001 East Molloy Road
Syracuse, NY 13211-7099

and

Air National Guard

Environmental Restoration Branch
3500 Fetchet Avenue
Andrews AFB, MD 20762-5157

Prepared By:

PARSONS ENGINEERING SCIENCE, INC.

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Phone: (315) 451-9560
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REVIEWED AND APPROVED BY:

Project Manager: ______________________ 3/9/01
Date

Technical Manager: DBB for GHM 4/5/01
Date

MARCH 2001

PARSONS

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SECTION 1

DATA USABILITY SUMMARY

Groundwater and surface soil samples were collected from the Hancock Airfield – Site 15 on January 23, 2001 through January 30, 2001. Analytical results from these samples were validated and reviewed by Parsons Engineering Science, Inc. (Parsons ES) for usability with respect to the following requirements:

- Work Plan,
- NYSDEC Analytical Services Protocol (ASP) dated September 1989 with October 1995 revisions, and
- USEPA Region II Standard Operating Procedures (SOPs) in "CLP Organics Data Review and Preliminary Review," SOP No. HW-6, Revision #8, January 1992, and "Evaluation of Metals Data for the CLP based on SOW 3/90," SOP No. HW-2, Revision #11, January 1992.

The analytical laboratories for this project were Galson Laboratories (Galson), O'Brien and Gere Laboratories (OBG), and Life Science Laboratories (LSL).

1.1 LABORATORY DATA PACKAGES

The laboratory data package turnaround time, defined as the time from sample receipt by the laboratory to receipt of the analytical data packages by Parsons ES, was 21 days on average for the groundwater and soil samples.

The data packages received from the laboratories were paginated, complete, and overall were of good quality. Comments on specific quality control (QC) and other requirements are discussed in detail in the attached data usability report, which is presented by media in Section 2.

1.2 SAMPLING AND CHAIN-OF-CUSTODY

Groundwater and surface soil samples were collected, properly preserved, shipped under a chain-of-custody (COC) record, and received at the laboratories within one to three days of sampling. All samples were received intact and in good condition at the laboratories.

1.3 LABORATORY ANALYTICAL METHODS

Groundwater samples were collected from Site 15 and analyzed for the volatile compounds benzene, toluene, ethylbenzene, and xylenes (BTEX), polychlorinated biphenyls (PCBs), iron, total organic carbon (TOC), nitrate, sulfate, and the dissolved gases methane, ethane, and ethene. Surface soil samples were collected from Site 15 and analyzed for PCBs only. Summaries of issues concerning these laboratory analyses are presented in Subsections 1.3.1 through 1.3.5. The data qualifications resulting from the data validation/usability review and statements on the laboratory analytical precision, accuracy, representativeness, completeness, and comparability

(PARCC) are discussed for each analytical method in Section 2. The laboratory data were reviewed and may be qualified with the following validation flag:

"U" - not detected at the value given,

"UJ" - not detected and estimated at the value given, and

"J" - estimated at the value given.

The validated laboratory data are presented by media in Attachment A.

1.3.1 BTEX Organic Analyses

The groundwater samples collected from Site 15 were analyzed for BTEX by LSL using the USEPA SW-846 8260B analytical method. The BTEX groundwater data did not require qualification resulting from data validation. Therefore, the BTEX analyses were 100% complete (usable) for the groundwater data presented by LSL. PARCC requirements were met overall.

1.3.2 PCB Organic Analyses

The surface soil samples and certain groundwater samples collected from Site 15 were analyzed by Galson for PCBs using the USEPA SW-846 8082 analytical method. The PCB data did not require qualification resulting from data validation. Therefore, the PCB analyses were 100% complete with all PCB data considered usable and valid for the PCB data presented by Galson. PARCC requirements were met.

1.3.3 Iron Analyses

The groundwater samples collected from Site 15 were analyzed by LSL for iron using the USEPA SW-846 6010B analytical method. Certain reported results for the iron samples were considered not detected and qualified "U" due to laboratory contamination present in the preparation blank. All of the iron analyses were considered usable and 100% complete for the groundwater data presented by LSL. PARCC requirements were met overall.

1.3.4 TOC, Sulfate and Nitrate Analyses

The groundwater samples collected from Site 15 were analyzed by LSL for TOC using the USEPA 415.2 analytical method, and sulfate and nitrate using the USEPA 300.0 analytical method. The TOC, sulfate, and nitrate data were reviewed and evaluated for laboratory method blank and field equipment blank contamination, holding times, laboratory control sample recoveries, matrix spike recoveries, calibration curve linearity, initial and continuing calibration verifications, field and laboratory duplicate precision, and sample results were verified with analytical raw data. The groundwater data did not require qualification as a result of this review. All of the TOC, sulfate, and nitrate analyses were considered 100% complete (usable) for the groundwater data presented by LSL. PARCC requirements were met.

1.3.5 Methane, Ethane, and Ethene Analyses

The groundwater samples collected from Site 15 were analyzed by OBG for the dissolved gases methane, ethane, and ethene using the USEPA approved RSK SOP-175 analytical method.

These data were reviewed and evaluated for laboratory method blank and trip/field equipment blank contamination, laboratory control sample recoveries, field duplicate precision, matrix spike/matrix spike duplicate (MS/MSD) precision and accuracy, instrument calibrations, holding times, and sample results were verified with analytical raw data. As a result of this review, the groundwater data did not require data validation qualification. All of the methane, ethane, and ethene analyses were 100% complete (usable) for the groundwater data presented by OBG. PARCC requirements were met.

SECTION 2

DATA USABILITY REPORT

2.1 GROUNDWATER

Data review has been completed for data packages generated by Galson, LSL, and OBG containing groundwater samples collected from Site 15. The specific samples contained in these data packages, the analyses performed, and a usability summary are presented in Table 2.1-1. All of these samples were properly preserved, shipped under a COC record, and received intact by the analytical laboratory. The validated laboratory data are presented in Attachment A-1.

Data validation was performed for all samples in accordance with the most current editions of the NYSDEC ASP and the USEPA Region II SOPs for organic and inorganic data review. This data validation and usability report is presented by analysis type.

2.1.1 BTEX

The following items were reviewed for compliancy in the BTEX analysis:

- Custody documentation
- Holding times
- Surrogate recoveries
- Matrix spike/matrix spike duplicate(MS/MSD) precision and accuracy
- Matrix spike blank (MSB) accuracy
- Laboratory method blank and field/trip blank contamination
- GC/MS instrument performance
- Laboratory control sample (LCS) recoveries
- Sample result verification and identification
- Initial and continuing calibrations
- Internal standard area counts and retention times
- Field duplicate precision
- Quantitation limits
- Data completeness

These items were considered compliant and acceptable in accordance with the validation protocols.

Usability

All BTEX sample results were considered usable following data validation.

Summary

The quality assurance objectives for measurement data included considerations for precision, accuracy, representativeness, completeness, and comparability. The BTEX data presented by LSL were 100% complete and usable. The validated BTEX laboratory data are presented in Attachment A-1.

2.1.2 PCB's

The following items were reviewed for compliancy in the PCB analysis:

- Custody documentation
- Holding times
- Surrogate recoveries
- MS/MSD precision and accuracy
- MSB recoveries
- Laboratory method blank and field equipment blank contamination
- Sample result verification and identification
- Initial calibrations
- Performance evaluation mixtures
- Verification calibrations
- Analytical sequence
- Cleanup efficiency
- Chromatogram quality
- Field duplicate precision
- Quantitation limits
- Data completeness

These items were considered compliant and acceptable in accordance with the validation protocols, with the exception of surrogate recoveries.

Surrogate Recoveries

Recoveries of sample surrogates were compliant and within QC advisory limits with the exception of the low recoveries for decachlorobiphenyl (QC limit 52-134%R) in samples MW-12S (48%R), MW-16 (35%R), and EQUIPBLANK (44%R). Validation qualification was not required for these samples since only one surrogate was outside QC advisory limits.

Usability

All PCB groundwater sample results were considered usable following data validation.

Summary

The quality assurance objectives for measurement data included considerations for precision, accuracy, representativeness, completeness, and comparability. The PCB groundwater data presented by Galson were 100% complete and all data were considered usable and valid. The validated data are tabulated and presented in Attachment A-1.

2.1.3 Iron

The following items were reviewed for compliancy in the iron analyses:

- Custody documentation
- Holding times
- Initial and continuing calibration verifications
- Initial and continuing calibration, laboratory preparation, and equipment blank contamination
- Matrix spike recoveries
- Laboratory duplicate precision
- Inductively coupled plasma (ICP) interference check sample (ICS)
- Laboratory control sample
- ICP serial dilution
- Sample result verification and identification
- Field duplicate precision
- Quantitation limits
- Data completeness

These items were considered compliant and acceptable in accordance with the validation protocols with the exception of blank contamination.

Blank Contamination

All initial and continuing calibration blanks and the field equipment blank did not contain iron contamination. However, the laboratory preparation blank associated with all groundwater samples contained iron at a concentration of 337.1 µg/L. Therefore, all groundwater iron results less than the validation action concentration of 1685.5 µg/L (five times the concentration of the blank) were considered not detected and qualified "U". The contamination present in this blank may be due to interference from the ICP ICS.

Usability

All iron sample results were considered usable following data validation.

Summary

The quality assurance objectives for measurement data included considerations for precision, accuracy, representativeness, completeness, and comparability. The iron data presented by LSL were 100% complete and all data were considered usable and valid. The validated iron laboratory data are tabulated and presented in Attachment A-1.

2.2 SURFACE SOIL

Data review has been completed for data packages generated by Galson containing surface soil samples collected from Site 15. The specific samples contained in these data packages, the analyses performed, and a usability summary are presented in Table 2.2-1. All of these samples were properly preserved, shipped under a COC record, and received intact by the analytical laboratory. The validated laboratory data are presented in Attachment A-2.

Data validation was performed for all samples in accordance with the most current editions of the NYSDEC ASP and USEPA Region II SOPs for organic and inorganic data review. This data validation and usability report is presented by analysis type.

2.2.1 PCBs

The following items were reviewed for compliancy in the PCB analysis:

- Custody documentation
- Holding times
- Surrogate recoveries
- MS/MSD precision and accuracy
- MSB recoveries
- Laboratory method blank contamination
- Sample result verification and identification
- Initial calibrations
- Performance evaluation mixtures
- Verification calibrations
- Analytical sequence
- Cleanup efficiency
- Chromatogram quality
- Quantitation limits
- Data completeness

These items were considered compliant and acceptable in accordance with the validation protocols, with the exception of MS/MSD precision and accuracy.

MS/MSD Precision and Accuracy

All of the MS/MSD precision results (relative percent differences; RPDs) and accuracy results (percent recoveries; %Rs) were considered compliant and within QC acceptance limits during spiked analyses with the exception of the MS/MSD recoveries for PCB-1254 (184%R/ 163%R; QC limit 60-130%R) during the spiked analyses of SS-18. Validation qualification of the unspiked sample results for SS-18 was not warranted due to this noncompliance since sample surrogate recoveries were within QC acceptance limits.

Usability

All PCB surface soil sample results were considered usable following data validation.

Summary

The quality assurance objectives for measurement data included considerations for precision, accuracy, representativeness, completeness, and comparability. The PCB surface soil data presented by Galson were 100% complete and all data were considered usable and valid. The validated data are tabulated and presented in Attachment A-2.

TABLE 2.1-1

SUMMARY OF SAMPLE ANALYSES AND USABILITY
HANCOCK AIRFIELD – SITE 15
GROUNDWATER

Sample ID	Matrix	Sample Date	BTEX	Iron	PCBs	TOC, Nitrate, sulfate	Methane, Ethane Ethene
MW-18	Water	1/23/01	OK	OK		OK	OK
MW-5R	Water	1/23/01	OK	OK		OK	OK
MW-12S	Water	1/24/01	OK	OK	OK	OK	OK
MW-8	Water	1/24/01	OK	OK	OK	OK	OK
MW-80	Water	1/24/01	OK	OK	OK	OK	OK
MW-17	Water	1/24/01	OK	OK	OK	OK	OK
MW-19	Water	1/24/01	OK	OK	OK	OK	OK
MW-12D	Water	1/24/01	OK	OK	OK	OK	OK
MW-16	Water	1/25/01	OK	OK	OK	OK	OK
EQUIP BLANK	Water	1/25/01	OK	OK	OK	OK	OK
MW-20	Water	1/25/01	OK	OK		OK	OK
MW-15	Water	1/25/01	OK	OK		OK	OK
MW-11	Water	1/25/01	OK	OK		OK	OK
MW-14	Water	1/25/01	OK	OK		OK	OK
MW-9	Water	1/25/01	OK	OK		OK	OK
MW-1	Water	1/26/01	OK	OK		OK	OK
MW-13	Water	1/26/01	OK	OK		OK	OK
MW-4	Water	1/26/01	OK	OK		OK	OK
MW-2	Water	1/26/01	OK	OK		OK	OK
Trip Blank	Water	1/26/01	OK				OK
	TOTAL SAMPLES		20	19	8	19	20

Notes: OK - Sample analysis considered valid and usable.

TABLE 2.1-1

SUMMARY OF SAMPLE ANALYSES AND USABILITY
HANCOCK AIRFIELD – SITE 15
SURFACE SOIL

SAMPLE ID	MATRIX	SAMPLE DATE	PCBs
SS-17 (0-1)	Soil	1/30/01	OK
SS-18 (0-1)	Soil	1/30/01	OK
SS-19 (0-1)	Soil	1/30/01	OK
SS-20 (0-1)	Soil	1/30/01	OK
TOTAL SAMPLES:			4

Notes: OK – Sample analysis considered valid and usable.

ATTACHMENT A

VALIDATED LABORATORY DATA

ATTACHMENT A-1

VALIDATED GROUNDWATER LABORATORY DATA

Hancock Airfield
Site 15
Validated Groundwater Analytical Data

									Dup of MW-8				
		Sample ID:	MW-1	MW-2	MW-4	MW-5R	MW-8	MW-80	MW-9	MW-11	MW-12D	MW-12S
		Lab Sample Id:	0100757-001	0100757-004	0100757-003	0100682-002	0100682-006	0100682-007	0100729-007	0100729-005	0100682-010	0100682-003
		LSL	LSL	LSL	LSL	LSL	LSL	LSL	LSL	LSL	LSL	LSL
		SDG:	100682	100682	100682	100682	100682	100682	100682	100682	100682	100682
		Matrix:	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water
		Sampled:	1/26/2001	1/26/2001	1/26/2001	1/23/2001	1/24/2001	1/24/2001	1/25/2001	1/25/2001	1/24/2001	1/24/2001
		Validated:	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001
CasNo	Parameter	Units										
	BTEX											
71-43-2	Benzene	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	93
108-88-3	Toluene	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	13
100-41-4	Ethylbenzene	ug/l	1 U	320	1 U	1 U	1 U	1 U	1 U	1 U	0.6 J	360
108-38-3	m/p-Xylene	ug/l	1 U	900	0.6 J	1 U	1 U	1 U	1 U	1 U	1 U	1300
95-47-6	o-Xylenes	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	420
	Inorganics											
	Iron	ug/l	86 UJ	11000	780 U	416 U	170 U	177 U	1140 U	3350	19.7 UJ	20200
	TOC	mg/l	4	3.3	2.7	8	2.1	2.2	3	2.4	1 U	10
	Nitrate as N	mg/l	0.4	0.5	0.2	2	0.3	0.3	2.6	0.2	0.2	0.2
	Sulfate	mg/l	28	3	49	20	33	33	54	27	101	24

Hancock Airfield
Site 15
Validated Groundwater Analytical Data

		Sample ID:	MW-13	MW-14	MW-15	MW-16	MW-17	MW-18	MW-19	MW-20	Equip Blank	Trip Blank-1
		Lab Sample Id:	0100757-002	0100729-006	0100729-004	0100729-001	0100682-008	0100682-001	0100682-009	0100729-003	0100729-002	0100682-011
		LSL	LSL	LSL	LSL	LSL	LSL	LSL	LSL	LSL	LSL	LSL
		SDG:	100682	100682	100682	100682	100682	100682	100682	100682	100682	100682
		Matrix:	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water
		Sampled:	1/26/2001	1/25/2001	1/25/2001	1/25/2001	1/24/2001	1/23/2001	1/24/2001	1/25/2001	1/25/2001	1/26/2001
		Validated:	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001
CasNo	Parameter	Units										
	BTEX											
71-43-2	Benzene	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	11	1 U	1 U	1 U
108-88-3	Toluene	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
100-41-4	Ethylbenzene	ug/l	1 U	1 U	1 U	1.5	1.4	1 U	82	1 U	1 U	1 U
108-38-3	m/p-Xylene	ug/l	1 U	1 U	1 U	5.5	1 U	1 U	16	1 U	1 U	1 U
95-47-6	o-Xylenes	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
	Inorganics											
	Iron	ug/l	18.3 UJ	527 U	7110	2540	4010	51.8 UJ	10900	9530	4.4 U	
	TOC	mg/l	1.2	2.3	3.2	3.1	3.3	3.4	3.6	4	1 U	
	Nitrate as N	mg/l	0.5	0.1 U	0.1 U	0.1 U	0.1 U	0.8	0.2	0.2	0.1 U	
	Sulfate	mg/l	19	45	33	36	38	27	8	10	1 U	

		Sample ID:	Trip Blank-2	Trip Blank-3
		Lab Sample Id:	0100682-011	0100682-011
		LSL	LSL	LSL
		SDG:	100682	100682
		Matrix:	Water	Water
		Sampled:	1/26/2001	1/26/2001
		Validated:	3/4/2001	3/4/2001
CasNo	Parameter	Units		
	BTEX			
71-43-2	Benzene	ug/l	1 U	1 U
108-88-3	Toluene	ug/l	1 U	1 U
100-41-4	Ethylbenzene	ug/l	1 U	1 U
108-38-3	m/p-Xylene	ug/l	1 U	1 U
95-47-6	o-Xylenes	ug/l	1 U	1 U
	Inorganics			
	Iron	ug/l		
	TOC	mg/l		
	Nitrate as N	mg/l		
	Sulfate	mg/l		

Hancock Airfield
Site 15
Validated Groundwater Analytical Data

								Dup of MW-8				
		Sample ID:	MW-1	MW-2	MW-4	MW-5R	MW-8	MW-80	MW-9	MW-11	MW-12D	MW-12S
		Lab Sample	R9667	R9670	R9669	R9653	R9655	R9656	R9666	R9664	R9659	R9654
		OBHancock	OBHancock	OBHancock	OBHancock	OBHancock	OBHancock	OBHancock	OBHancock	OBHancock	OBHancock	OBHancock
		SDG:	7946	7946	7946	7946	7946	7946	7946	7946	7946	7946
		Matrix:	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water
		Sampled:	1/26/2001	1/26/2001	1/26/2001	1/23/2001	1/24/2001	1/24/2001	1/25/2001	1/25/2001	1/24/2001	1/24/2001
		Validated:	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001
CasNo	Parameter	Units										
	VOLATILES											
74-82-8	Methane	mg/L	0.02	9	0.1	0.002 U	0.02	0.01	0.002 U	0.08	0.003	5
74-84-0	Ethane	mg/L	0.004 U	0.8 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.4 U
74-85-1	Ethene	mg/L	0.004 U	0.8 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.4 U

Hancock Airfield
Site 15
Validated Groundwater Analytical Data

		Sample ID:	MW-13	MW-14	MW-15	MW-16	MW-17	MW-18	MW-19	MW-20	Equip Blank	QC Trip Blank
		Lab Sample	R9668	R9665	R9663	R9660	R9657	R9652	R9658	R9662	R9661	R9671
		OBHancock	OBHancock	OBHancock	OBHancock	OBHancock	OBHancock	OBHancock	OBHancock	OBHancock	OBHancock	OBHancock
		SDG:	7946	7946	7946	7946	7946	7946	7946	7946	7946	7946
		Matrix:	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water
		Sampled:	1/26/2001	1/25/2001	1/25/2001	1/25/2001	1/24/2001	1/23/2001	1/24/2001	1/25/2001	1/25/2001	1/23/2001
		Validated:	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001
CasNo	Parameter	Units										
	VOLATILES											
74-82-8	Methane	mg/L	0.002 U	0.02	0.02	0.08	0.6	0.002 U	1	0.03	0.002 U	0.002 U
74-84-0	Ethane	mg/L	0.004 U	0.004 U	0.004 U	0.004 U	0.04 U	0.004 U	0.04 U	0.004 U	0.004 U	0.004 U
74-85-1	Ethene	mg/L	0.004 U	0.004 U	0.004 U	0.004 U	0.04 U	0.004 U	0.04 U	0.004 U	0.004 U	0.004 U

Hancock Airfield
Site 15
Validated Groundwater Analytical Data

				Dup of MW-8						
		Sample ID:	MW-8	MW-80	MW-12D	MW-12S	MW-16	MW-17	MW-19	EQUIP BLANK
		Lab Sample Id:	L67808-4	L67808-5	L67808-8	L67808-1	L67808-9	L67808-6	L67808-7	L67808-10
		Source:	GALSON	GALSON	GALSON	GALSON	GALSON	GALSON	GALSON	GALSON
		SDG:	L67808	L67808	L67808	L67808	L67808	L67808	L67808	L67808
		Matrix:	Water	Water	Water	Water	Water	Water	Water	Water
		Sampled:	1/24/2001	1/24/2001	1/24/2001	1/24/2001	1/25/2001	1/24/2001	1/24/2001	1/25/2001
		Validated:	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001	3/4/2001
CasNo	Parameter	Units								
	PCBs									
12674-11-2	Aroclor-1016	ug/l	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
11104-28-2	Aroclor-1221	ug/l	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
11141-16-5	Aroclor-1232	ug/l	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
53469-21-9	Aroclor-1242	ug/l	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
12672-29-6	Aroclor-1248	ug/l	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
11097-69-1	Aroclor-1254	ug/l	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
11096-82-5	Aroclor-1260	ug/l	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U

ATTACHMENT A-2

VALIDATED SURFACE SOIL LABORATORY DATA

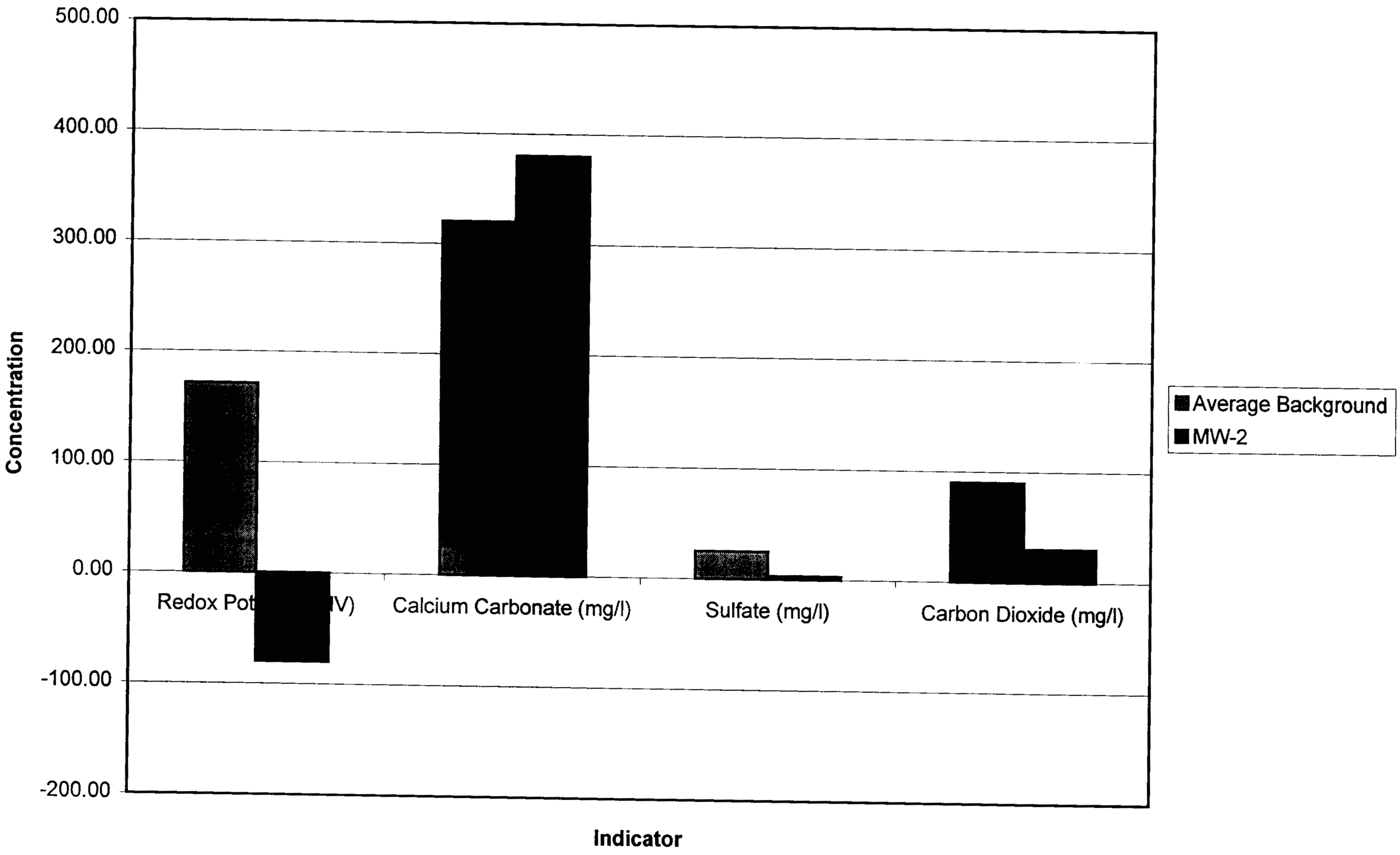
Hancock Airfield
Site 15
Validated Soil Analytical Data

		Sample ID:	SS-17 (0-1)	SS-18 (0-1)	SS-19 (0-1)	SS-20 (0-1)
		Lab Sample Id:	L67948-1	L67948-2	L67948-5	L67948-6
		Source:	GALSON	GALSON	GALSON	GALSON
		SDG:	L67948	L67948	L67948	L67948
		Matrix:	Soil	Soil	Soil	Soil
		Sampled:	1/30/2001	1/30/2001	1/30/2001	1/30/2001
		Validated:	3/4/2001	3/4/2001	3/4/2001	3/4/2001
CasNo	Parameter	Units				
	PCBs					
12674-11-2	Aroclor-1016	ug/kg	44 U	44 U	120 U	20 U
11104-28-2	Aroclor-1221	ug/kg	44 U	44 U	120 U	20 U
11141-16-5	Aroclor-1232	ug/kg	44 U	44 U	120 U	20 U
53469-21-9	Aroclor-1242	ug/kg	44 U	44 U	120 U	20 U
12672-29-6	Aroclor-1248	ug/kg	44 U	44 U	120 U	20 U
11097-69-1	Aroclor-1254	ug/kg	44 U	44 U	120 U	20 U
11096-82-5	Aroclor-1260	ug/kg	590	520	1600	330

