November 2003

Supplement to Site Investigation Report-Volume III
EPA Reports

Environmental Restoration Project
Clean Water/Clean Air Bond Act of 1996
Independent Leather
321-333 South Main Street
City of Gloversville
Fulton County, New York

Prepared for:

CITY OF GLOVERSVILLE
CITY HALL
3 Frontage Road
Gloversville, New York 12078

Prepared by:

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C.T. MALE ASSOCIATES, P.C.

ENVIRONMENTAL RESTORATION PROJECT
SUPPLEMENT TO SITE INVESTIGATION REPORT
VOLUME III - EPA REPORTS
INDEPENDENT LEATHER
321-333 SOUTH MAIN STREET
GLOVERSVILLE, NEW YORK

DOCUMENT OVERVIEW

C.T. Male Associates, P.C. prepared this document to present miscellaneous EPA's reports generated by EPA under a CERCLA Emergency Removal Action. During the time C.T. Male was completing the site investigation at the project site, EPA was concurrently conducting a CERCLA Emergency Removal Action. EPA, specifically Mr. Paul Kahn (on-scene coordinator) coordinated supplemental investigation work tasks to assist EPA in effectively completing the Emergency Response Action.

This document presents those additional reports generated by EPA and their subcontractors. The table of contents lists each Report and associated information. Each exhibit of this document presents the report as received from EPA. The content of the EPA reports are summarized and discussed within the appropriate sections of the Draft Site Investigation Report.

LIST OF ENCLOSURES

1. *Geophysical Survey*, Independent Leather Site, U.S. EPA Work Assignment 0-222.1 – Trip Report, Dated May 31, 2002, Prepared by Gordon Shields of Lockheed Martin Technology Services of Edison, New Jersey.

2. *Soil and Sediment Sampling*, Independent Leather Site, U.S. EPA Work Assignment 0-222: Trip Report, Dated November 16, 2001, Prepared by David Aloysius of Lockheed Martin Technology Services of Edison, New Jersey.

3. *Final Report, Soil Contamination Investigation*, Independent Leather Site, U.S. EPA Work Assignment No.: 0-222, Lockheed Martin Work Order No.: R1A00222, U.S. EPA Contract No.: 68-C99-223, Dated January 23, 2002, Prepared by David Aloysius and Steven Clapp of Lockheed Martin Technology Services of Edison, New Jersey.

4. *Final Report, Results of Field Sampling, Testing and Geochemical Modeling,* Independent Leather Site, U.S. EPA Work Assignment No.: 0-222, Lockheed Martin Work Order No.: R1A00222, U.S. EPA Contract No.: 68-C99-223, Dated March 5, 2003, Prepared by David Aloysius and Dennis Miller of Lockheed Martin Technology Services of Edison, New Jersey.

GEOPHYSICAL SURVEY, INDEPENDENT LEATHER SITE

Lockheed Martin Technology Services
Environmental Services REAC
2890 Woodbridge Avenue   Building 209 Annex
Edison, NJ 08837-3679
Telephone 732-321-4200   Facsimile 732-494-4021

LOCKHEED MARTIN

DATE: 31 May 2002

TO: JoAnn Camacho, U.S. EPA / ERTC, Work Assignment Manager

THROUGH: Gary Newhart, REAC Operations Manager (Acting) Gary Newhart
David Aloysius, REAC Task Leader

FROM: Gordon Shields, REAC Geophysicist

SUBJECT: GEOPHYSICAL SURVEY, INDEPENDENT LEATHER SITE
WORK ASSIGNMENT 0-222.1 – TRIP REPORT

INTRODUCTION

The United States Environmental Protection Agency (U.S. EPA) Region II requested that the Environmental Response Team Center (ERTC) provide technical assistance by performing geophysical surveys at the Independent Leather Site in Gloversville, New York. Lockheed Martin, under the Response Engineering and Analytical Contract (REAC), was tasked to provide on- and off-site technical and field support to the ERTC.

The purpose of the geophysical surveys was to investigate an area where hazardous wastes are suspected to be buried and locate potential exploratory excavation sites. Lockheed Martin REAC used electromagnetic (EM), magnetic, and ground penetrating radar (GPR) methods to accomplish this task.

This Trip Report documents the geophysical surveys performed at the Independent Leather Site on 18 April 2002.

BACKGROUND

The Independent Leather Site is located in Gloversville, New York. Past activities at the site include leather tanning and related industrial processes. Chromium (Cr) is the primary contaminant of concern at the site, as this metal is associated with past site processes. The site is physically divided by Cayadutta Creek (Figure 1), which flows in an approximate north-to-south direction. Light-industrial equipment is present at the site including above-ground storage tanks, transformers, and sewage treatment structures.

In October 2001 Lockheed Martin REAC performed soil and stream sediment sampling (Lockheed Martin REAC, 2002).

METHODS

On 18 April 2002 a site grid was established with the grid origin (0 east, 0 north) located near the southwest corner of the proposed survey area (Figure 2). The grid origin is at one of soil sample points labeled SSW-33. The geophysical survey grid baseline was oriented approximately north-south and parallel to the South Main Street. The baseline was marked using yellow plastic pin-flags placed 25 feet (ft) apart from the origin to 220 ft north.

Geophysical survey lines were oriented east-west using measuring tapes by turning off the baseline with a right angle prism at an interval of 10.0 ft. Geophysical surveys were also performed between the tapes for an effective line spacing of 5.0 ft. Four lines were oriented north-south from 50 ft north to about 120 ft north behind the Command Post trailer.

Measurements were taken along the geophysical survey lines every 2.5 ft for the EM survey and every 5.0 ft for the magnetic survey. GPR measurements were taken at a density of six traces per ft. For most of the survey area, the GPR survey was performed only on every second line for an effective line spacing of 10.0 ft. All geophysical data were stored in data loggers and downloaded to a processing computer at the completion of the survey.

EM data were obtained using a Geonics EM-31 terrain conductivity instrument in the vertical dipole configuration. The EM-31 is a Slingram-type EM device. The transmitter and receiver coils are coplanar in a rigid boom, separated by a distance of 12 ft. The instrument is carried by the operator at about 3 ft above the ground surface. A 9.8 kilohertz (kHz) alternating current is induced into the ground through the transmitting coil at one end of the instrument. Resultant current loops, proportional to terrain electrical conductivity, generate a magnetic field that is proportional to current magnitude. The magnetic field is detected by the receiving coil, which is positioned at the other end of the instrument. The instrument converts magnetic field responses to output voltages that are proportional to terrain conductivity. The instrument responds to lateral variations in near-surface electrical conductivity that can result from changes in soil type, mineralogy, pore-water conductivity, saturation, porosity, and presence of metallic conductors. Measurements, recorded in an attached digital data-logger, are apparent conductivity of the ground (terrain conductivity) in units of milliSiemens per meter (mS/m) and magnitude of the in-phase response, in units of parts per thousand (ppt). The in-phase response is used primarily for metal detection.

Magnetic data were collected with a GEM Systems GSM-19 magnetometer/gradiometer and base station. These instruments measure the Earth's total magnetic intensity (TMI) in units of nanoTeslas (nT). The vertical magnetic gradient (VMG) in units of nT / meter (m) is also measured by comparing the TMI recorded by two sensors, vertically spaced 1.00 m (3.281 ft) apart. The lower sensor was held at 0.5 m above ground level instead of the usual 1.0 m above ground level in an attempt to achieve greater detail. The Earth's TMI is affected by lateral variations in concentrations of magnetically susceptible minerals. Minerals that also have permanent magnetic properties, called remanence, may have large magnetic fields of their own (e.g., magnetite). Because ferro-magnetic objects (e.g., iron, steel, nickel) have magnetic susceptibilities and sometimes remanences that are much higher than naturally occurring minerals, significant variations in both the TMI and VMG will result. The VMG is preferred for metal detection due to its greater sensitivity and its immunity to diurnal drift.

GPR data were collected with a GSSI SIR 2000 console and 200 megahertz (MHz) antennae. The instrument responds to changes in ground conductivity and dielectric constant. Pulses of radar energy are reflected by significant contrasts in these properties with depth. The measured signals are time-based and converted to depth using an assumed two-way travel time. The time interval of 150 nanoseconds (ns) was used and a three point gain set at 15, 50 and 75 decibels (dB). Any type of metal object, a cavity, or even a boulder, will cause a strong reflector. However, using a 200 MHz signal, objects less than about 1.5 ft in diameter would probably not be detected. Objects less than about 3.0 ft in diameter will appear as a hyperbola in the pseudosection. Objects greater than about 3.0 ft in diameter will begin to appear as discrete reflectors and may reveal information regarding shape and orientation.

RESULTS AND OBSERVATIONS

The EM-31 survey covered approximately 2,500 ft of grid lines with a 2.5 ft sample spacing. The magnetic survey covered approximately 2,500 ft of grid lines with a 5 ft sample spacing. The GPR survey covered approximately 1,200 ft of grid lines.

Poor quality EM and magnetic geophysical data were collected in the vicinity of the Command Post trailer in the center of the survey area. The fence and power lines on the west side of the survey area were also sources of cultural noise in the geophysical data. Metal was visible on the ground surface at several locations. Steel reinforcing bars are likely present in the concrete wall that bounds the northeast part of the property. Due to the excessive amount of cultural noise on this site, the EM quadrature (apparent conductivity) and the TMI contained no useful information and are not reported.

Grid contouring of the EM and magnetic data was performed using a minimum curvature method. A 2.0 ft grid cell size and a 4.0 ft blanking distance was used. The color contours were distributed using an equal-area distribution for the VMG and EM in-phase. Grid shading, to enhance the displayed data, is based upon a sun angle of 45 degrees off the horizon at 045 degrees azimuth. The overlain profiles are used to estimate the anomaly locations and depths of burial.

The GPR data are represented as pseudo-sections at each line surveyed. The contouring is based on a grey scale with light being positive amplitude and dark being negative. No post processing of these data occurred. The depth scale was estimated assuming a two way travel time of 7.5 ns / ft. Due to the volume of sections generated, they are contained in Appendix A to this report.

EM Survey

The EM in-phase contours and profiles have their strongest negative anomalies (about -50 ppt) in the vicinity of the Command Post trailer (Figure 3). The typical response over buried metal, a negative anomaly flanked by two positive shoulders, is not seen in these data. Only negative anomalies of about -5 to -50 ppt occur. These are interpreted as possible occurrences of buried metal. Generally, character of all the EM in-phase anomalies indicate depths of burial of less than 3.0 ft.

A long, arcuate sequence of EM in-phase anomalies on the west side of the survey area appears to strike approximately grid north parallel to the road. The consistency of this trend from line to line probably indicates a buried metal pipe. The south end of the trend occurs near a small collapsed hole where a large metal pipe was observed at a depth of about 1.5 ft.

Another, wider sequence of EM in-phase anomalies occurs in the southeast corner of the survey area. This probably represents various small pieces of buried metal.

The strongest negative anomaly was measured at about 5 ft east, 45 ft north. This appears to indicate a single, large buried metal object. However, this anomaly lies very close to a metal flag pole.

Magnetic Survey

The VMG data from the magnetic survey appear to confirm all of the EM in-phase anomalies (Figure 4). However, the size of the anomalous areas indicated by the VMG data is significantly larger than indicated by the in-phase data. Furthermore, the magnetic survey may have been affected more than the EM survey by cultural features such as power lines and metal fence posts on the west side of the survey area.

A few other single VMG anomalies are also present that appear to suggest iron or steel but perhaps in quantities not detectable by the EM survey. The strongest negative anomalies (less than about -5000 nT/m) are probably due to remanence and are observed in conjunction with known metal on the ground surface. Therefore, all other medium to strong negative anomalies (less than about -3500 nT/m) with the exception of those with probable cultural sources, were interpreted as possible occurrences of buried ferro-magnetic material.

In some cases, as would normally be expected for natural magnetic induction, positive anomalies were also measured. However, all of the positive VMG anomalies appear to be coincident with metal occurring above ground such as a guy wire, a flag pole, the trailer, and two steel tanks.

Generally, the character of all the VMG anomalies also indicate depths of burial of less than 3.0 ft.

GPR Survey

The GPR data from lines 90 north through 210 north mostly confirm the long arcuate sequence of EM in-phase anomalies on the west side of the survey area (Appendix A). The pseudo-sections appear to confirm the expected depth to this feature at about 2.0 ft below ground surface. A few other anomalies are observed to the south and east of the trailer.

The GPR data do not appear to confirm the rather large area of buried metal indicated by the EM in-phase anomalies in the southeast corner of the survey area. A possible explanation for this is that the metal is too close to the ground surface to measure a reflection, although this should also affect the entire vertical section below. Another explanation is that the buried metal is composed of numerous small pieces with no interconnectivity.

Many of the pseudo-sections appear to have features at depths of about 10 ft or greater. However, without further data processing and filtering, no interpretation has been attempted.

CONCLUSIONS AND RECOMMENDATIONS

Anomalous EM in-phase, VMG, and GPR data indicate possible buried metal at several locations (Figure 5). Some of the locations are coincident, some form linear trends or areas that need not be excavated at every location, and some are questionable. Anomalies observed near the concrete wall are probably due to steel reinforcing bars.

There are two main features evident from the results of the geophysical surveys. The first feature is an area of probable buried metal objects in the southeast corner of the survey area. This should be given the highest priority for exploratory excavation. The second feature is a probable buried metal pipe that occurs along almost the entire west side of the survey area. This could be considered an existing utility, in which case it should be avoided. However, it may also be considered part of the previous industrial processes at this site, in which case it should be further investigated as a possible source of hazardous waste. Any other areas with suspected buried metal should be given a low priority for exploratory excavation.

All the areas with suspected buried metal are also suspected to contain hazardous waste. Therefore, invasive activity should proceed with caution and appropriate personal protective equipment should be used. The average depth of burial at all locations is about 2.0 ft and not likely to exceed 5.0 ft.

No conclusions can be made regarding the area where the Command Post trailer is located and its immediate vicinity. The trailer physically prevented the collection of geophysical data and also adversely affected any data collected within about 10 to 20 ft of its perimeter (for the EM and magnetic surveys, respectively).

Further geophysical surveys may be recommended at the Independent Leather Site depending on the results of the exploratory excavations.

FUTURE ACTIVITIES

No future geophysical activities are planned at this site.

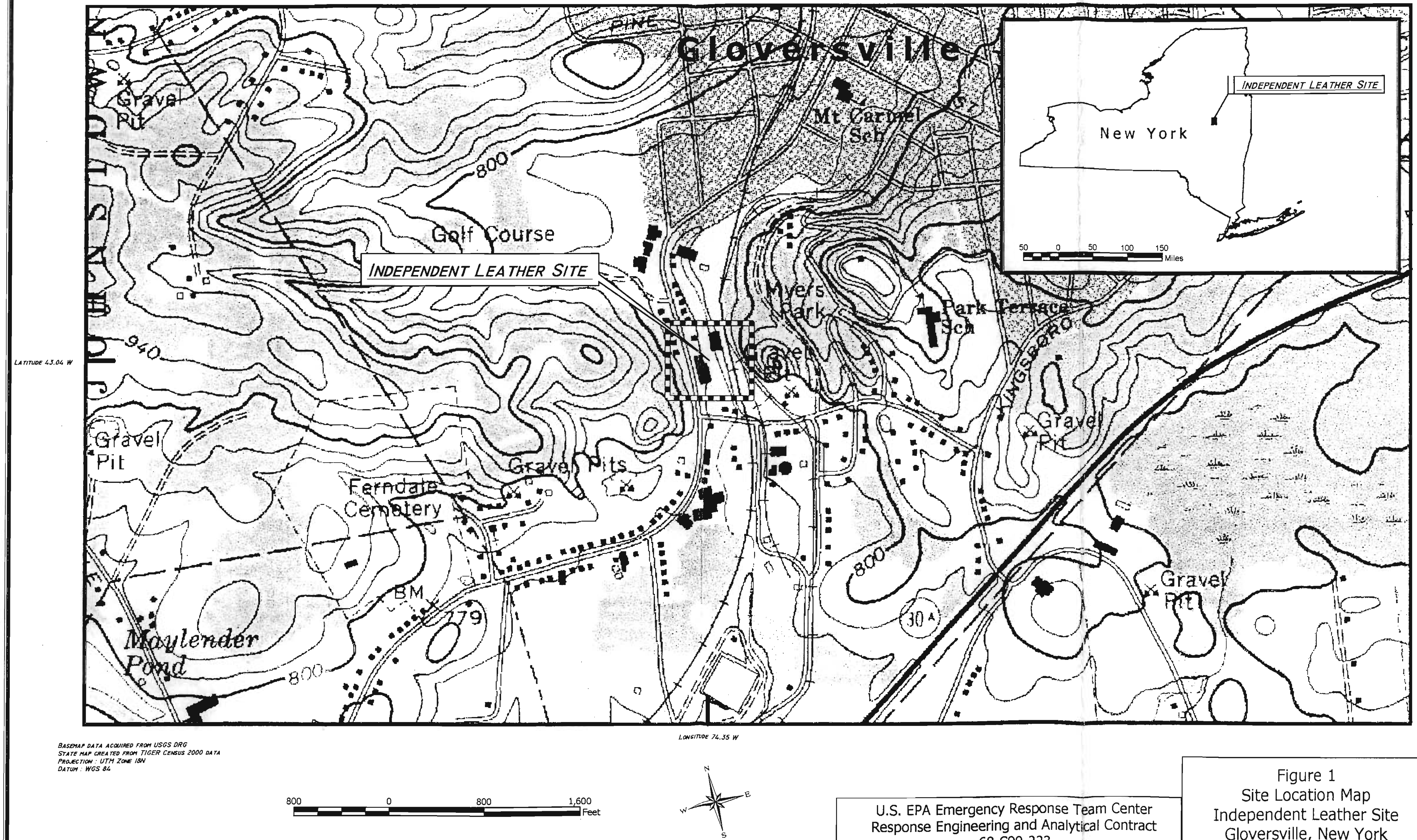
REFERENCES

Lockheed Martin REAC. 2002. Final Report: Soil Contamination Investigation, Independent Leather Site, Gloversville, New York. Work Assignment 0-222. January 2002.

Attachments:

5 Figures
1 Appendix

cc: Central File - WA 0-222.1
David Aloysius, REAC Task Leader



BASEMAP DATA ACQUIRED FROM USGS DRG
STATE MAP CREATED FROM TIGER CENSUS 2000 DATA
PROJECTION : UTM ZONE 18N
DATUM : WGS 84

DATA: G:\ARCVIEWPROJECTS\222
.MXD FILE: G:\ARCINFOPROJECTS\REAC3\R1A00222_IND_LEATHER

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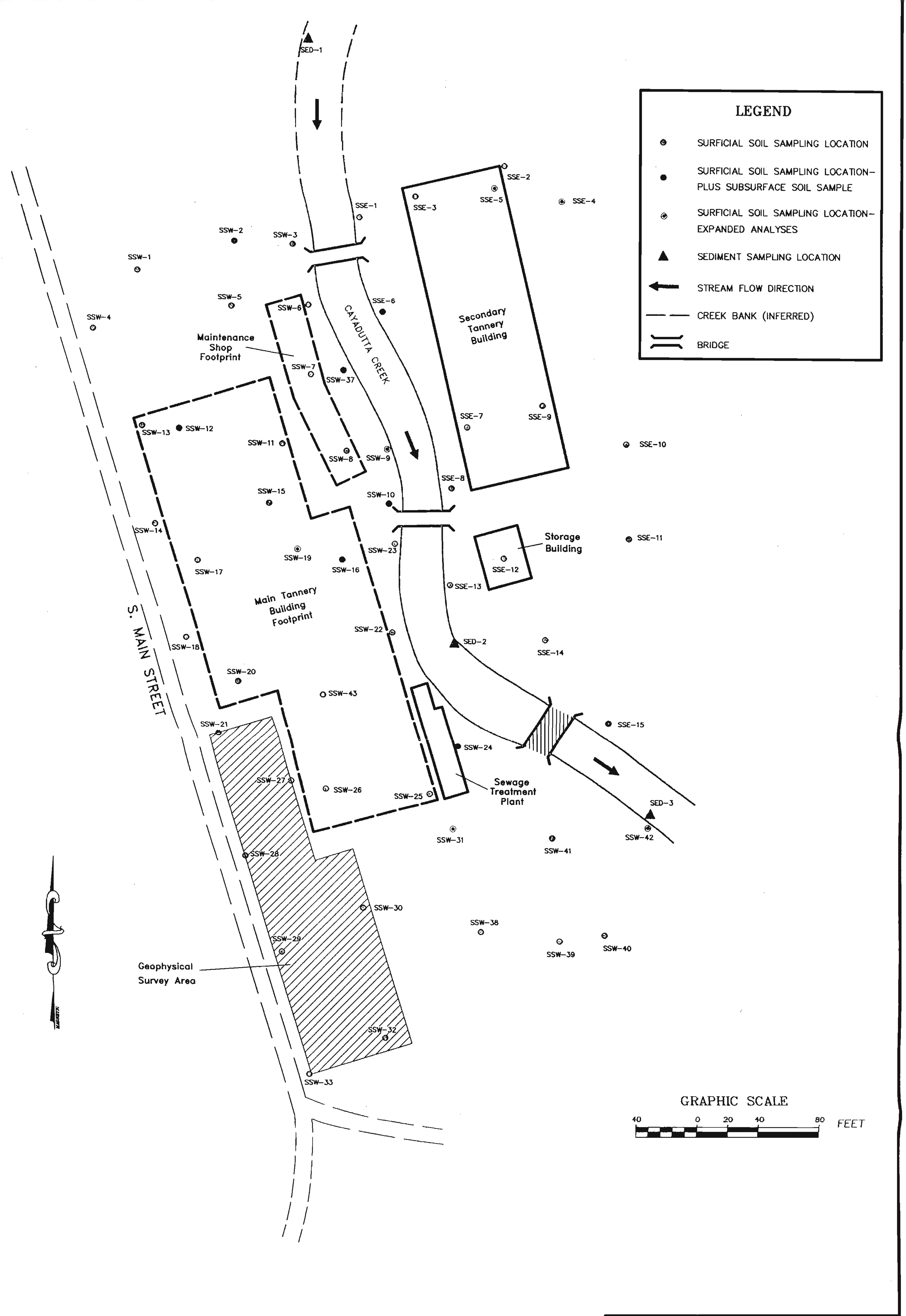
W.A. # R1A00222