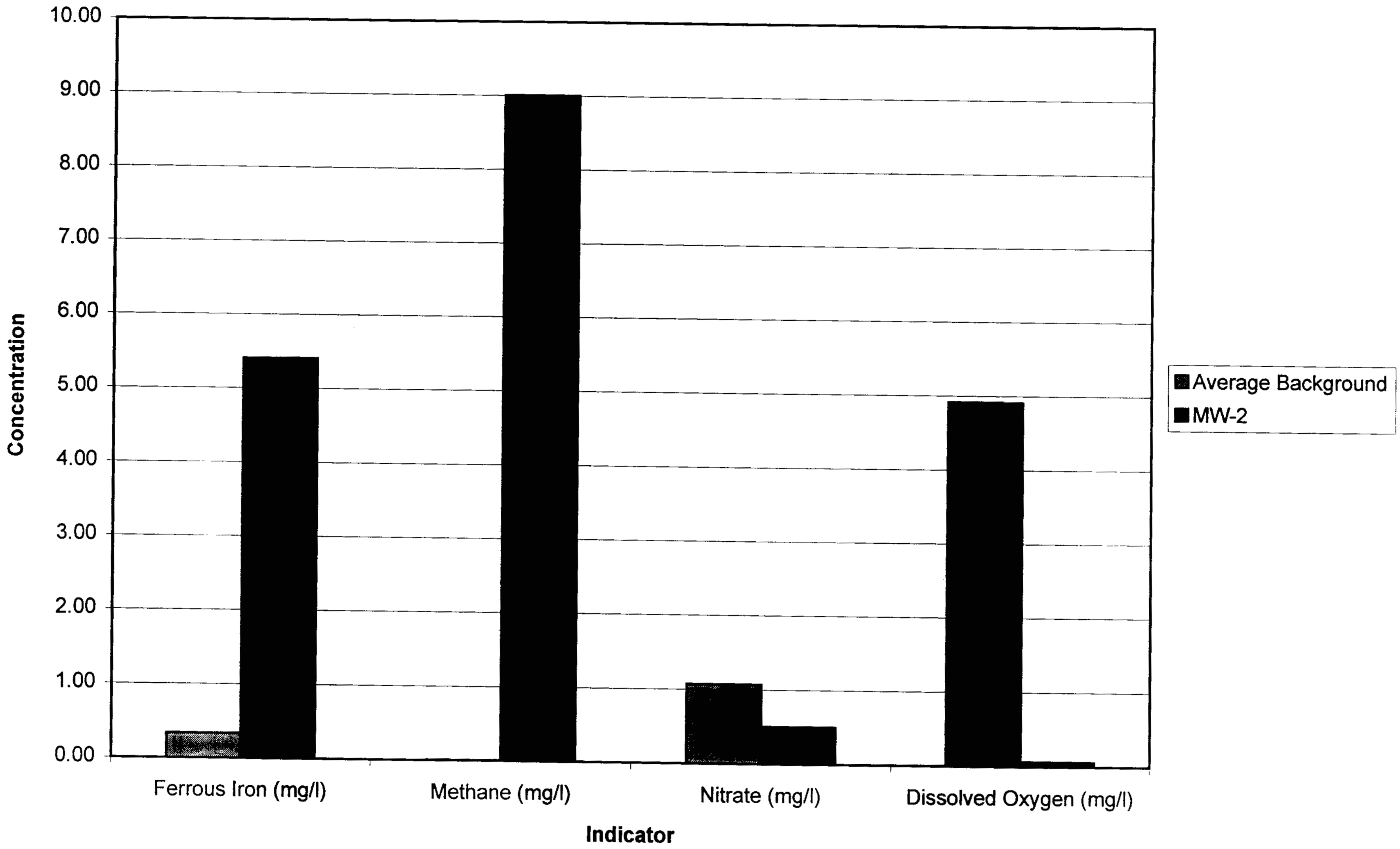
APPENDIX C

GRAPHICAL PLOTS OF RESULTS FOR NATURAL ATTENUATION INDICATOR PARAMETERS

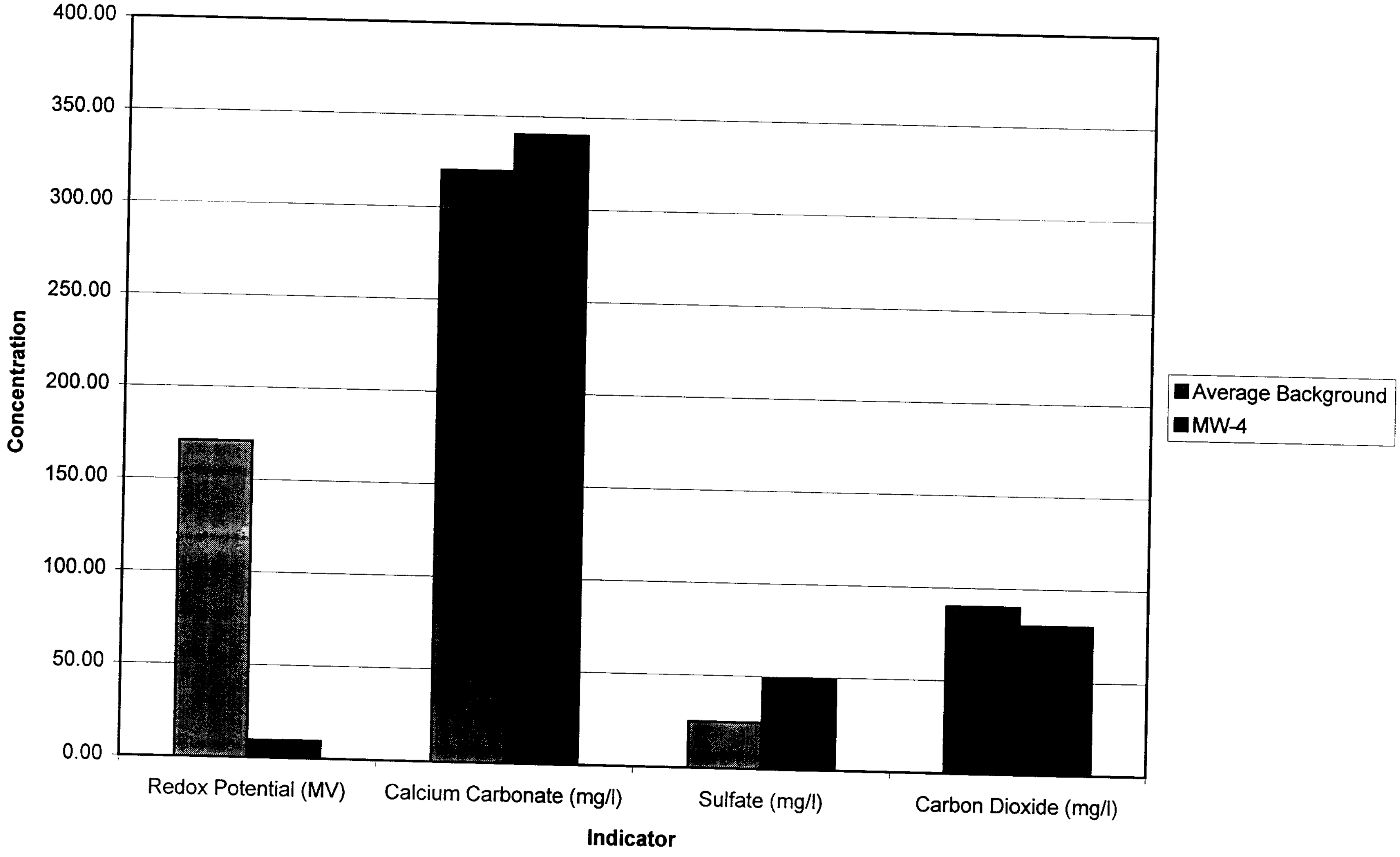
Indicator Concentrations MW-2



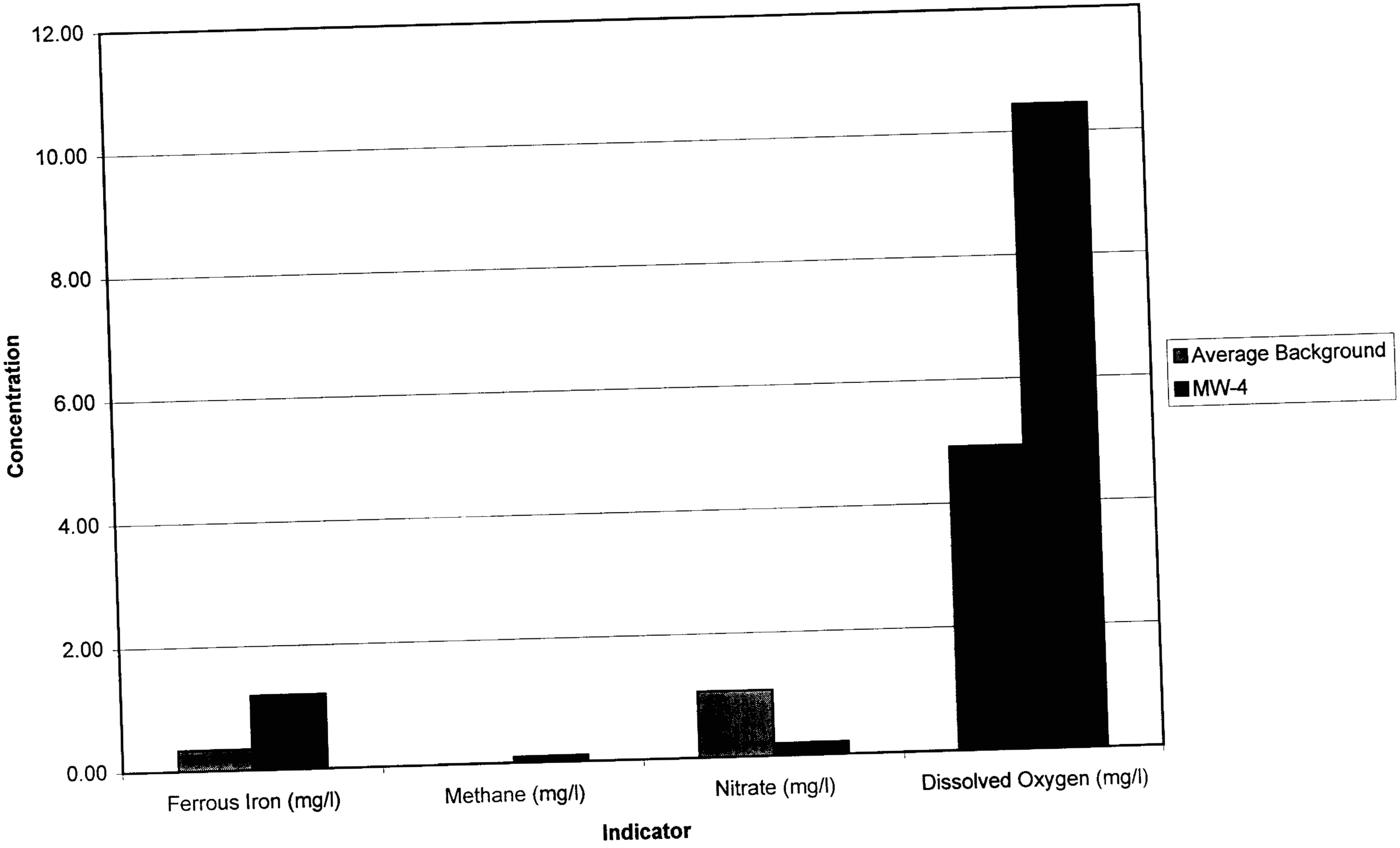
Indicator Concentrations MW-2



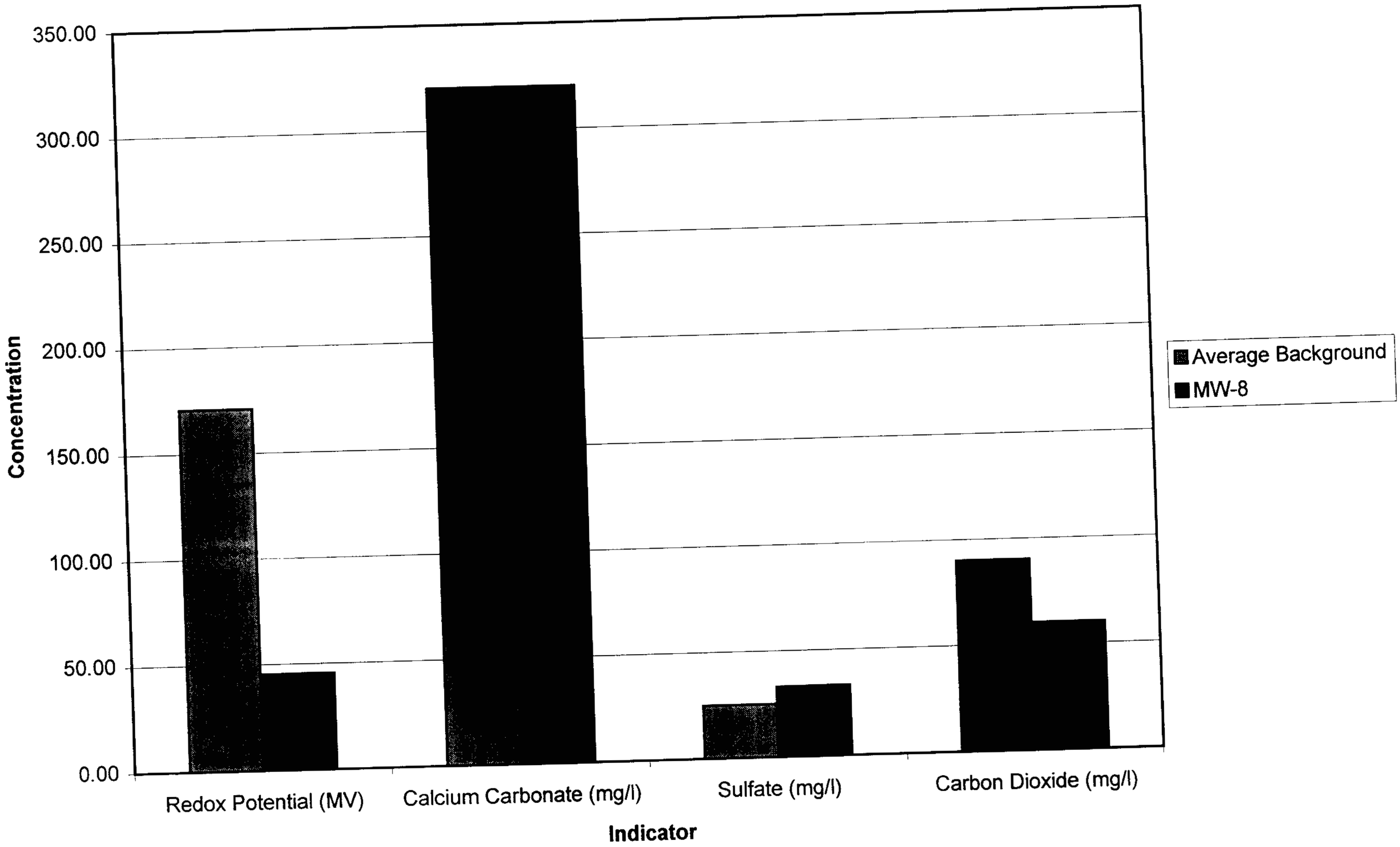
Indicator Concentrations MW-4



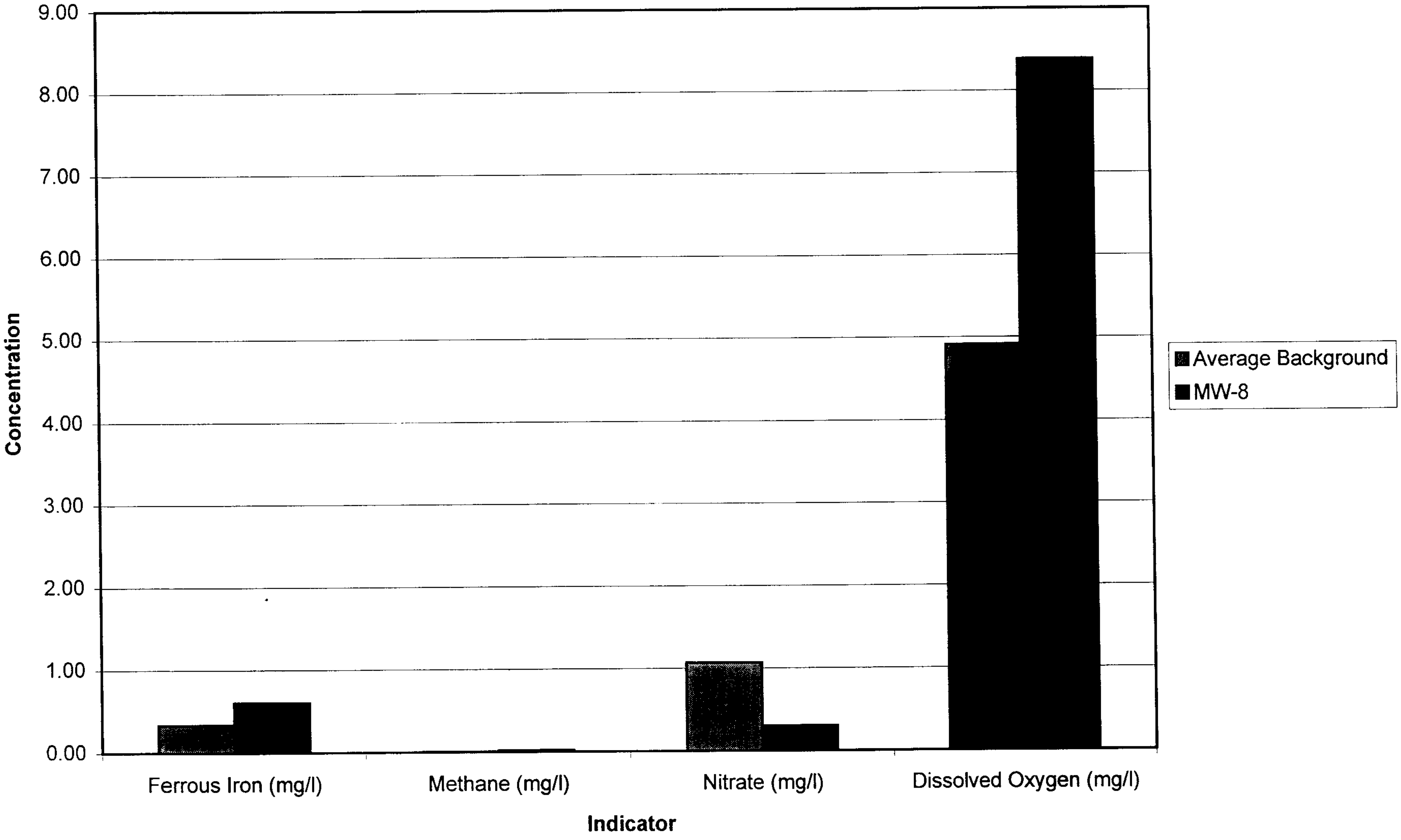
Indicator Concentrations MW-4

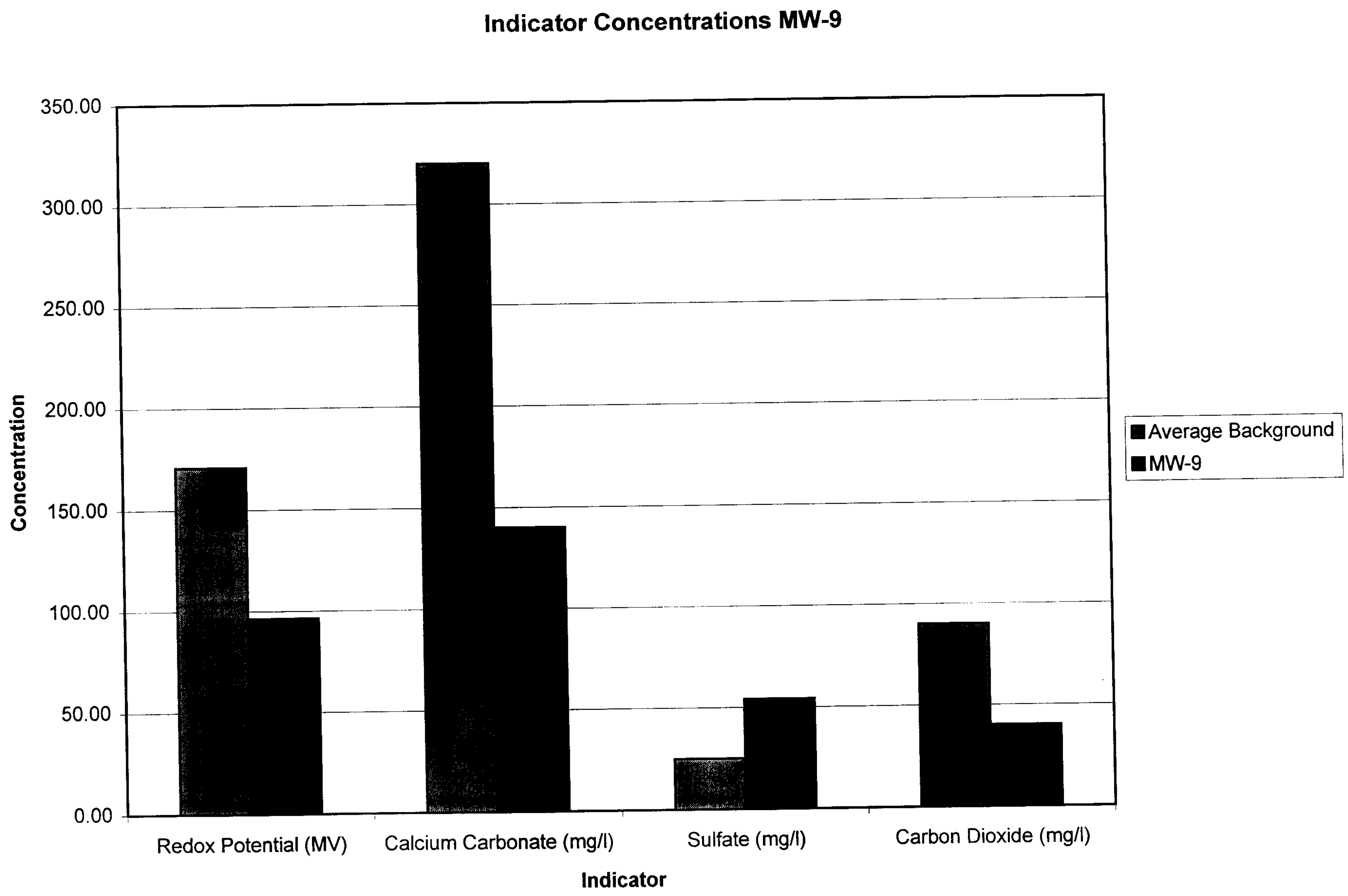


Indicator Concentrations MW-8

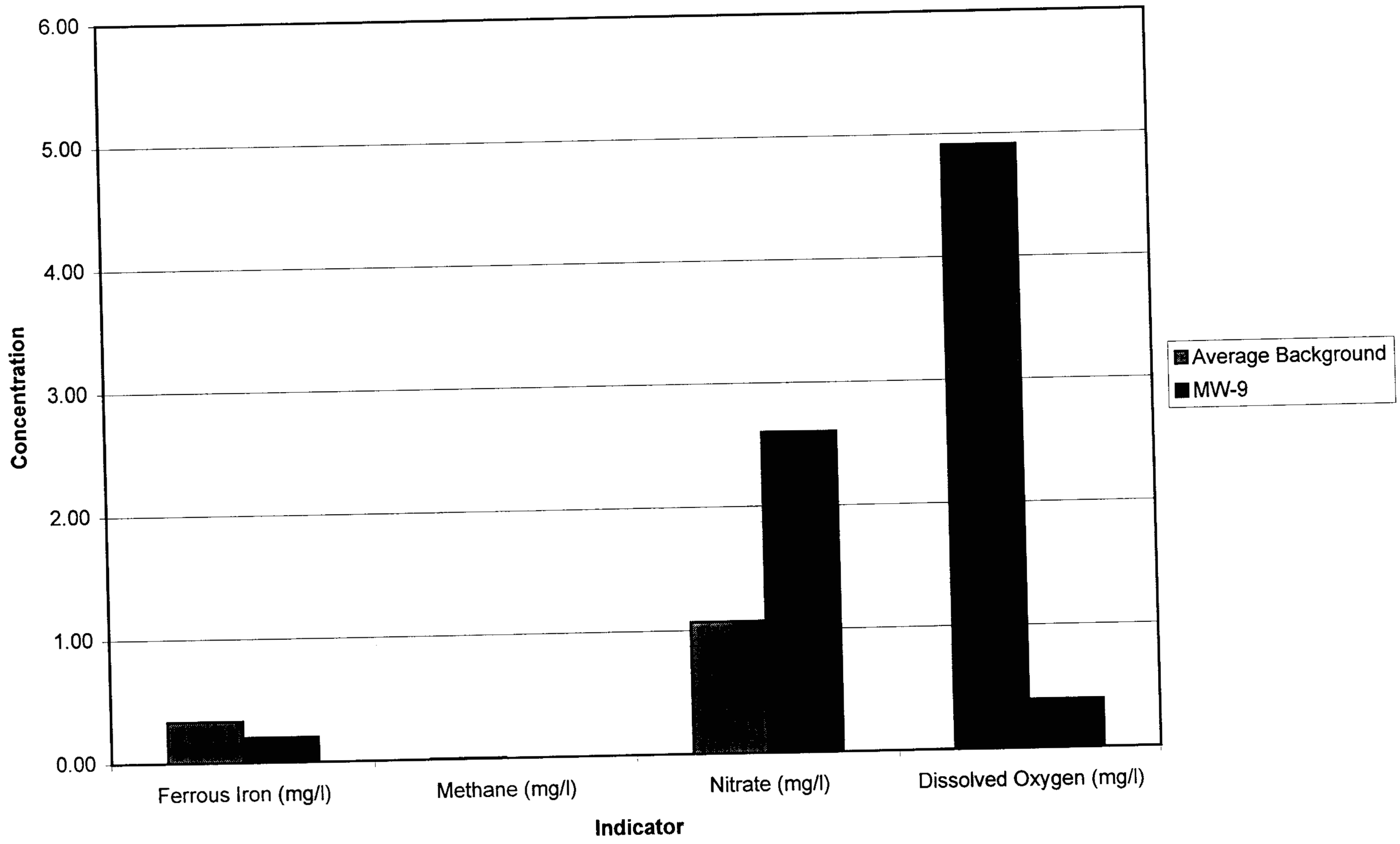


Indicator Concentrations MW-8

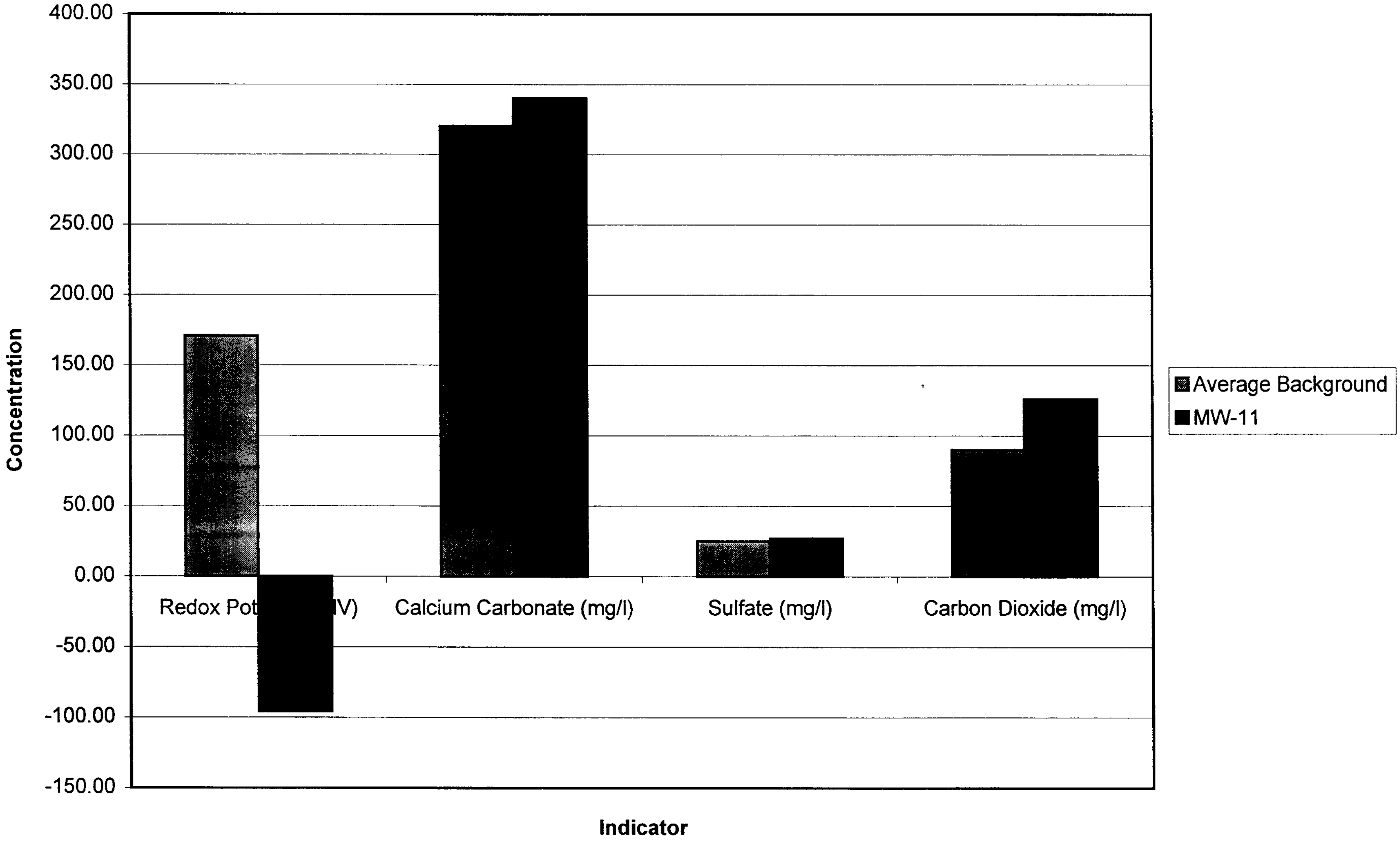



Indicator Concentrations MW-9
Concentration
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Redox Potential (MV)
Calcium Carbonate (mg/l)
Sulfate (mg/l)
Carbon Dioxide (mg/l)
Indicator
Average Background
MW-9