Figure 1
Site Location Map
Independent Leather Site
Gloversville, New York
May 2002



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RESPONSE ENGINEERING AND ANALYTICAL CONTRACT
68-C99-223
W.O.# R1A00222

FIGURE 2
SITE INVESTIGATION MAP
INDEPENDENT LEATHER SITE
GLOVERSVILLE, NEW YORK
MAY 2002

00-222/sitemap-new14.dwg

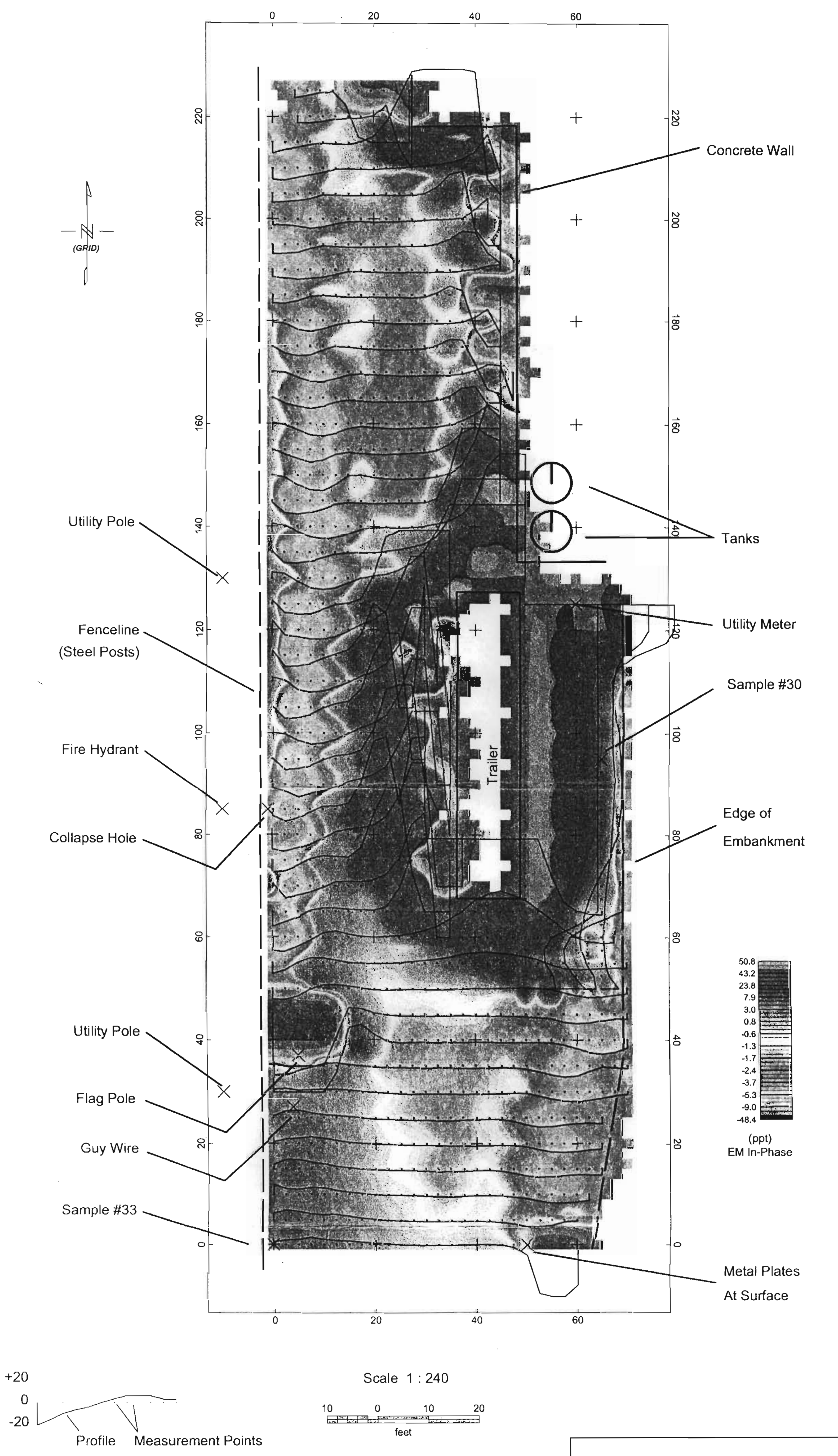

Figure 3. Electromagnetic In-Phase
Independent Leather Site
Gloversville, New York
May 2002

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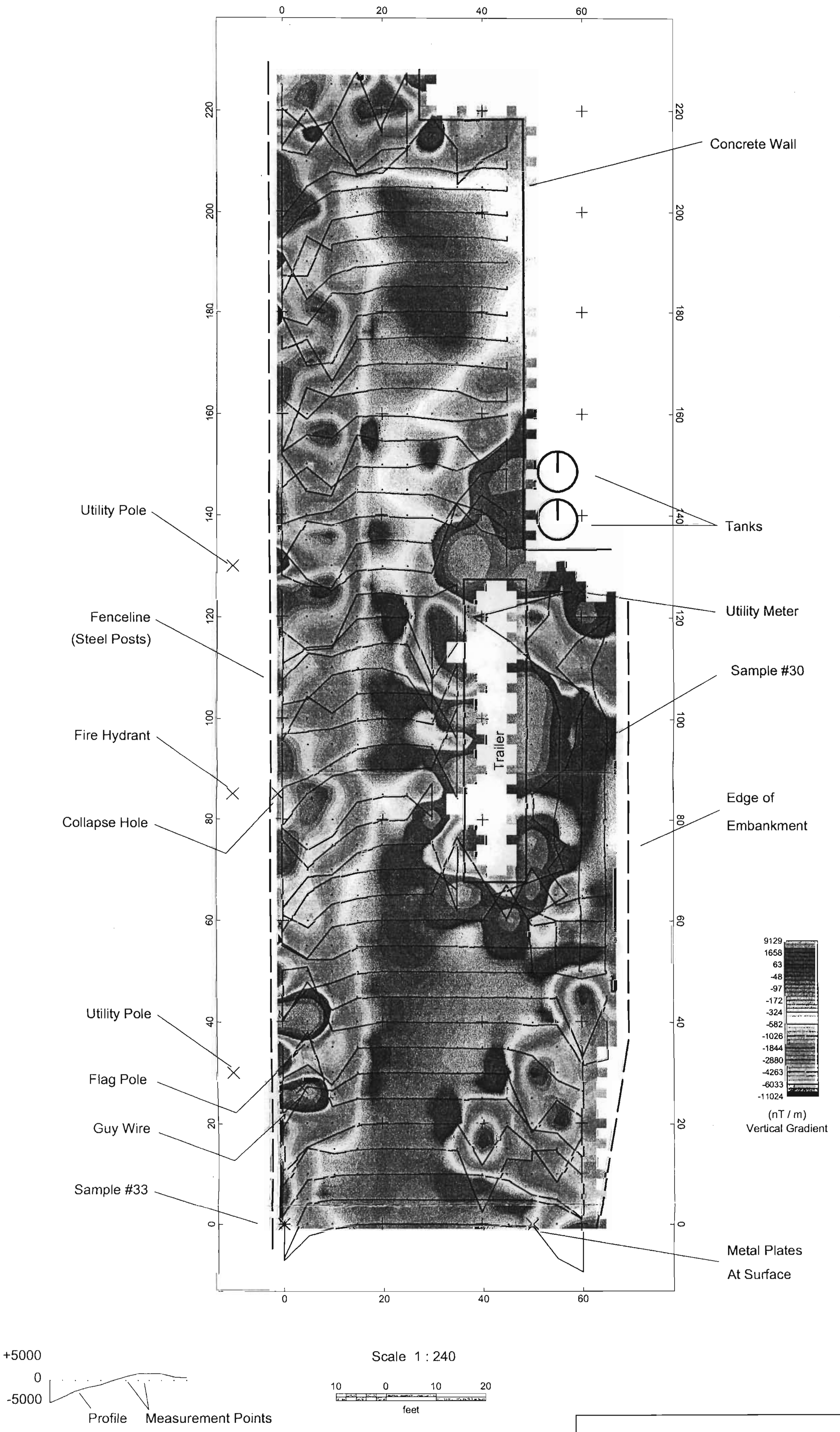

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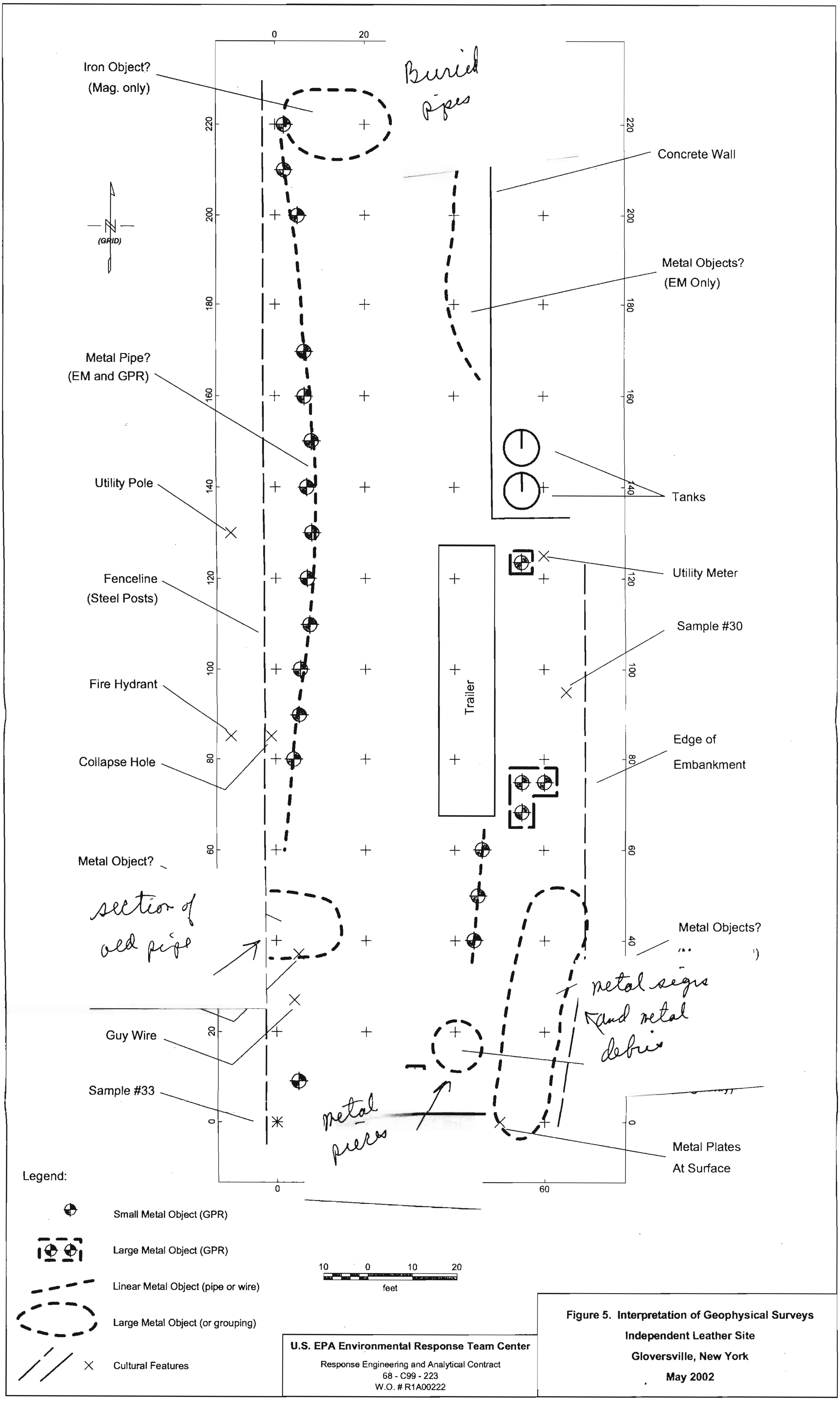
Figure 4. Vertical Magnetic Gradient
Independent Leather Site
Gloversville, New York
May 2002



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W.O. # R1A00222

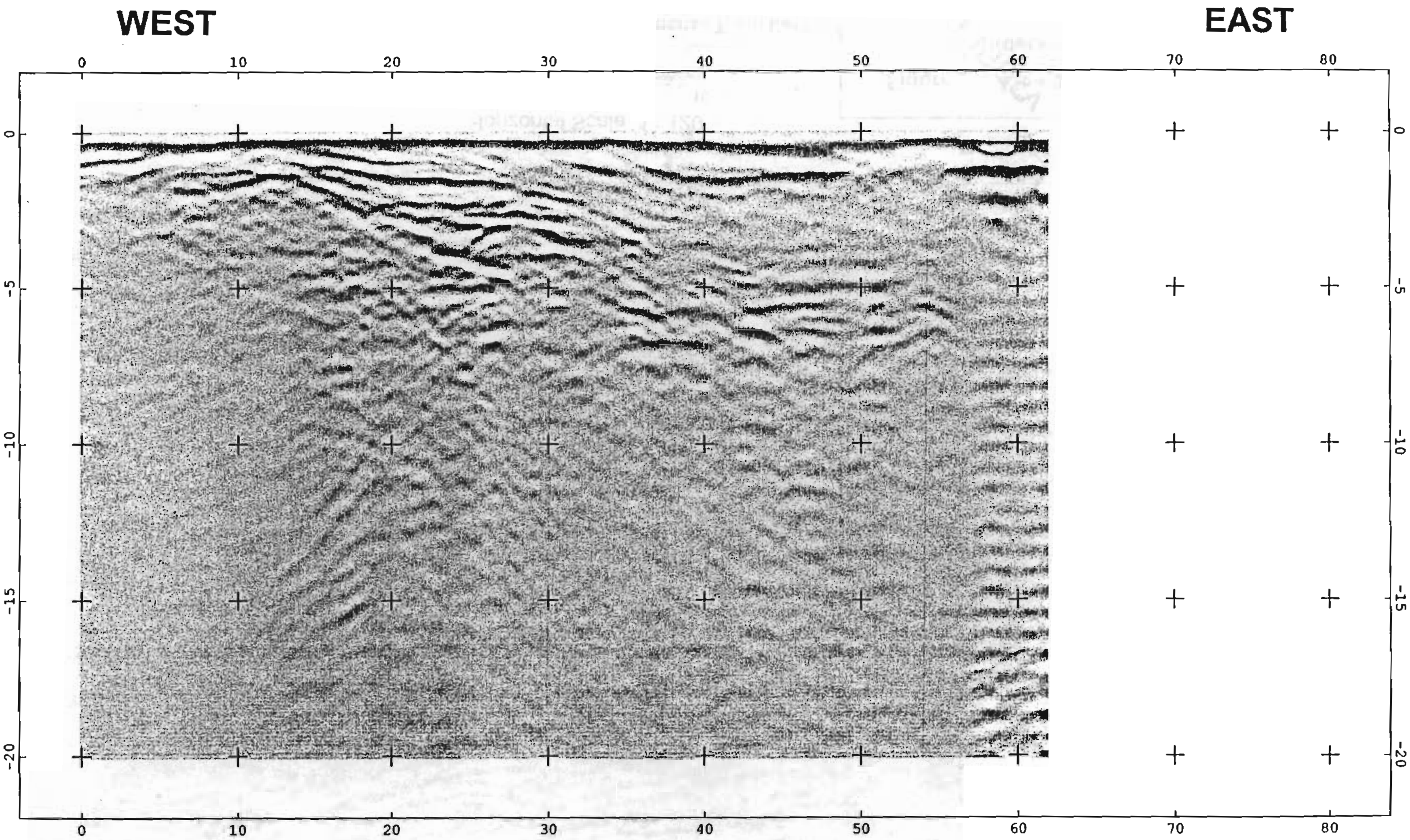
Figure 5. Interpretation of Geophysical Surveys
Independent Leather Site
Gloversville, New York
May 2002

Appendix A. GPR Psuedo-Sections

Independent Leather Site

Gloversville, New York

May, 2002



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Vertical Scale Based On TWT = 7.5 nS / ft

(Vertical Exageration = 2)

Response Amplitude Gained at 15, 50 and 75

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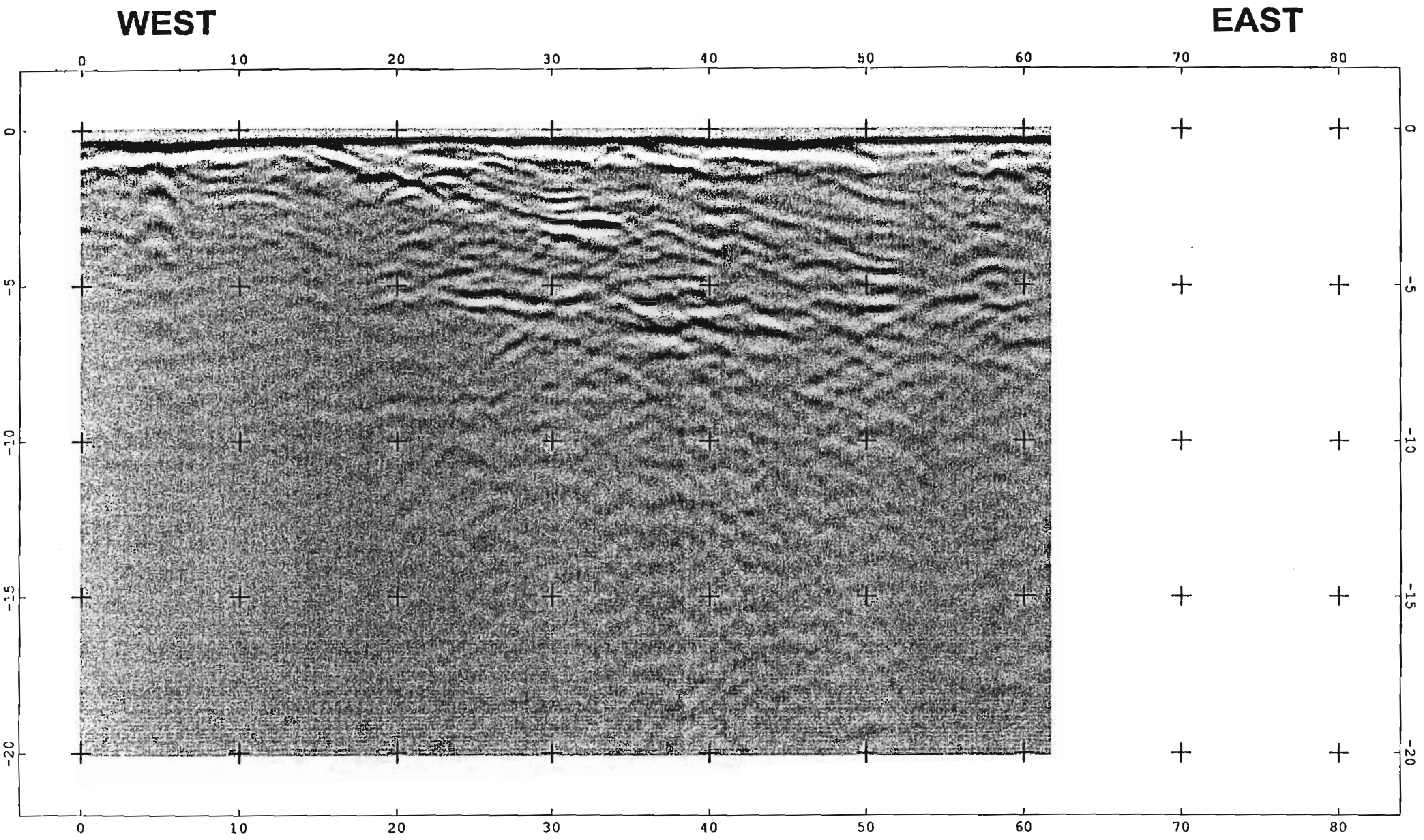
Figure __. Line 000 N, GPR Psuedo-Section
Independent Leather Site
Gloversville, New York
May 2002



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Response Amplitude Gained at 15, 50 and 75

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W.O. # R1A00222

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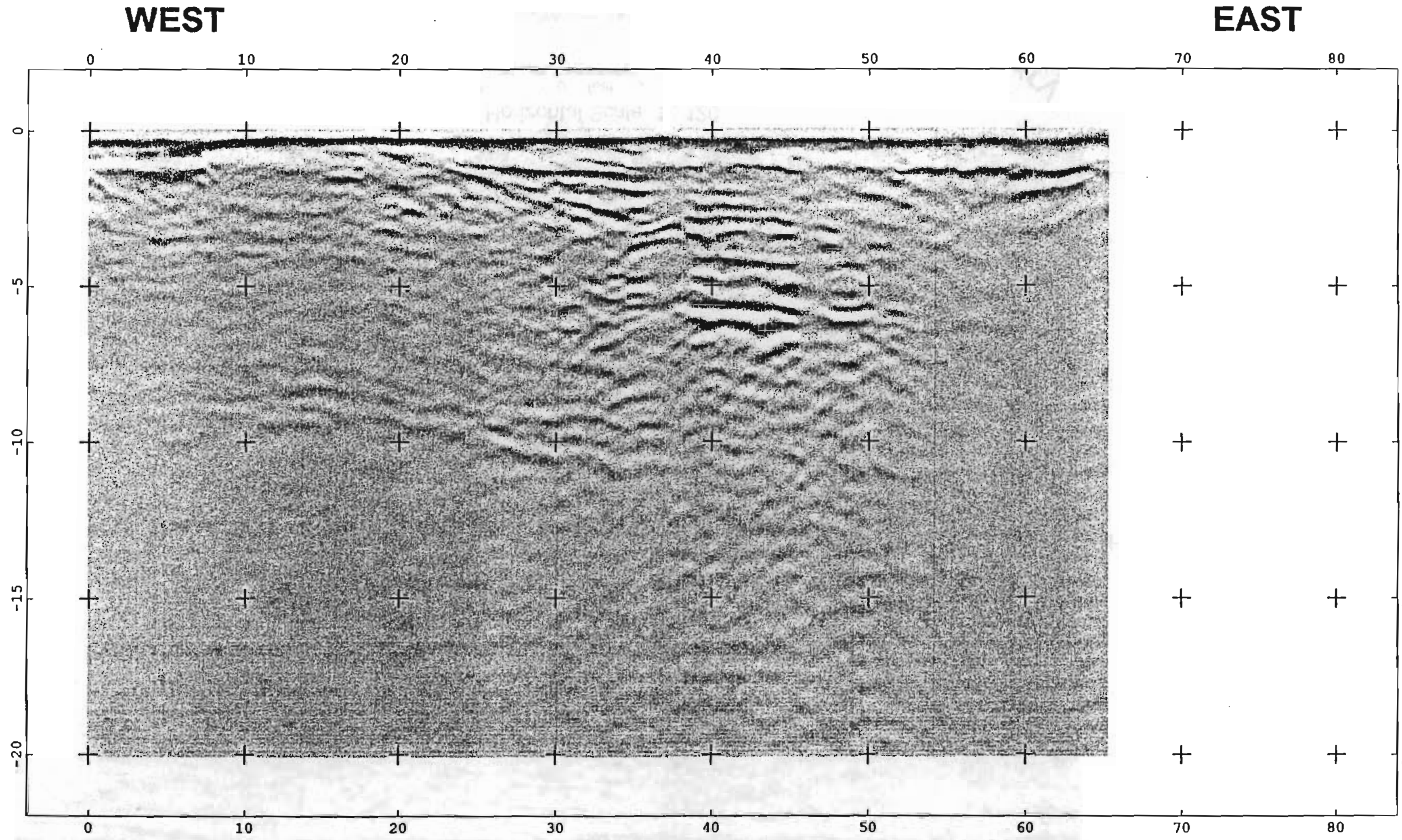
Independent Leather Site
Gloversville, New York
May 2002



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Vertical Scale Based On TWT = 7.5 nS / ft

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Response Amplitude Gained at 15, 50 and 75

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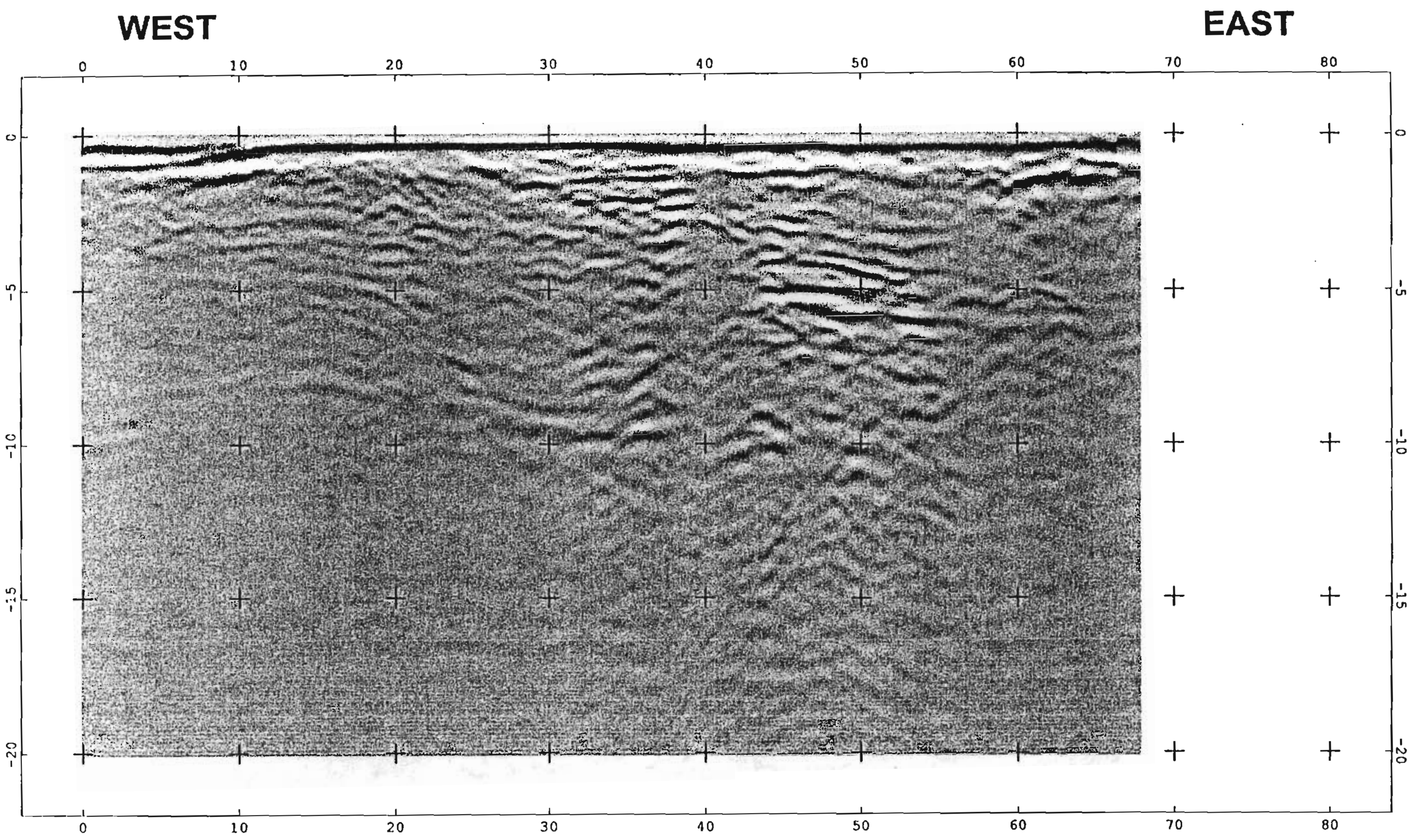
Figure __. Line 020 N, GPR Psuedo-Section
Independent Leather Site
Gloversville, New York
May 2002



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Vertical Scale Based On TWT = 7.5 nS / ft

(Vertical Exageration = 2)

Response Amplitude Gained at 15, 50 and 75

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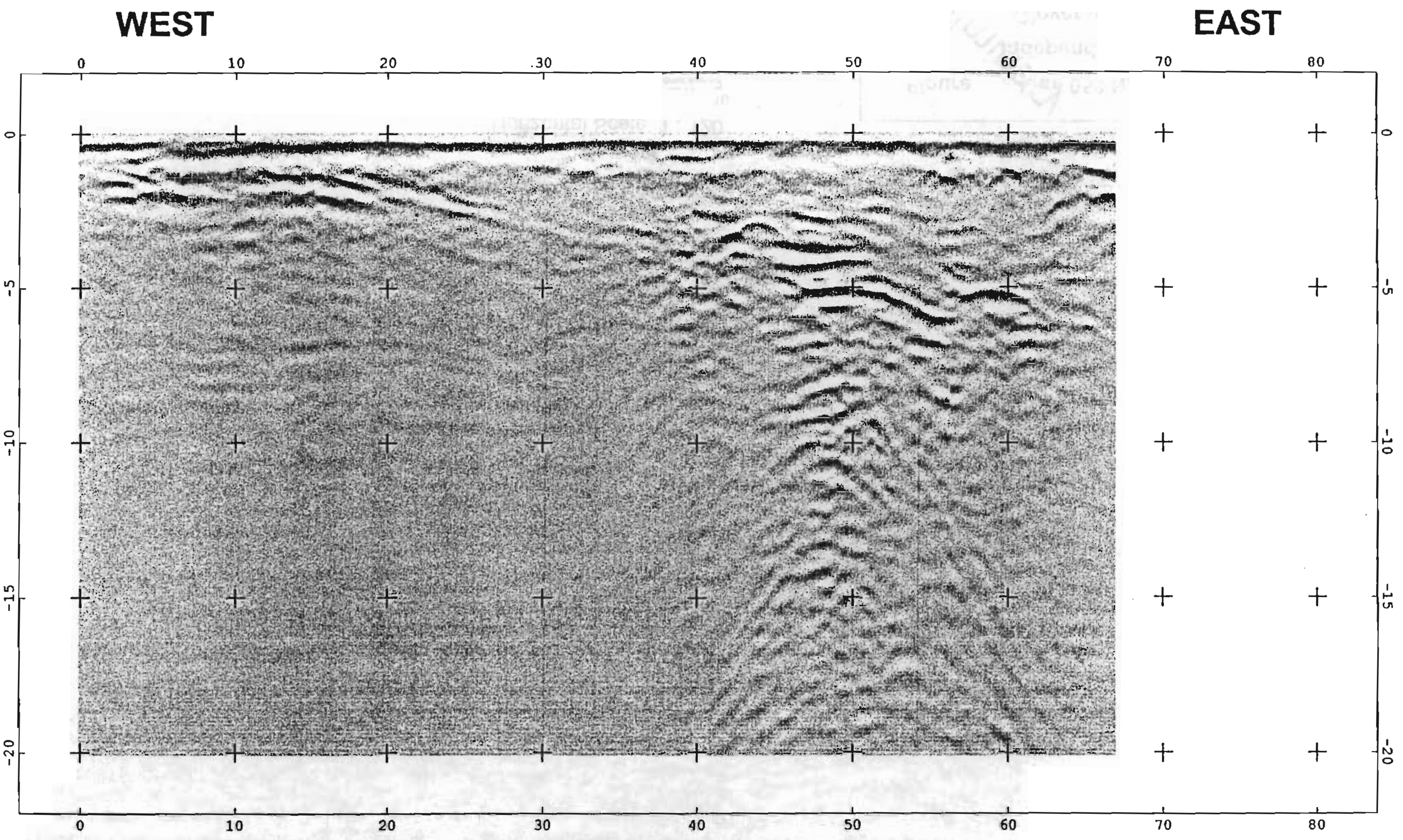
Figure __. Line 030 N, GPR Psuedo-Section
Independent Leather Site
Gloversville, New York
May 2002



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Vertical Scale Based On TWT = 7.5 nS / ft

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Response Amplitude Gained at 15, 50 and 75

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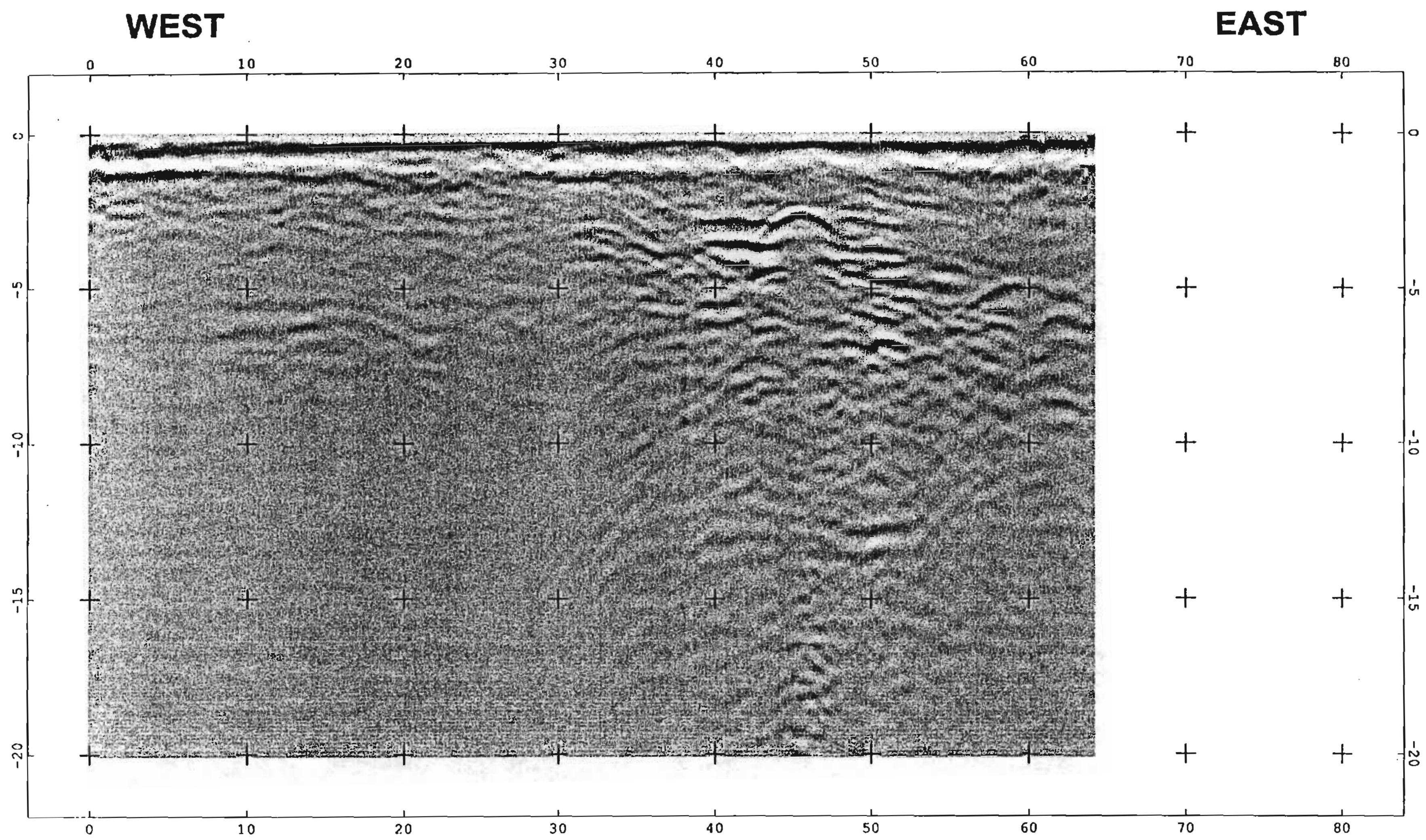
Figure __. Line 040 N, GPR Psuedo-Section
Independent Leather Site
Gloversville, New York
May 2002



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Vertical Scale Based On TWT = 7.5 nS / ft

(Vertical Exageration = 2)

Response Amplitude Gained at 15, 50 and 75

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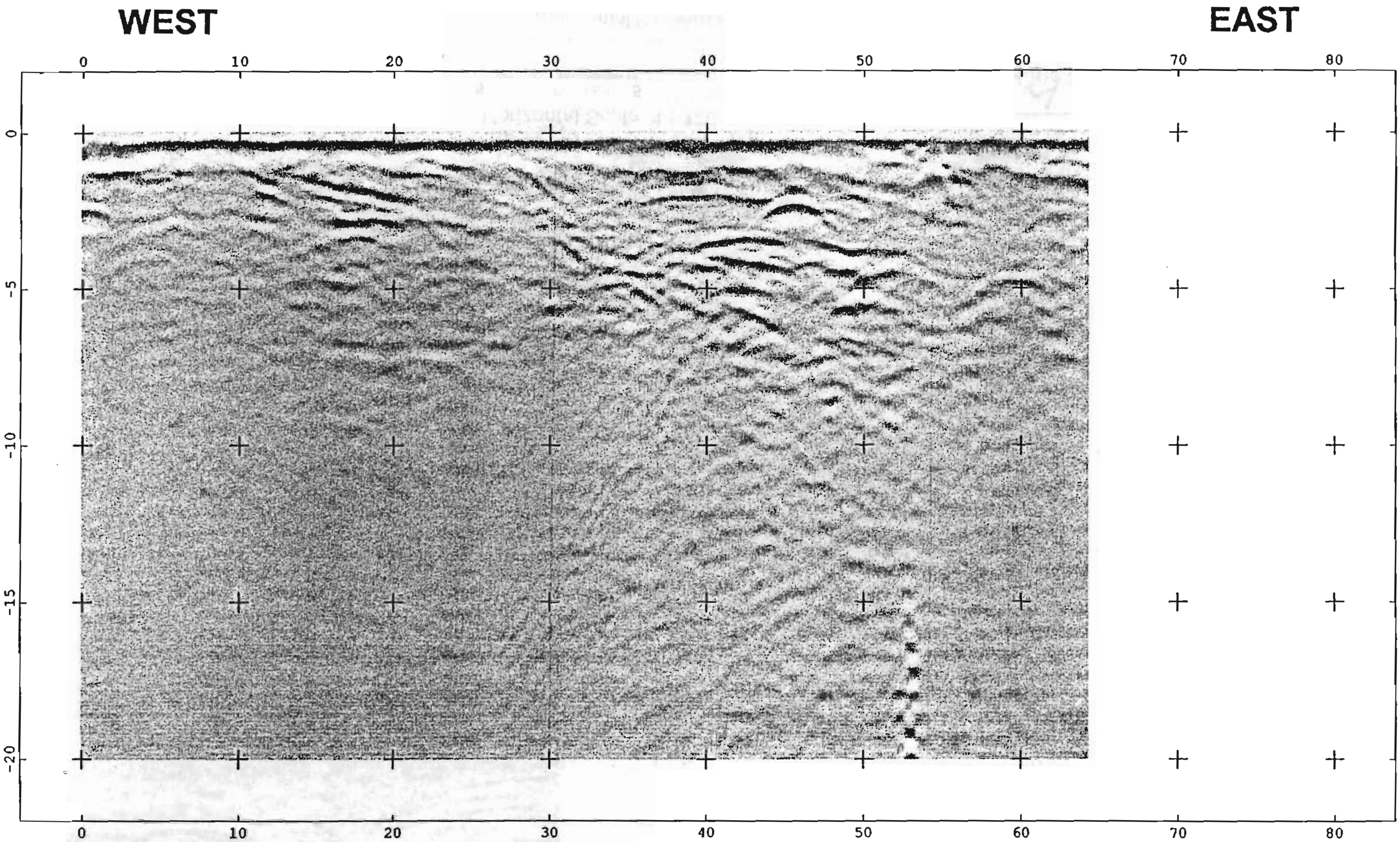
Figure __. Line 050 N, GPR Psuedo-Section
Independent Leather Site
Gloversville, New York
May 2002

Preliminary Draft



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(Vertical Exageration = 2)

Response Amplitude Gained at 15, 50 and 75

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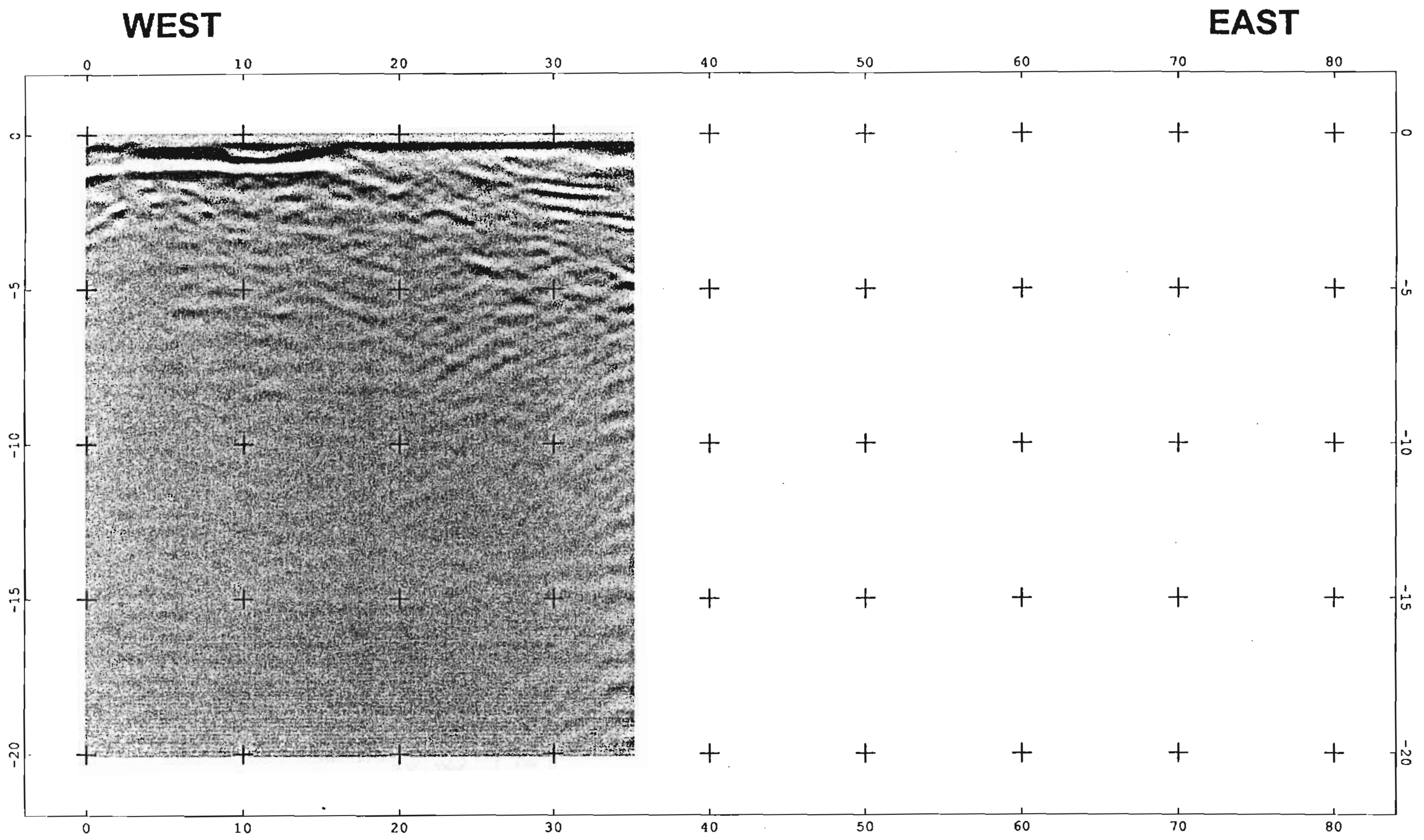
Independent Leather Site
Gloversville, New York
May 2002



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Response Amplitude Gained at 15, 50 and 75