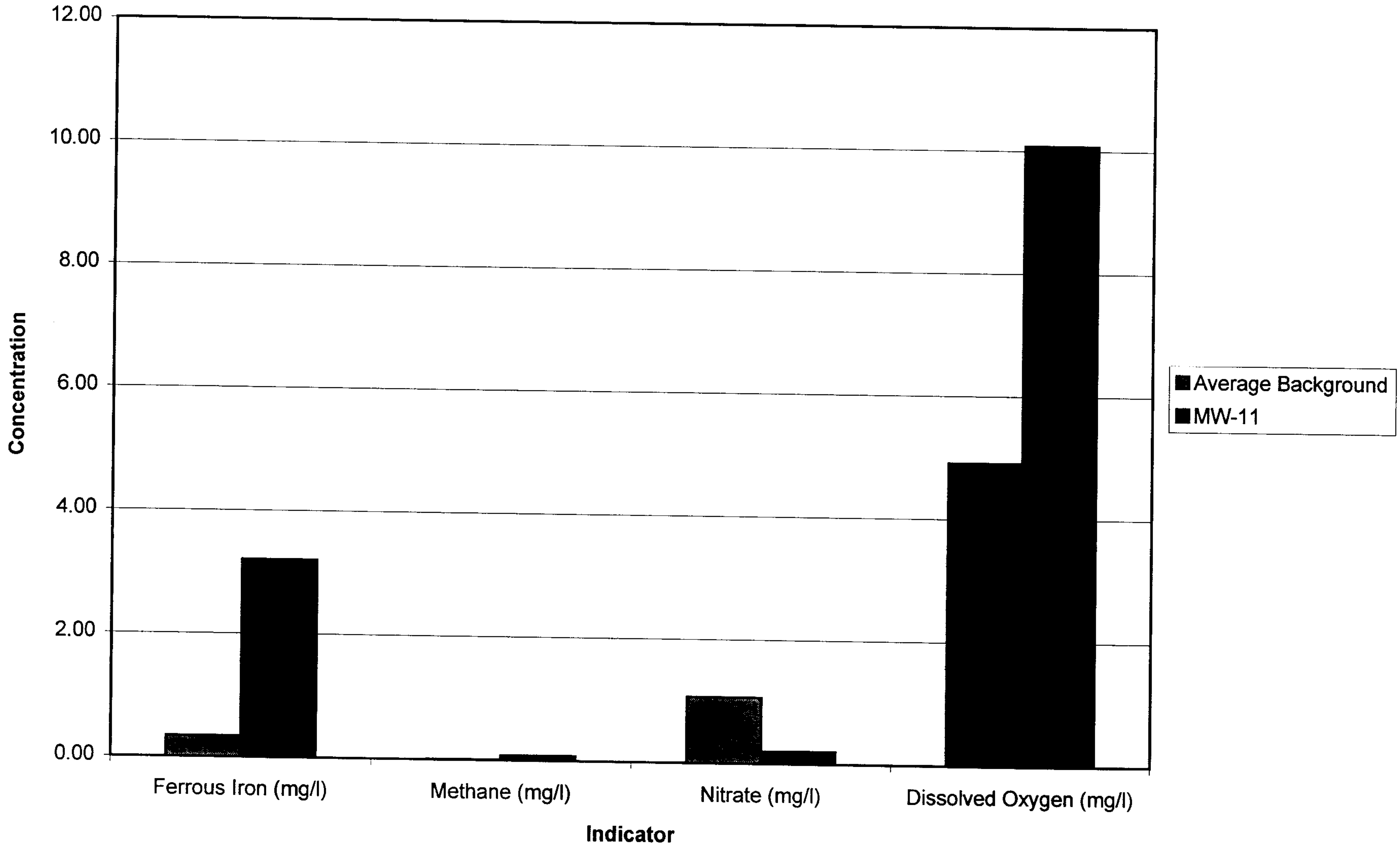
Indicator Concentrations MW-9



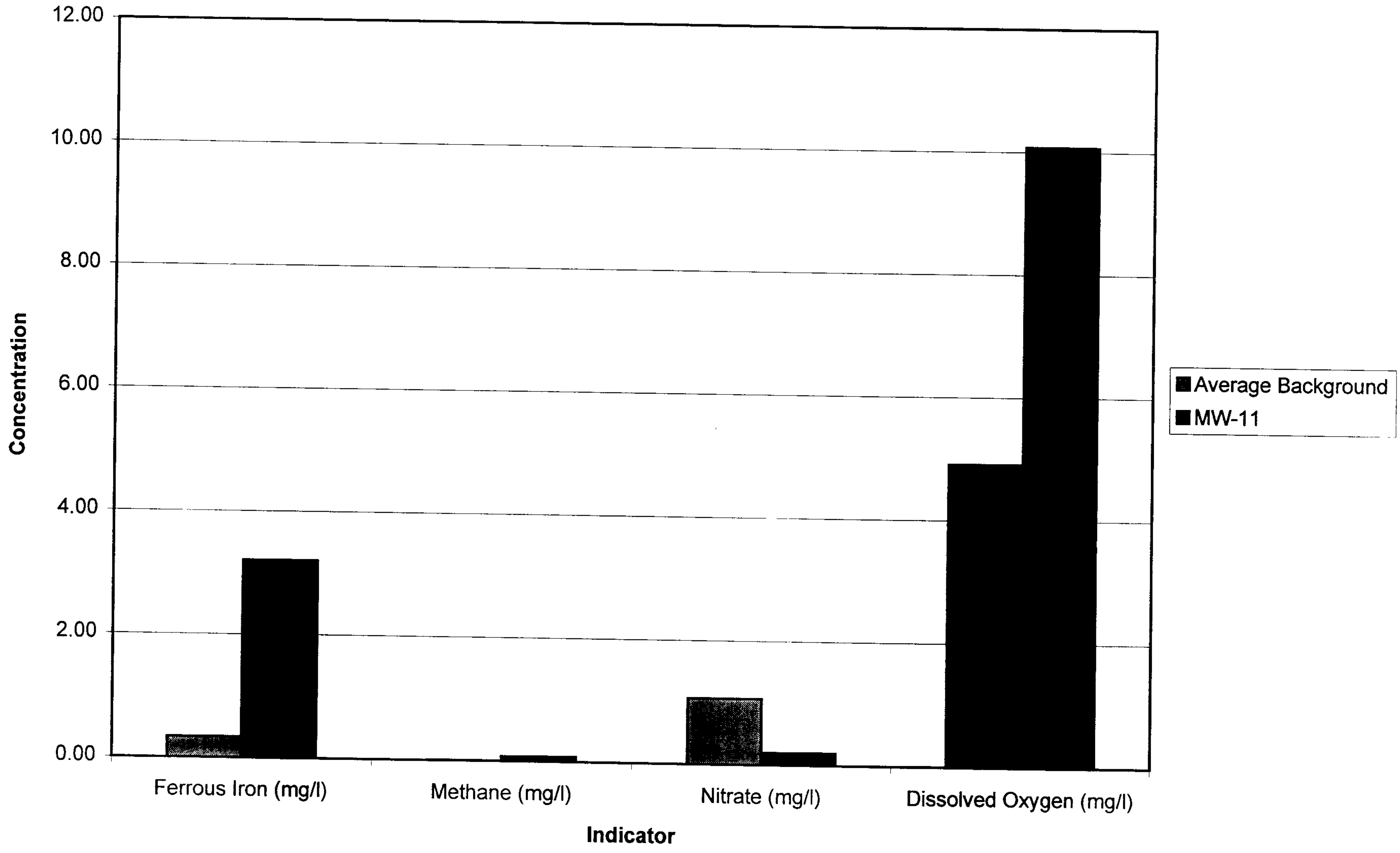
Indicator Concentrations MW-11



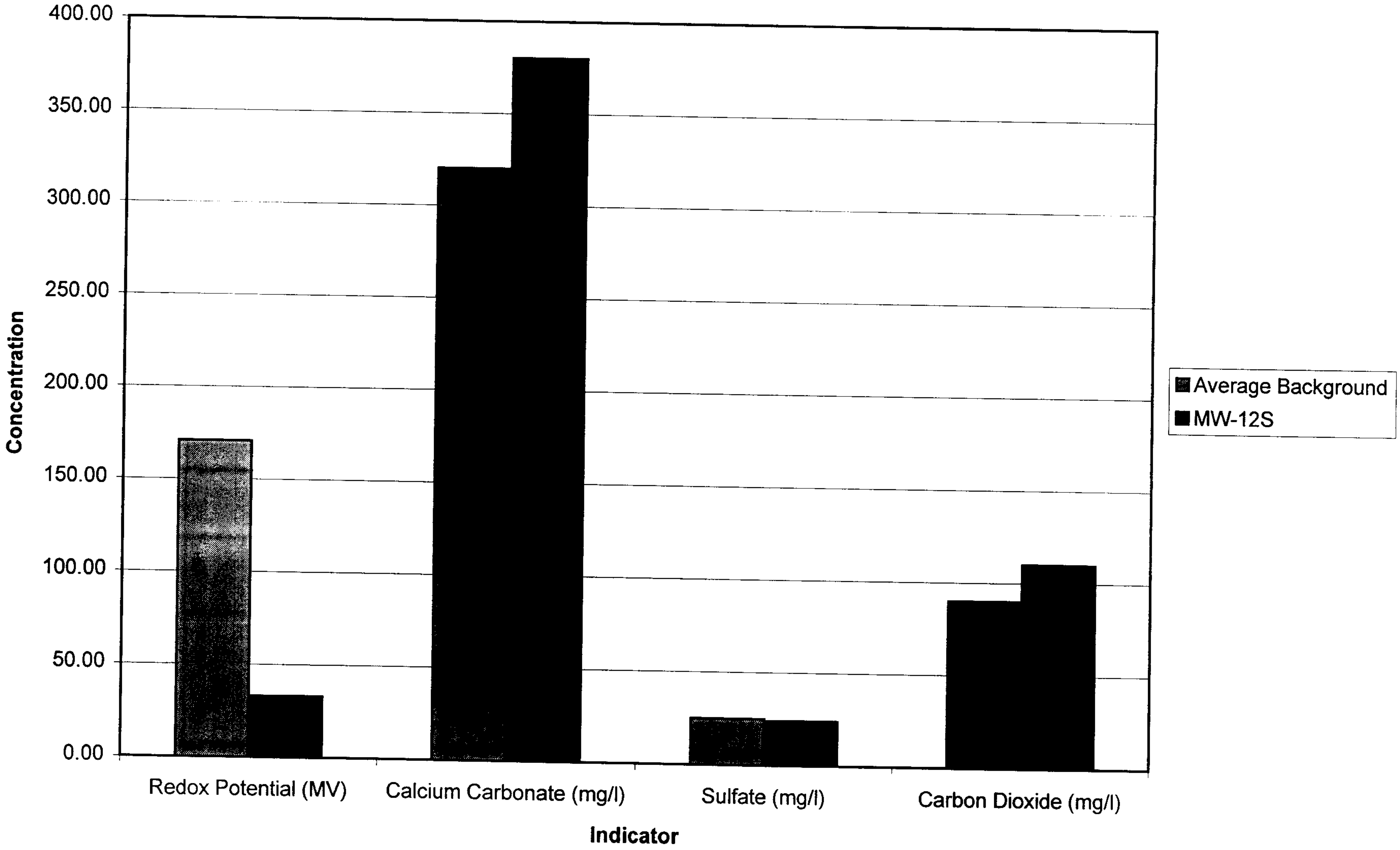
Indicator Concentrations MW-11



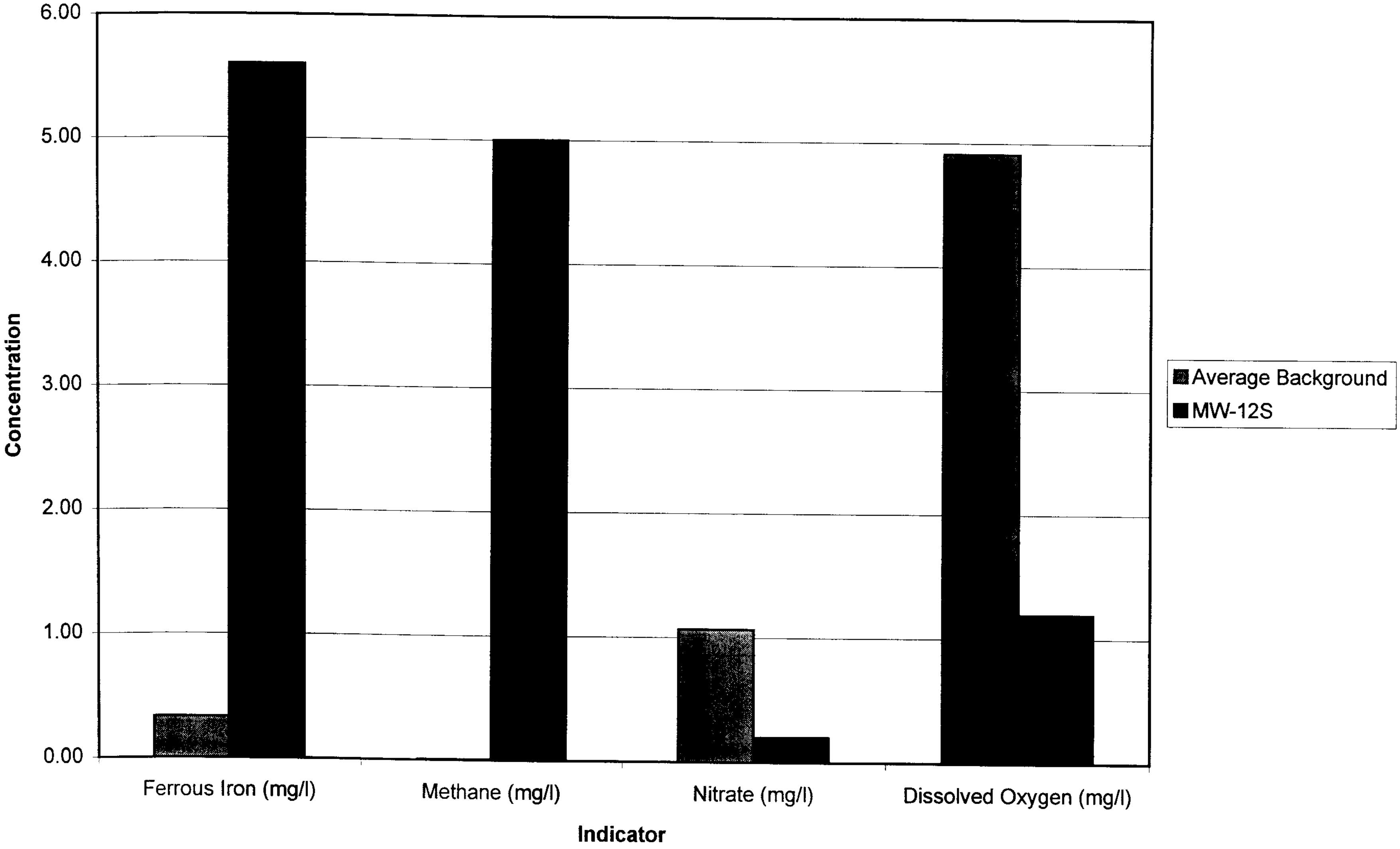
Indicator Concentrations MW-11



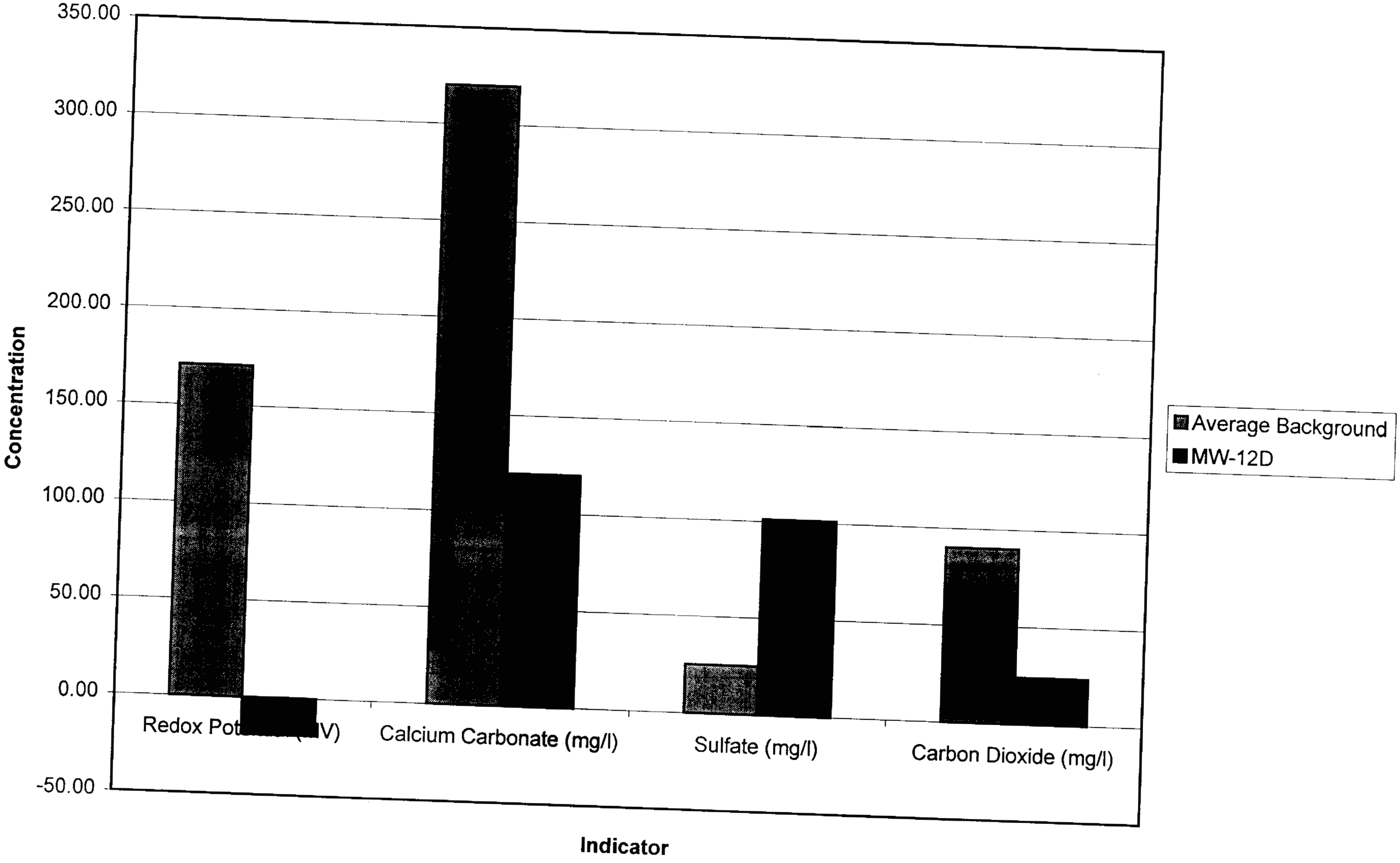
Indicator Concentrations MW-12S



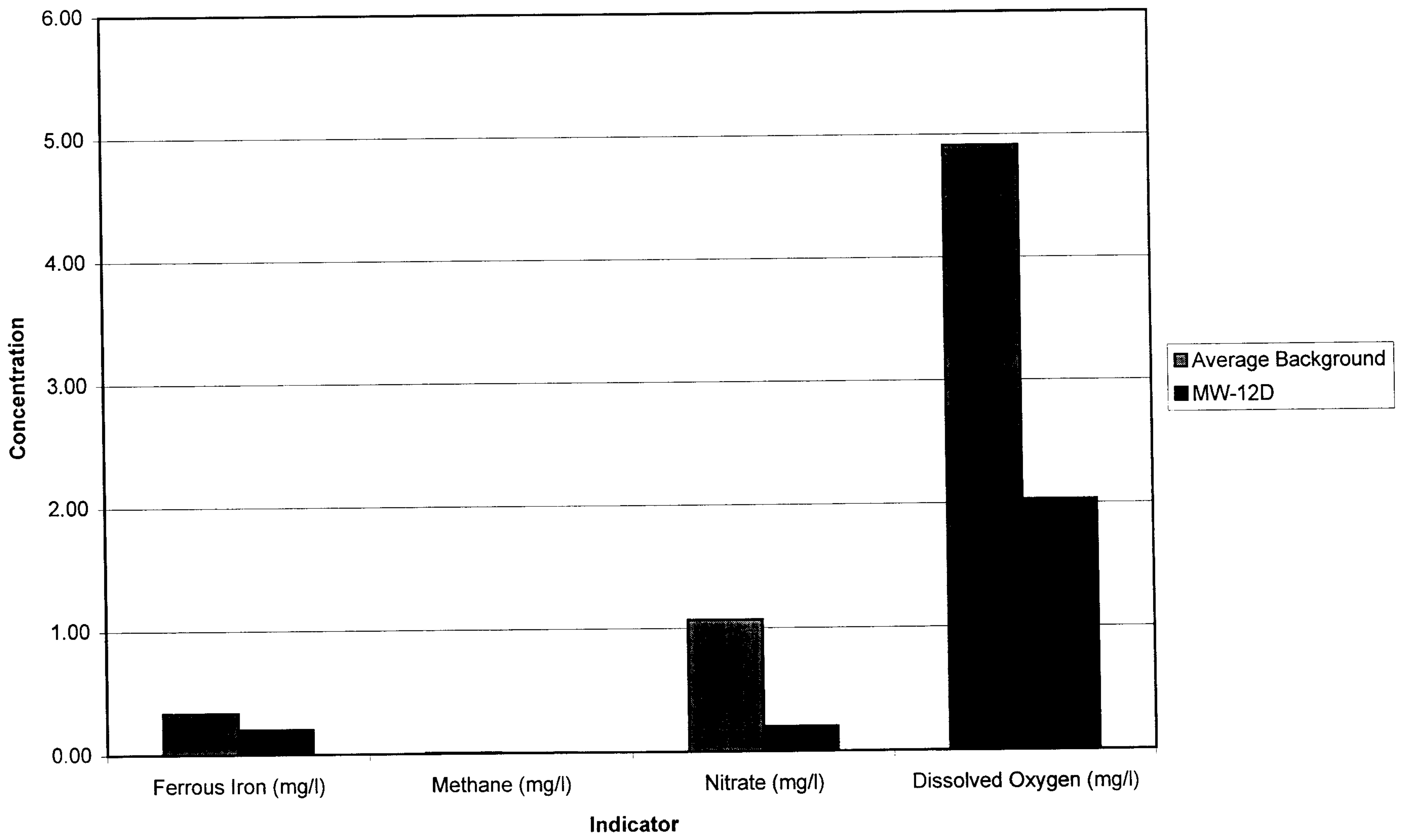
Indicator Concentrations MW-12S



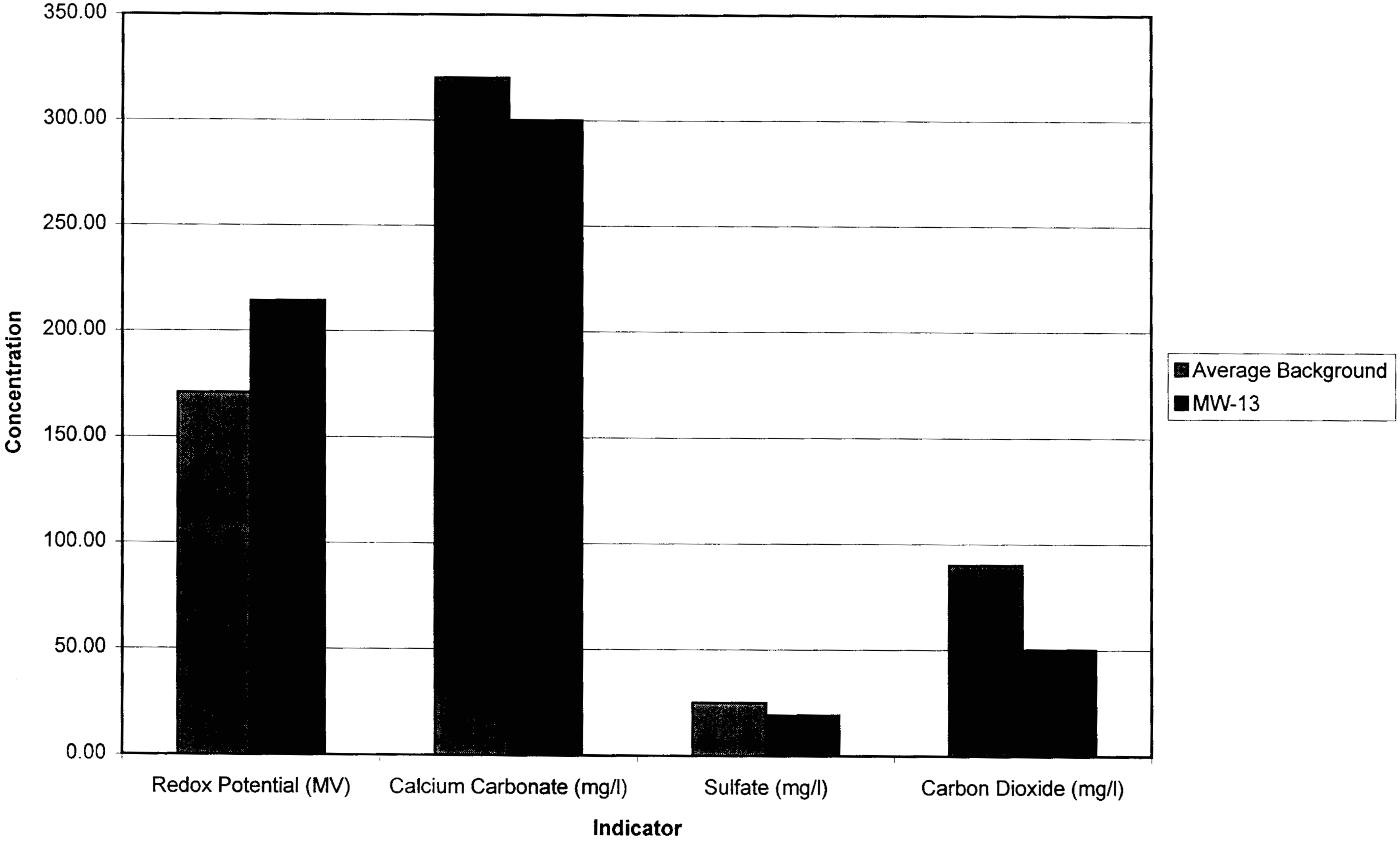
Indicator Concentrations MW-12D

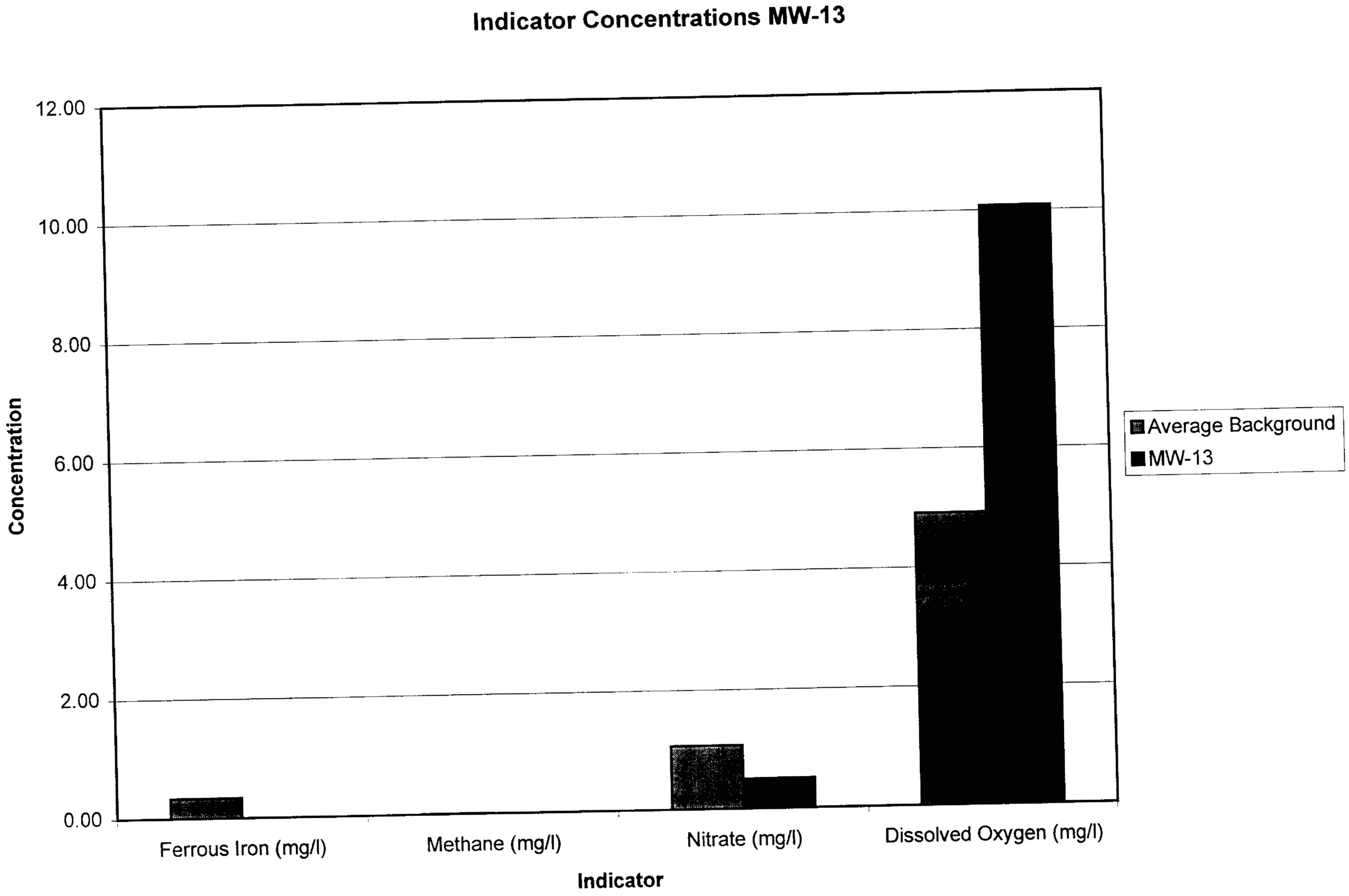


Indicator Concentrations MW-12D

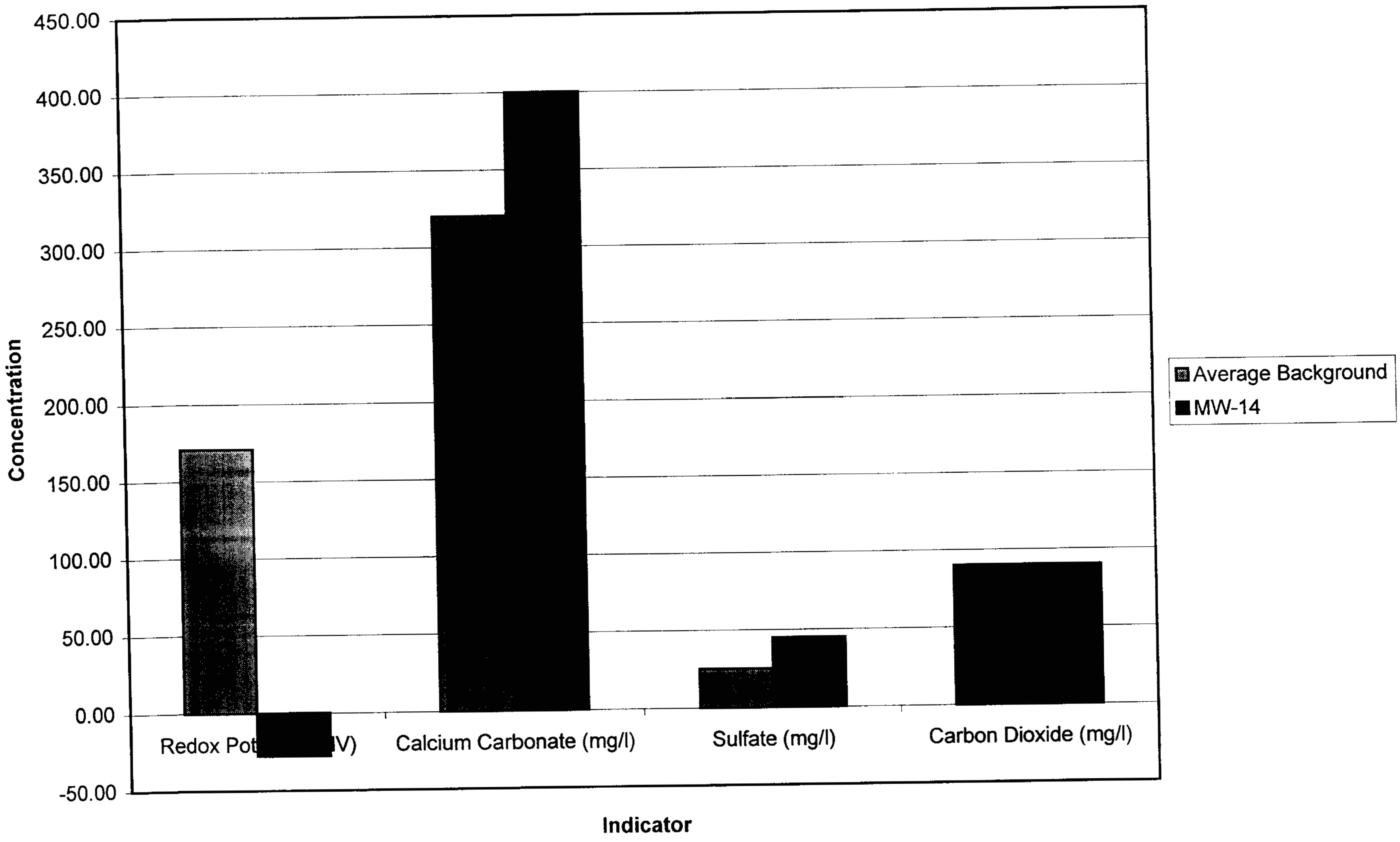


Indicator Concentrations MW-13

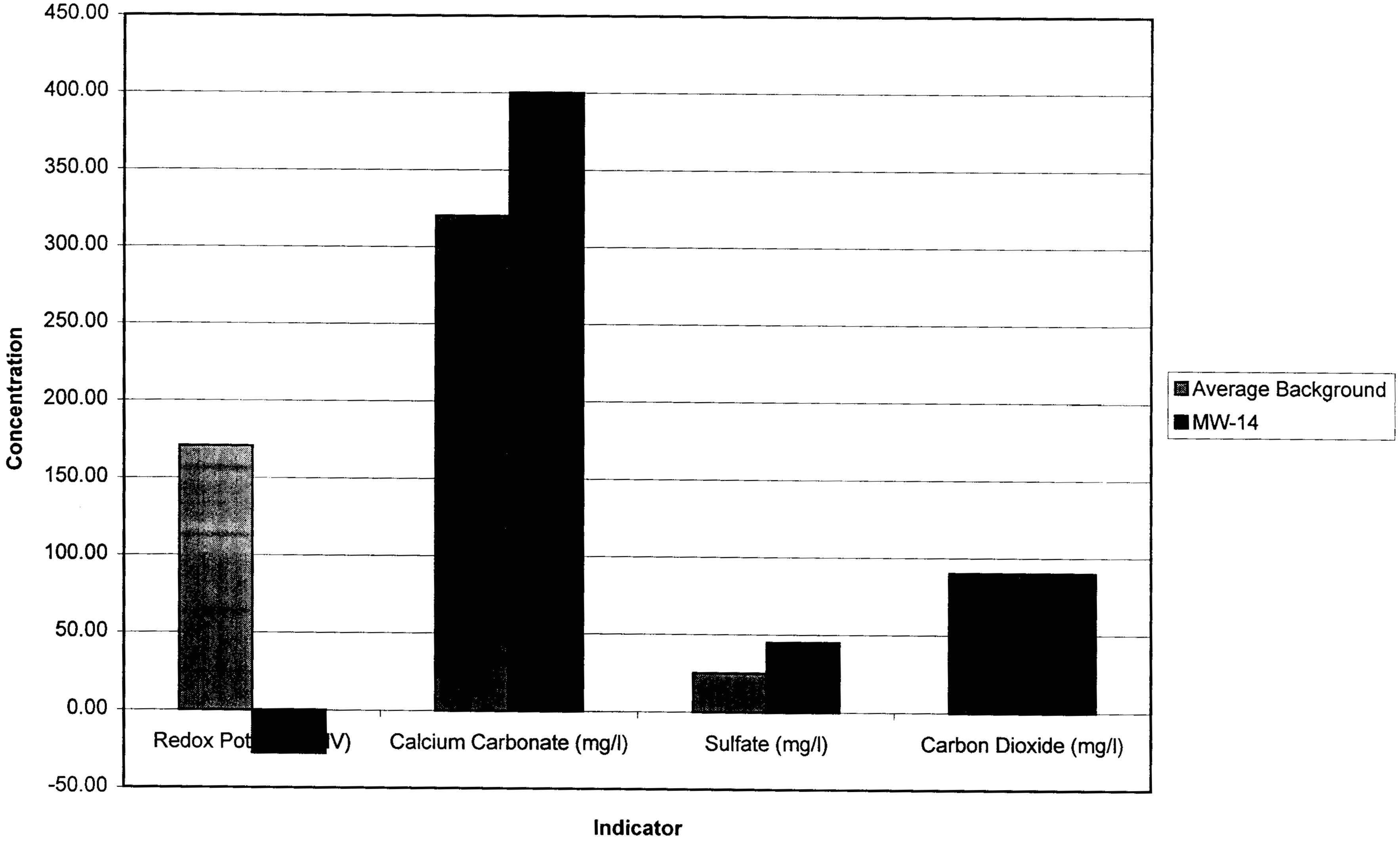



Indicator Concentrations MW-13