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Figure __. Line 070 N, GPR Psuedo-Section
Independent Leather Site
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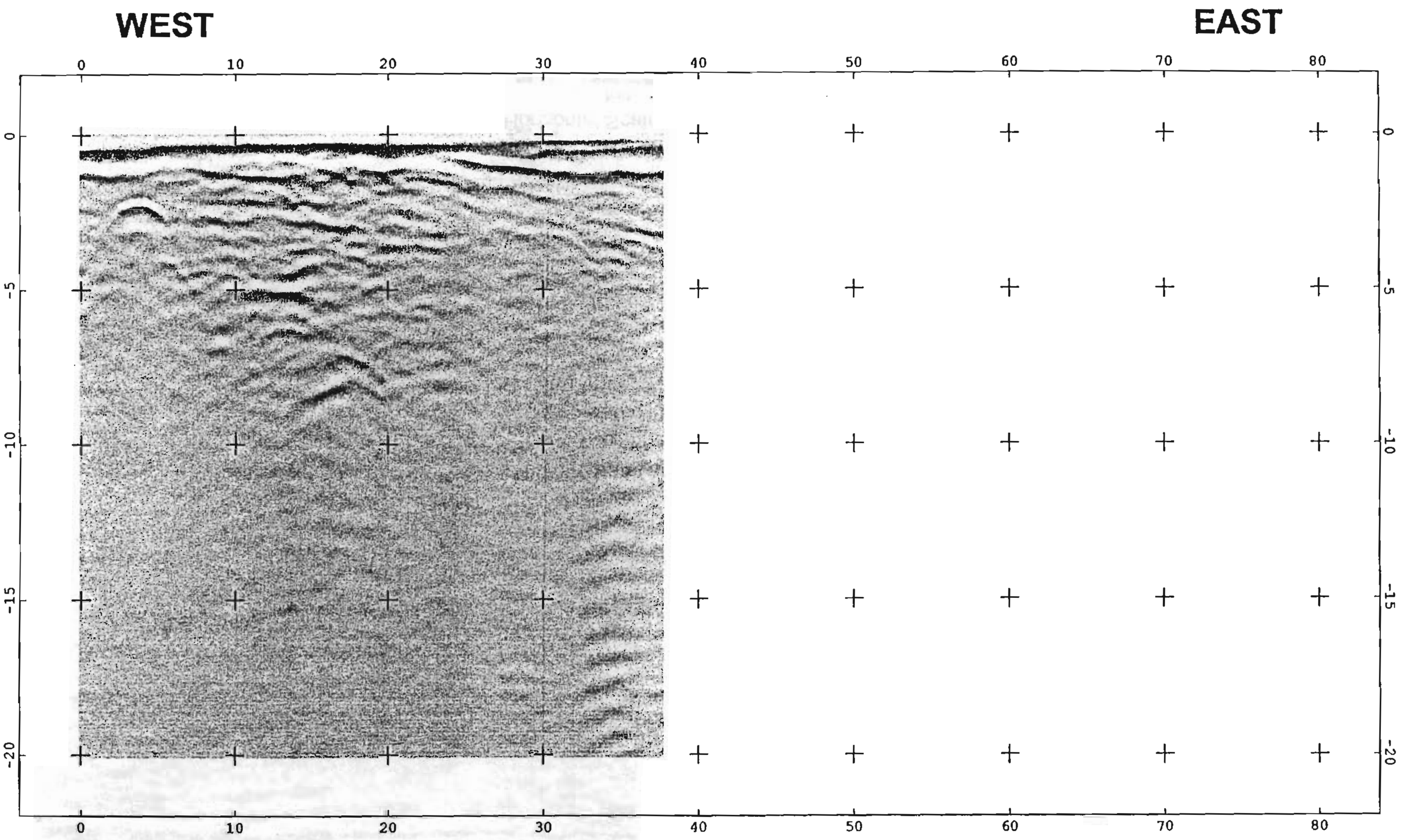
May 2002



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Vertical Scale Based On TWT = 7.5 nS / ft

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Response Amplitude Gained at 15, 50 and 75

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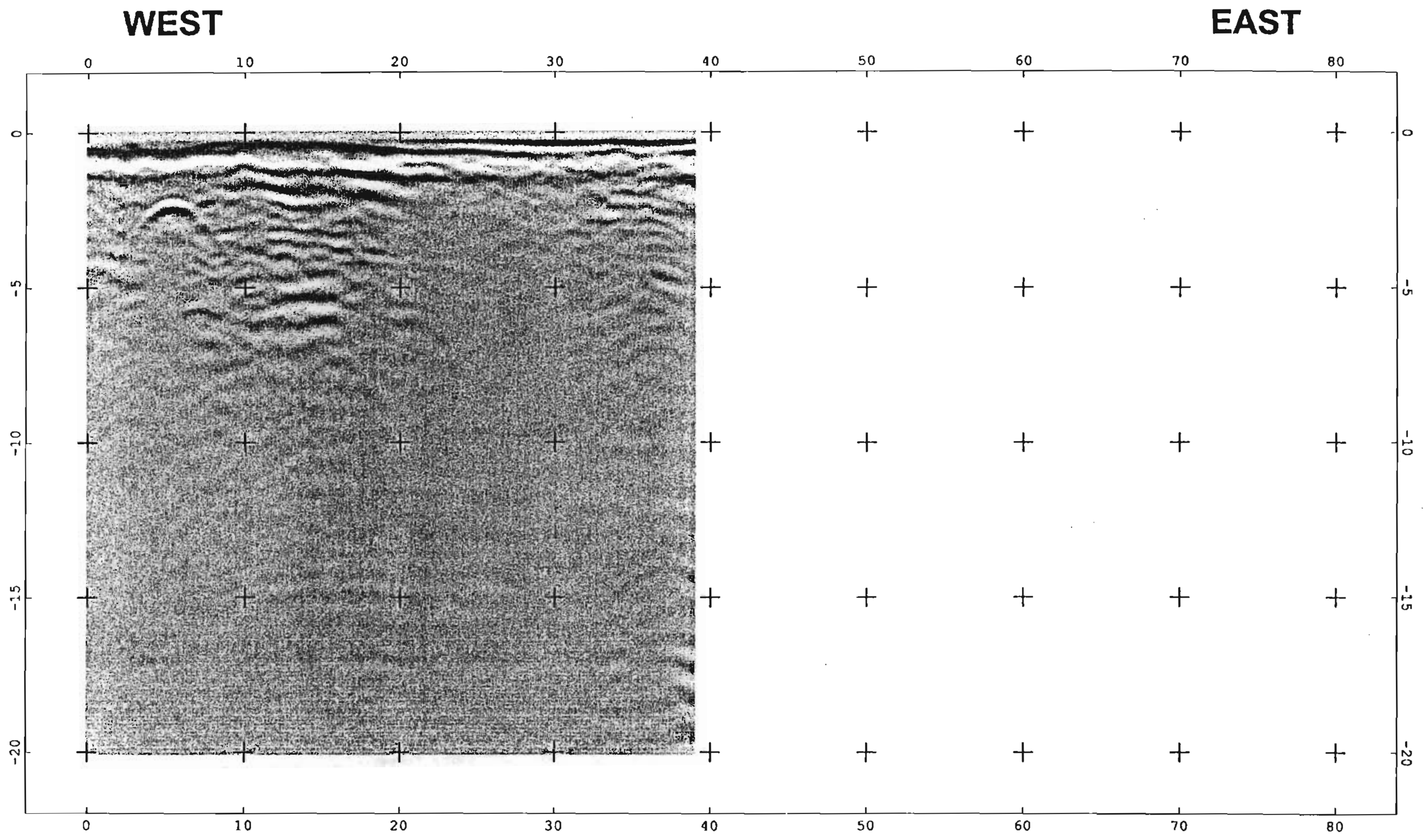
May 2002

Preliminary Draft



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Vertical Scale Based On TWT = 7.5 nS / ft

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Response Amplitude Gained at 15, 50 and 75

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W.O. # R1A00222

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Independent Leather Site
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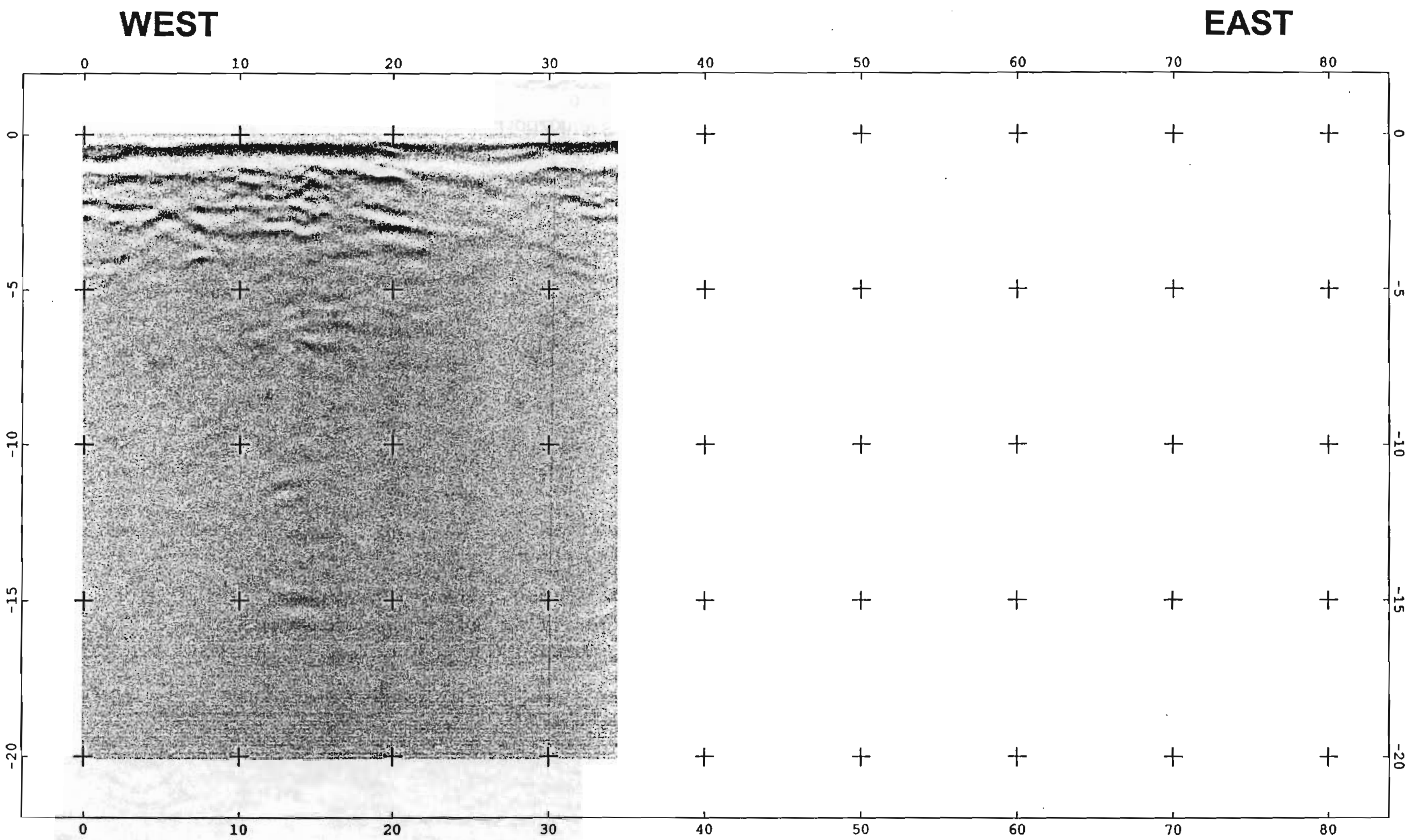
May 2002



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(Vertical Exageration = 2)

Response Amplitude Gained at 15, 50 and 75

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68 - C99 - 223
W.O. # R1A00222

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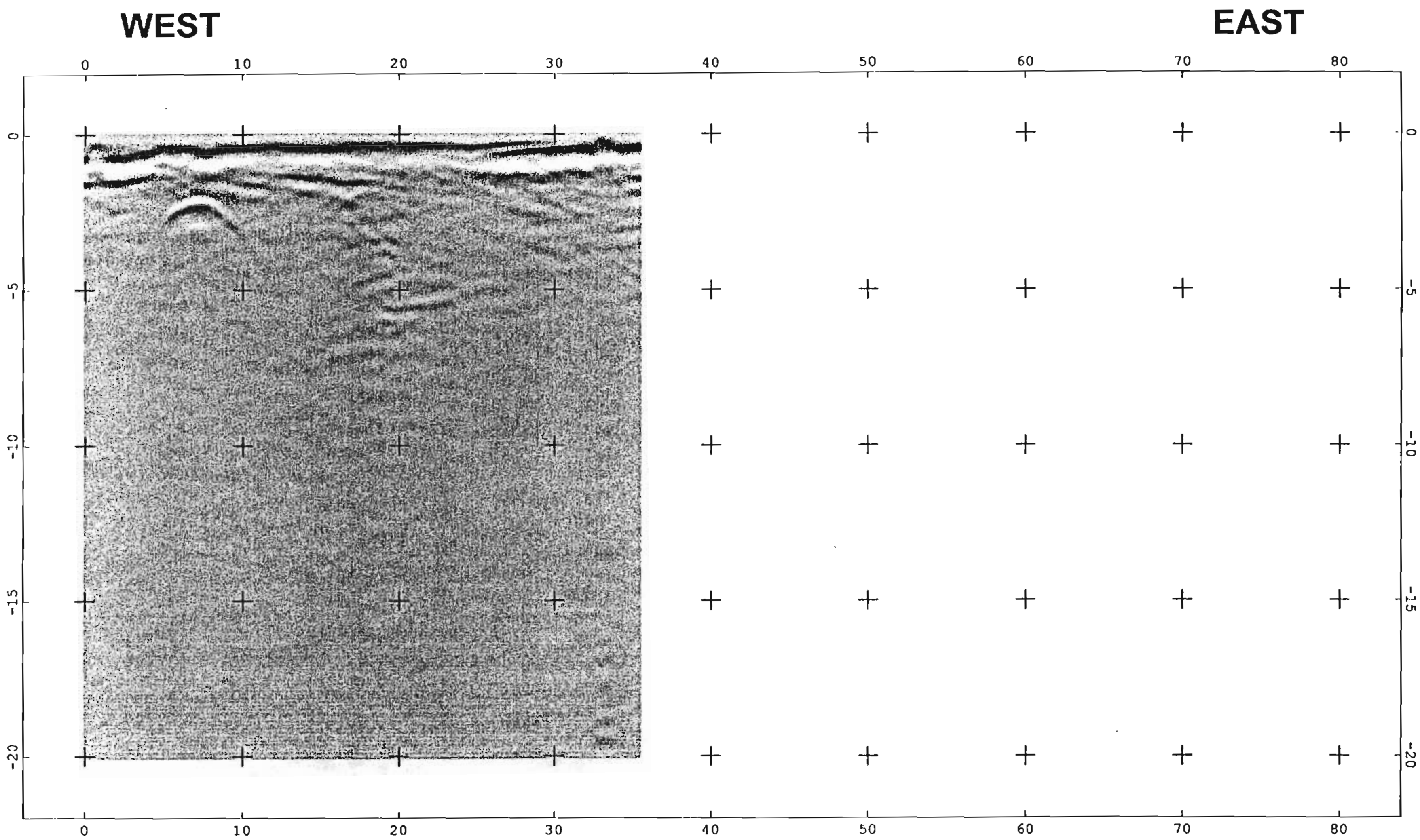
Independent Leather Site
Gloversville, New York
May 2002



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Response Amplitude Gained at 15, 50 and 75

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Independent Leather Site
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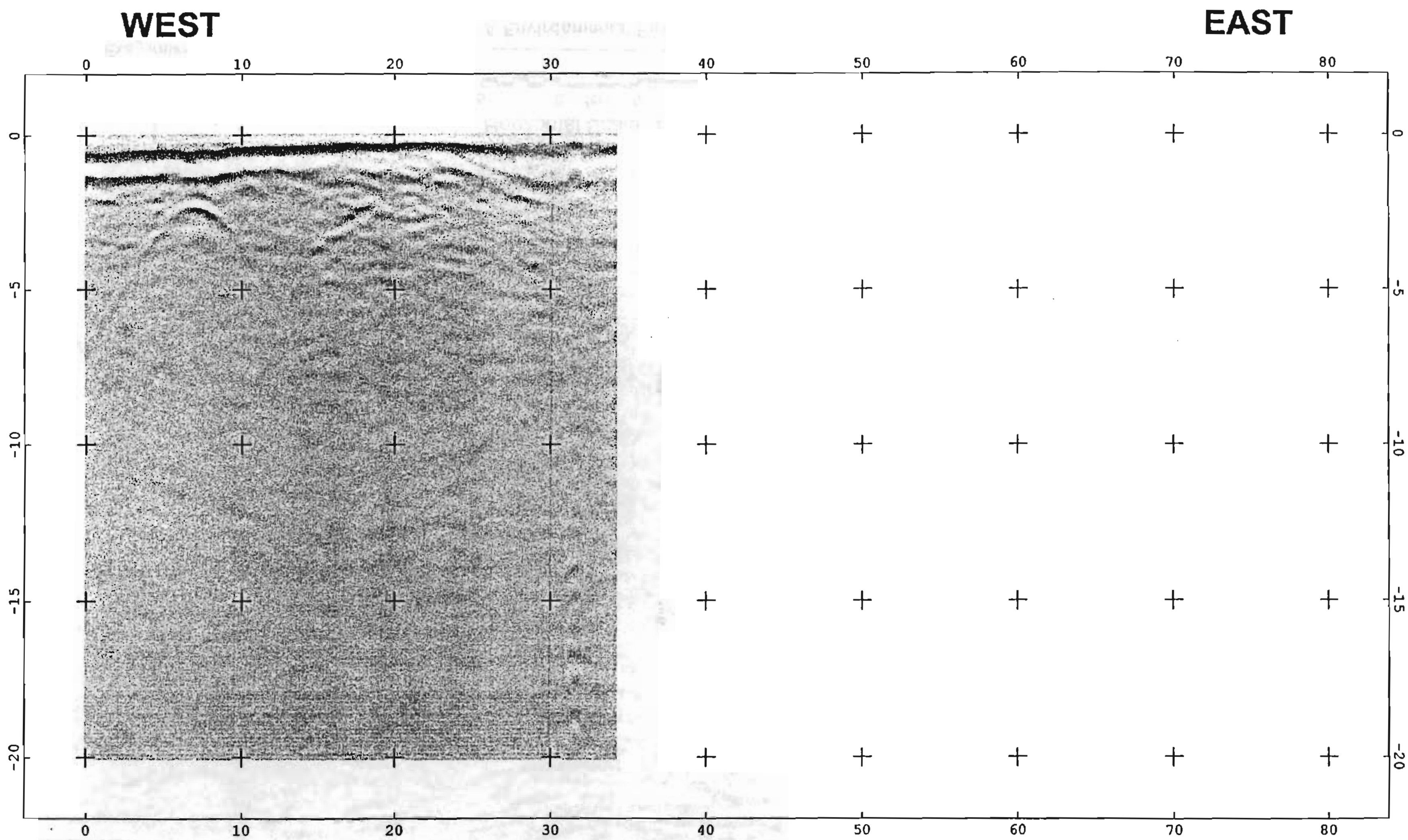

Vertical Scale Based On TWT = 7.5 nS / ft
(Vertical Exageration = 2)
Response Amplitude Gained at 15, 50 and 75

Horizontal Scale 1 : 120
5 0 feet 5 10

U.S. EPA Environmental Response Team Center
Response Engineering and Analytical Contract
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W.O. # R1A00222

Figure __. Line 120 N, GPR Psuedo-Section
Independent Leather Site
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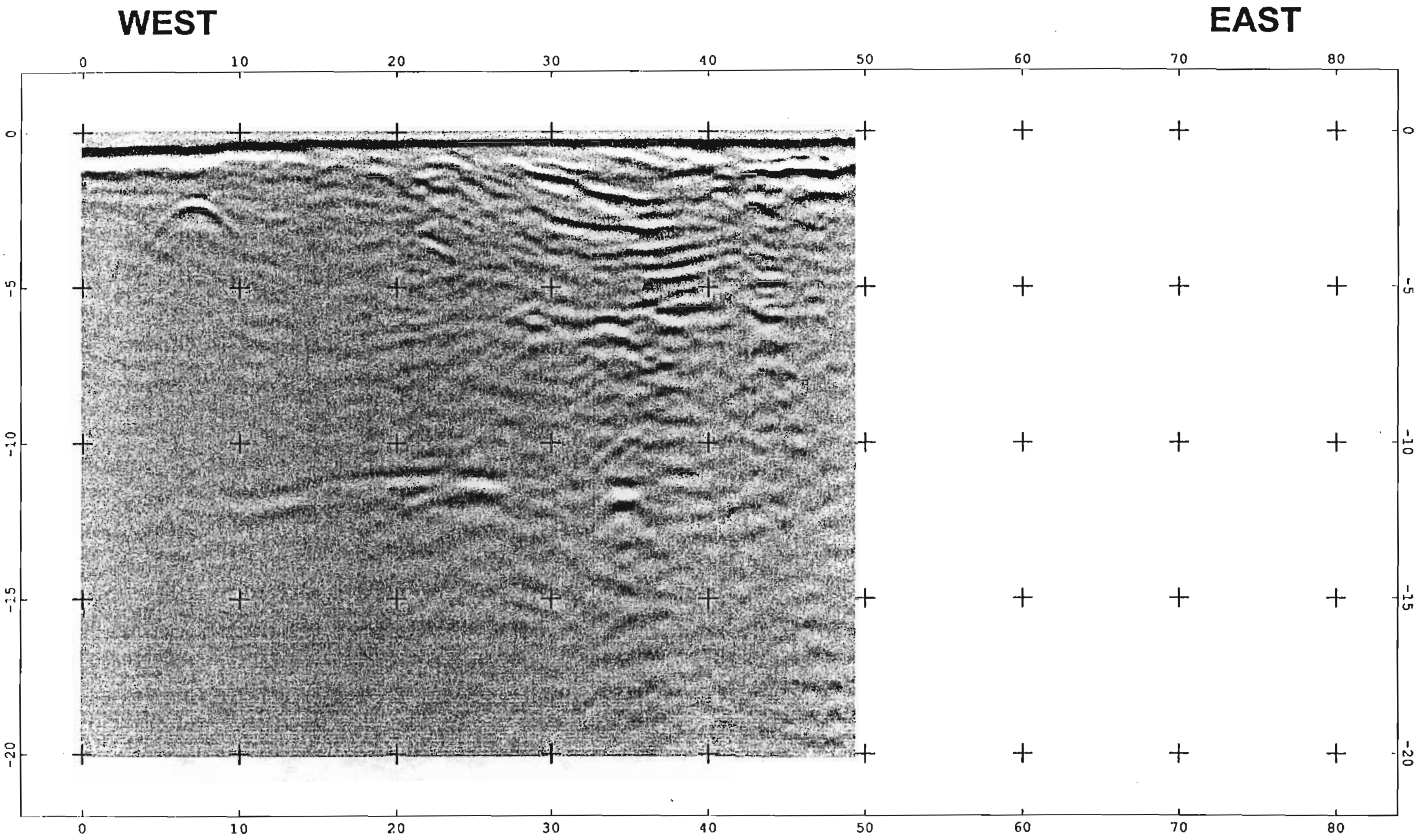
May 2002