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Concentration
Ferrous Iron (mg/l)
Methane (mg/l)
Nitrate (mg/l)
Dissolved Oxygen (mg/l)
Indicator
▨ Average Background
■ MW-13

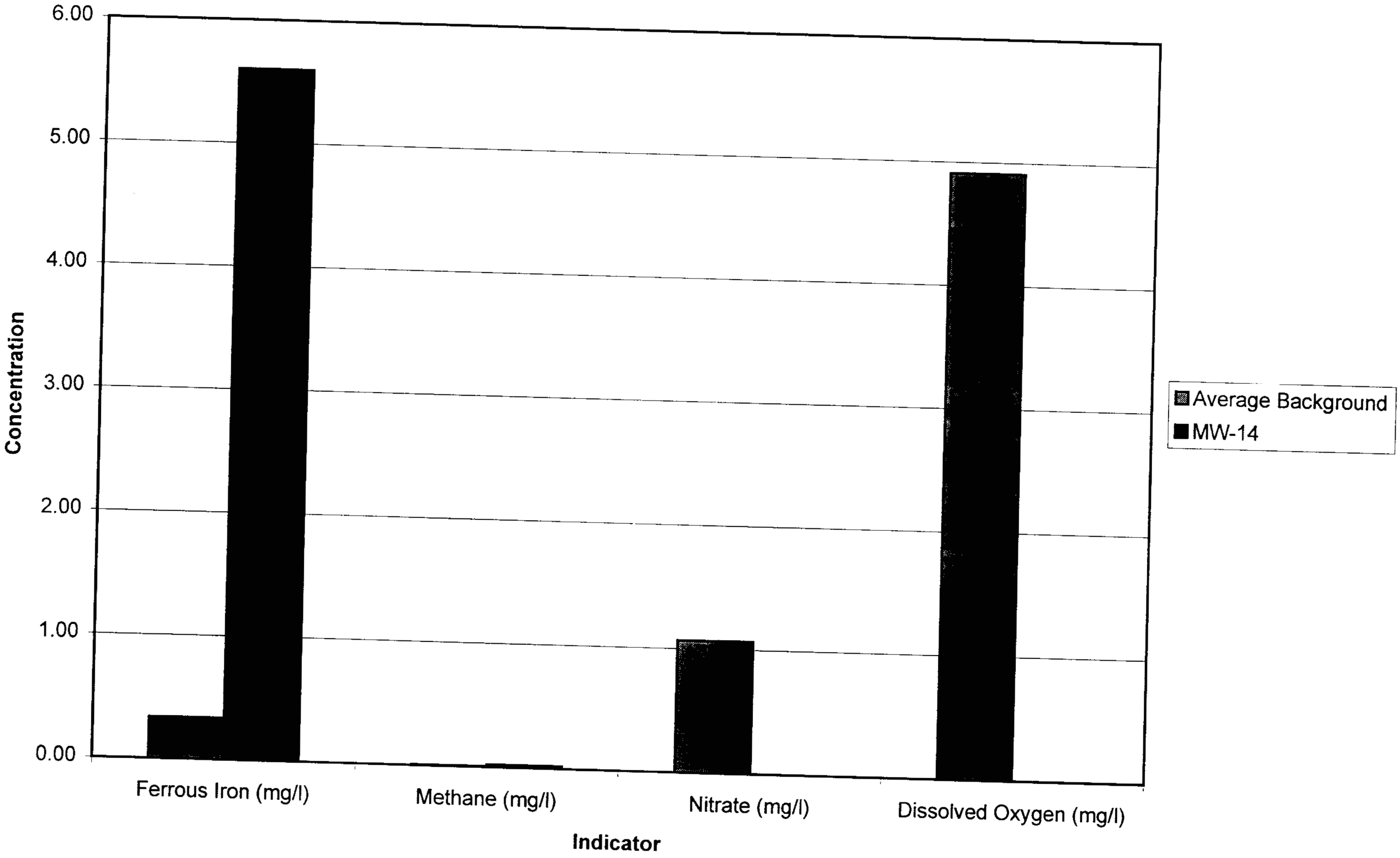
Indicator Concentrations MW-14



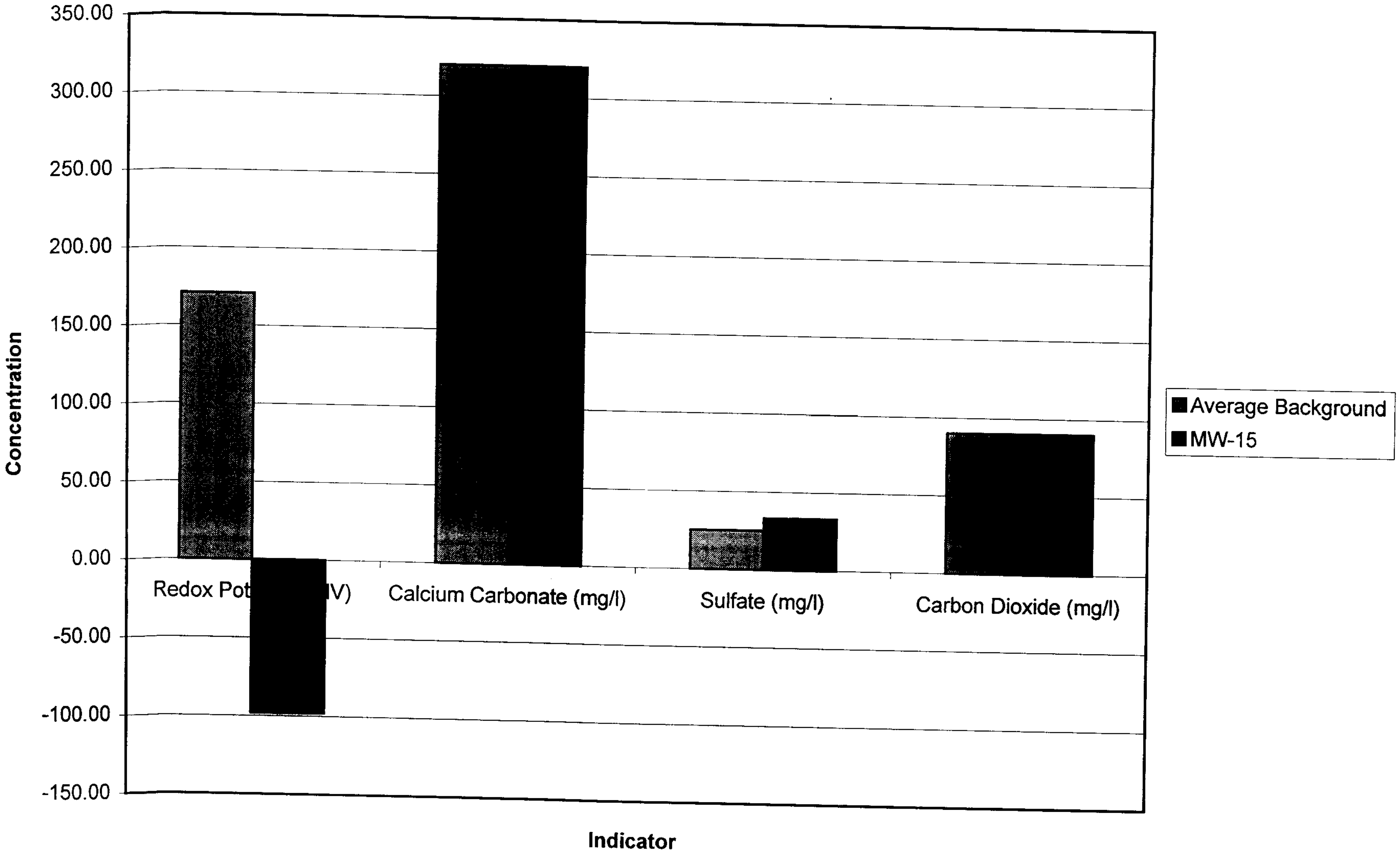
Indicator Concentrations MW-14

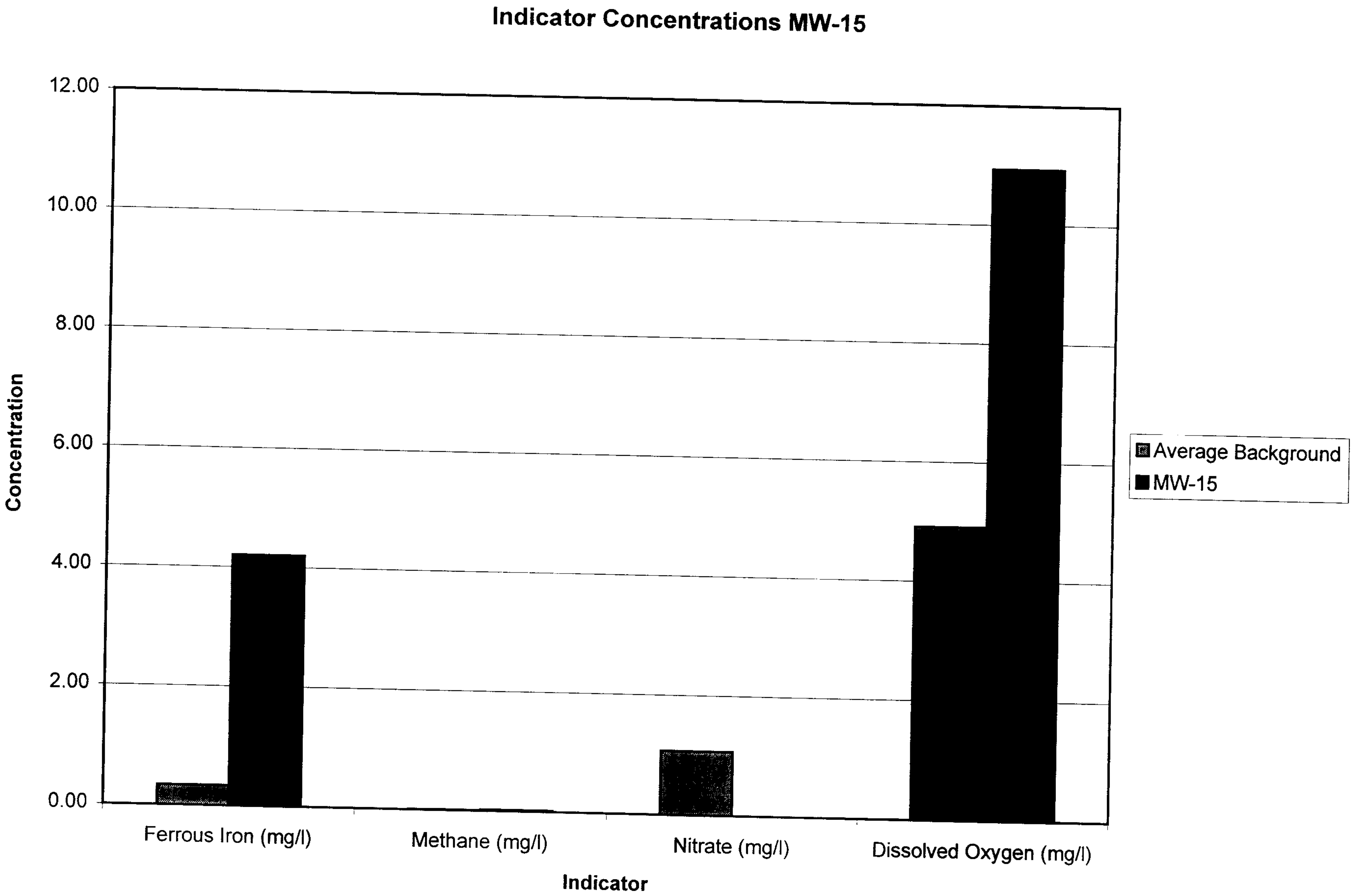


Indicator Concentrations MW-14

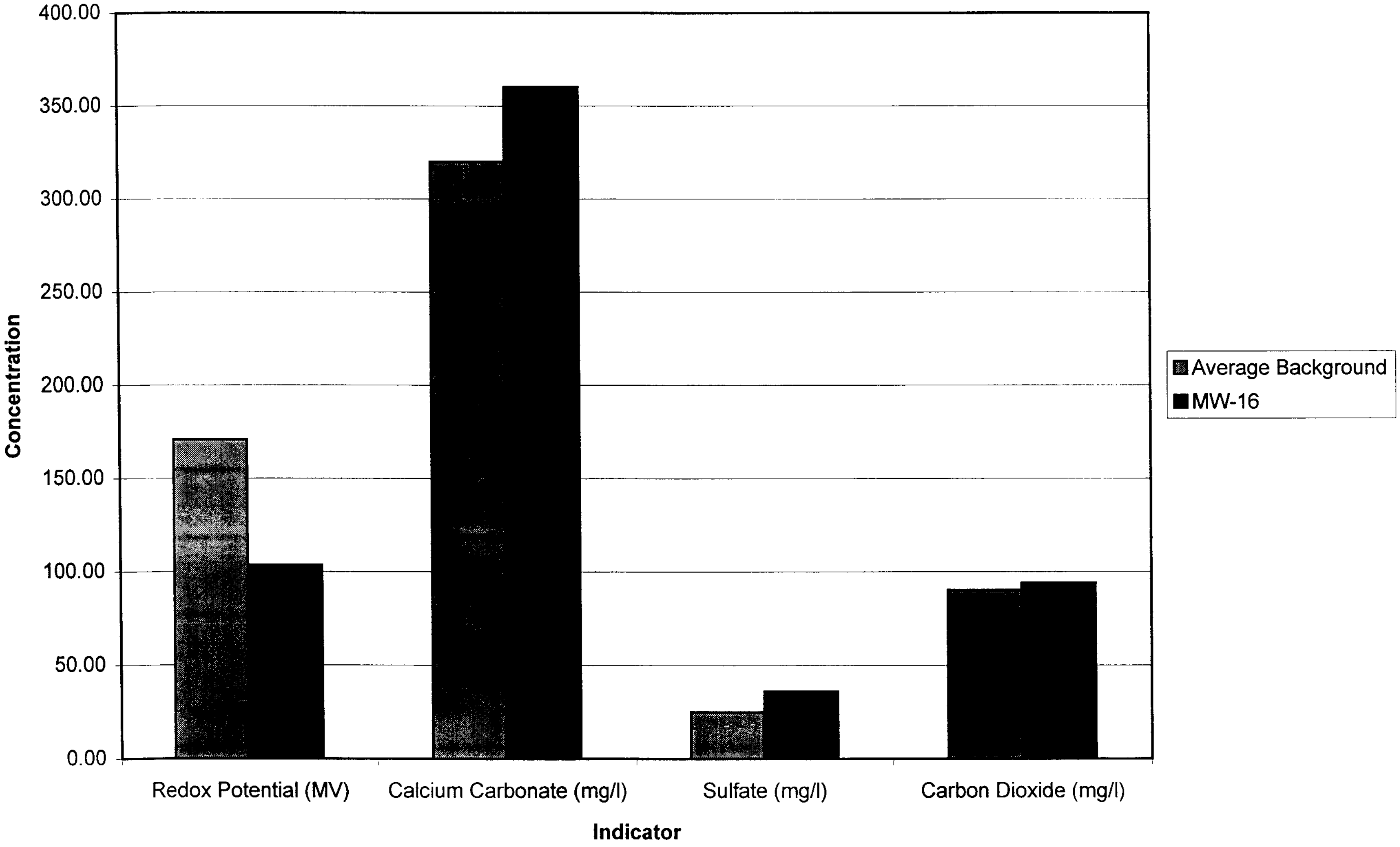


Indicator Concentrations MW-15

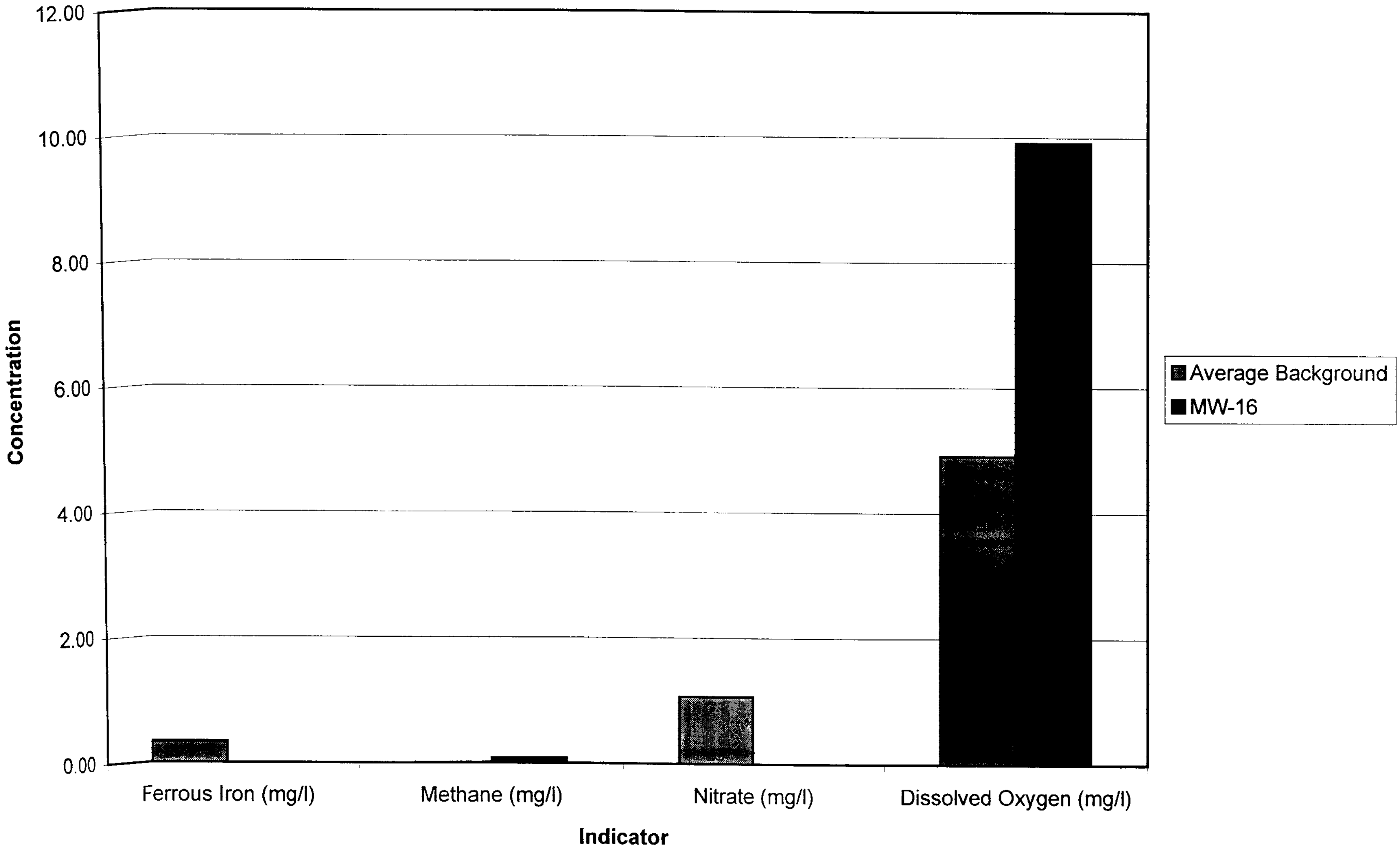


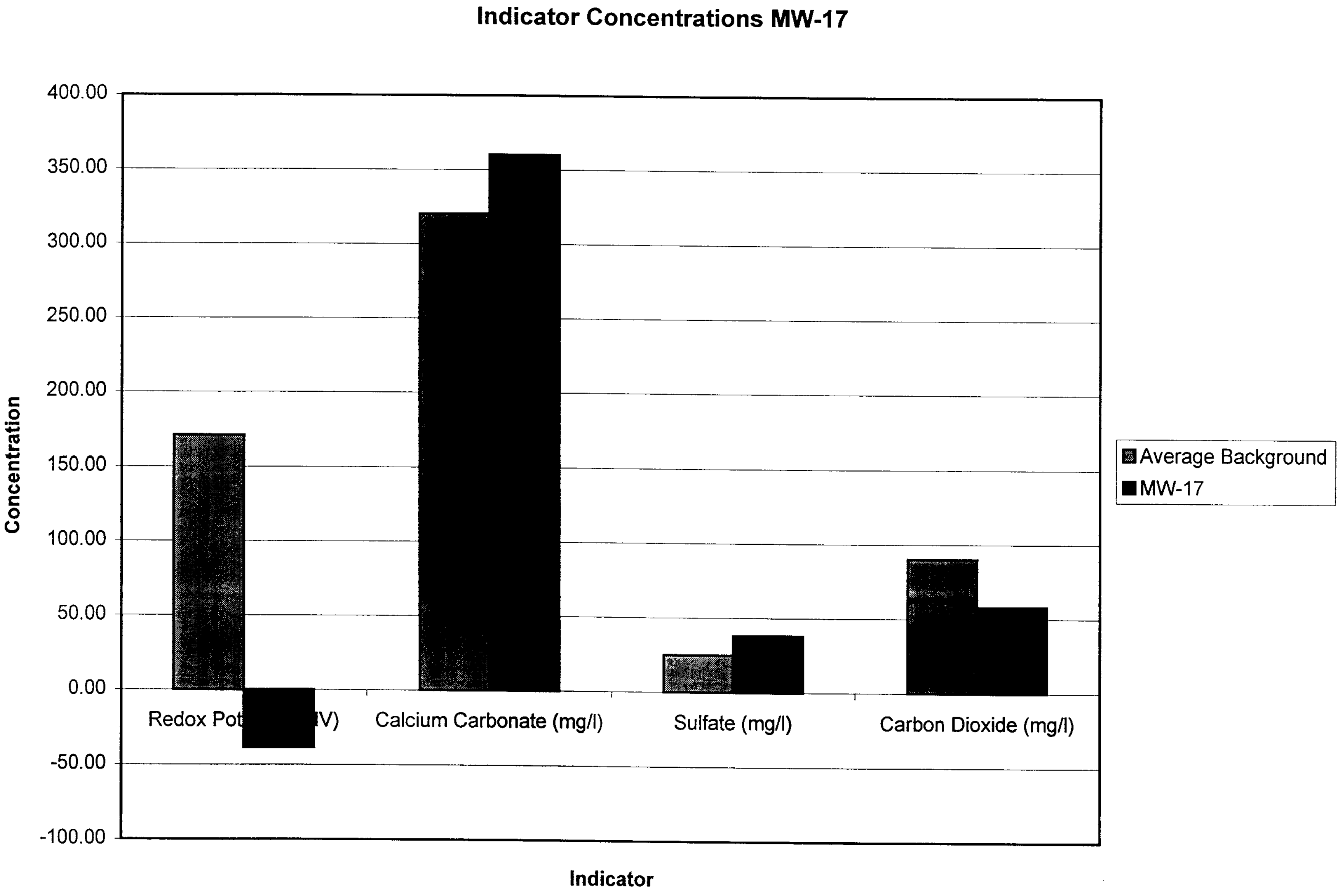

Indicator Concentrations MW-15
Concentration
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Ferrous Iron (mg/l)
Methane (mg/l)
Nitrate (mg/l)
Dissolved Oxygen (mg/l)
Indicator
▨ Average Background
■ MW-15