Horizontal Scale 1 : 120

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(Vertical Exageration = 2)

Response Amplitude Gained at 15, 50 and 75

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Figure __. Line 130 N, GPR Psuedo-Section
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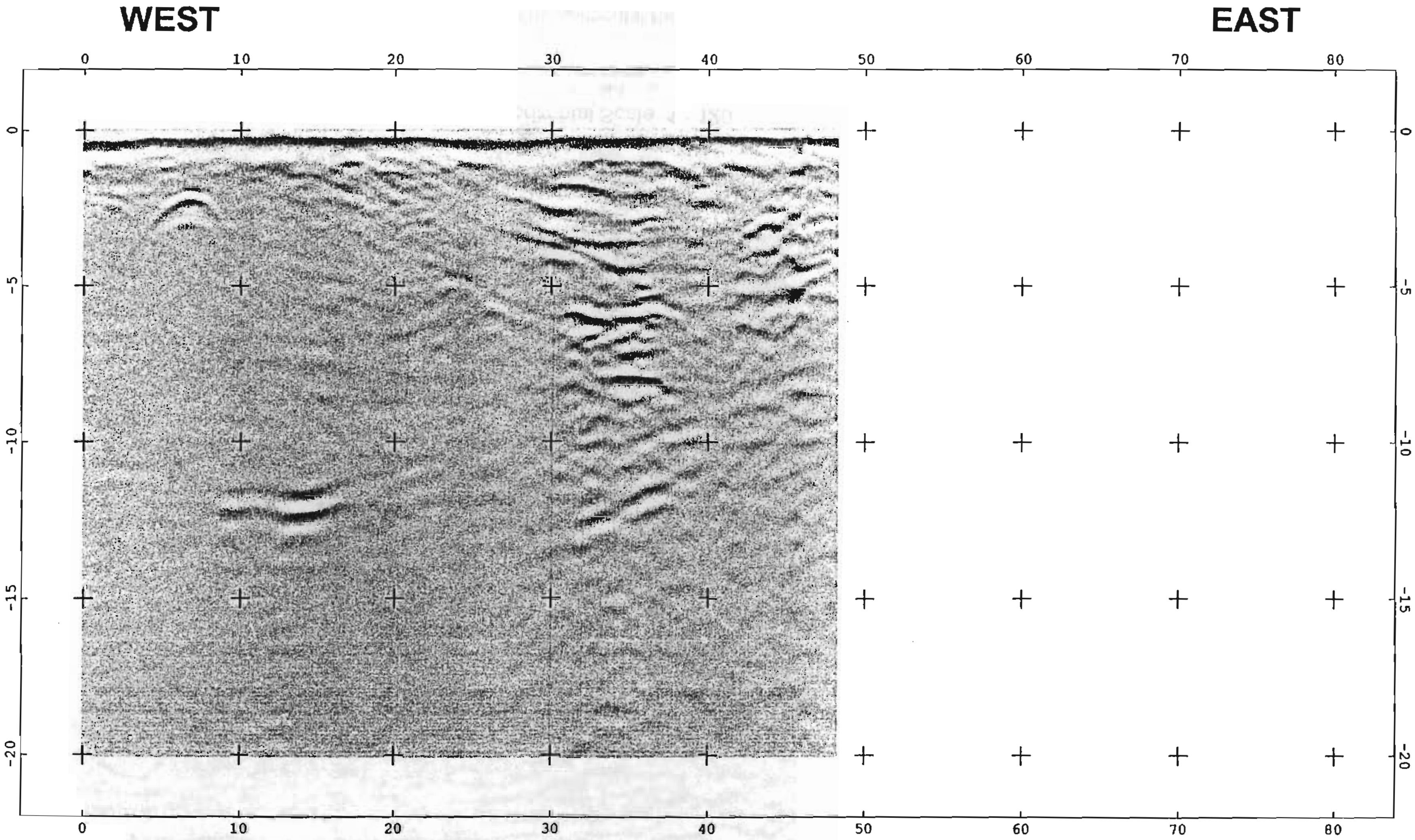
Gloversville, New York
May 2002



Horizontal Scale 1 : 120

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Vertical Scale Based On TWT = 7.5 nS / ft

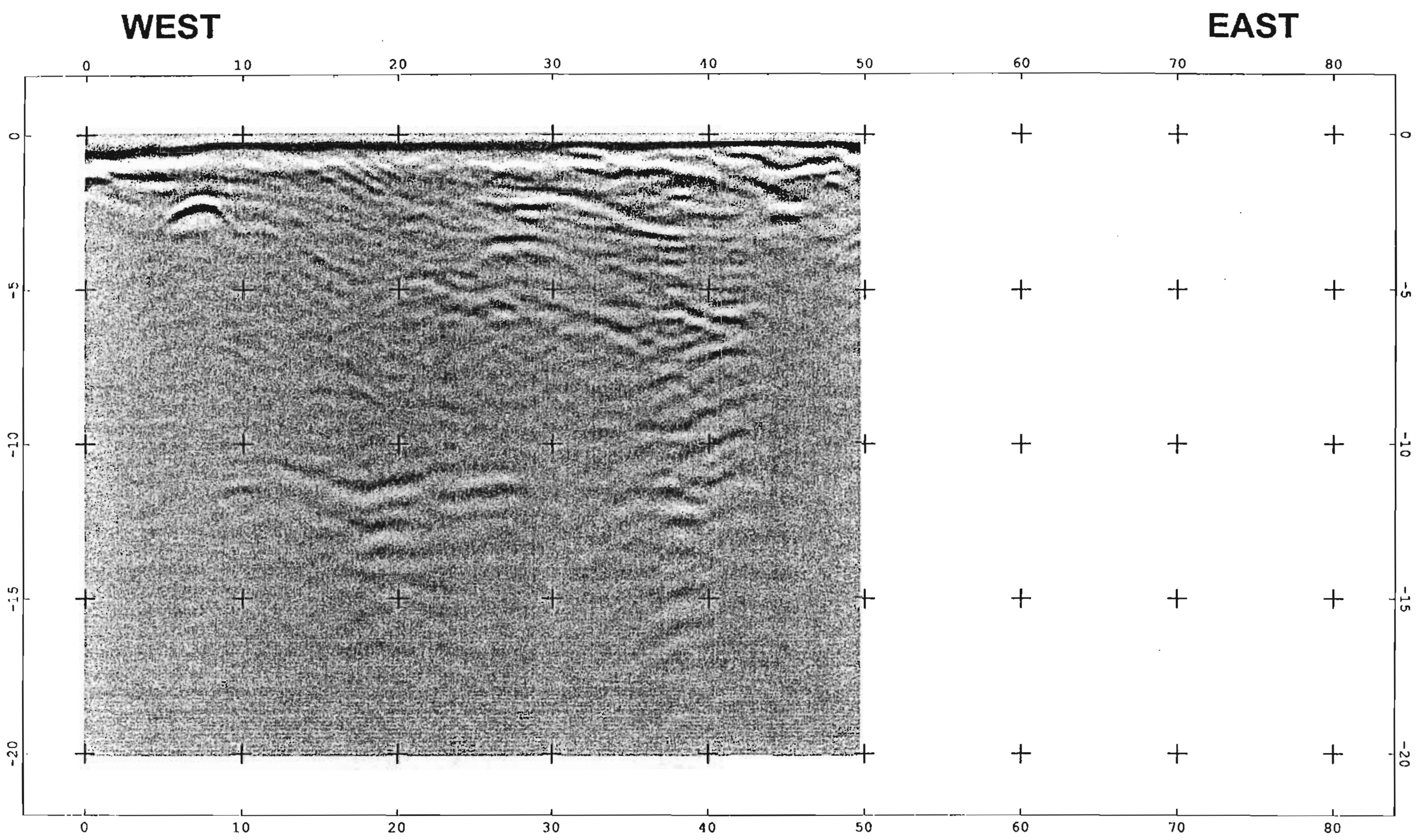
(Vertical Exageration = 2)

Response Amplitude Gained at 15, 50 and 75

U.S. EPA Environmental Response Team Center

Response Engineering and Analytical Contract
68 - C99 - 223
W.O. # R1A00222

Figure __. Line 140 N, GPR Psuedo-Section
Independent Leather Site
Gloversville, New York
May 2002



Horizontal Scale 1 : 120

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Vertical Scale Based On TWT = 7.5 nS / ft

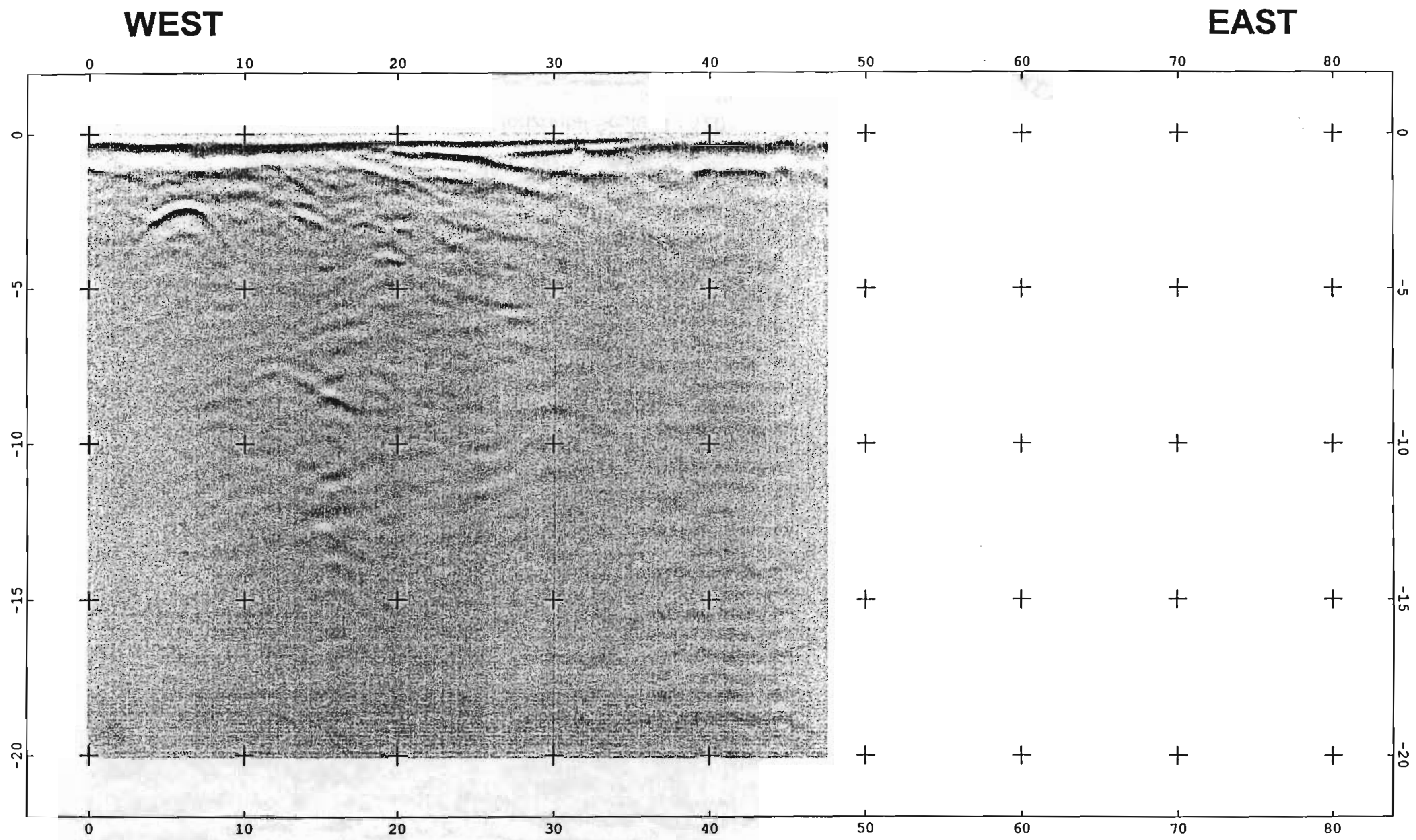
(Vertical Exageration = 2)

Response Amplitude Gained at 15, 50 and 75

U.S. EPA Environmental Response Team Center

Response Engineering and Analytical Contract
68 - C99 - 223
W.O. # R1A00222

Figure __. Line 150 N, GPR Psuedo-Section
Independent Leather Site
Gloversville, New York
May 2002



Horizontal Scale 1 : 120

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Vertical Scale Based On TWT = 7.5 nS / ft

(Vertical Exageration = 2)

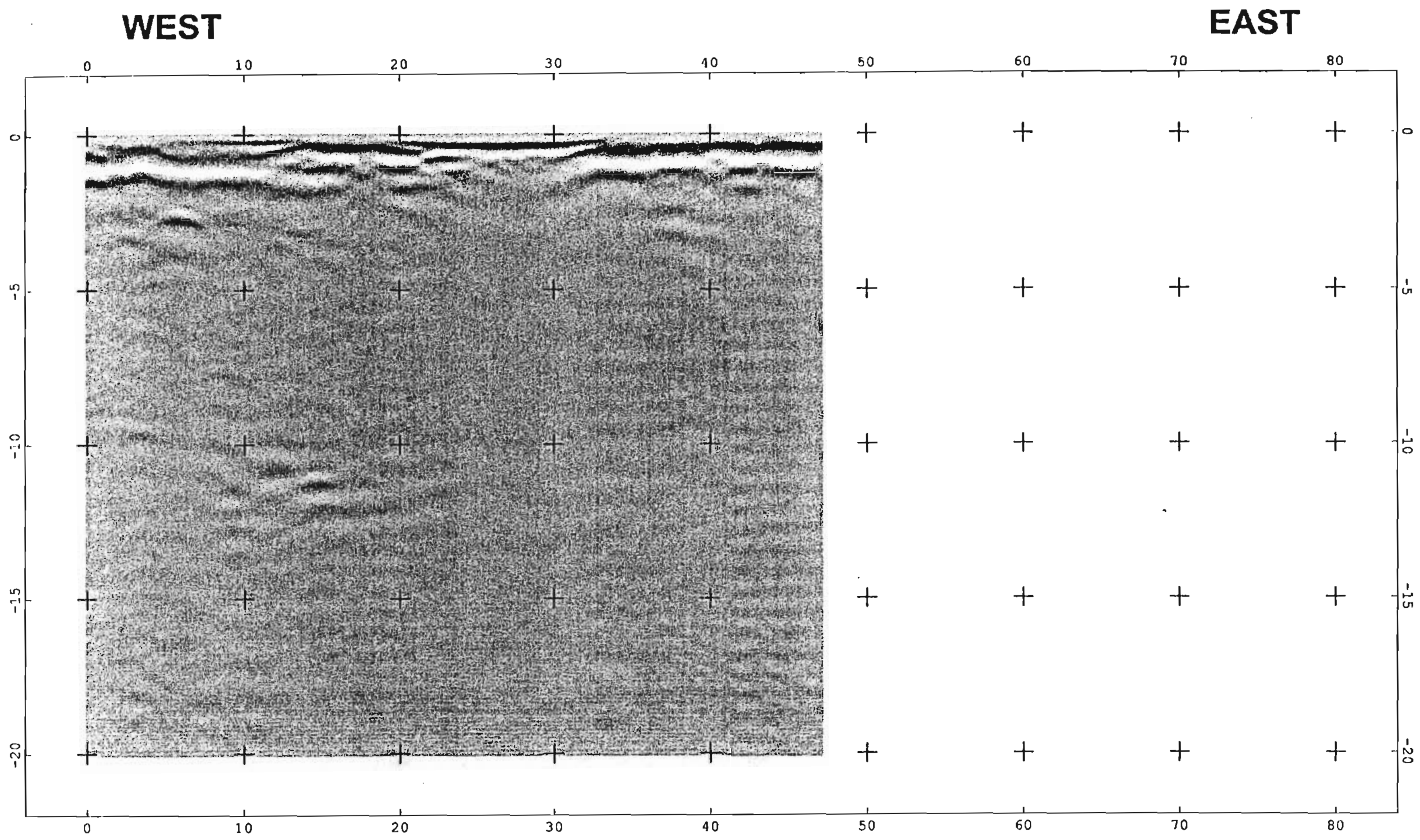
Response Amplitude Gained at 15, 50 and 75

U.S. EPA Environmental Response Team Center

Response Engineering and Analytical Contract
68 - C99 - 223
W.O. # R1A00222

Figure __. Line 160 N, GPR Psuedo-Section
Independent Leather Site
Gloversville, New York
May 2002

Preliminary Draft



Horizontal Scale 1 : 120

5 0 feet 5 10

Vertical Scale Based On TWT = 7.5 nS / ft

(Vertical Exageration = 2)

Response Amplitude Gained at 15, 50 and 75

U.S. EPA Environmental Response Team Center

Response Engineering and Analytical Contract
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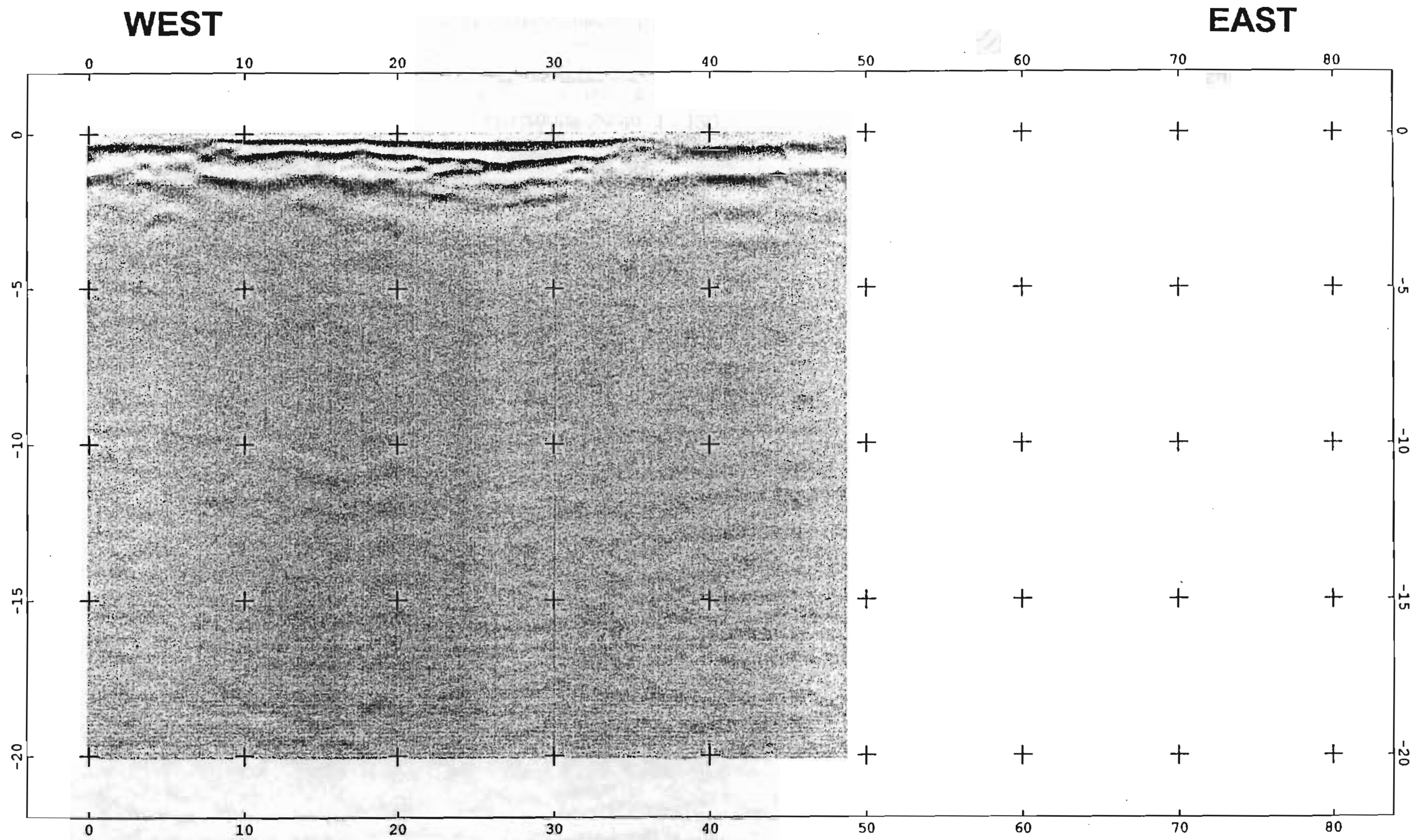
W.O. # R1A00222

Figure __. Line 170 N, GPR Psuedo-Section
Independent Leather Site
Gloversville, New York
May 2002



Horizontal Scale 1 : 120

5 0 feet 5 10

Vertical Scale Based On TWT = 7.5 nS / ft

(Vertical Exageration = 2)

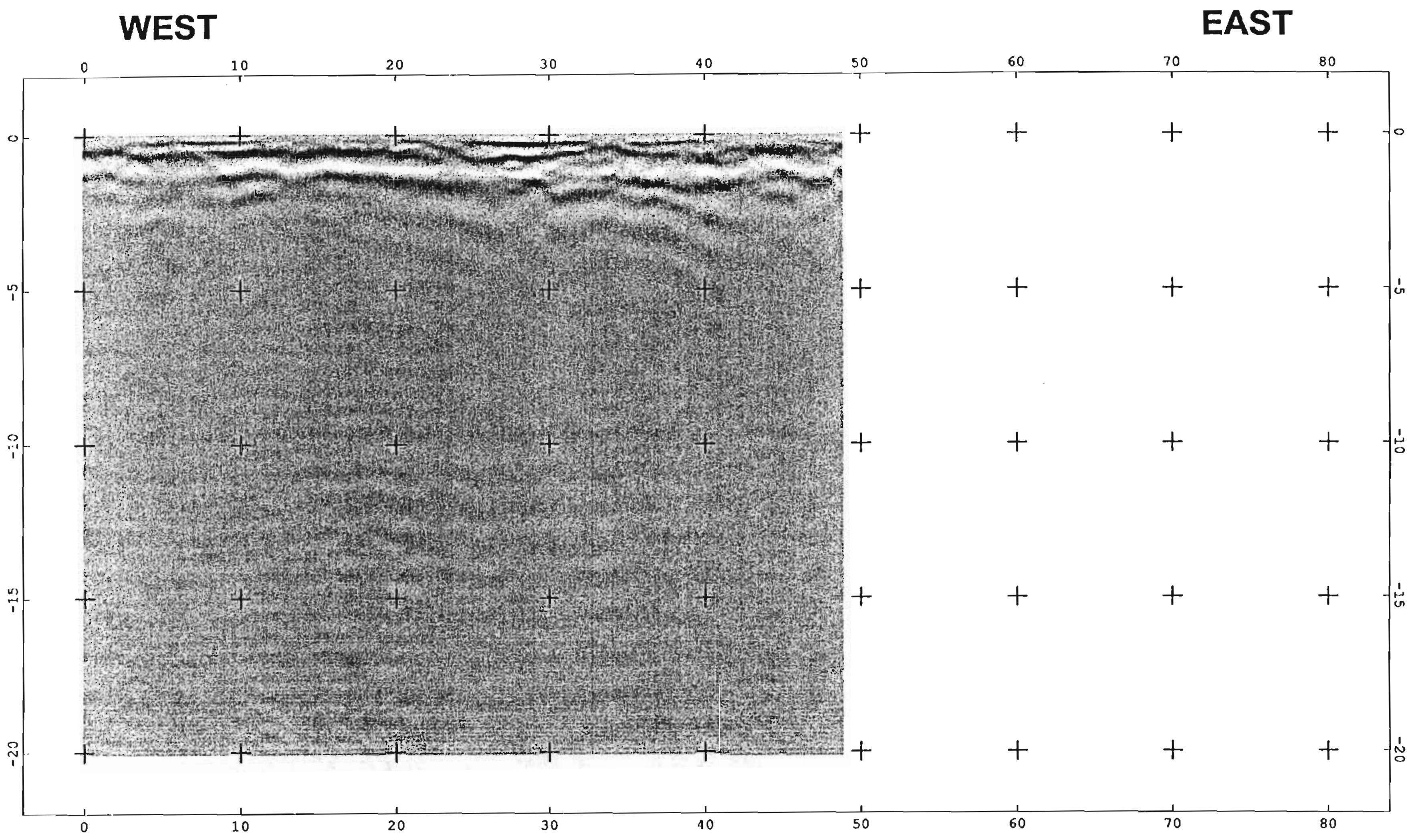
Response Amplitude Gained at 15, 50 and 75

U.S. EPA Environmental Response Team Center

Response Engineering and Analytical Contract
68 - C99 - 223
W.O. # R1A00222

Figure __. Line 180 N, GPR Psuedo-Section
Independent Leather Site
Gloversville, New York
May 2002

Preliminary Draft



Horizontal Scale 1 : 120

5 0 feet 5 10

Vertical Scale Based On TWT = 7.5 nS / ft

(Vertical Exageration = 2)

Response Amplitude Gained at 15, 50 and 75

U.S. EPA Environmental Response Team Center

Response Engineering and Analytical Contract
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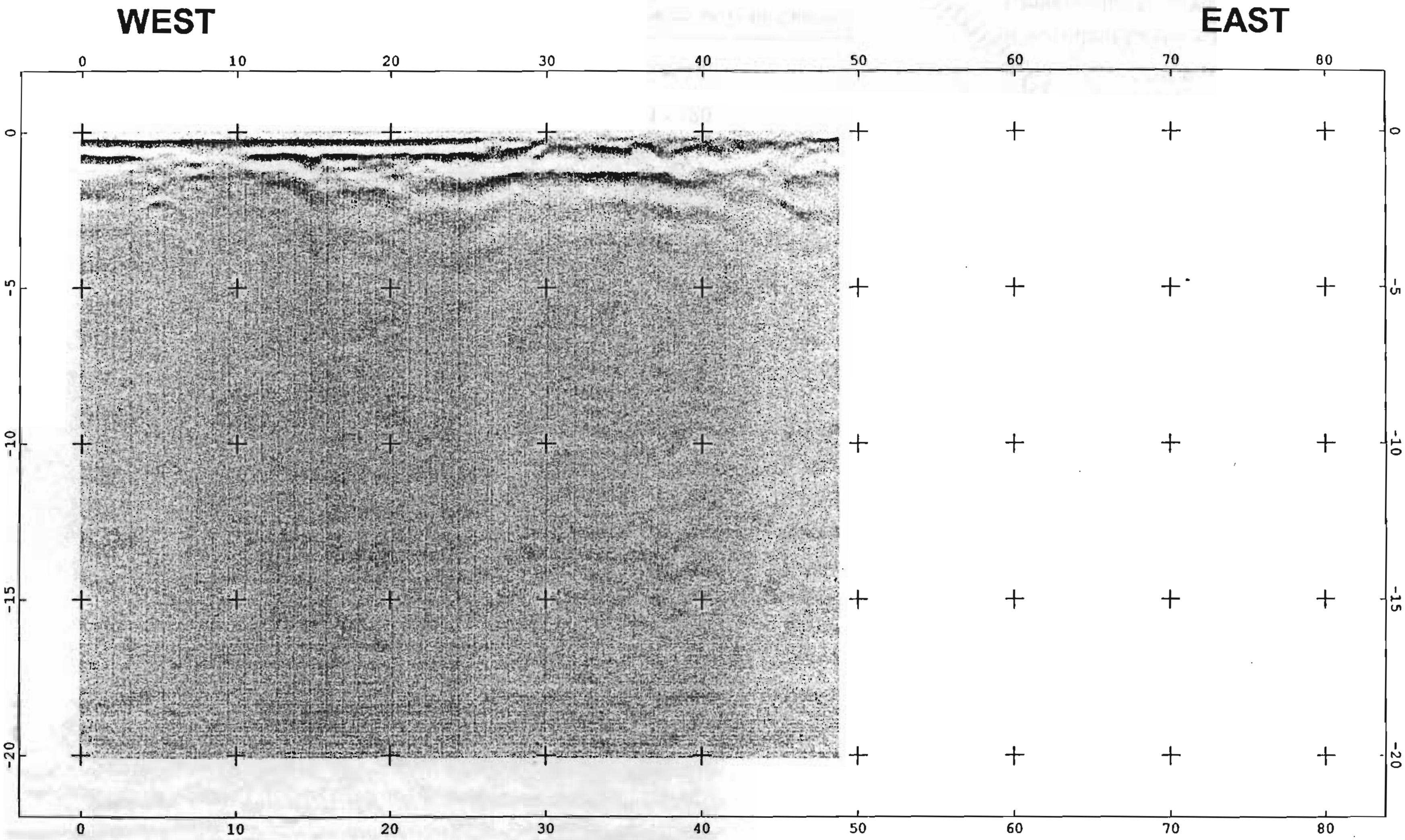
W.O. # R1A00222

Figure __. Line 190 N, GPR Psuedo-Section
Independent Leather Site
Gloversville, New York
May 2002



Horizontal Scale 1 : 120

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Vertical Scale Based On TWT = 7.5 nS / ft

(Vertical Exageration = 2)

Response Amplitude Gained at 15, 50 and 75

U.S. EPA Environmental Response Team Center

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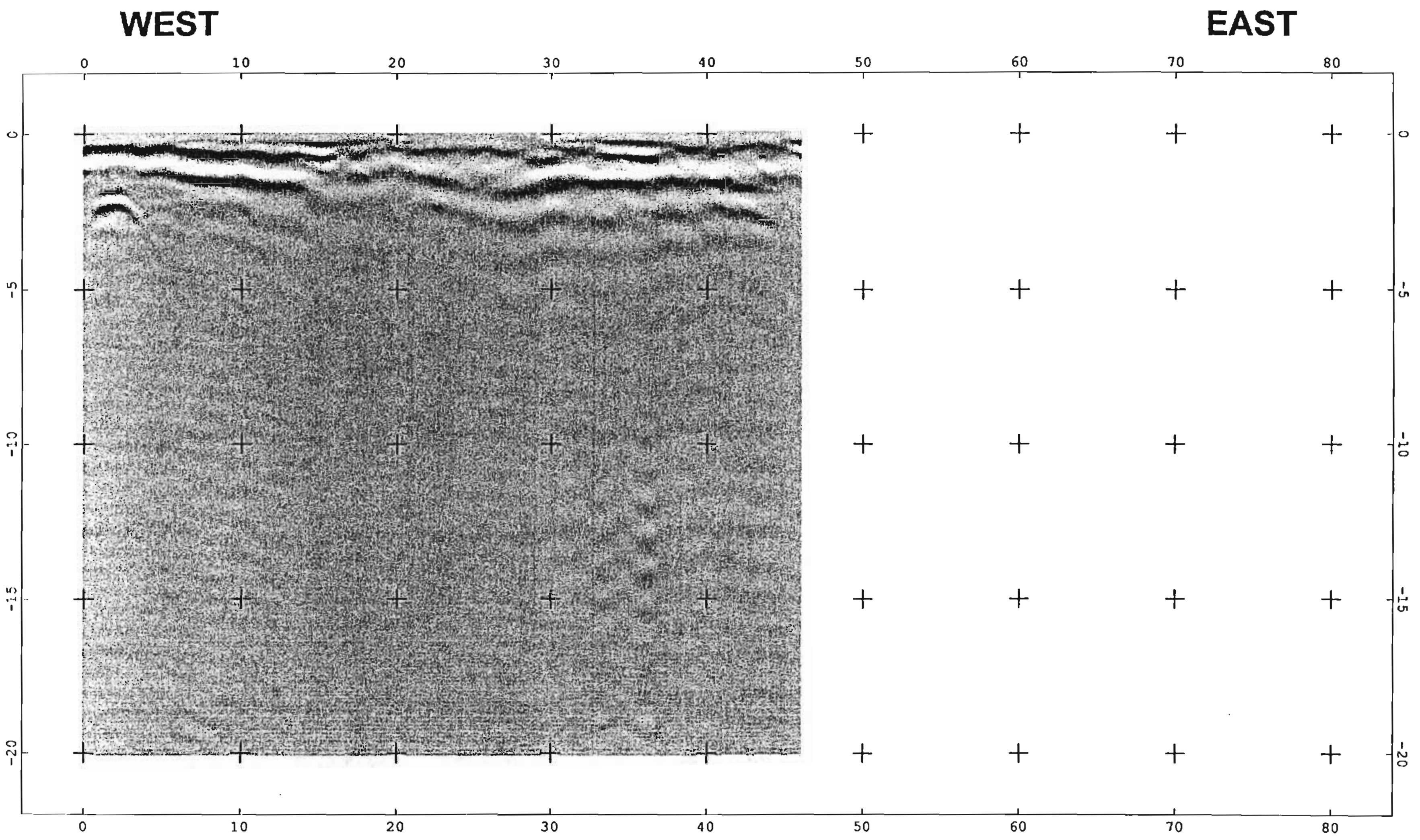
W.O. # R1A00222

Figure __. Line 200 N, GPR Psuedo-Section
Independent Leather Site
Gloversville, New York
May 2002



Horizontal Scale 1 : 120

5 0 feet 5 10

Vertical Scale Based On TWT = 7.5 nS / ft

(Vertical Exageration = 2)

Response Amplitude Gained at 15, 50 and 75

U.S. EPA Environmental Response Team Center

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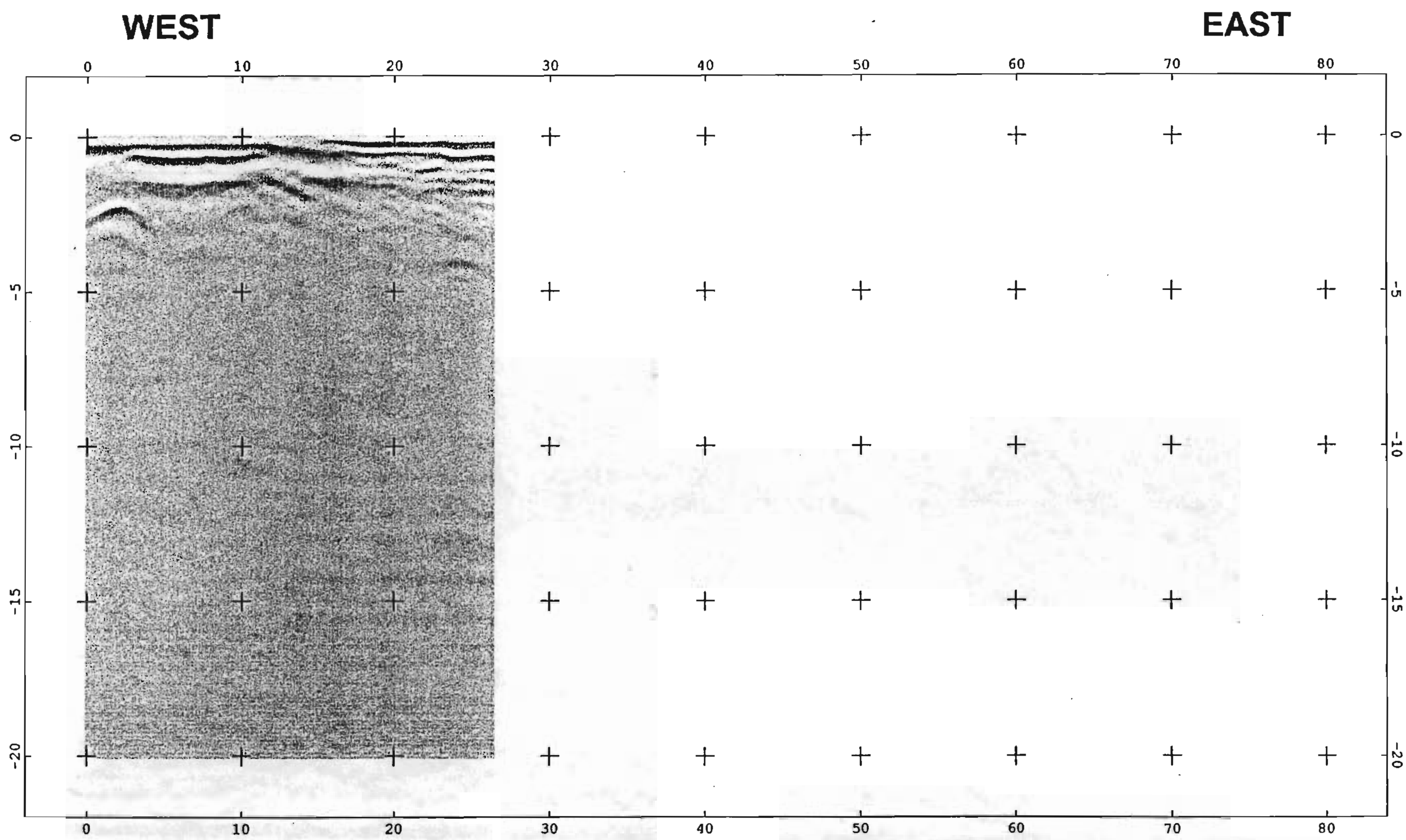
Figure __. Line 210 N, GPR Psuedo-Section
Independent Leather Site
Gloversville, New York
May 2002



Horizontal Scale 1 : 120

5 0 feet 5 10

Vertical Scale Based On TWT = 7.5 nS / ft

(Vertical Exageration = 2)

Response Amplitude Gained at 15, 50 and 75

U.S. EPA Environmental Response Team Center

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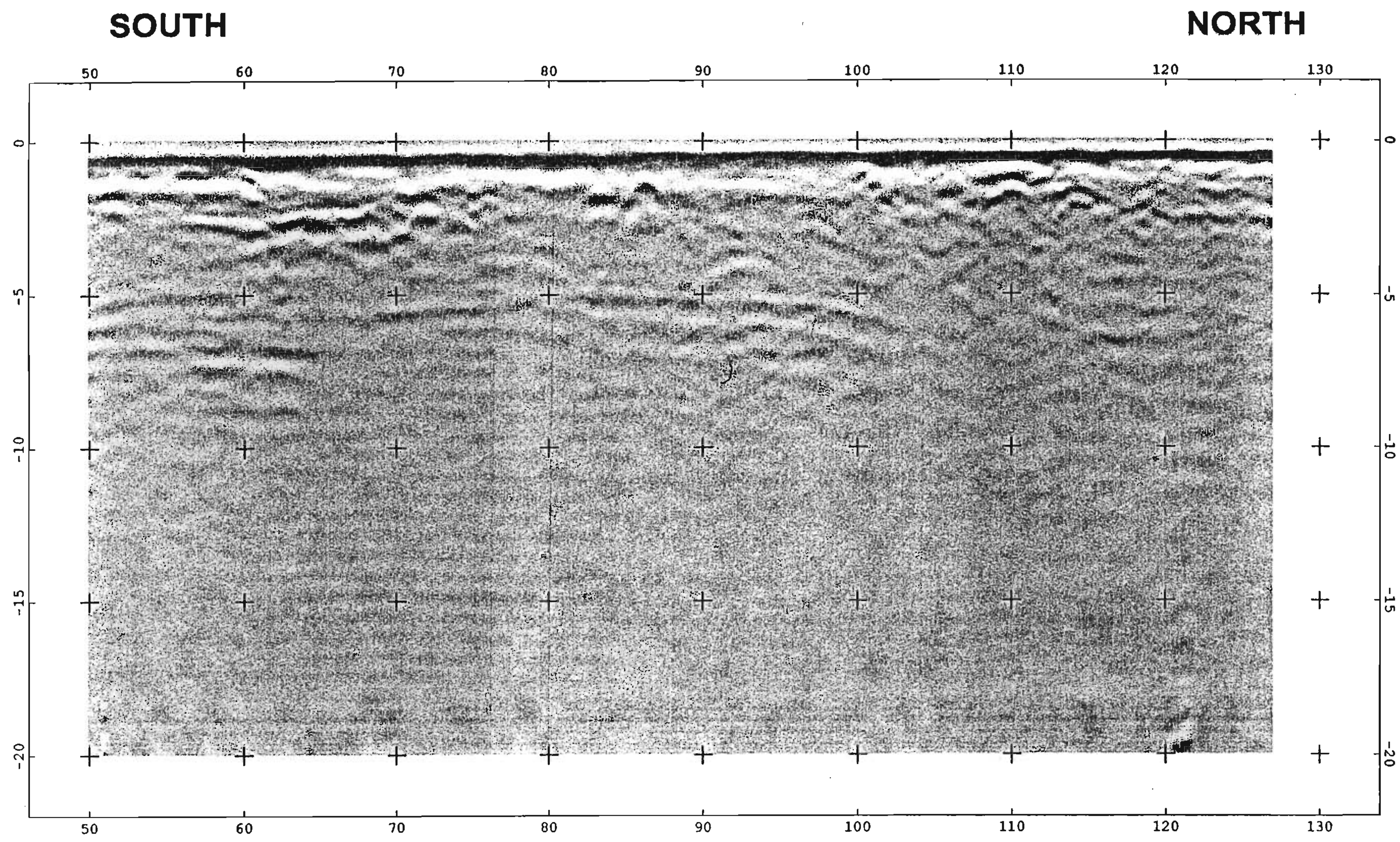
W.O. # R1A00222

Figure __. Line 220 N, GPR Psuedo-Section
Independent Leather Site
Gloversville, New York
May 2002



Horizontal Scale 1 : 120

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Vertical Scale Based On TWT = 7.5 nS / ft