Indicator Concentrations MW-16



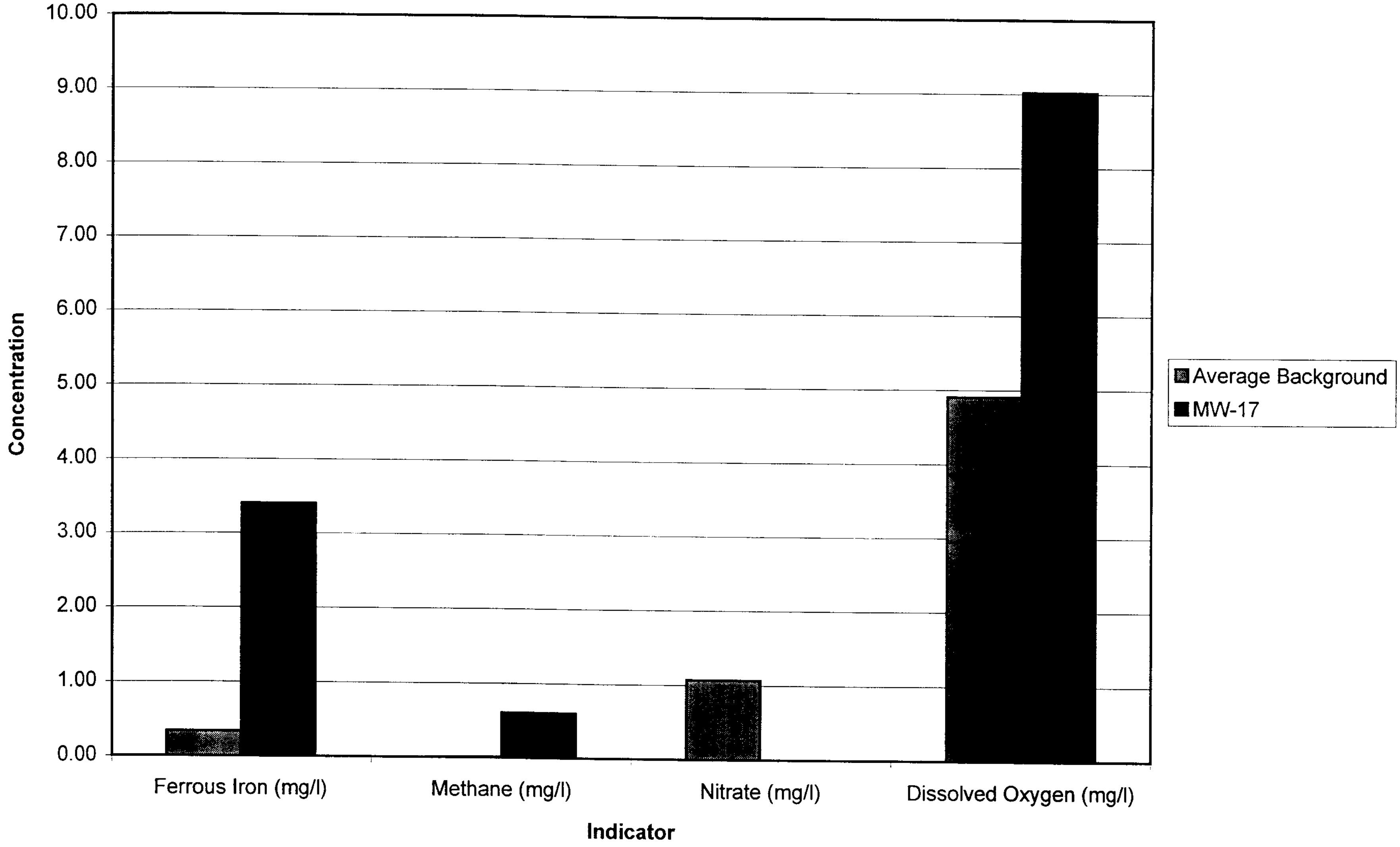
Indicator Concentrations MW-16



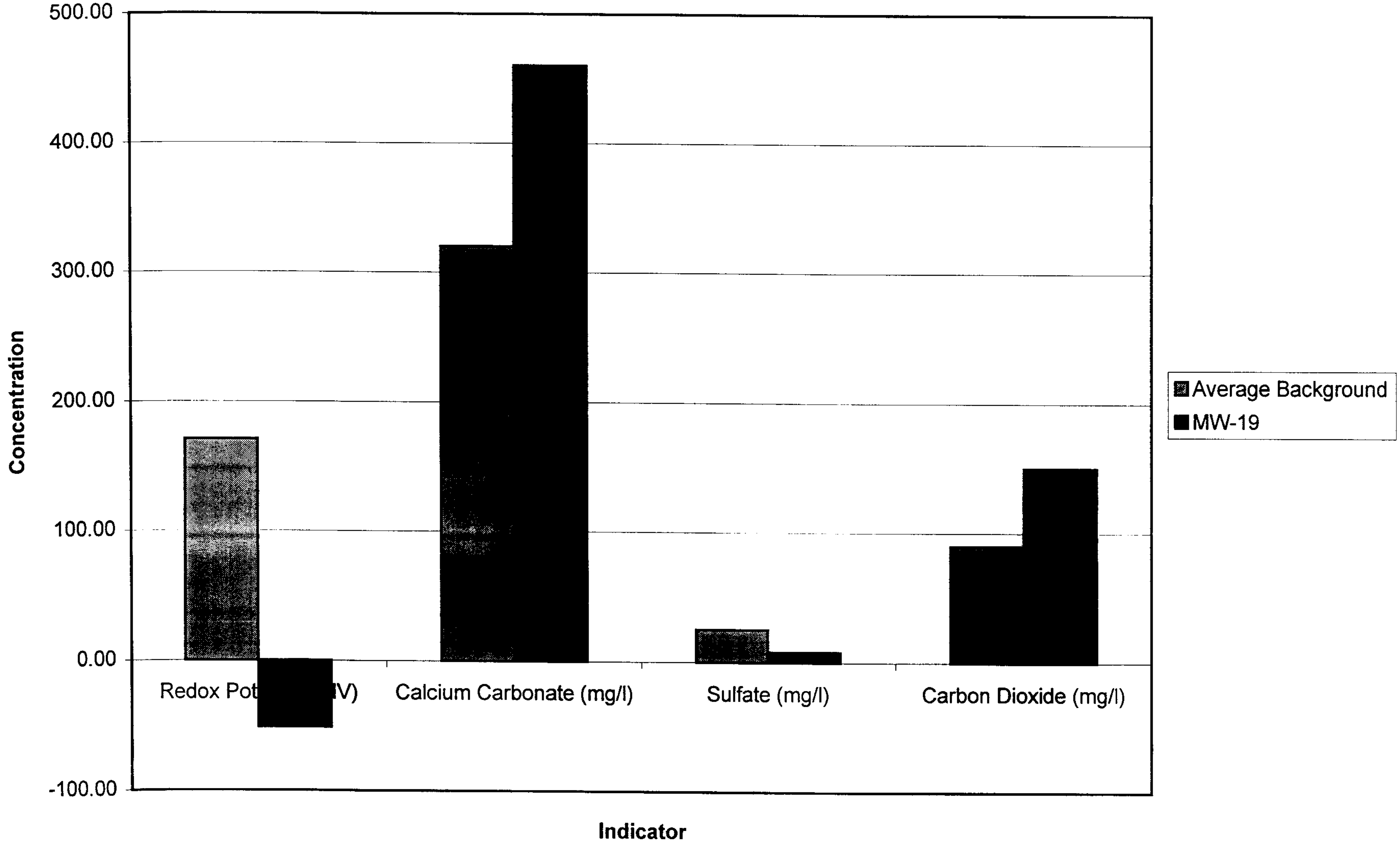


Indicator Concentrations MW-17

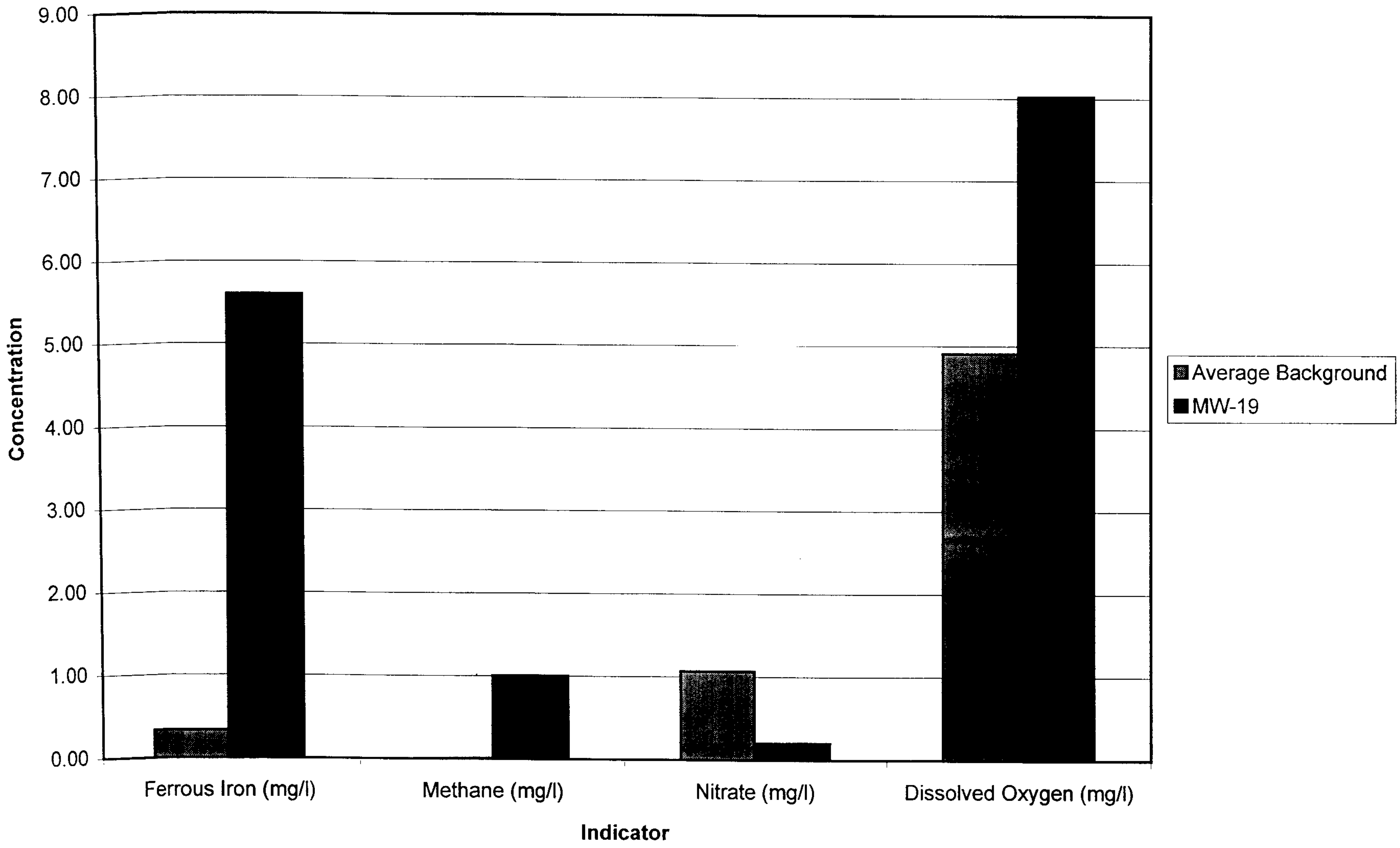
Indicator Concentrations MW-17

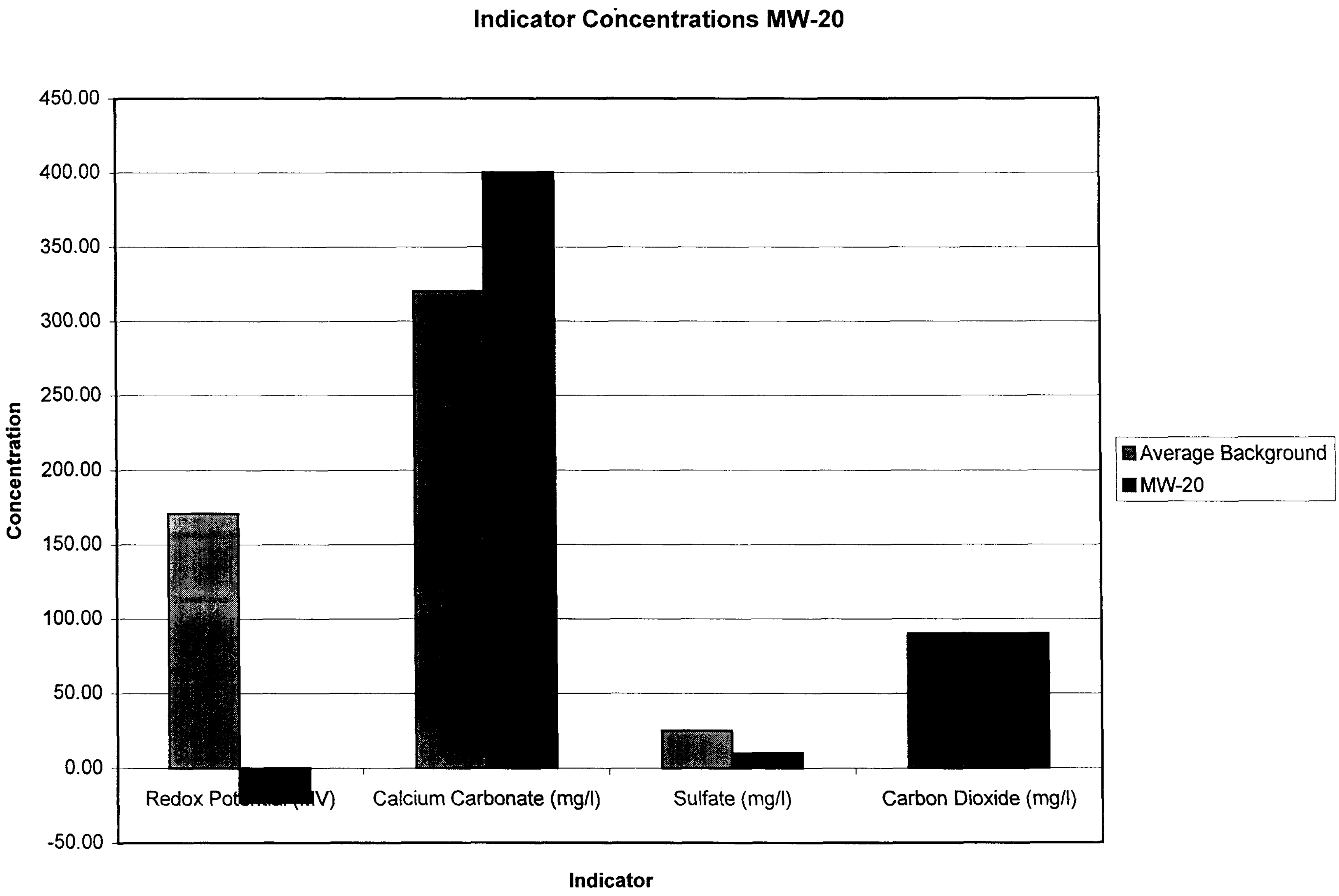


Indicator Concentrations MW-19

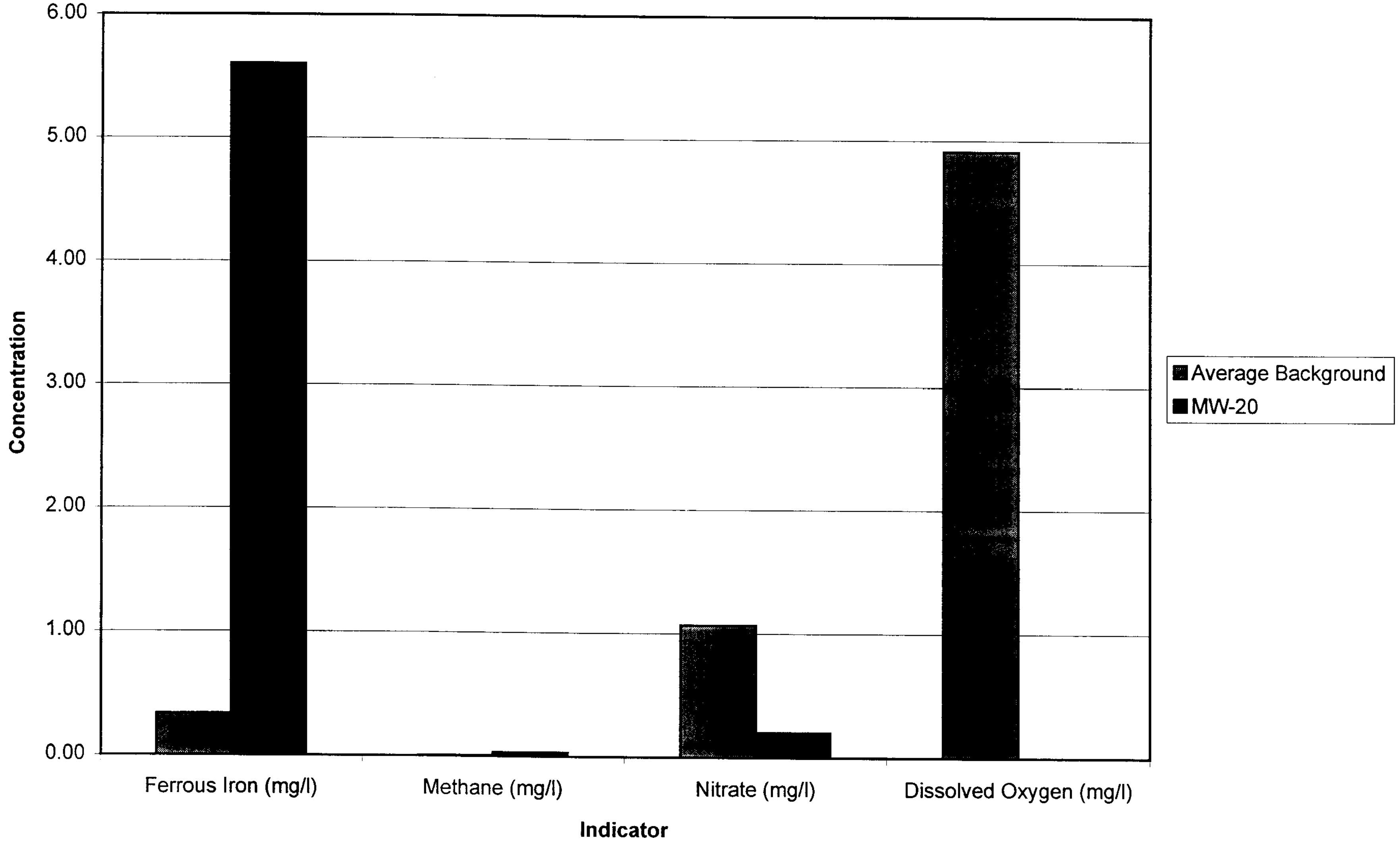


Indicator Concentrations MW-19




Indicator Concentrations MW-20
Concentration
450.00
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
-50.00
Redox Pot (mV)
Calcium Carbonate (mg/l)
Sulfate (mg/l)
Carbon Dioxide (mg/l)
Indicator
▨ Average Background
■ MW-20

Indicator Concentrations MW-20

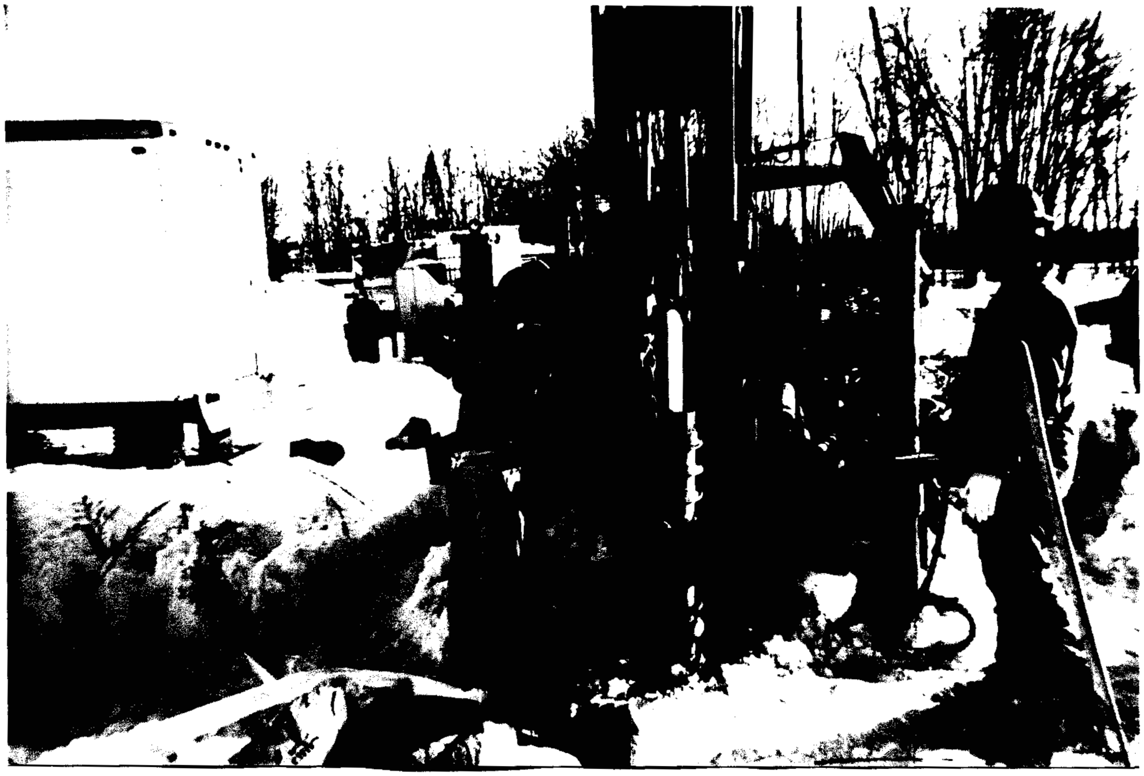


APPENDIX D

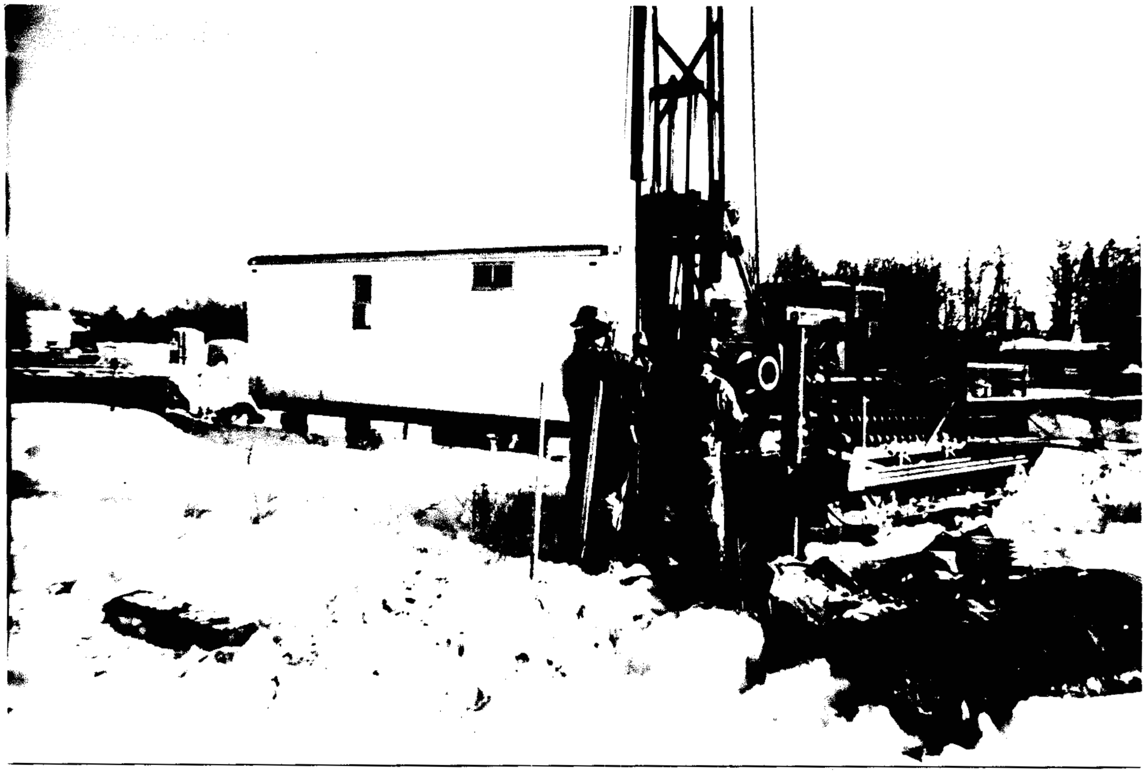
PHOTO LOG

PROJECT: Site 15, Hancock Airfield
PROJECT #: 738483.04010

LOCATION: Syracuse, NY
Client: 174th Fighter Wing/Air National Guard



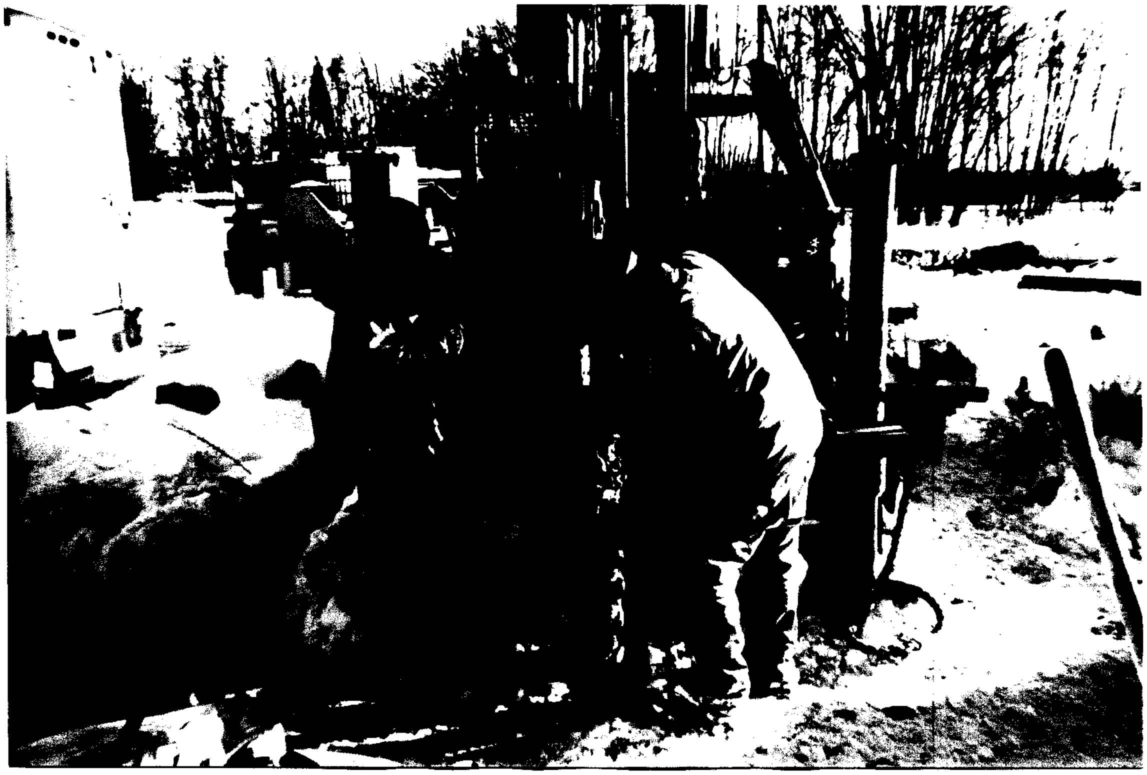
Status as of: 1/01
Description: View of drillers collecting soil samples at MW-21 with split spoon sampler.
Photo by: E.J. Ashton



Status as of: 1/01
Description: View of drillers installing PVC well screen and casing for monitoring well MW-21.
Photo by: E.J. Ashton