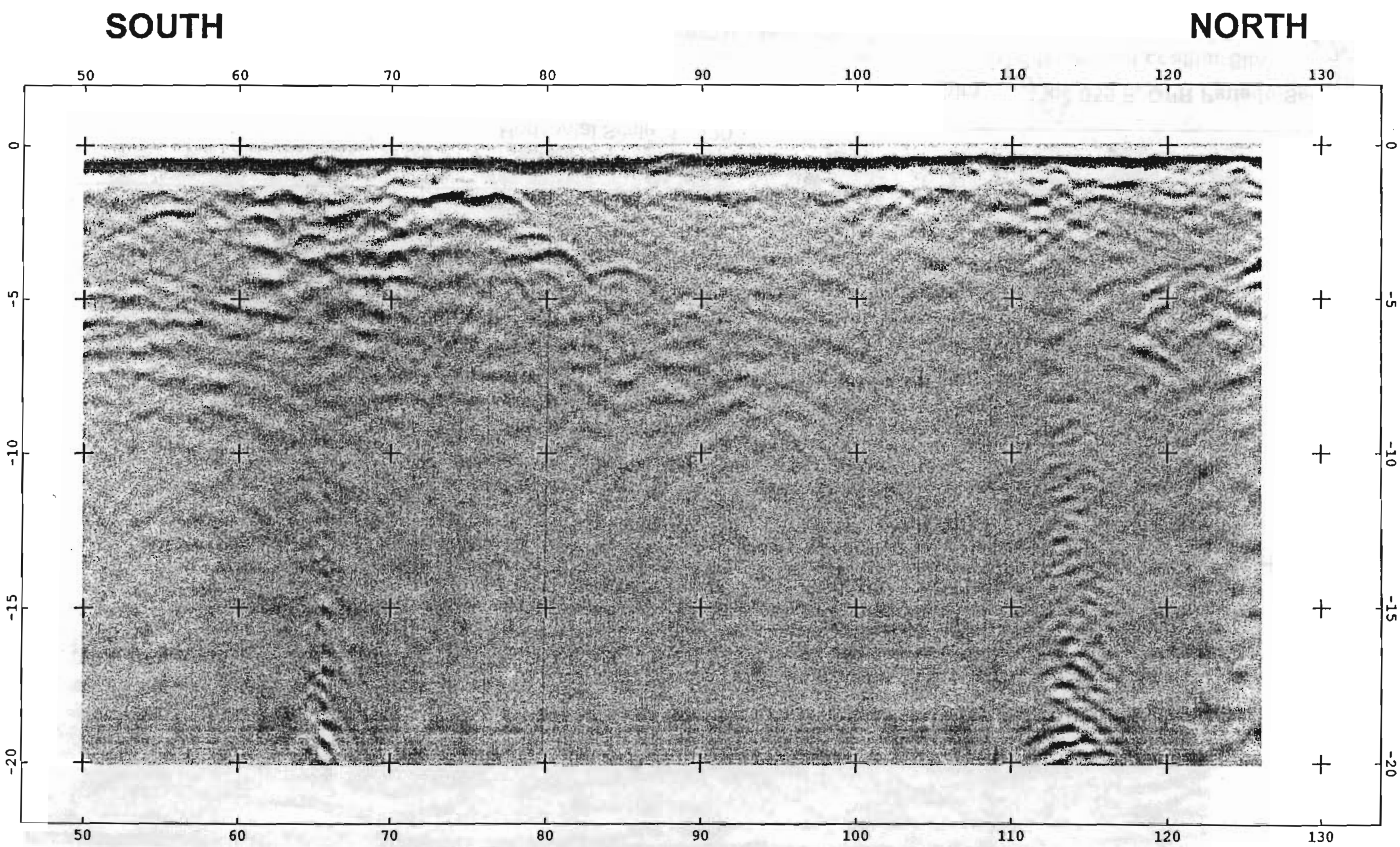
(Vertical Exageration = 2)

Response Amplitude Gained at 15, 50 and 75

U.S. EPA Environmental Response Team Center

Response Engineering and Analytical Contract
68 - C99 - 223
W.O. # R1A00222

Figure __. Line 065 E, GPR Psuedo-Section
Independent Leather Site
Gloversville, New York
May 2002



Horizontal Scale 1 : 120

5 0 feet 5 10

Vertical Scale Based On TWT = 7.5 nS / ft

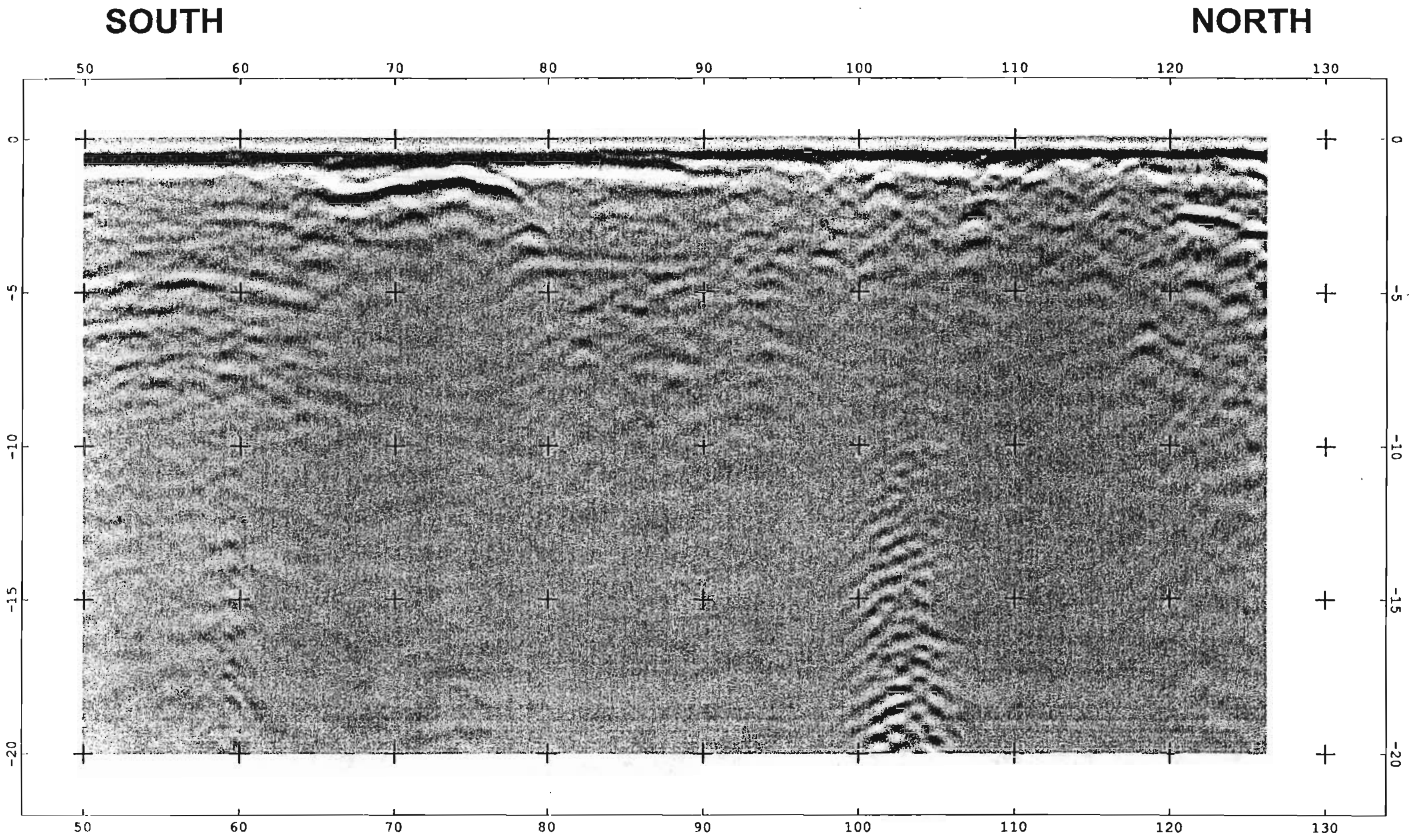
(Vertical Exageration = 2)

Response Amplitude Gained at 15, 50 and 75

U.S. EPA Environmental Response Team Center

Response Engineering and Analytical Contract
68 - C99 - 223
W.O. # R1A00222

Figure __. Line 060 E, GPR Psuedo-Section
Independent Leather Site
Gloversville, New York
May 2002



Horizontal Scale 1 : 120

5 0 feet 5 10

Vertical Scale Based On TWT = 7.5 nS / ft

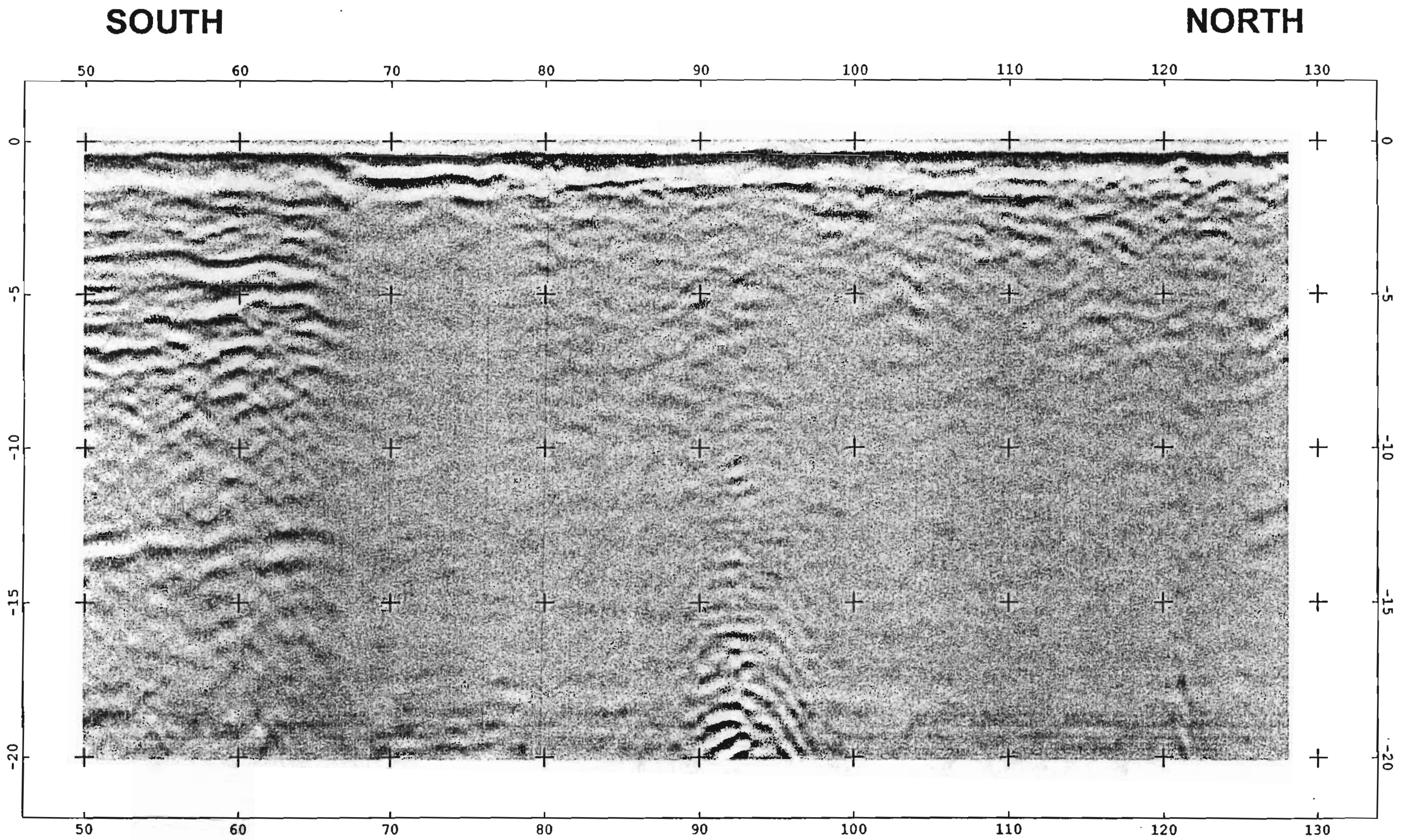
(Vertical Exageration = 2)

Response Amplitude Gained at 15, 50 and 75

U.S. EPA Environmental Response Team Center

Response Engineering and Analytical Contract
68 - C99 - 223
W.O. # R1A00222

Figure __. Line 055 E, GPR Psuedo-Section
Independent Leather Site
Gloversville, New York
May 2002



Horizontal Scale 1 : 120

5 0 feet 5 10

Vertical Scale Based On TWT = 7.5 nS / ft

(Vertical Exageration = 2)

Response Amplitude Gained at 15, 50 and 75

U.S. EPA Environmental Response Team Center

Response Engineering and Analytical Contract
68 - C99 - 223
W.O. # R1A00222

Figure __. Line 050 E, GPR Psuedo-Section
Independent Leather Site
Gloversville, New York
May 2002

Preliminary Draft

SOIL AND SEDIMENT SAMPLING, INDEPENDENT LEATHER SITE

DATE: November 16, 2001

TO: JoAnn Camacho, U.S. EPA/ERTC Work Assignment Manager

THROUGH: Richard Henry, REAC Operations Leader

FROM: David Aloysius, REAC Task Leader

SUBJECT: SOIL AND SEDIMENT SAMPLING
INDEPENDENT LEATHER SITE, GLOVERSVILLE, NEW YORK
WORK ASSIGNMENT 0-222: TRIP REPORT

BACKGROUND

The Independent Leather Site is located in Gloversville, New York. Past activities at the site include leather tanning and related industrial processes. Chromium (Cr) is the primary contaminant of concern at the site, as this metal is associated with past site processes. The site is physically divided by Cayadutta Creek (Figure 1), which flows in an approximate north-to-south direction. Light-industrial equipment is present at the site including above-ground storage tanks (ASTs), transformers, and sewage treatment structures.

On August 13 and 14, 2001, the Response Engineering and Analytical Contract (REAC) Task Leader accompanied the Work Assignment Manager (WAM) of the United States Environmental Protection Agency (U.S. EPA), Environmental Response Team Center (ERTC) to the Independent Leather Site. The purpose of this site visit, as specified in the U.S. EPA/ERTC Work Assignment (0-222), was to meet with the U.S. EPA Region 2 On-Scene Coordinator (OSC) to define a site sampling program.

A *Site Sampling Plan* (Lockheed Martin/REAC, 2001) was subsequently prepared to meet the following objectives of the program, as defined during the site visit:

- Evaluate surficial soil samples, obtained at approximate depths of 3- to 12-inches below ground surface, for the presence of total Cr, and at a sample density sufficient to satisfy New York State Brownfield classification requirements.
- Evaluate five subsurface soil samples, obtained at an approximate depth of five feet below ground surface, for the presence of total Cr.
- Evaluate five surficial soil samples, obtained at approximate depths of 3- to 12-inches below ground surface, for the presence of Target Analyte List (TAL) metals, volatile organic compounds (VOCs),

and semi-volatile organic compounds (SVOCs).

- Evaluate three stream sediment samples for the presence of total Cr.

OBSERVATIONS AND ACTIVITIES

On October 22, 2001, REAC personnel mobilized to the site to initiate the field sampling program. Samples were collected at the site between October 23 and October 26, 2001.

Figure 1 is a preliminary site investigation map, which illustrates the approximate locations where soil and sediment samples were collected. This site map will be revised, based on field survey data collected during the sampling program. The revised site investigation map will be presented in a final report, showing all sampling locations and pertinent site features.

As illustrated in Figure 1, forty (40) surficial soil samples (labeled "SSW") were collected on the west side of Cayadutta Creek and 15 surficial samples (labeled "SSE") were collected on the east side of the creek. At the request of the OSC, samples SSW-34, SSW-35, and SSW-36 were not collected because they fell outside the site boundaries.

The following bullets summarize the types and numbers of field samples that were collected:

- Surficial soil samples were collected at 49 individual locations (one sample per location) for total Cr analysis (marked with either an orange or a red dot in Figure 1). Duplicate samples were additionally collected at four locations for total Cr analysis.

- At six surficial soil sample locations, subsurface samples were additionally collected for total Cr analysis (one sample per location). These six locations coincided with surficial soil sample locations SSW-37, SSW-10, SSW-12, SSW-16, SSW-24, and SSE-6, and have been designated in Figure 1 as VS-1, VS-2, VS-3, VS-4, VS-5, and VS-6, respectively. The subsurface sample at SSE-6 was added to the originally planned five locations, per request of the OSC. The depths of the subsurface samples ranged from 2 feet (auger refusal) to 5 feet below ground surface.

- Three sediment samples were collected along the lower banks of Cayadutta Creek for total Cr analysis. One sample was collected at the northern site boundary (SED-1), one at a mid-point location, downstream of outfalls that emanate from the former site buildings (SED-2), and one near the southern site boundary (SED-3).

- At six separate locations, surficial soil samples were collected for an ‘expanded’ analysis, which included TAL metals, Target Compound List (TCL) VOCs, and TCL SVOCs. These six locations are identified in Figure 1 as SSW-9, SSW-19, SSW-31, SSW-42, SSE-4, and SSE-5. An expanded analysis was not originally planned at sample location SSE-5. However, because strong odors were detected during sampling, additional soil mass was collected for the expanded analysis. Duplicate samples were additionally collected at SSW-9 for comparative analysis.

In general, surficial soil samples were obtained within the first 3- to 6-inches below ground surface, after vegetation and loose debris had been removed. Sediment samples were obtained in calm water areas, where sediment had accumulated near the creek banks. Samples were collected with either dedicated plastic scoops or decontaminated stainless steel trowels. All samples were visually described in the field for their physical characteristics. Surficial materials across the site varied from native, reworked sand and gravel to artificial fill (e.g., topsoil). The material descriptions will be provided in the final report.

Hand augers were used for collection of subsurface soil samples. Attempts were made to reach the intended target depth at each location (approximately five-feet below ground surface); however, the high gravel content in the soils precluded reaching this depth at several locations. Once the final depths were reached, the subsurface soil samples were directly transferred from the auger bucket to the sample jars. The sample depths at the six locations were as follows: SSW-37 (2 feet), SSW-10 (4 feet), SSW-12 (2 feet), SSW-16 (5 feet), SSW-24 (5 feet), and SSE-6 (2 feet).

Reinforced concrete floors were present at a number of locations where samples were taken. These locations included the main tannery building and maintenance shop footprints (i.e., structures no longer present, except for the former floors), the secondary tannery building, and the storage building (refer to Figure 1). To obtain soil samples beneath the concrete floors, a tire-mounted Bobcat™ utility vehicle with a jack-hammer attachment was used to break up and remove the concrete. The thickness of the concrete ranged from approximately 6- to 8-inches within the main tannery building footprint to approximately 4-inches in the secondary tannery building (i.e., at location SSE-5).

Based on the intended analysis, samples were placed in appropriate sample jars, as follows: total Cr and TAL metals (4-ounce glass); VOCs (4-ounce glass with septa lid); and SVOCs (8-ounce glass). All samples were subsequently shipped under chain-of-custody to the REAC Laboratories in Edison, New Jersey for analysis of total Cr, TAL metals, TCL VOCs, and TCL SVOCs. Samples for total Cr analysis were analyzed by X-Ray Fluorescence (XRF). Confirmation analysis for total Cr will also be conducted on approximately 10 percent of the XRF samples (i.e., XRF sample cups) by inductively coupled plasma (ICP) methodology. The analytical data and a discussion of the results will be provided in the final report.

Global positioning system (GPS) navigation was used to horizontally locate most of the sampling locations. Because building roofs were present, a survey tape was used to determine sample locations within the secondary tannery and storage buildings (i.e., SSE-3, SSE-5, SSE-7, SSE-9, and SSE-12). Others features were also surveyed during the sampling program by GPS navigation, which included the main tannery building footprint (i.e., outline of concrete floor), the maintenance shop footprint, the former sewage treatment plant, the secondary tannery building, the storage building, several small bridge crossings, and the outer east and west banks of Cayadutta Creek. A revised site investigation map will be presented in the final report, showing all sampling locations and other site features that were surveyed during the sampling program.

PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

Preliminary analytical results indicate the presence of VOCs in a soil sample collected beneath the concrete floor at location SSE-5 (i.e., at the northeast corner of the secondary tannery building). Based on previous discussions with the WAM, contamination may be originating from an off-site source to the east. Additional sampling will be required to determine the full nature and extent of this contamination. Although some monitor wells currently exist on site, additional wells may be required to fully assess the impacts to the groundwater.

It is understood that another private contractor will be collecting additional soil samples for analysis in the future. It is recommended that additional soil samples be taken near the northwest corner of the main tannery building footprint (i.e., in the vicinity of sample locations SSW-12 and SSW-13) for analysis of TAL metals, VOCs, and SVOCs due to the presence of discolored, ponded water that was observed in this area during the last day on site (October 26th). Slight odors were also detected near ground surface. The samples collected in this area were obtained several days earlier, on October 23rd, at which time this condition was not readily obvious. The discolored water may be due to dyes that had been previously used in the former leather tanning processes on site.

FUTURE ACTIVITIES

To complete this project, REAC personnel will perform the following tasks in accordance with the Amended Work Assignment (AWA), 0-222:

- Revise the site investigation map using updated field survey data collected during the field sampling program.
- Prepare a final report that will summarize and discuss the results of the field sampling and analytical data.

At present, there are no future site-related activities that have been scheduled for REAC personnel.

REFERENCES

Lockheed Martin/REAC, 2001. Site Sampling Plan, Independent Leather Site, Gloversville, New York. Work Assignment 0-222. October 2001.

cc: Central File - WA # 0-222

C.T. MALE ASSOCIATES, P.C.

FINAL REPORT,
SOIL CONTAMINATION INVESTIGATION,
INDEPENDENT LEATHER SITE

Lockheed Martin Technology Services
Environmental Services REAC
2890 Woodbridge Avenue Building 209 Annex
Edison, NJ 08837-3679
Telephone 732-321-4200 Facsimile 732-494-4021

LOCKHEED MARTIN

DATE: January 24, 2002

TO: JoAnn Camacho, U.S. EPA/ERTC Work Assignment Manager

THROUGH: Steven A. Clapp, REAC Program Manager [illegible] for S.C.

FROM: David L. Aloysius, REAC Task Leader

SUBJECT: DOCUMENT TRANSMITTAL UNDER WORK ASSIGNMENT 0-222

Attached please find the following document prepared under this work assignment:

FINAL REPORT
INDEPENDENT LEATHER SITE
SOIL CONTAMINATION INVESTIGATION
GLOVERSVILLE, NEW YORK

cc: Central File - WA # 0-222 (w/attachments)
REAC Program Manager (w/o attachments)

REAC
Response Engineering and Analytical Contract

FINAL REPORT
INDEPENDENT LEATHER SITE
SOIL CONTAMINATION INVESTIGATION
GLOVERSVILLE, NEW YORK
JANUARY 2002

U.S. EPA Work Assignment No.: 0-222
Lockheed Martin Work Order No.: R1A00222
U.S. EPA Contract No.: 68-C99-223

OFFICE OF EMERGENCY AND REMEDIAL RESPONSE

FINAL REPORT
INDEPENDENT LEATHER SITE
SOIL CONTAMINATION INVESTIGATION
GLOVERSVILLE, NEW YORK
JANUARY 2002

U.S. EPA Work Assignment No.: 0-222
Lockheed Martin Work Order No.: R1A00222
U.S. EPA Contract No.: 68-C99-223

Prepared by:

Lockheed Martin/REAC

1-23-02
David L. Aloysius
REAC Task Leader
Date

1/23/02
Steven A. Clapp
REAC Program Manager
Date

Prepared for:

U.S. EPA/ERTC

JoAnn Camacho
Work Assignment Manager

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1.0 INTRODUCTION

The Independent Leather Site is located in Gloversville, New York (Figure 1). Past activities at the site included leather tanning and related industrial processes. Chromium (Cr) was the primary contaminant of concern at the site, as this metal is associated with past site processes. However, other metals and organic contaminants were also suspected of being present. The site is physically divided by Cayadutta Creek (Figure 2), which flows in an approximate north-to-south direction. Light-industrial equipment is present at the site including above-ground storage tanks (ASTs), transformers, and sewage treatment structures.