PROJECT: Site 15, Hancock Airfield
PROJECT #: 738483.04010

LOCATION: Syracuse, NY
Client: 174th Fighter Wing/Air National Guard

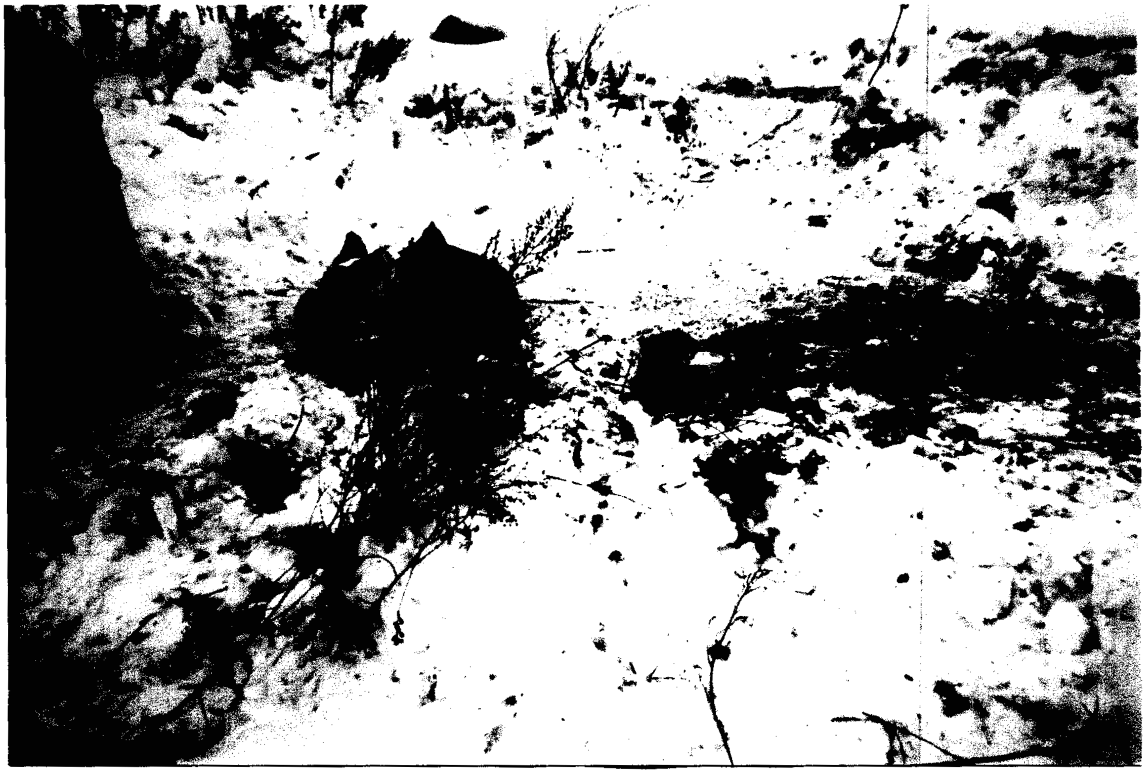


Status as of: 1/01
Description: View of drillers installing sand pack for monitoring well MW-21.
Photo by: E.J. Ashton

Status as of: 1/01
Description: View of drillers installing bentonite seal for monitoring well MW-21.
Photo by: E.J. Ashton

PROJECT: Site 15, Hancock Airfield
PROJECT #: 738483.04010

LOCATION: Syracuse, NY
Client: 174th Fighter Wing/Air National Guard



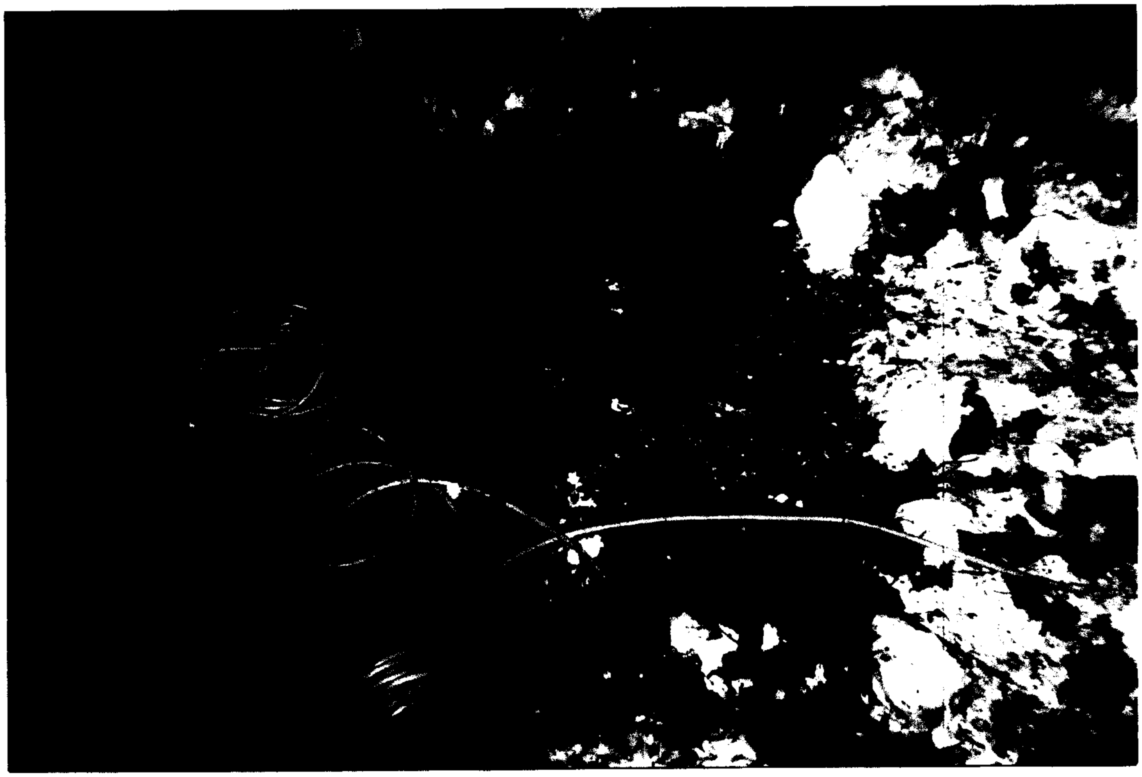
Status as of: 1/01
Description: View of monitoring well MW-21 installed with flushmount cover placed over well.
Photo by: E.J. Ashton

Status as of: 1/01
Description: View of monitoring well MW-21 with concrete pad and flushmount.
Photo by: E.J. Ashton

PROJECT: Site 15, Hancock Airfield
PROJECT #: 738483.04010

LOCATION: Syracuse, NY
Client: 174th Fighter Wing/Air National Guard

Status as of: 1/01
Description: View of driller cutting off at grade protective steel casing and PVC well casing to pre-existing double-cased monitoring well MW-12D. Well was filled with cement/bentonite slurry prior to removal of PVC and protective steel casing.
Photo by: E.J. Ashton



Status as of: 1/01
Description: View of pre-existing double-cased monitoring well MW-12D filled with cement/bentonite slurry up to grade..
Photo by: E.J. Ashton

PROJECT: Site 15, Hancock Airfield
PROJECT #: 738483.04010

LOCATION: Syracuse, NY
Client: 174th Fighter Wing/Air National Guard

Status as of: 1/01
Description: View of pre-existing double-cased monitoring well MW-12D abandoned. Concrete patch over abandoned well.
Photo by: E.J. Ashton

Status as of: 1/01
Description: View of driller developing monitoring well MW-21 with dedicated tubing and pump.
Photo by: E.J. Ashton

PROJECT: Site 15, Hancock Airfield
PROJECT #: 738483.04010

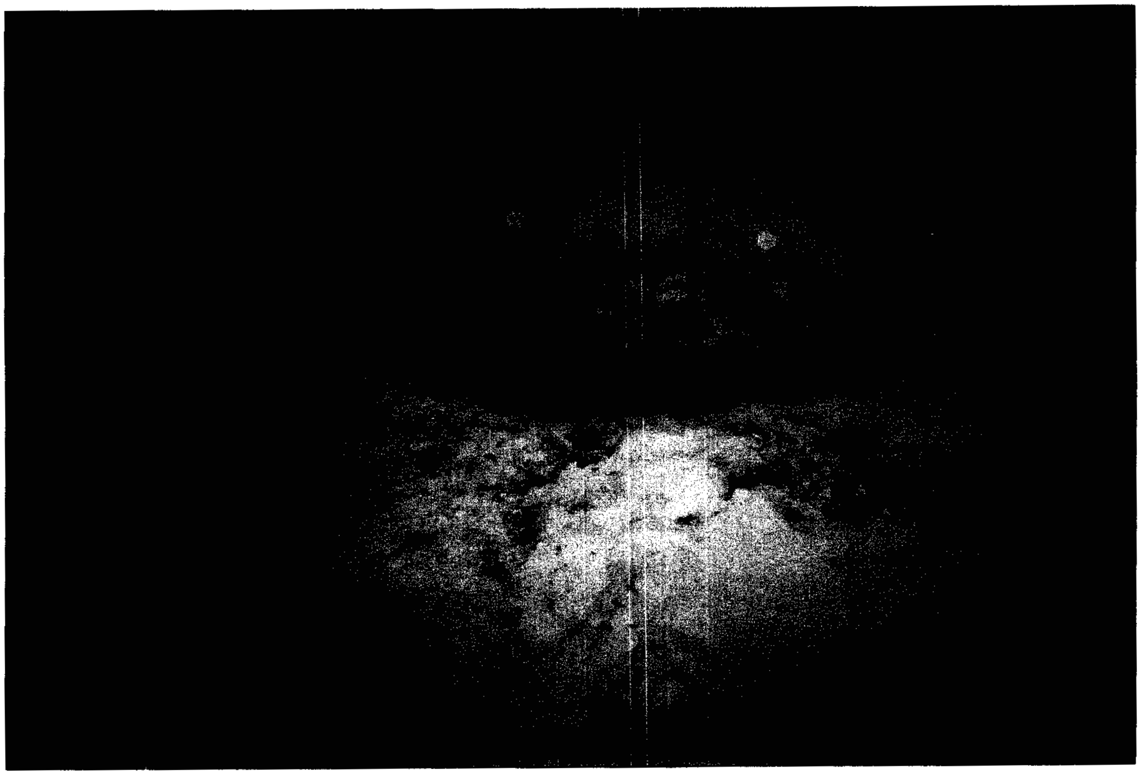
LOCATION: Syracuse, NY
Client: 174th Fighter Wing/Air National Guard

Status as of: 1/01
Description: View of decontaminating equipment with steam cleaner.
Photo by: E.J. Ashton

PROJECT: Site 15, Hancock Airfield
PROJECT #: 738483.04010

LOCATION: Syracuse, NY
Client: 174th Fighter Wing/Air National Guard

Status as of: 1/01
Description: View of monitoring well MW-11 installed.
Photo by: E.J. Ashton



Status as of: 1/01
Description: View of monitoring well MW-22 with concrete pad and flushmount.
Photo by: E.J. Ashton

PROJECT: Site 15, Hancock Airfield
PROJECT #: 738483.04010

LOCATION: Syracuse, NY
Client: 174th Fighter Wing/Air National Guard

Status as of: 1/01
Description: View of monitoring well MW-23 with concrete pad and flushmount.
Photo by: E.J. Ashton

Status as of: 1/01
Description: View of drillers injecting cement/bentonite slurry into pre-existing double- cased monitoring well MW-12D during abandonment activities
Photo by: E.J. Ashton

PROJECT: Site 15, Hancock Airfield
PROJECT #: 738483.04010

LOCATION: Syracuse, NY
Client: 174th Fighter Wing/Air National Guard

Status as of: 1/01
Description: View of drillers drilling with potable water at double-cased monitoring well MW-12D.
Photo by: E.J. Ashton

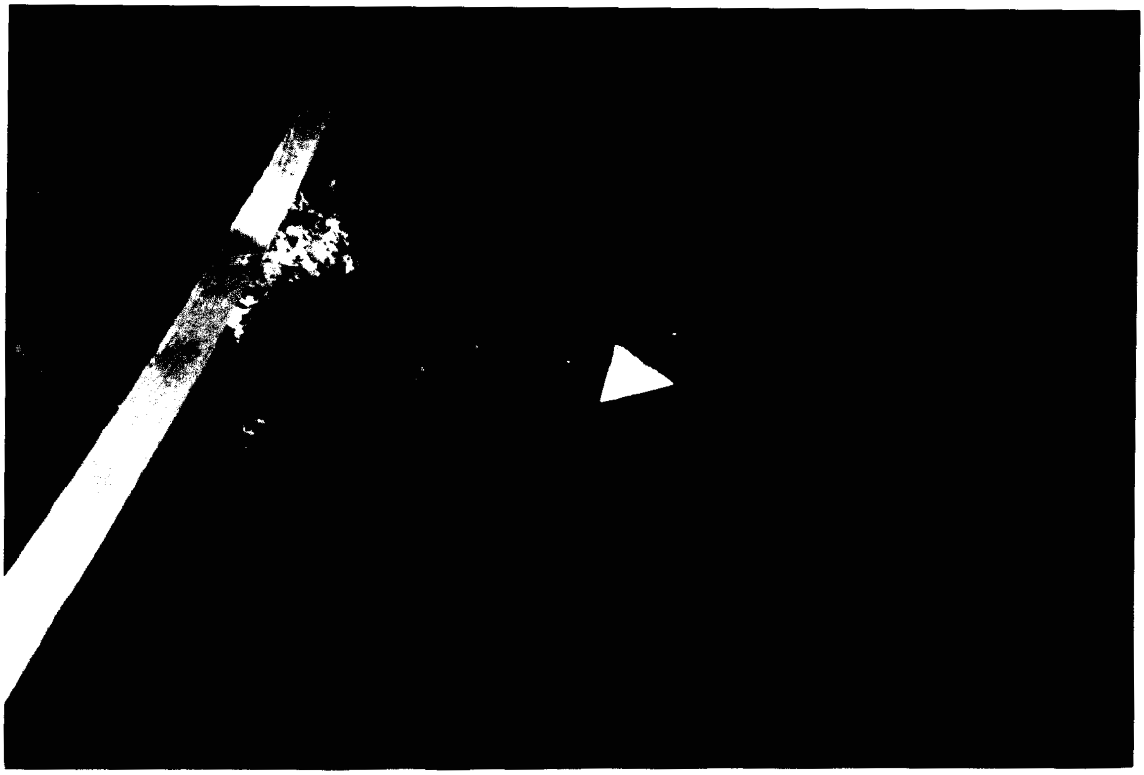
Status as of: 1/01
Description: View of drillers installing outer stainless steel casing for double-cased monitoring well MW-12D.
Photo by: E.J. Ashton

PHOTOGRAPHIC LOG
PARSONS ENGINEERING SCIENCE, INC.

PROJECT: Site 15, Hancock Airfield
PROJECT #: 738483.04010

LOCATION: Syracuse, NY
Client: 174th Fighter Wing/Air National Guard

Status as of: 1/01
Description: View of double-cased monitoring well MW-12D installed prior to concrete pad and flushmount installation.
Photo by: E.J. Ashton



Status as of: 1/01
Description: View of double-cased monitoring well MW-12D with concrete pad and flushmount.
Photo by: E.J. Ashton

PHOTOGRAPHIC LOG
PARSONS ENGINEERING SCIENCE, INC.

PROJECT: Site 15, Hancock Airfield
PROJECT #: 738483.04010

LOCATION: Syracuse, NY
Client: 174th Fighter Wing/Air National Guard

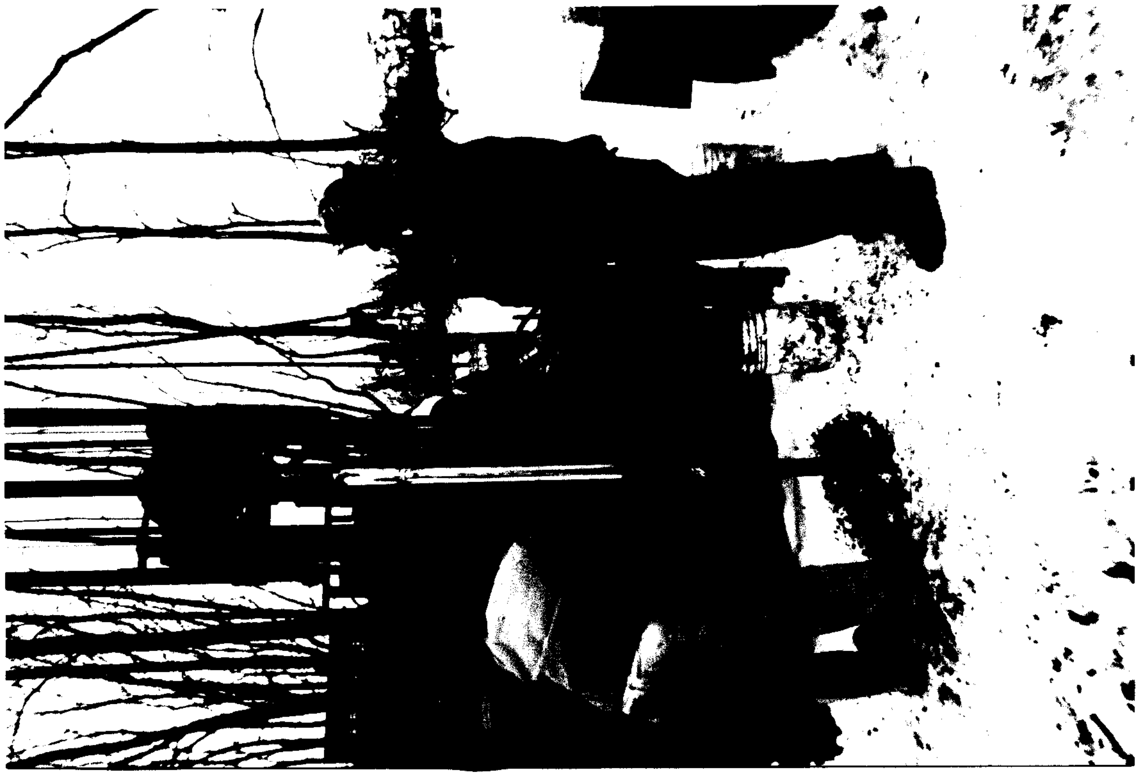
Status as of: 1/01
Description: View of drillers pulling outer protective steel casing at pre-existing monitoring well MW-11 during abandonment activities.
Photo by: E.J. Ashton

Status as of: 1/01
Description: View of drillers injecting cement/bentonite slurry into pre-existing monitoring well MW-11 prior to pulling the PVC well screen and casing from subsurface.
Photo by: E.J. Ashton

PHOTOGRAPHIC LOG
PARSONS ENGINEERING SCIENCE, INC.

PROJECT: Site 15, Hancock Airfield
PROJECT #: 738483.04010

LOCATION: Syracuse, NY
Client: 174th Fighter Wing/Air National Guard



Status as of: 1/01
Description: View of drillers extracting PVC well screen and casing from pre-existing monitoring well MW-11 during abandonment activities..
Photo by: E.J. Ashton

Status as of: 1/01
Description: View of drillers re-installing monitoring well MW-11.
Photo by: E.J. Ashton

APPENDIX B

LETTER REPORT

PARSONS

Parsons Engineering Science Inc.
A Unit of Parsons Infrastructure & Technology Group
290 Elwood Davis Road, Suite 312 • Liverpool, New York 13088 • (315) 451-9560 • Fax (315) 451-9570 • www.parsons.com

January 10, 2002

ANG/CEVR
3500 Fetchet Avenue
Andrews AFB, MD 20762-5157
Attn: Badrul Hoda

RE: Results From Fall 2001 Additional Site Investigation at Hancock Site 15

Dear Mr. Hoda:

As you know, Parsons Engineering Science, Inc. (Parsons ES) worked with the Air National Guard and the 174th Fighter Wing to conduct additional site investigation work this Fall at Hancock Site 15. This additional work was performed in accordance with the October 2001 Work Plan for the Time Critical Removal Action at Site 15 approved by the State of New York Department of Environmental Conservation (NYSDEC) with minor deviations as described herein. Also, the NYSDEC approved the scope of the December investigation work based on conversations and emails that were a follow-up to the October work.

The purpose of the additional groundwater investigation work was to more completely define the extent of groundwater impacted at the downgradient portion of Site 15 and also offsite across Molloy Road at the Brooklawn Golf Course. In addition, and as indicated in Section 3 of the October 2001 Design Report for the removal action, Parsons ES also sampled drainage swale sediment to better assess the extent of PCBs within sediment west of the pump house on site. The purpose of this letter is to report findings from the October - December 2001 site investigation efforts. A summary of results from the golf course groundwater monitoring effort has already been shared with the Department and with the golf course owner.

October 2001 Groundwater Investigation Effort

The October 2001 groundwater investigation effort included collection of groundwater samples at six new locations 50 to 150 feet south (downgradient) of Molloy Road, as shown in Figure 1 (no Figure 1 with my copy). The samples were collected from temporary (direct push) well points, and analyzed for both BTEX and PCBs using USEPA Method 8260 and USEPA Method 8082, respectively. Samples were not filtered prior to analysis. As agreed with the Department prior to drilling, samples at four of the six locations were collected from shallow groundwater 10 to 15 feet below ground surface, while samples at the other two locations were collected from 30 to 40 feet below ground surface. In addition, samples of groundwater were collected from eleven previously installed monitoring well points (MW-2, MW-6D, MW-9, MW-11, MW-14, MW-15, MW-19, MW-20, MW-21, MW-22, and MW-23). The only deviation from the work scope specified in the approved work plan was sampling of MW-14 in place of MW-6S due to 0.1 foot of floating non-aqueous-phase liquid being measured at MW-6S.

On October 3, 2001, a total of six temporary soil borings (PARGP-1 through PARGP-6) were installed at the Brooklawn Golf Course across Molloy Road from Hancock Field, using the direct push technique. Approximate locations of these six temporary borings are shown on Figure 1.

At four of the six temporary soil boring locations (all except PARGP-2 and PARGP-6), the soil borings were advanced to the shallow groundwater table using a portable Geoprobe drilling rig and direct push sampling techniques. Soil borings PARGP-2 and PARGP-6 were advanced to 30 to 40 feet below ground surface in order to assess conditions of deeper groundwater, immediately above a silty clay (till) zone. The silty clay (till) was believed to exist starting at a depth of 30 to 40 feet below ground surface based on drilling logs generated from previous site investigations. Soil samples were collected continuously over the entire depth of each boring. Soil samples retrieved from the borings were classified, visually inspected for signs of staining, screened for the evolution of organic vapors with a photoionization detector (PID), and logged in the field by an experienced Parsons geologist. Unconsolidated deposits encountered during the soil sampling generally consisted of fine to medium sand, fine gravel, and soft to stiff, low to medium plastic clay. A stiff, silty clay (till) was encountered at a depth of approximately 39 to 40 feet below ground surface, as expected.

Immediately following the drilling of each temporary soil boring, a four–foot, stainless steel screened sampler was advanced to the groundwater zones located within the lithologic formation at each of the boreholes. The sampler was placed between 12 to 16 feet below ground surface within boreholes PARGP-1, 3, 4 and 5, between 26 and 30 feet below ground surface within borehole PARGP-2, and between 39 and 40 feet below ground surface within borehole PARGP-6. Following placement of the stainless steel sampler within the subsurface, Teflon™ tubing and a stainless steel check valve were placed into the hollow drilling rods that led down to the stainless steel sampler and connected to a low-flow peristaltic pump. Groundwater was then extracted from the borehole. Approximately 1.0 gallon of groundwater was purged from each borehole. Groundwater samples were then collected and analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX) by EPA Method 8260 and polychlorinated biphenyls (PCBs) by EPA Method 8082.

In addition, the depth to water was also measured prior to sample collection using an electronic contact probe. The depth to water was measured from the top edge of the stainless steel drilling rod located within the subsurface at each drilling location. The distance between the top of the stainless steel drilling rod and ground surface was then calculated and used to determine the estimated depth to the water table. The depth to groundwater at each of the six temporary boreholes at the golf course ranged between 8.5 and 11.5 feet below ground surface.

Upon completion of the drilling and sampling at each soil boring location, the stainless steel sampler was removed from the ground. The borehole was then abandoned by backfilling the entire depth of the boring with any excess soil cuttings generated during the boring and subsequently filling any remaining void space with a bentonite slurry. A topsoil cap was then placed over each temporary borehole.

Groundwater analytical results for samples from the six temporary boreholes and for samples from the onsite monitoring wells are summarized in Table 1. Groundwater analyses were provided by Galson Laboratories of East Syracuse, NY for PCBs and by Life Science Laboratories of East Syracuse, NY for BTEX. Laboratory data were validated by a trained and experienced chemist that has validated previous data from other New York State Superfund sites. Data validation work was done in accordance with work plan quality assurance procedures. The data are fully useable, although some data qualifiers were added by the validator to the qualifiers assigned by the laboratories.

Results from the October 2001 groundwater investigation show the following:

- Water levels measured during October 2001 show flow direction and gradient consistent with previous groundwater monitoring efforts at this site. Water levels were approximately 1.3 to 1.8 feet lower during the October 2001 monitoring than during January 2001. Measurable nonaqueous-phase liquid was found only at MW-6S at a thickness of 0.1 foot. Sheens were detected at MW-21 and MW-22 but not at any of the other monitoring wells.

- PCBs were found in groundwater from only one monitoring well sampled (MW-21) at 0.20 part per billion of Aroclor-1260. Soil in the area of MW-21 is being removed as part of the time-critical removal action (as is MW-21 itself);
- The magnitude of BTEX observed in groundwater at Hancock Site 15 is similar to what was monitored at Site 15 previously (see Figure 2); and
- Two of the six direct push locations (PARGP-3 and PARGP-5) where Parsons sampled groundwater at the Brooklawn golf course across Molloy Road from Hancock show BTEX concentrations exceeding State groundwater quality standards.

The two golf course locations where BTEX was found were shallow (12 to 14 feet below ground surface) temporary direct push points directly south of MW-19 and within 100 feet of Molloy Road. Groundwater at the golf course is not being used, and volatile compounds detected in the golf course groundwater were not detected in airspace analyzed using a field detector. No soil staining or odors were noted during the field effort.

December 2001 Groundwater Investigation Effort

Based on the October 2001 results, it appeared the Hancock Site 15 BTEX plume extends within the shallow zone onto the golf course located south of Site 15. So, as a follow-up effort during the week of December 17, 2001, and after obtaining concurrence from you on the work scope, Parsons and a subcontracted driller pushed temporary shallow wellpoints into place at 15 locations south (i.e., downgradient) of the October 2001 golf course wellpoints. Laboratory results from the December work were all nondetect for BTEX and MTBE in shallow groundwater.

The October and December 2001 investigation work show that the extent of the BTEX plume on the golf course is limited to approximately 100 feet in a north-south direction into the golf course from Molloy Road. The deeper zone at the golf course is not impacted based on results from two deeper direct push holes drilled during October 2001. Consistent with plume shape north of Molloy Road on Government property, the east-west extent of the plume on the golf course appears to be within a relatively narrow 100 to 150-foot wide zone. The depth to groundwater adjacent to Molloy Road was nine to 12 feet below ground surface during this additional investigation effort. Results from the groundwater monitoring conducted during October and December 2001 are summarized in Table 1 and Figure 1. These results match well with modeled results for BTEX based on first order degradation of BTEX within the groundwater.

Parsons recommends that ANG address impacted groundwater beneath the golf course as part of the long-term remedial action for Site 15 at Hancock ANG Base across Molloy Road from the golf course. Work to design and install an in-situ extraction system would encompass the small, northernmost portion of the golf course where groundwater has been impacted. Extraction system components could be kept below ground surface as much as reasonably possible so as not to affect use of the golf course except possibly when the system is being installed. There is no observed risk to golf course users that comes from this impact based on visual observations and based on no detectable volatile organics found within the airspace from PID readings made within the temporary boreholes at the golf course during the October and December 2001 investigation efforts.

Fall 2001 Swale Sediment Sampling Effort

As presented in a previous report (Parsons ES, May 2001), fourteen surface sediment samples (SS-07 through SS-20) were collected previously from the two swales located southwest and northeast of the former Pump House. A total of 1.5 and 1.6 parts per million (ppm) of PCBs were found previously in two sediment samples from the swale southwest of the former Pump House (see Figure 3) (Figure 3 not included in my copy). Other swale sediment samples all had either non-detectable levels of PCBs or PCB levels below 1 ppm. Additional sediment sampling was conducted by Parsons on October 1, 2001 in the swale southwest of the former Pump House to confirm that concentrations of PCBs exceed the NYSDEC cleanup criteria of one ppm for surface soils. Two sediment samples (SS-19A and SS-07A) were collected from the previous sample locations with detectable PCB concentrations (SS-19 and SS-07) in the bottom of the swale.

Sediment samples were collected in the same manner as during the previous swale sediment sampling work using a stainless steel hand-driven auger. The auger was decontaminated between each soil boring location in accordance with approved work plan procedures. Each surface sediment sample was collected from 0 to 1 foot below ground surface and submitted to Galson Laboratories for PCB analysis using USEPA SW-846 Method 8082.

Analytical results of the soil samples SS-07A and SS-19A during the October 1, 2001 sampling indicated that the PCBs concentrations in the swale sediments are below 1 ppm at both sample locations. Based on these results, the samples taken further down gradient in the swale were not analyzed. A summary of the analytical results of the soil samples SS-07A and SS-19A collected during the October 1, 2001 sampling event, as well as previous results from the December 2000 event, is shown in Table 2. Based on these most recent results, and given the grassy nature of the swale that minimizes potential sediment erosion, excavation of sediments in the swale southwest of the former Pump House is not planned as part of the time-critical removal action. This is consistent with the removal action as documented in the November 2001 Final Design Report (see Drawing C-2 in particular).

Please contact me if you have any questions about the contents of this letter.

Sincerely,

PARSONS ENGINEERING SCIENCE, INC.

David B. Babcock, P.E.
Project Manager

Attachment

cc: T. Sager, 174th FW

Table 1 Fall 2001 Groundwater Analytical Results

TABLE 1

Hancock Field		Sample ID:	MW-2	MW-6D	MW-9	MW-11	MW-14	MW-15	MW-19	MW-20	MW-21	MW-22
Validated Groundwater Analytical Data		LSL Lab ID:	0112705-0132X	0112792-0022X	01127500110X	0112705-0062X	0112792-0012X	0112705-0072X	0112705-0092X	0112705-0022X	0112705-0102X	0112705-0112X
October 2001 Sampling		Galson Lab ID:	L75504-11	L75632-2	L75504-1	L75504-5	L75632-1	L75504-6	L75504-7	L75504-2	L75504-8	L75504-9
SDG: 2417		Source:	LSL/Galson	LSL/Galson	LSL/Galson	LSL/Galson	LSL/Galson	LSL/Galson	LSL/Galson	LSL/Galson	LSL/Galson	LSL/Galson
Detected Compound Summary		SDG:	2417/L75504	2417/L75504	2417/L75504	2417/L75504	2417/L75504	2417/L75504	2417	2417/L75504	2417/L75504	2417/L75504
		Matrix:	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER
		Sampled:	10/10/2001	10/11/2001	10/9/2001	10/9/2001	10/11/2001	10/9/2001	10/10/2001	10/9/2001	10/10/2001	10/10/2001
		Validated:	11/7/2001	11/7/2001	11/7/2001	11/7/2001	11/7/2001	11/7/2001	11/7/2001	11/7/2001	11/7/2001	11/7/2001
CAS NO.	COMPOUND											
	VOLATILES											
71-43-2	Benzene	ug/l	2 UJ	2 U	3 J	18	14	150	23	2 U	16	21 J
100-41-4	Ethylbenzene	ug/l	180 J	2 U	10 U	3	5	92	450	2 U	21	14 J
1330-20-7	m+p-Xylene	ug/l	340 J	2 U	10 U	2	2 J	81	440	2	70	32 J
95-47-6	o-Xylene	ug/l	2 UJ	2 U	10 U	2 U	2 U	1 J	2 U	2 U	2 U	2 UJ
	MTBE	ug/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	PCBs											
	None Detected		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 1, continued

								Dup of PARGP-4				
Hancock Field		Sample ID:	MW-23	PARGP-1	PARGP-2	PARGP-3	PARGP-4	PARGP-40	PARGP-5	PARGP-6	PARGP-7	PARGP-8
Validated Groundwater Analytical Data		LSL Lab ID:	0112705-0122X	0112417-0052X	0112417-0062X	0112417-0032X	0112417-0012X	0112417-0022X	0112417-0042X	0112417-0072X	0115975-003	0115975-004
October 2001 Sampling		Galson Lab ID:	L75504-10	L75306-5	L75306-6	L75306-3	L75306-1	L75306-2	L75306-4	L75306-7		
SDG: 2417		Source:	LSL/Galson	LSL/Galson	LSL/Galson	LSL/Galson	LSL/Galson	LSL/Galson	LSL/Galson	LSL/Galson	LSL	LSL
Detected Compound Summary		SDG:	2417/L75504	2417/L75306	2417/L75306	2417/L75306	2417/L75306	2417/L75306	2417/L75306	2417/L75306	115975	115975
		Matrix:	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER
		Sampled:	10/10/2001	10/3/2001	10/3/2001	10/3/2001	10/3/2001	10/3/2001	10/3/2001	10/3/2001	12/17/2001	12/17/2001
		Validated:	11/7/2001	11/7/2001	11/7/2001	11/7/2001	11/7/2001	11/7/2001	11/7/2001	11/7/2001		
CAS NO.	COMPOUND											
	VOLATILES [illegible]											
71-43-2	Benzene	ug/l	41 J	2 U	2 U	17	2 U	2 U	95	2 U	1 U	1 U
100-41-4	Ethylbenzene	ug/l	240 J	2 U	2 U	220	2 U	2 U	91	2 U	1 U	1 U
1330-20-7	m+p-Xylene	ug/l	620 J	2 U	2 U	170	2 U	2 U	26	2 U	1 U	1 U
95-47-6	o-Xylene	ug/l	3 J	2 U	2 U	2 U	2 U	2 U	2 U	2 U	1 U	1 U
	MTBE	ug/l	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U
	PCB [illegible]											
	None Detected		ND	ND	ND	ND	ND	ND	ND	ND	NA	NA

TABLE 1, continued

Hancock Field		Sample ID:	PARGP-9	PARGP-10	PARGP-11	PARGP-12	PARGP-13	PARGP-14	PARGP-15	PARGP-20	PARGP-21
Validated Groundwater Analytical Data		LSL Lab ID:	0115975-005	0115975-001	0115754-005	0115754-004	0115975-007	0115975-008	0115975-006	0115754-002	0115754-001
October 2001 Sampling		Galson Lab ID:									
SDG: 2417		Source:	LSL	LSL	LSL	LSL	LSL	LSL	LSL	LSL	LSL
Detected Compound Summary		SDG:	115975	115975	115754	115754	115975	115975	115975	115754	115754
		Matrix:	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER
		Sampled:	12/17/2001	12/17/2001	12/17/2001	12/17/2001	12/17/2001	12/17/2001	12/17/2001	12/17/2001	12/17/2001
		Validated:									
CAS NO.	COMPOUND										
	VOLATILES [illegible]										
71-43-2	Benzene	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
100-41-4	Ethylbenzene	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1330-20-7	m+p-Xylene	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
95-47-6	o-Xylene	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
	MTBE	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
	PCB [illegible]										
	None Detected		NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 2 Swale Sediment PCB Results At Hancock Site 15 Swale Locations Where PCBs Were Detected Above 1 Part Per Million

		December 2000		**October 2001**	
	Sample ID:	SS-19	SS-07	SS-19A	SS-07A
Parameter	Units			.	.
Aroclor-1016	ppm	0.12 U	0.11 U	0.041 U	0.098 U
Aroclor-1221	ppm	0.12 U	0.11 U	0.041 U	0.098 U
Aroclor-1232	ppm	0.12 U	0.11 U	0.041 U	0.098 U
Aroclor-1242	ppm	0.12 U	0.11 U	0.041 U	0.098 U
Aroclor-1248	ppm	0.12 U	0.11 U	0.041 U	0.098 U
Aroclor-1254	ppm	0.12 U	0.11 U	0.041 U	0.098 U
Aroclor-1260	ppm	1.6	1.5	0.5	0.73

ppm – part per million (equivalent to milligram per kilogram)

U – not detected at the specified reporting limit.

LSL

RECEIVED
OCT 24 2001
SYRACUSE

Dave Babcock
Parsons Engineering Science
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Liverpool, NY 13088

Phone: (315) 451-9560
FAX: (315) 451-9570

Laboratory Analysis Report
For
Parsons Engineering Science

Project Number: 740741.02010
LSL Project Number: 0112705

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Fax (315) 445-1301	Fax (315) 388-4061	Fax (716) 728-2711
NYS DOH ELAP #10248	NYS DOH ELAP #10900	NYS DOH ELAP #11667

This report was reviewed by: Janice F. Lafferty QC **Date:** 10/22/01
Life Science Laboratories, Inc.

-- LABORATORY ANALYSIS REPORT --

Parsons Engineering Science

Dave Babcock
Phone Number: (315) 451-9560
Project No.: 740741.02010
LSL Project No.: 0112705
Authorization:
Report Date: 10/22/01

Sample ID: MW-9

Source: Hancock ANG B, Site 15
LSL Sample ID: 0112705-001
Sample Matrix: NPW
Date Sampled: 10/9/2001

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX			
Benzene	<1	ug/l	10/17/01
Toluene	<1	ug/l	10/17/01
Ethyl benzene	<1	ug/l	10/17/01
Xylenes (Total)	<1	ug/l	10/17/01
Surrogate (4-BFB)	105	%R	10/17/01
Surrogate (Tol-d8)	94	%R	10/17/01
Surrogate (1,2-DCA-d4)	107	%R	10/17/01

Sample ID: MW-20

Source: Hancock ANG B, Site 15
LSL Sample ID: 0112705-002
Sample Matrix: NPW
Date Sampled: 10/9/2001

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX			
Benzene	<1	ug/l	10/17/01
Toluene	<1	ug/l	10/17/01
Ethyl benzene	<1	ug/l	10/17/01
Xylenes (Total)	2.1	ug/l	10/17/01
Surrogate (4-BFB)	110	%R	10/17/01
Surrogate (Tol-d8)	94	%R	10/17/01
Surrogate (1,2-DCA-d4)	108	%R	10/17/01

Sample ID: Field Equip. Blank

Source: Hancock ANG B, Site 15
LSL Sample ID: 0112705-003
Sample Matrix: NPW
Date Sampled: 10/9/2001

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX			
Benzene	<1	ug/l	10/17/01
Toluene	<1	ug/l	10/17/01
Ethyl benzene	<1	ug/l	10/17/01
Xylenes (Total)	<1	ug/l	10/17/01
Surrogate (4-BFB)	118	%R	10/17/01
Surrogate (Tol-d8)	89	%R	10/17/01
Surrogate (1,2-DCA-d4)	112	%R	10/17/01

Parsons Engineering Science

Dave Babcock
Phone Number: (315) 451-9560

Project No.: 740741.02010
Authorization:

LSL Project No.: 0112705
Report Date: 10/22/01

Sample ID: MW-20 MS

Source: Hancock ANG B, Site 15
Sample Matrix: NPW
LSL Sample ID: 0112705-004
Date Sampled: 10/9/2001

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX			
Benzene	116	%R	10/17/01
Toluene	94	%R	10/17/01
Ethyl benzene	92	%R	10/17/01
Xylenes (Total)	92	%R	10/17/01
Surrogate (4-BFB)	111	%R	10/17/01
Surrogate (Tol-d8)	87	%R	10/17/01
Surrogate (1,2-DCA-d4)	117	%R	10/17/01

Sample ID: MW-20 MSD

Source: Hancock ANG B, Site 15
Sample Matrix: NPW
LSL Sample ID: 0112705-005
Date Sampled: 10/9/2001

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX			
Benzene	4	RPD	10/17/01
Toluene	3	RPD	10/17/01
Ethyl benzene	<1	RPD	10/17/01
Xylenes (Total)	4	RPD	10/17/01
Surrogate (4-BFB)	108	%R	10/17/01
Surrogate (Tol-d8)	96	%R	10/17/01
Surrogate (1,2-DCA-d4)	118	%R	10/17/01

Sample ID: MW-11

Source: Hancock ANG B, Site 15
Sample Matrix: NPW
LSL Sample ID: 0112705-006
Date Sampled: 10/9/2001

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX			
Benzene	18	ug/l	10/17/01
Toluene	<1	ug/l	10/17/01
Ethyl benzene	3.2	ug/l	10/17/01
Xylenes (Total)	<1	ug/l	10/17/01
Surrogate (4-BFB)	106	%R	10/17/01
Surrogate (Tol-d8)	83	%R	10/17/01
Surrogate (1,2-DCA-d4)	109	%R	10/17/01

Parsons Engineering Science		**Dave Babcock**	
		Phone Number:	**(315) 451-9560**
Project No.:	**740741.02010**	**LSL Project No.:**	**0112705**
Authorization:		**Report Date:**	**10/22/01**

Sample ID: MW-15

Source:	**Hancock ANG B, Site 15**	**LSL Sample ID:**	**0112705-007**
Sample Matrix:	**NPW**	**Date Sampled:**	**10/9/2001**

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX			
Benzene	150	ug/l	10/17/01
Toluene	<1	ug/l	10/17/01
Ethyl benzene	92	ug/l	10/17/01
Xylenes (Total)	83	ug/l	10/17/01
Surrogate (4-BFB)	110	%R	10/17/01
Surrogate (Tol-d8)	94	%R	10/17/01
Surrogate (1,2-DCA-d4)	117	%R	10/17/01

Sample ID: Trip Blank

Source:	**Hancock ANG B, Site 15**	**LSL Sample ID:**	**0112705-008**
Sample Matrix:	**TB**	**Date Sampled:**	**10/9/2001**

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX			
Benzene	<1	ug/l	10/17/01
Toluene	<1	ug/l	10/17/01
Ethyl benzene	<1	ug/l	10/17/01
Xylenes (Total)	<1	ug/l	10/17/01
Surrogate (4-BFB)	118	%R	10/17/01
Surrogate (Tol-d8)	92	%R	10/17/01
Surrogate (1,2-DCA-d4)	108	%R	10/17/01

Sample ID: MW-19

Source:	**Hancock ANG B, Site 15**	**LSL Sample ID:**	**0112705-009**
Sample Matrix:	**NPW**	**Date Sampled:**	**10/9/2001**

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX			
Benzene	23	ug/l	10/17/01
Toluene	<1	ug/l	10/17/01
Ethyl benzene	440	ug/l	10/17/01
Xylenes (Total)	440	ug/l	10/17/01
Surrogate (4-BFB)	115	%R	10/17/01
Surrogate (Tol-d8)	95	%R	10/17/01
Surrogate (1,2-DCA-d4)	118	%R	10/17/01

Parsons Engineering Science		**Dave Babcock**	
		Phone Number:	**(315) 451-9560**
Project No.:	**740741.02010**	**LSL Project No.:**	**0112705**
Authorization:		**Report Date:**	**10/22/01**

Sample ID: MW-21

Source: Hancock ANG B, Site 15
LSL Sample ID: 0112705-010
Sample Matrix: NPW
Date Sampled: 10/10/2001

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX			
Benzene	16	ug/l	10/17/01
Toluene	<1	ug/l	10/17/01
Ethyl benzene	21	ug/l	10/17/01
Xylenes (Total)	70	ug/l	10/17/01
Surrogate (4-BFB)	117	%R	10/17/01
Surrogate (Tol-d8)	109	%R	10/17/01
Surrogate (1,2-DCA-d4)	110	%R	10/17/01

Sample ID: MW-22

Source: Hancock ANG B, Site 15
LSL Sample ID: 0112705-011
Sample Matrix: NPW
Date Sampled: 10/10/2001

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX			
Benzene	21	ug/l	10/17/01
Toluene	<1	ug/l	10/17/01
Ethyl benzene	14	ug/l	10/17/01
Xylenes (Total)	32	ug/l	10/17/01
Surrogate (4-BFB)	112	%R	10/17/01
Surrogate (Tol-d8)	96	%R	10/17/01
Surrogate (1,2-DCA-d4)	116	%R	10/17/01

Sample ID: MW-23

Source: Hancock ANG B, Site 15
LSL Sample ID: 0112705-012
Sample Matrix: NPW
Date Sampled: 10/10/2001

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX			
Benzene	41	ug/l	10/17/01
Toluene	<1	ug/l	10/17/01
Ethyl benzene	240	ug/l	10/17/01
Xylenes (Total)	620	ug/l	10/17/01
Surrogate (4-BFB)	104	%R	10/17/01
Surrogate (Tol-d8)	97	%R	10/17/01
Surrogate (1,2-DCA-d4)	115	%R	10/17/01

Parsons Engineering Science		**Dave Babcock**	
		Phone Number:	**(315) 451-9560**
Project No.:	**740741.02010**	**LSL Project No.:**	**0112705**
Authorization:		**Report Date:**	**10/22/01**

Sample ID: MW-2

Source:	**Hancock ANG B, Site 15**	**LSL Sample ID:**	**0112705-013**
Sample Matrix:	**NPW**	**Date Sampled:**	**10/10/2001**

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX			
Benzene	<1	ug/l	10/17/01
Toluene	<1	ug/l	10/17/01
Ethyl benzene	180	ug/l	10/17/01
Xylenes (Total)	340	ug/l	10/17/01
Surrogate (4-BFB)	110	%R	10/17/01
Surrogate (Tol-d8)	107	%R	10/17/01
Surrogate (1,2-DCA-d4)	120	%R	10/17/01

Life Science Laboratories, Inc.
CHAIN OF CUSTODY RECORD

112705

LSL North Lab.	LSL Central Lab.
131 St. Lawrence Ave.	5854 Butternut Drive
Waddington, N.Y. 13694	E. Syracuse, N.Y. 13057
Phone: 315-388-4476	Phone:315-445-1105
Fax: 315-388-4061	Fax: 315-445-1301

Report Address:
Name: Hancock ANGB, Site 15
Company: Parsons, Attn: Dave Babcock
Street: 290 Elwood Davis Rd, Suite 312
City/State: Liverpool, NY Zip: 13088
Phone: 315-451-9560 Fax: 315-451-9560
Email:

Turnaround Time
Normal 14 DAY ☑
Pre-Authorized: Next Day* ☐ 3-Day* ☐ 2-Day* ☐ 7-Day* ☐
*Additional Charges may apply

Date Needed or Special Instructions:

Authorization or P.O. #

Client Project ID/Client Site ID 740741.02010

LSL Project Number

Client's Sample Identifications	Sample Date	Sample Time	Type grab/comp	Matrix	Preserv Added	Containers #	Containers size/type	Analyses	Preserv Check	LSL ID#
MW-19	10/9/01	1145	Grab	water	HCL	2	40mL	BTEX-8260		001
MW-20	10/9/01	1115	Grab	water	HCL	2	40mL	BTEX-8260		002
Field Equip Blank	10/9/01	1130	Grab	water	HCL	2	40mL	BTEX-8260		003
MW-20MS	10/9/01	1115	Grab	water	HCL	2	40mL	BTEX-8260		004
MW-20MSD	10/9/01	1115	Grab	water	HCL	2	40mL	BTEX-8260		005
MW-11	10/9/01	1440	Grab	water	HCL	2	40mL	BTEX-8260		006
MW-15	10/9/01	1505	Grab	water	HCL	2	40mL	BTEX-8260		007
Trip Blank	—	—	—	water	-	2	40mL	BTEX-8260		008
MW-19	10/9/01	1715	Grab	water	HCL	2	40mL	BTEX-8260		009
MW-21	10/10/01	1150	Grab	water	HCL	2	40mL	BTEX-8260		010

LSL use only:

Containers this C-O-C

Custody Transfers		Date	Time
Sampled By: Ed Ashton	Received By:		
Relinquished By:	Received By:	10/10/01	1529
Relinquished By:	Rec'd for Lab By:	10/10/01	15:39
Shipment Method: Hand delivered	Received Intact: Y N	Sample Temp	8.6°

*** All areas of this Chain of Custody Record MUST be filled out in order to process samples in a timely manner IN PEN ONLY***

Coc

page 2 of 2

Life Science Laboratories, Inc.

CHAIN OF CUSTODY RECORD

112705

LSL North Lab.
131 St. Lawrence Ave.
Waddington, N.Y. 13694
Phone: 315-388-4476
Fax: 315-388-4061

LSL Central Lab.
5854 Butternut Drive
E. Syracuse, N.Y. 13057
Phone:315-445-1105
Fax: 315-445-1301

Report Address:
Name: Hancock ANGB, Site 15
Company: Parsons, Attn: Dave Badcock
Street: 290 Elwood Davis Rd Suite 312
City/State: Liverpool, NY
Zip: 13088
Phone: 315-451-9560
Fax: 315-451-9570
Email:

Turnaround Time
Normal 14 DAY ☑
Pre-Authorized: Next Day* ☐ 2-Day* ☐ 3-Day* ☐ 7-Day* ☐
*Additional Charges may apply

Date Needed or Special Instructions:

Authorization or P.O. #

Client Project ID/Client Site ID: 740741.02010

LSL Project Number:

Client's Sample Identifications	Sample Date	Sample Time	Type grab/comp	Matrix	Preserv Added	Containers #	Containers size/type	Analyses	Preserv Check	LSL ID#
MW-22	10/10/01	1200	Grab	water	HCL	2	40 mL	BTEX-8260		D11
MW-23	10/10/01	1455	Grab	water	HCL	2	40 mL	BTEX 8260		D12
MW-2	10/10/01	1400	Grab	water	HCL	2	40 mL	BTEX 8260		D13

LSL use only:

Containers this C-O-C

Custody Transfers		Date	Time
Sampled By: Ed Ashta	Received By:		
Relinquished By:	Received By:	10/10/01	1529
Relinquished By:	Rec'd for Lab By:	10/10/01	15:39
Shipment Method: Hand Delivered	Received Intact: Y [✓ N]	Sample Temp	12.3

*** All areas of this Chain of Custody Record MUST be filled out in order to process samples in a timely manner IN PEN ONLY***

Coc

LSL

Full Internal Chain of Custody Record

Client: Parsons
Preservative: HCl
Matrix: NPW
Analytes: 8260 BTEX
LSL Sample Number Series: 011-013
LSL Project Number: 0112705
Client's Sample Number Series: —
Total Number of Bottles For this COC: 26
Storage Location: organics Refrigerator

LSL Sample # Whole Series **Client's Sample #** Whole Series

Custody Transfers:		Date	Time	Locked Up?
Relinquished By:	Received By: Bill Dobbin	10-17-01	8:00	
Relinquished By:	Received By:			
Relinquished By:	Received By:			
Relinquished By:	Received By:			
Relinquished By:	Received By:			
Relinquished By:	Received By:			
Relinquished By:	Received By:			

LSL Sample # **Client's Sample #**

Custody Transfers:		Date	Time	Locked Up?
Relinquished By:	Received By:			
Relinquished By:	Received By:			

LSL Sample # **Client's Sample #**

Custody Transfers:		Date	Time	Locked Up?
Relinquished By:	Received By:			
Relinquished By:	Received By:			

LSL Sample # **Client's Sample #**

Custody Transfers:		Date	Time	Locked Up?
Relinquished By:	Received By:			
Relinquished By:	Received By:			

LSL Sample # **Client's Sample #**

Custody Transfers:		Date	Time	Locked Up?
Relinquished By:	Received By:			
Relinquished By:	Received By:			

LSL Sample # **Client's Sample #**

Custody Transfers:		Date	Time	Locked Up?
Relinquished By:	Received By:			
Relinquished By:	Received By:			

LSL Sample # **Client's Sample #**

Custody Transfers:		Date	Time	Locked Up?
Relinquished By:	Received By:			
Relinquished By:	Received By:			

LSL Sample # **Client's Sample #**

Custody Transfers:		Date	Time	Locked Up?
Relinquished By:	Received By:			
Relinquished By:	Received By:			

LSL

SAMPLE RECEIVING CHECK LIST

Page 1 of 1

Log-in Date: 10/10/01

Received by:

Project #: 0112705
SDG #: 112705

REMARKS:

1. Custody Seals present/ [✓ absent]
   intact/broken
2. Custody Seal Nos.:
3. Chain-of Custody Records [✓ present]/absent
4. Traffic Reports present/ [✓ absent]
5. Packing List present/ [✓ absent]
6. Airbill present/ [✓ absent]
7. Airbill No.:
8. Sample Tags [✓ present]/absent
9. Sample Tag Nos.: [✓ listed]/not listed on Chain-of Custody
10. CLSIS's present/ [✓ absent]
11. Condition of Shipping Container cooler w/ ice
    5.6°C
12. Does information on custody records, traffic reports, and sample agree? [✓ Yes]/No
13. Date Received at Lab: 10/10/01
14. Time Received at Lab: 15:39

Sample Transfer

Storage Area: organics Refrigerator
By:
On: 10-10-01

Corresponding ASP Sample #	Corresponding Client Sample #	Corresponding LSL Sample #	REMARKS: Condition of sample shipment, etc.
	MW-19	112705-001	
	MW-20	-002	
	Field Equip Blank	-003	
	MW-20MS	-004	
	MW-20MSD	-005	
	MW-11	-006	
	MW-15	-007	
	Trip Blank	-008	
	MW-19	-009	
	MW-21	-010	
	MW-22	-011	
	MW-23	-012	
	MW-2	-013	

Logbook No: N/A
Logbook Page Number: N/A

Revised: 7/29/1998
L9009.Form1

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LSL

NOV 06 2001

Dave Babcock
Parsons Engineering Science
290 Elwood Davis Road, Suite 312
Liverpool, NY 13088

Phone: **(315) 451-9560**
FAX: **(315) 451-9570**

Revised Laboratory Analysis Report
For
Parsons Engineering Science

Project Number: **740741.02010**
LSL Project Number: **0112792**

Life Science Laboratories, Inc.

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LSL Finger Lakes Lab
16 N. Main St., PO Box 424
Wayland, NY 14572
Tel. (716) 728-3320
Fax (716) 728-2711
NYS DOH ELAP #11667

This report was reviewed by: ______________________
Life Science Laboratories, Inc.

Date: 11-1-01

-- REVISED LABORATORY ANALYSIS REPORT

Parsons Engineering Science

Dave Babcock
Phone: (315) 451-9560

Sample ID: MW-14
Project No.: 740741.02010
Source: Hancock ANG
LSL Sample ID: 0112792-001
Sample Matrix: NPW

Authorization:
LSL Project No.: 0112792
Date Sampled: 10/11/01
Revised Report Date: 11/1/2001
Original Report Date: 10/26/2001

Parameter(s)	Results	Units	Analysis Date & Time
(1) EPA 8260 BTEX			
Benzene	14	ug/l	10/17/01
Toluene	<1	ug/l	10/17/01
Ethyl benzene	4.9	ug/l	10/17/01
Xylenes (Total)	1.5	ug/l	10/17/01
Surrogate (4-BFB)	105	%R	10/17/01
Surrogate (Tol-d8)	89	%R	10/17/01
Surrogate (1,2-DCA-d4)	112	%R	10/17/01

-- REVISED LABORATORY ANALYSIS REPORT -

Parsons Engineering Science

Dave Babcock
Phone: (315) 451-9560

Sample ID: MW-6D
Project No.: 740741.02010
Source: Hancock ANG
LSL Sample ID: 0112792-002
Sample Matrix: NPW

Authorization:
LSL Project No.: 0112792
Date Sampled: 10/11/01
Revised Report Date: 11/1/2001
Original Report Date: 10/26/2001

Parameter(s)	Results	Units	Analysis Date & Time
(1) EPA 8260 BTEX			
Benzene	<1	ug/l	10/17/01
Toluene	<1	ug/l	10/17/01
Ethyl benzene	<1	ug/l	10/17/01
Xylenes (Total)	<1	ug/l	10/17/01
Surrogate (4-BFB)	108	%R	10/17/01
Surrogate (Tol-d8)	84	%R	10/17/01
Surrogate (1,2-DCA-d4)	106	%R	10/17/01

-- REVISED LABORATORY ANALYSIS REPORT --

Parsons Engineering Science		**Dave Babcock**	
		Phone:	**(315) 451-9560**
Sample ID:	**Trip Blank**		
Project No.:	**740741.02010**	**Authorization:**	
Source:	**Hancock ANG**	**LSL Project No.:**	**0112792**
LSL Sample ID:	**0112792-003**	**Date Sampled:**	**10/11/01**
Sample Matrix:	**TB**	**Revised Report Date:**	**11/1/2001**
		Original Report Date:	**10/26/2001**

Parameter(s)	**Results**	**Units**	**Analysis Date & Time**
(1) EPA 8260 BTEX			
Benzene	<1	ug/l	10/17/01
Toluene	<1	ug/l	10/17/01
Ethyl benzene	<1	ug/l	10/17/01
Xylenes (Total)	<1	ug/l	10/17/01
Surrogate (4-BFB)	108	%R	10/17/01
Surrogate (Tol-d8)	90	%R	10/17/01
Surrogate (1,2-DCA-d4)	109	%R	10/17/01

LSL

Mike Brochart
Parsons Engineering Science
290 Elwood Davis Road, Suite 312
Liverpool, NY 13088

Phone: (315) 451-9560
FAX: (315) 451-9570

Laboratory Analysis Report
For
Parsons Engineering Science

Project Number: 740741.02010
LSL Project Number: 0112417

Life Science Laboratories, Inc.

LSL Central Lab	LSL North Lab	LSL Finger Lakes Lab
5854 Butternut Drive	131 St. Lawrence Avenue	16 N. Main St., PO Box 424
East Syracuse, NY 13057	Waddington, NY 13694	Wayland, NY 14572
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Fax (315) 445-1301	Fax (315) 388-4061	Fax (716) 728-2711
NYS DOH ELAP #10248	NYS DOH ELAP #10900	NYS DOH ELAP #11667

This report was reviewed by: Sutton QAO
Life Science Laboratories, Inc.

Date: 10-19-01

LSL

QUICK RESPONSE FAX OF LABORATORY RESULTS

10-19-01
Today's Date

TO: **Mike Brochart**

COMPANY: **Parsons Engineering Science**

PROJECT NUMBER: **740741.02010**

FAX PHONE NUMBER: **(315) 451-9570**

FROM: **LIFE SCIENCE LABORATORIES, INC.**

LSL PROJECT #: 0112417

NUMBER OF PAGES TRANSMITTED: 6
(INCLUDING COVER PAGE)

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Status of Samples Currently Being Analyzed	The Technical Services Department

If you do not receive all of the pages, please contact us immediately at (315) 445-1105.

LIFE SCIENCE LABORATORIES, INC.
5854 Butternut Drive, E. Syracuse, NY 13057

-- LABORATORY ANALYSIS REPORT --

Parsons Engineering Science		**Mike Brochart**	
		Phone Number:	**(315) 451-9560**
Project No.:	**740741.02010**	**LSL Project No.:**	**0112417**
Authorization:		**Report Date:**	**10/19/01**

Sample ID: PARGP - 4

Source: **Hancock ANGB**
LSL Sample ID: **0112417-001**
Sample Matrix: **NPW,ASP**
Date Sampled: **10/3/2001**

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX			
Benzene	<1	ug/l	10/12/01
Toluene	<1	ug/l	10/12/01
Ethyl benzene	<1	ug/l	10/12/01
Xylenes (Total)	<1	ug/l	10/12/01
Surrogate (4-BFB)	115	%	10/12/01
Surrogate (Tol-d8)	89	%	10/12/01
Surrogate (1,2-DCA-d4)	106	%	10/12/01

Sample ID: PARGP - 4D

Source: **Hancock ANGB**
LSL Sample ID: **0112417-002**
Sample Matrix: **NPW,ASP**
Date Sampled: **10/3/2001**

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX			
Benzene	<1	ug/l	10/12/01
Toluene	<1	ug/l	10/12/01
Ethyl benzene	<1	ug/l	10/12/01
Xylenes (Total)	<1	ug/l	10/12/01
Surrogate (4-BFB)	116	%	10/12/01
Surrogate (Tol-d8)	92	%	10/12/01
Surrogate (1,2-DCA-d4)	102	%	10/12/01

Sample ID: PARGP - 3

Source: **Hancock ANGB**
LSL Sample ID: **0112417-003**
Sample Matrix: **NPW,ASP**
Date Sampled: **10/3/2001**

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX			
Benzene	17	ug/l	10/12/01
Toluene	<1	ug/l	10/12/01
Ethyl benzene	220	ug/l	10/12/01
Xylenes (Total)	170	ug/l	10/12/01
Surrogate (4-BFB)	99	%	10/12/01
Surrogate (Tol-d8)	94	%	10/12/01
Surrogate (1,2-DCA-d4)	111	%	10/12/01

-- LABORATORY ANALYSIS REPORT --

Parsons Engineering Science		**Mike Brochart**	
		Phone Number:	**(315) 451-9560**
Project No.:	**740741.02010**	**LSL Project No.:**	**0112417**
Authorization:		**Report Date:**	**10/19/01**

Sample ID: PARGP - 5

Source: Hancock ANGB
LSL Sample ID: 0112417-004
Sample Matrix: NPW,ASP
Date Sampled: 10/3/2001

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX			
Benzene	95	ug/l	10/12/01
Toluene	<1	ug/l	10/12/01
Ethyl benzene	91	ug/l	10/12/01
Xylenes (Total)	26	ug/l	10/12/01
Surrogate (4-BFB)	106	%	10/12/01
Surrogate (Tol-d8)	93	%	10/12/01
Surrogate (1,2-DCA-d4)	111	%	10/12/01

Sample ID: PARGP - 1

Source: Hancock ANGB
LSL Sample ID: 0112417-005
Sample Matrix: NPW,ASP
Date Sampled: 10/3/2001

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX			
Benzene	<1	ug/l	10/12/01
Toluene	<1	ug/l	10/12/01
Ethyl benzene	<1	ug/l	10/12/01
Xylenes (Total)	<1	ug/l	10/12/01
Surrogate (4-BFB)	105	%	10/12/01
Surrogate (Tol-d8)	93	%	10/12/01
Surrogate (1,2-DCA-d4)	104	%	10/12/01

Sample ID: PARGP - 2

Source: Hancock ANGB
LSL Sample ID: 0112417-006
Sample Matrix: NPW,ASP
Date Sampled: 10/3/2001

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX			
Benzene	<1	ug/l	10/12/01
Toluene	<1	ug/l	10/12/01
Ethyl benzene	<1	ug/l	10/12/01
Xylenes (Total)	<1	ug/l	10/12/01
Surrogate (4-BFB)	117	%	10/12/01
Surrogate (Tol-d8)	91	%	10/12/01
Surrogate (1,2-DCA-d4)	107	%	10/12/01

-- LABORATORY ANALYSIS REPORT --

Parsons Engineering Science		**Mike Brochart**	
		Phone Number:	**(315) 451-9560**
Project No.:	**740741.02010**	**LSL Project No.:**	**0112417**
Authorization:		**Report Date:**	**10/19/01**

Sample ID: PARGP - 6

Source:	**Hancock ANGB**	**LSL Sample ID:**	**0112417-007**
Sample Matrix:	**NPW,ASP**	**Date Sampled:**	**10/3/2001**

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX			
Benzene	<1	ug/l	10/12/01
Toluene	<1	ug/l	10/12/01
Ethyl benzene	<1	ug/l	10/12/01
Xylenes (Total)	<1	ug/l	10/12/01
Surrogate (4-BFB)	113	%	10/12/01
Surrogate (Tol-d8)	88	%	10/12/01
Surrogate (1,2-DCA-d4)	107	%	10/12/01

Sample ID: Trip Blank

Source:	**Hancock ANGB**	**LSL Sample ID:**	**0112417-008**
Sample Matrix:	**TB,ASP**	**Date Sampled:**	**10/3/2001**

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX			
Benzene	<1	ug/l	10/12/01
Toluene	<1	ug/l	10/12/01
Ethyl benzene	<1	ug/l	10/12/01
Xylenes (Total)	<1	ug/l	10/12/01
Surrogate (4-BFB)	117	%	10/12/01
Surrogate (Tol-d8)	91	%	10/12/01
Surrogate (1,2-DCA-d4)	106	%	10/12/01

112417

Life Science Laboratories, Inc.
CHAIN OF CUSTODY RECORD

LSL North Lab.
131 St. Lawrence Ave.
Waddington, N.Y. 13694
Phone: 315-388-4476
Fax: 315-388-4061

LSL Central Lab.
5854 Butternut Drive
E. Syracuse, N.Y. 13057
Phone:315-445-1105
Fax: 315-445-1301

Report Address:
Name: Mike Broschart
Company: Parsons Engineering Science, Inc.
Street: 290 Elwood Davis Rd, Suite 312
City/State: Liverpool, NY 13088
Zip: 13088
Phone: 315-451-9560
Fax: 315-451-9570
Email:

Turnaround Time
Normal 14 DAY ☑
Pre-Authorized: Next Day* ☐ 2-Day* ☐ 3-Day* ☐ 7-Day* ☐
*Additional Charges may apply

Date Needed or Special Instructions:

Authorization or P.O. #
Parsons # = 740741.02010

Client Project ID/Client Site ID
Hancock ANGB / 740741.02010

LSL Project Number:

Client's Sample Identifications	Sample Date	Sample Time	Type grab/comp	Matrix	Preserv Added	Containers #	Containers size/type	Analyses	Preserv Check	LSL ID#
PARGP-4	10/3/01	1040	Grab	water	HCL	2	40mL	BTEX 8260		001
PARGP-40	10/3/01	1045	Grab	water	HCL	2	40mL	BTEX 8260		002
PARGP-3	10/3/01	1140	Grab	water	HCL	2	40mL	BTEX 8260		003
PARGP-5	10/3/01	1230	Grab	water	HCL	2	40mL	BTEX 8260		004
PARGP-1	10/3/01	1335	Grab	water	HCL	2	40mL	BTEX 8260		005
PARGP-2	10/3/01	1555	Grab	water	HCL	2	40mL	BTEX 8260		006
PARGP-6	10/3/01	1910	Grab	water	HCL	2	40mL	BTEX 8260		007
Trip Blank	—	—	—	—	—	2	40mL	BTEX 8260		

LSL use only:
Containers this C-O-C

Custody Transfers		Date	Time
Sampled By: Edward	Received By:	10/4/01	0912
Relinquished By:	Received By:		
Relinquished By:	Rec'd for Lab By:	10-4-01	0921
Shipment Method:	Received Intact: Y N	Sample Temp 10.4	

*** All areas of this Chain of Custody Record MUST be filled out in order to process samples in a timely manner IN PEN ONLY***

LSL

RECEIVED
DEC 20 2001

Dave Babcock
Parsons Engineering Science
290 Elwood Davis Road, Suite 312
Liverpool, NY 13088

Phone: (315) 451-9560
FAX: (315) 451-9570

Laboratory Analysis Report
For
Parsons Engineering Science

Project Number: 740741
LSL Project Number: 0115754

Life Science Laboratories, Inc.

LSL Central Lab	LSL North Lab	LSL Finger Lakes Lab
5854 Butternut Drive	131 St. Lawrence Avenue	16 N. Main St., PO Box 424
East Syracuse, NY 13057	Waddington, NY 13694	Wayland, NY 14572
Tel. (315) 445-1105	Tel. (315) 388-4476	Tel. (716) 728-3320
Fax (315) 445-1301	Fax (315) 388-4061	Fax (716) 728-2711
NYS DOH ELAP #10248	NYS DOH ELAP #10900	NYS DOH ELAP #11667

This report was reviewed by: QAO
Life Science Laboratories, Inc.

Date: 12-18-01

ANALYSIS REPORT --

Parsons Engineering Science
Dave Babcock
Phone Number: (315) 451-9560
Project No.: 740741
LSL Project No.: 0115754
Authorization:
Report Date: 12/18/01

Sample ID: PARGP-21

Source: Hancock Air Field, Site 15, Golf Course
LSL Sample ID: 0115754-001
Sample Matrix: NPW,24hr RUSH
Date Sampled: 12/17/2001

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX			
Benzene	<1	ug/l	12/18/01
Toluene	<1	ug/l	12/18/01
Ethyl benzene	<1	ug/l	12/18/01
Xylenes (Total)	<1	ug/l	12/18/01
MTBE	<1	ug/l	12/18/01
Surrogate (4-BFB)	112	%	12/18/01
Surrogate (Tol-d8)	108	%	12/18/01
Surrogate (1,2-DCA-d4)	98	%	12/18/01

Sample ID: PARGP-20

Source: Hancock Air Field, Site 15, Golf Course
LSL Sample ID: 0115754-002
Sample Matrix: NPW,24hr RUSH
Date Sampled: 12/17/2001

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX			
Benzene	<1	ug/l	12/18/01
Toluene	<1	ug/l	12/18/01
Ethyl benzene	<1	ug/l	12/18/01
Xylenes (Total)	<1	ug/l	12/18/01
MTBE	<1	ug/l	12/18/01
Surrogate (4-BFB)	114	%	12/18/01
Surrogate (Tol-d8)	108	%	12/18/01
Surrogate (1,2-DCA-d4)	92	%	12/18/01

Sample ID: Trip Blank

Source: Hancock Air Field, Site 15, Golf Course
LSL Sample ID: 0115754-003
Sample Matrix: NPW,24hr RUSH
Date Sampled: 12/17/2001

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX			
Benzene	<1	ug/l	12/18/01
Toluene	<1	ug/l	12/18/01
Ethyl benzene	<1	ug/l	12/18/01
Xylenes (Total)	<1	ug/l	12/18/01
MTBE	<1	ug/l	12/18/01
Surrogate (4-BFB)	107	%	12/18/01
Surrogate (Tol-d8)	105	%	12/18/01

Parsons Engineering Science		**Dave Babcock**	
		Phone Number:	**(315) 451-9560**
Project No.:	**740741**	**LSL Project No.:**	**0115754**
Authorization:		**Report Date:**	**12/18/01**

Surrogate (1,2-DCA-d4)	91	%	12/18/01

Sample ID: PARGP-12

Source:	**Hancock Air Field, Site 15, Golf Course**	**LSL Sample ID:**	**0115754-004**
Sample Matrix:	**NPW,24hr RUSH**	**Date Sampled:**	**12/17/2001**

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX			
Benzene	<1	ug/l	12/18/01
Toluene	<1	ug/l	12/18/01
Ethyl benzene	<1	ug/l	12/18/01
Xylenes (Total)	<1	ug/l	12/18/01
MTBE	<1	ug/l	12/18/01
Surrogate (4-BFB)	109	%	12/18/01
Surrogate (Tol-d8)	108	%	12/18/01
Surrogate (1,2-DCA-d4)	97	%	12/18/01

Sample ID: PARGP-11

Source:	**Hancock Air Field, Site 15, Golf Course**	**LSL Sample ID:**	**0115754-005**
Sample Matrix:	**NPW,24hr RUSH**	**Date Sampled:**	**12/17/2001**

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX			
Benzene	<1	ug/l	12/18/01
Toluene	<1	ug/l	12/18/01
Ethyl benzene	<1	ug/l	12/18/01
Xylenes (Total)	<1	ug/l	12/18/01
MTBE	<1	ug/l	12/18/01
Surrogate (4-BFB)	112	%	12/18/01
Surrogate (Tol-d8)	108	%	12/18/01
Surrogate (1,2-DCA-d4)	93	%	12/18/01

CHAIN OF CUSTODY RECORD

115754

NO: 3172

CLIENT: Parsons	PROJECT NO. 740741	PROJECT MGR: David Babcock
PROJECT NAME: Hancock Air Field, Site 15 Golf Course	NOTES - (Reference QAPP and/or analytical protocols to be used): 24 or 48 T-A-T, whichever fastest possible	
SAMPLERS: Ed Ashton		

Send results to:
PARSONS ENGINEERING SCIENCE, INC.
290 Elwood Davis Road-Suite 312
Liverpool, NY 13088
Telephone: (315) 451-9560
Fax: (315) 451-9570

Lab Submitted to:
Life Science Labs
5854 Butternut Dr.
E. Syracuse, NY 13057
315-445-1105

ANALYSES REQUIRED

FIELD SAMPLE ID	LOCATION DESCRIPTION	DATE	TIME	GRAB	COMP	MATRIX	Number of Bottles	8260- BTEX, MTBE	REMARKS
PARGP-21	PARGP21	12/17/01	0830	x		w	2	x	001 A/B
PARGP-20	PARGP-20	12/17/01	0935	x		w	2	x	002
Trip Blank	Trip Blank	–	–	–	–	–	2	x	003 ↓
PARGP-19	PARGP-19	12/17/01	1042	x		w	2	x	Hold off analysis until permission given by Pars
PARGP-12	PARGP-12	12/17/01	1225	x		w	2	x	004 A/B
PARGP-11	PARGP-11	12/17/01	1305	x		w	2	x	005 ↓

Relinquished by: (Signature)	Date:	Time:	Shipped via:	Airbill #:	Received by:(Signature)	Date:	Time:	Cooler Temp:
	12/17/01		Hand delivered					___°C Samples Intact: ___Yes ___No
Victor McElmer								___°C Samples Intact: ___Yes ___No
					R Dunbar	12/17/01	1332	___°C Samples Intact: ___Yes ___No

TYPE CODES:

SOLID		WATER			MATRIX	QUALITY CONTROL
SD- Sediment	TP- Test Pit/Tank Pit	MW- Monitoring Well	FD- Fuel Dispenser	ST- Storm Water	W - Water	FB- Field Blank (with date)
SS- Surface Soil	DR- Drum Waste	LC- Leachate	MH- Manhole	WW- Waste Water	S - Soil	TB- Trip Blank (with date)
SB- Subsurface Soil	WA- Solid Waste	SW- Surface Water	OW- Oil Water Separator	OL- Other Liquid (eg. Drum liquid)		WB- Wash Blank (with date)
MW- Monitoring Well Boring	OS- Other Solid	DW- Drill Water	PR- Piping Run			

NO: 3172

Parsons Engineering Science, Inc.

Revised: 9/30/98

24 hr TAT

LSL

RECEIVED
JAN 03 2002

Dave Babcock
Parsons Engineering Science
290 Elwood Davis Road, Suite 312
Liverpool, NY 13088

Phone: (315) 451-9560
FAX: (315) 451-9570

Laboratory Analysis Report
For
Parsons Engineering Science

Project Number: 740741
LSL Project Number: 0115975

Life Science Laboratories, Inc.

LSL Central Lab
5854 Butternut Drive
East Syracuse, NY 13057
Tel. (315) 445-1105
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LSL North Lab
131 St. Lawrence Avenue
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Tel. (315) 388-4476
Fax (315) 388-4061
NYS DOH ELAP #10900

LSL Finger Lakes Lab
16 N. Main St., PO Box 424
Wayland, NY 14572
Tel. (716) 728-3320
Fax (716) 728-2711
NYS DOH ELAP #11667

This report was reviewed by: ______________________
Life Science Laboratories, Inc.

Date: 12-31-01

Parsons Engineering Science		**Dave Babcock**	
		Phone Number:	**(315) 451-9560**
Project No.:	**740741**	**LSL Project No.:**	**0115975**
Authorization:		**Report Date:**	**12/31/01**

Sample ID: PARGP-10

Source:	**Hancock Airfield, Riders Golf Course**	**LSL Sample ID:**	**0115975-001**
Sample Matrix:	**NPW**	**Date Sampled:**	**12/17/2001**

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX+MTBE			
Benzene	<1	ug/l	12/22/01
Toluene	<1	ug/l	12/22/01
Ethyl benzene	<1	ug/l	12/22/01
Xylenes (Total)	<1	ug/l	12/22/01
MTBE	<1	ug/l	12/22/01
Surrogate (4-BFB)	115	%R	12/22/01
Surrogate (Tol-d8)	107	%R	12/22/01
Surrogate (1,2-DCA-d4)	91	%R	12/22/01

Sample ID: Trip Blank

Source:	**Hancock Airfield, Riders Golf Course**	**LSL Sample ID:**	**0115975-002**
Sample Matrix:	**TB**	**Date Sampled:**	**12/17/2001**

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX+MTBE			
Benzene	<1	ug/l	12/22/01
Toluene	<1	ug/l	12/22/01
Ethyl benzene	<1	ug/l	12/22/01
Xylenes (Total)	<1	ug/l	12/22/01
MTBE	<1	ug/l	12/22/01
Surrogate (4-BFB)	121	%R	12/22/01
Surrogate (Tol-d8)	103	%R	12/22/01
Surrogate (1,2-DCA-d4)	101	%R	12/22/01

Sample ID: PARGP-7

Source:	**Hancock Airfield, Riders Golf Course**	**LSL Sample ID:**	**0115975-003**
Sample Matrix:	**NPW**	**Date Sampled:**	**12/17/2001**

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX+MTBE			
Benzene	<1	ug/l	12/22/01
Toluene	<1	ug/l	12/22/01
Ethyl benzene	<1	ug/l	12/22/01
Xylenes (Total)	<1	ug/l	12/22/01
MTBE	<1	ug/l	12/22/01
Surrogate (4-BFB)	121	%R	12/22/01
Surrogate (Tol-d8)	109	%R	12/22/01

Parsons Engineering Science		**Dave Babcock**	
		Phone Number:	**(315) 451-9560**
Project No.:	**740741**	**LSL Project No.:**	**0115975**
Authorization:		**Report Date:**	**12/31/01**

Surrogate (1,2-DCA-d4)	98	%R	12/22/01

Sample ID: PARGP-8

Source: **Hancock Airfield, Riders Golf Course**
LSL Sample ID: **0115975-004**
Sample Matrix: **NPW**
Date Sampled: **12/17/2001**

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX+MTBE			
Benzene	<1	ug/l	12/25/01
Toluene	<1	ug/l	12/25/01
Ethyl benzene	<1	ug/l	12/25/01
Xylenes (Total)	<1	ug/l	12/25/01
MTBE	<1	ug/l	12/25/01
Surrogate (4-BFB)	107	%R	12/25/01
Surrogate (Tol-d8)	106	%R	12/25/01
Surrogate (1,2-DCA-d4)	93	%R	12/25/01

Sample ID: PARGP-9

Source: **Hancock Airfield, Riders Golf Course**
LSL Sample ID: **0115975-005**
Sample Matrix: **NPW**
Date Sampled: **12/17/2001**

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX+MTBE			
Benzene	<1	ug/l	12/25/01
Toluene	<1	ug/l	12/25/01
Ethyl benzene	<1	ug/l	12/25/01
Xylenes (Total)	<1	ug/l	12/25/01
MTBE	<1	ug/l	12/25/01
Surrogate (4-BFB)	108	%R	12/25/01
Surrogate (Tol-d8)	108	%R	12/25/01
Surrogate (1,2-DCA-d4)	94	%R	12/25/01

Sample ID: PARGP-15

Source: **Hancock Airfield, Riders Golf Course**
LSL Sample ID: **0115975-006**
Sample Matrix: **NPW**
Date Sampled: **12/18/2001**

Parameter(s)	*Results*	*Units*	*Analysis Date and Time*
(1) EPA 8260 BTEX+MTBE			
Benzene	<1	ug/l	12/25/01
Toluene	<1	ug/l	12/25/01
Ethyl benzene	<1	ug/l	12/25/01
Xylenes (Total)	<1	ug/l	12/25/01
MTBE	<1	ug/l	12/25/01

Surrogate (4-BFB)	115	%R	12/25/01
Surrogate (Tol-d8)	104	%R	12/25/01
Surrogate (1,2-DCA-d4)	96	%R	12/25/01

Sample ID: PARGP-13

Source:	**Hancock Airfield, Riders Golf Course**	**LSL Sample ID:**	**0115975-007**
Sample Matrix:	**NPW**	**Date Sampled:**	**12/18/2001**

Parameter(s)	***Results***	***Units***	***Analysis Date and Time***
(1) EPA 8260 BTEX+MTBE			
Benzene	<1	ug/l	12/25/01
Toluene	<1	ug/l	12/25/01
Ethyl benzene	<1	ug/l	12/25/01
Xylenes (Total)	<1	ug/l	12/25/01
MTBE	<1	ug/l	12/25/01
Surrogate (4-BFB)	111	%R	12/25/01
Surrogate (Tol-d8)	103	%R	12/25/01
Surrogate (1,2-DCA-d4)	90	%R	12/25/01

Sample ID: PARGP-14

Source:	**Hancock Airfield, Riders Golf Course**	**LSL Sample ID:**	**0115975-008**
Sample Matrix:	**NPW**	**Date Sampled:**	**12/18/2001**

Parameter(s)	***Results***	***Units***	***Analysis Date and Time***
(1) EPA 8260 BTEX+MTBE			
Benzene	<1	ug/l	12/25/01
Toluene	<1	ug/l	12/25/01
Ethyl benzene	<1	ug/l	12/25/01
Xylenes (Total)	<1	ug/l	12/25/01
MTBE	<1	ug/l	12/25/01
Surrogate (4-BFB)	117	%R	12/25/01
Surrogate (Tol-d8)	104	%R	12/25/01
Surrogate (1,2-DCA-d4)	97	%R	12/25/01

Sample ID: PARGP-16

Source:	**Hancock Airfield, Riders Golf Course**	**LSL Sample ID:**	**0115975-009**
Sample Matrix:	**NPW**	**Date Sampled:**	**12/18/2001**

Parameter(s)	***Results***	***Units***	***Analysis Date and Time***
(1) Sample on Hold			
Sample ~~on Hold~~ not analyzed			

DB

-- LABORATORY ANALYSIS REPORT --

Parsons Engineering Science		**Dave Babcock**	
		Phone Number:	**(315) 451-9560**
Project No.:	**740741**	**LSL Project No.:**	**0115975**
Authorization:		**Report Date:**	**12/31/01**

Sample ID: PARGP-17

Source: **Hancock Airfield, Riders Golf Course**

LSL Sample ID: **0115975-010**

Sample Matrix: **NPW**

Date Sampled: **12/18/2001**

Parameter(s)	***Results***	***Units***	***Analysis Date and Time***
(1) Sample on Hold **Sample ~~on Hold~~** not analyzed			

Sample ID: PARGP-18

Source: **Hancock Airfield, Riders Golf Course**

LSL Sample ID: **0115975-011**

Sample Matrix: **NPW**

Date Sampled: **12/18/2001**

Parameter(s)	***Results***	***Units***	***Analysis Date and Time***
(1) Sample on Hold **Sample ~~on Hold~~** not analyzed			

DAB

CHAIN OF CUSTODY RECORD

115975

NO: 3173

CLIENT: Parsons	PROJECT NO: 740741	PROJECT MGR: David Bascat
PROJECT NAME: Hancock Airfield, site 5, Golf Course	NOTES - (Reference QAPP and/or analytical protocols to be used): Standard T-A-T	
SAMPLERS: Ed Ashton		

Send results to:
PARSONS ENGINEERING SCIENCE, INC.
290 Elwood Davis Road-Suite 312
Liverpool, NY 13088
Telephone: (315) 451-9560
Fax: (315) 451-9570

Lab Submitted to:
Life Sciences Labs
5854 Butternut Drive
E. Syracuse NY 13057
315-445-1105

ANALYSES REQUIRED

	FIELD SAMPLE ID	LOCATION DESCRIPTION	DATE	TIME	GRAB	COMP	MATRIX	Number of Bottles	8260-BTEX, MTBE
001A/B	PARGP-10	PARGP-10	12/17/01	1430	+		W	2	X
002	Trip Blank	Trip Blank	—	—	-	-	-	2	X
003	PARGP-7	PARGP-7	12/17/01	1507	+		W	2	X
004	PARGP-8	PARGP-8	12/17/01	1542	X		W	2	X
005	PARGP-9	PARGP-9	12/17/01	1625	+		W	2	X
	~~PAR-15~~ E04 12/18/01	—	—	—					
006	PARGP-15	PARGP-15	12/18/01	0935	+		W	2	X
007	PARGP-13	PARGP-13	12/18/01	1035	+		W	2	X
008	PARGP-14	PARGP-14	12/18/01	1010	+		W	2	X
009	PARGP-16	PARGP-16	12/18/01	1135	+		W	2	X

REMARKS
Hold off on analysis until given permission by Parsons

Relinquished by: (Signature)	Date: 12/18/01	Time: 1416	Shipped via: Hand delivered	Airbill #:	Received by: (Signature)	Date:	Time:	Cooler Temp: ___ °C Samples Intact: ___Yes ___No
Relinquished by: (Signature)	Date:	Time:	Shipped via:	Airbill #:	Received by: (Signature)	Date:	Time:	Cooler Temp: ___ °C Samples Intact: ___Yes ___No
Relinquished by: (Signature)	Date:	Time:	Shipped via:	Airbill #:	Received by: (Signature) R. Dunbar	Date: 12/18/01	Time: 1420	Cooler Temp: 8.3 °C Samples Intact: X Yes ___No

onic

TYPE CODES: SOLID
SD- Sediment
SS- Surface Soil
SB- Subsurface Soil
MW- Monitoring Well Boring
TP- Test Pit/Tank Pit
DR- Drum Waste
WA- Solid Waste
OS- Other Solid

WATER
MW- Monitoring Well
LC- Leachate
SW- Surface Water
DW- Drill Water
FD- Fuel Dispenser
MH- Manhole
OW- Oil Water Separator
PR- Piping Run
ST- Storm Water
WW- Waste Water
OL- Other Liquid (eg. Drum liquid)

MATRIX
W - Water
S - Soil

QUALITY CONTROL
FB- Field Blank (with date)
TB- Trip Blank (with date)
WB- Wash Blank (with date)

NO: 3173

Parsons Engineering Science, Inc.

Revised: 9/30/98

DBASE/CHAIN.XLS

CHAIN OF CUSTODY RECORD

115975

NO: 3174

CLIENT: Parsons

PROJECT NO. 740741

PROJECT MGR: David Babcock

PROJECT NAME: Hancock Airfield, Site 15, Golf Course

NOTES - (Reference QAPP and/or analytical protocols to be used): standard T-A-T

SAMPLERS: Ed Ashton

Send results to:
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315-445-1105

	FIELD SAMPLE ID	LOCATION DESCRIPTION	DATE	TIME	GRAB	COMP	MATRIX	Number of Bottles	ANALYSES REQUIRED 8260-BTEX, MTBE									REMARKS
010A/B	PARGP-17	PARGP-17	12/18/01	1220	X		W	2	X									Hold off analysis until permission by Pa
011↓	PARGP-18	PARGP-18	12/18/01	1255	X		W	2	X									↓

Relinquished by: (Signature)	Date:	Time:	Shipped via:	Airbill #:	Received by:(Signature)	Date:	Time:	Cooler Temp: / Samples Intact:
	12/18/01	1416	Hand delivered.					____°C ____Yes ____No
								____°C ____Yes ____No
					R Dunbar	12/18/01	1420	8.3 °C X Yes ____No

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TYPE CODES:

SOLID
- SD- Sediment
- SS- Surface Soil
- SB- Subsurface Soil
- MW- Monitoring Well Boring
- TP- Test Pit/Tank Pit
- DR- Drum Waste
- WA- Solid Waste
- OS- Other Solid

WATER
- MW- Monitoring Well
- LC- Leachate
- SW- Surface Water
- DW- Drill Water
- FD- Fuel Dispenser
- MH- Manhole
- OW- Oil Water Separator
- PR- Piping Run
- ST- Storm Water
- WW- Waste Water
- OL- Other Liquid (eg. Drum liquid)

MATRIX
- W - Water
- S - Soil

QUALITY CONTROL
- FB- Field Blank (with date)
- TB- Trip Blank (with date)
- WB- Wash Blank (with date)

NO: 3174