On August 13 and 14, 2001, the Response Engineering and Analytical Contract (REAC) Task Leader accompanied a Work Assignment Manager (WAM) of the United States Environmental Protection Agency (U.S. EPA), Environmental Response Team Center (ERTC) to the Independent Leather Site. The purpose of this site visit, as specified in the U.S. EPA/ERTC Work Assignment (0-222), was to meet with the U.S. EPA Region 2 On-Scene Coordinator (OSC) to define a site sampling program.

A Site Sampling Plan (Lockheed Martin/REAC, 2001a) was subsequently prepared to meet the following objectives of the program, as defined during the site visit:

- Collect and analyze surficial soil samples, obtained between 3- and 12-inches below ground surface (bgs), for total Cr, and at a sample density sufficient to satisfy New York State Brownfield classification requirements.
- Collect and analyze five subsurface soil samples, obtained at an approximate depth of five feet bgs, for total Cr.
- Collect and analyze five surficial soil samples, obtained between 3- and 12-inches bgs, for Target Analyte List (TAL) metals, Target Compound List (TCL) volatile organic compounds (VOCs), and TCL semi-volatile organic compounds (SVOCs).
- Collect and analyze three stream sediment samples for total Cr.

2.0 METHODOLOGY

On October 22, 2001, REAC personnel mobilized to the site to initiate the field sampling program. Samples were collected at the site between October 23 and October 26, 2001. A trip report was subsequently prepared (Lockheed Martin/REAC, 2001b), which described the soil and sediment sampling activities.

The Site Investigation Map (Figure 2) illustrates the approximate locations where soil and sediment samples were collected. Forty (40) surficial soil samples (labeled "SSW") were collected on the west side of Cayadutta Creek and 15 surficial samples (labeled "SSE") were collected on the east side of the creek. Samples were collected in accordance with ERT/REAC Standard Operating Procedure (SOP) # 2012, *Soil Sampling*. At the request of the OSC, samples SSW-34, SSW-35, and SSW-36 were not collected because they fell outside the site boundaries.

The following bullets summarize the types and numbers of field samples that were collected at the site:

- Surficial soil samples were collected at 49 individual locations (one sample per location) for total Cr analysis (marked with either an orange or a red dot on Figure 2).

- At six surficial soil sample locations, subsurface samples were collected for total Cr analysis (one sample per location). The subsurface samples were collected at SSW-10, SSW-12, SSW-16, SSW-24, SSW-37, and SSE-6. The subsurface sample at SSE-6 was added to the originally planned five locations, per request of the OSC. The depths of the subsurface samples ranged from 2 feet (auger refusal) to 5 feet bgs.

- Three sediment samples were collected along the lower banks of Cayadutta Creek for total Cr analysis. One sample was collected at the northern site boundary (SED-1), one at a mid-point location, downstream of outfalls that emanate from the former site buildings (SED-2), and one near the southern site boundary (SED-3). Samples were collected in accordance with ERT/REAC SOP # 2016, *Sediment Sampling*.

- At six separate locations, surficial soil samples were collected for an "expanded" analysis, which included TAL metals, TCL VOCs, and TCL SVOCs. The sample locations (marked with a green dot on Figure 2) included SSW-9, SSW-19, SSW-31, SSW-42, SSE-4, and SSE-5. An expanded analysis was not originally planned at sample location SSE-5. However, because strong odors were detected during sampling, additional soil mass was collected for the expanded analysis. Duplicate samples were additionally collected at SSW-9 for comparative analysis.

Surficial soil samples were obtained within the first 3- to 6-inches bgs, after vegetation and loose debris had been removed. In most instances, it was not necessary to go below 6-inches in depth, as originally anticipated. The sediment samples were obtained in calm water areas, where material had accumulated near the creek banks. Samples were collected using either dedicated plastic scoops or decontaminated stainless steel trowels. All samples were visually described in the field. Surficial materials across the site varied from native, reworked sand and gravel to artificial fill (i.e., topsoil). The material descriptions are provided in Table 1.

Hand augers were used for collection of subsurface soil samples. Attempts were made to reach the intended target depth at each location (approximately five-feet bgs); however, the high gravel content in the soils precluded reaching this depth at several locations. Once the final depths were reached, the subsurface soil samples were directly transferred from the auger bucket to the sample jars. The sample depths at the six locations were as follows: SSW-37 (2 feet), SSW-10 (4 feet), SSW-12 (2 feet), SSW-16 (5 feet), SSW-24 (5 feet), and SSE-6 (2 feet). The material descriptions for these samples are provided in Table 1.

Reinforced concrete floors were present at a number of locations where samples were taken. These locations included the main tannery building and maintenance shop footprints (i.e., structures no longer present, except for the former floors), the secondary tannery building, and the storage building (refer to Figure 2). To obtain soil samples beneath the concrete floors, a tire-mounted Bobcat™ utility vehicle with a jack-hammer attachment was used to break up and remove the concrete. The thickness of the concrete ranged from approximately 6- to 8-inches within the main tannery building footprint and was approximately 4-inches in the secondary tannery building (i.e., at location SSE-5).

Based on the intended analysis, samples were placed in appropriate sample jars as follows: total Cr and TAL metals (4-ounce glass); VOCs (4-ounce glass with septum lid); and SVOCs (8-ounce glass). All samples were subsequently shipped under chain-of-custody to the REAC Laboratory in Edison, New Jersey for analysis of total Cr, TAL metals, TCL VOCs, and TCL SVOCs. Samples for total Cr analysis were initially analyzed by X-Ray Fluorescence (XRF). Confirmation analysis for Cr was performed on approximately 10 percent of the XRF samples (i.e., XRF sample cups) by inductively coupled plasma (ICP) atomic emission spectroscopy .

Global positioning system (GPS) navigation was used to horizontally locate most of the sampling locations. Because building roofs were present, a survey tape was used to determine sample locations within the secondary tannery and storage buildings (i.e., SSE-3, SSE-5, SSE-7, SSE-9, and SSE-12). Others features were also surveyed during the sampling program by GPS navigation, which included the main tannery building footprint (i.e., outline of concrete floor), the maintenance shop footprint, the former sewage treatment plant, the secondary tannery building, the storage building, several small bridge crossings, and the outer east and west banks of Cayadutta Creek. The Site Investigation Map (Figure 2) illustrates all sampling locations and other site features that were surveyed during the sampling program. The survey coordinates for the sample locations are presented in Table 2.

3.0 RESULTS AND DISCUSSION

Chromium results from the XRF analysis of surficial soil and sediment samples are presented in Table 3. Total Cr concentrations, greater than 1,000 milligrams per kilogram (mg/Kg), were observed in surficial soils collected at locations SSW-10, SSW-25, SSW-28, and SSW-39. Chromium was not detected in any of the three sediment samples collected from Cayadutta Creek. Figure 3 shows the distribution of total Cr concentrations in surficial soil and sediment samples across the site.

Chromium was also detected in two of the six subsurface samples that were collected during the field sampling (refer to Table 3). At SSW-10, a soil sample from approximately four feet in depth had a Cr concentration of 690 mg/Kg, or about half the concentration that was detected in the surficial soil sample at this location. At SSW-37, a soil sample from approximately two feet in depth had a Cr concentration of 410 mg/Kg, which was slightly higher than the concentration detected in the surficial soil sample at this location.

Confirmation analysis for Cr was performed on ten XRF samples (i.e., the XRF sample cups) by ICP. A comparison of the XRF and ICP results is presented in Table 4. The data indicate that the XRF results for Cr are approximately two times the Cr results obtained by ICP analysis. When plotted on an x-y graph (Figure 4), the data show a linear trend with a very good correlation ($R^2 = 0.9759$, based on eight data points). Note that two of the ten XRF results were not included in the regression analysis, because the concentrations were listed as *not detected* (i.e., below the Method Detection Limit).

The total Cr concentrations that were determined by XRF analysis (refer to Figure 3) were mathematically adjusted using the linear equation presented in Figure 4. The adjusted Cr concentrations, along with the ICP confirmatory concentrations, are presented in Table 5. The concentrations may be interpreted as "acid extractable" Cr, based on the sample preparation procedure prior to ICP analysis. The data in Table 5 were plotted on the site map to illustrate the distribution of "acid extractable" Cr in surficial soil and sediment samples across the site (Figure 5). The map shows that the highest Cr concentrations were detected near the south end of the sewage treatment plant. It should be noted that the acid extractable Cr concentrations are probably higher than those that would leach out of the soils under normal environmental conditions.

The analytical results for TAL metals are presented in Table 6. Observed concentration ranges, in mg/Kg dry weight, for a number of detected metals are summarized below:

Metal	# of Samples	Range (mg/Kg)
Arsenic	(6)	2.1 - 95
Cadmium	(3)	1.1 - 19
Cobalt	(6)	2.4 - 21
Copper	(6)	6.9 - 470
Lead	(6)	11 - 350
Mercury	(5)	0.043 - 0.4
Nickel	(6)	3.6 - 79
Vanadium	(6)	10 - 180
Zinc	(6)	21 - 990

The highest metal concentrations were detected in the soil sample collected at location SSW-19.

The analytical results for VOCs are summarized in Table 7. A number of detections were observed in the soil sample from SSE-5, which was obtained immediately beneath the concrete floor of the secondary tannery building. Based on discussions with the WAM, this contamination may be originating from an off-site source to the east.

Additionally, two compounds (i.e., acetone and trichlorofluoromethane) were detected in the soil sample from SSW-19, which was obtained immediately beneath the concrete floor of the former main tannery building. While these compounds are known laboratory contaminants, the concentrations are probably real considering that these compounds were not detected in either soil blank or field blank samples. Acetone was detected in two out of three trip blanks; however, the concentrations were below the method detection limit (J-values). The average acetone concentration between the two trip blanks was 6.95 micrograms per kilogram (µg/Kg).

The analytical results for SVOCs are summarized in Table 8. A number of positive detections were observed in samples from three of the six locations that were sampled for SVOCs; namely, SSE-4, SSW-9, and SSW-19. A number of SVOCs were additionally detected in a surficial sample from SSW-31; however, all of the compounds were detected below the method detection limit (J-values) for this sampling location. SVOCs were not detected in samples from SSW-42 and SSE-5.

The laboratory analytical results (Final Analytical Reports) are provided in Appendix A.

4.0 SUMMARY AND CONCLUSIONS

- Past activities at the Independent Leather Site included leather tanning and related industrial processes. Leather tanning and finishing involves many processes, each of which utilizes particular chemicals and generates various liquid and solid waste streams. While Cr was the primary contaminant of concern, other metals and organic compounds were also detected in samples collected at the site.

- A total of 58 soil and sediment samples were analyzed for Cr by XRF. Confirmation analysis for Cr was performed on ten XRF samples (i.e., the XRF sample cups) by ICP.

- Regression analysis of Cr results indicated that QA2 data quality objectives were met ($R^2 > 0.970$). Chromium concentrations were mathematically adjusted using a linear regression equation obtained from XRF versus ICP confirmatory data.

- The "acid extractable" Cr concentrations, as presented in this report, are probably higher than what would actually leach out of site soils under normal environmental conditions.

- In addition to Cr, a number of other metals were detected in soil samples including arsenic, cadmium, cobalt, copper, lead, mercury, nickel, vanadium, and zinc. The highest metal concentrations were detected in the sample collected at location SSW-19 (within the main tannery building footprint).

- A number of VOCs were detected in a soil sample collected beneath the concrete floor at location SSE-5 (i.e., at the northeast corner of the secondary tannery building). Based on previous discussions with the WAM, contamination may be originating from an off-site source to the east. Additional sampling will be required to determine the full nature and extent of this contamination. Although some groundwater monitoring wells currently exist on site, additional wells may be required to fully assess the impact on the groundwater.

- Finally, a number of SVOCs were detected in surficial soils from three of six locations that were sampled and tested for these specific compounds.

REFERENCES

Lockheed Martin/REAC, 2001a. Site Sampling Plan, Independent Leather Site, Gloversville, New York. Work Assignment 0-222. October 2001.

Lockheed Martin/REAC, 2001b. Trip Report: Soil and Sediment Site Sampling, Independent Leather Site, Gloversville, New York. Work Assignment 0-222. November 2001.

TABLE 1
Soil and Sediment Descriptions
Independent Leather Site
January 2002

Sample No.	Description
SED-1	creek sediment: f/m sand & silt
SED-2	creek sediment: f/m/c sand; trace to little amounts of f gravel & silt
SED-3	creek sediment: f/m sand; little c sand
SSE-1	f/m sand; trace of gravel; reddish brown colored from weathered brick
SSE-2	tan f/m sand & silt; damp
SSE-3	tan f/m sand; little silt; damp
SSE-4	dark brown f sand & silt (top soil); damp
SSE-5	f sand & silt; stained black; wet; strong organic odor
SSE-6	dark brown silt & f sand
SSE-6 (2')	dark brown f/m sand & silt; trace of clay; trace of roots
SSE-7	f sand & silt; stained black
SSE-8	dark brown f sand, silt, and clay (top soil); some roots
SSE-9	damp sand & silt
SSE-10	dark brown f sand & silt (top soil)
SSE-11	dark brown f sand & silt (top soil); some roots
SSE-12	moist m/f sand & little f gravel
SSE-13	brown f/m sand; little silt; some roots; moist
SSE-14	dark brown f/m sand; some silt and decomposed building stone/cement; damp
SSE-15	dark brown f sand & silt with roots (top soil)
SSW-1	dark brown f sand & silt (top soil)
SSW-2	dark brown f sand & silt (top soil)
SSW-3	dark brown f sand & silt (top soil)
SSW-4	dark brown f sand & silt (top soil)
SSW-5	f sand & silt; some m/f gravel (construction fill)
SSW-6	dark brown f sand & silt; trace of clay
SSW-7	dark brown (stained?) m/f sand & f gravel
SSW-8	tan m/f sand
SSW-9	dark brown f sand & silt with roots
SSW-10	dark brown m/f sand; some silt; damp
SSW-10 (4')	dark brown m/f sand; some silt; some broken red brick and rubble; damp
SSW-11	brown m/f sand & f/m gravel; trace amounts of coal
SSW-12	brown f sand & silt
SSW-12 (2')	wet m/f tan sand with slight odor
SSW-13	dark brown m/f sand; some silt; some purple dye staining; wet
SSW-14	dark brown f sand & silt (top soil)
SSW-15	tan m/f sand
SSW-16	brown f/m sand & silt; some clay material; little red brick material; trace yellow staining
SSW-16 (5')	tan m/f sand
SSW-17	brown m/f sand
SSW-18	dark brown f sand & silt (top soil)
SSW-19	dark brown m/f sand; some f/m gravel and concrete rubble; little silt

TABLE 1 (cont.)
Soil and Sediment Descriptions
Independent Leather Site
January 2002

Sample No.	Description
SSW-20	brown m/f sand; some clay
SSW-21	tan m/f sand over dark brown f sand & silt
SSW-22	dark brown m/f sand; some f/m gravel
SSW-23	brown m/f sand; some silt
SSW-24	tan m/f sand; damp
SSW-24 (5')	tan m/f sand; damp
SSW-25	dark brown m/f sand; some f gravel, brick material, and weathered concrete
SSW-26	dark brown silt & f sand
SSW-27	dark brown f sand & silt (top soil)
SSW-28	dark brown f sand & silt (top soil)
SSW-29	dark brown f sand & silt (top soil)
SSW-30	dark brown f sand & silt (top soil)
SSW-31	dark brown f/m sand & silt; little f gravel; damp
SSW-32	dark brown f sand & silt (top soil)
SSW-33	dark brown f sand & silt (top soil)
SSW-37	dark brown f sand & silt
SSW-37 (2')	dark brown f sand & silt
SSW-38	dark brown f sand & silt; some m/f gravel; damp
SSW-39	dark brown f sand & silt; some m/f gravel; damp
SSW-40	dark brown f sand & silt; some m/f gravel; damp
SSW-41	dark brown f sand & silt; trace of m/f gravel and clay
SSW-42	dark brown f sand & silt; little m sand; damp
SSW-43	brown to tan m/f sand

SSW - surficial soil (west)
SSE - surficial soil (east)
SED - sediment

f = fine-grained
m = medium-grained
c = coarse-grained

Note: All samples are surficial soils (obtained 3- to 6-inches below ground surface) unless otherwise noted.

TABLE 2
Sample Survey Coordinates
Independent Leather Site
January 2002

Sample No.	Northing	Easting
SED-1	15634620.69903	1813378.61316
SED-2	15634230.50148	1813475.28587
SED-3	15634119.46388	1813604.22425
SSE-1	15634506.48646	1813412.19295
SSE-2	15634540.35939	1813507.19809
SSE-3	15634520.38409	1813448.82541
SSE-4	15634517.69523	1813544.71148
SSE-5	15634525.93646	1813500.47206
SSE-6	15634444.92191	1813427.49471
SSE-7	15634370.59981	1813483.39861
SSE-8	15634331.13901	1813473.20638
SSE-9	15634384.87411	1813532.82709
SSE-10	15634360.17373	1813587.96945
SSE-11	15634299.07228	1813589.71517
SSE-12	15634286.01579	1813507.66978
SSE-13	15634268.66107	1813472.25455
SSE-14	15634233.50314	1813535.11794
SSE-15	15634180.00986	1813576.89041
SSW-1	15634471.31087	1813266.87965
SSW-2	15634490.74457	1813329.99655
SSW-3	15634488.95949	1813368.37523
SSW-4	15634433.24867	1813238.45804
SSW-5	15634448.16046	1813328.12606
SSW-6	15634449.08551	1813378.80917
SSW-7	15634404.30124	1813380.82532
SSW-8	15634355.11360	1813404.50969
SSW-9	15634356.28121	1813430.76599
SSW-10	15634320.97662	1813432.22345
SSW-11	15634359.53435	1813362.29489
SSW-12	15634368.97256	1813294.49842
SSW-13	15634370.61815	1813270.61304
SSW-14	15634307.23782	1813279.64855
SSW-15	15634321.04457	1813353.74751
SSW-16	15634284.70811	1813401.75682
SSW-17	15634283.73563	1813307.05802
SSW-18	15634233.99745	1813299.61249
SSW-19	15634291.36276	1813372.17843
SSW-20	15634205.93131	1813334.01210
SSW-21	15634172.04673	1813320.45334
SSW-22	15634237.80905	1813434.41103

TABLE 2 (cont.)
Sample Survey Coordinates
Independent Leather Site
January 2002

Sample No.	Northing	Easting
SSW-23	15634295.09924	1813436.22285
SSW-24	15634163.74930	1813477.75418
SSW-25	15634132.63906	1813459.51516
SSW-26	15634135.65892	1813391.44929
SSW-27	15634140.66179	1813368.89116
SSW-28	15634092.00030	1813338.90476
SSW-29	15634029.58444	1813362.80127
SSW-30	15634058.47223	1813397.22874
SSW-31	15634110.08969	1813474.49527
SSW-32	15633974.31422	1813430.24443
SSW-33	15633950.75819	1813380.33845
SSW-37	15634407.03608	1813402.09734
SSW-38	15634042.97194	1813493.20790
SSW-39	15634036.86012	1813544.85890
SSW-40	15634040.85406	1813574.40387
SSW-41	15634104.36510	1813540.03577
SSW-42	15634111.18476	1813602.45989
SSW-43	15634197.59775	1813389.39897

Coordinates: Universal Transverse Mercator (UTM) 1983
Zone 18: New York State

TABLE 3
Total Chromium Concentrations: XRF Data
Independent Leather Site
January 2002

Sample No.	Concentration (mg/Kg)
SSW-1	U
SSW-2	240
SSW-3	190
SSW-4	330
SSW-5	210
SSW-6	330
SSW-7	U
SSW-8	U
SSW-9	NA
SSW-10	**1,300**
SSW-10 (4')	690
SSW-11	190
SSW-12	220
SSW-12 (2')	U
SSW-13	U
SSW-14	U
SSW-15	340
SSW-16	445
SSW-16 (5')	U
SSW-17	U
SSW-18	U
SSW-19	NA
SSW-20	255
SSW-21	U
SSW-22	U
SSW-23	U
SSW-24	U
SSW-24 (5')	U
SSW-25	**2,500**
SSW-26	U
SSW-27	U
SSW-28	**1,100**
SSW-29	630
SSW-30	710
SSW-31	NA
SSW-32	U
SSW-33	300
SSW-37	325
SSW-37 (2')	410
SSW-38	380
SSW-39	**2,000**
SSW-40	270
SSW-41	700
SSW-42	NA
SSW-43	180
SSE-1	U
SSE-2	U
SSE-3	U
SSE-4	NA
SSE-5	NA
SSE-6	U
SSE-6 (2')	U
SSE-7	U
SSE-8	440
SSE-9	U
SSE-10	U
SSE-11	U
SSE-12	U
SSE-13	300
SSE-14	520
SSE-15	835
SED-1	U
SED-2	U
SED-3	U

XRF: X-ray fluorescence
U: not detected. (Note: Method Detection Limit = 160 mg/Kg).
mg/Kg: milligrams per kilogram

NA: not analyzed by X-ray fluorescence

TABLE 4
Chromium Results: XRF vs. ICP Data
Independent Leather Site
January 2002

Sample No.	XRF Results (mg/Kg)	ICP Results (mg/Kg)
SSW-1	U	16
SSW-3	190	120
SSW-10	1,300	520
SSW-16	445	290
SSW-24	U	6.1
SSW-25	2,500	1,200
SSW-29	630	350
SSW-37	325	200
SSE-14	520	300
SSE-15	835	360

XRF: X-ray fluorescence
ICP: inductively coupled plasma methodology

mg/Kg: milligrams per kilogram
U: not detected. (Note: Method Detection Limit = 160 mg/kg).

TABLE 5
Chromium Concentrations: ICP and Adjusted Data*
Independent Leather Site
January 2002

Sample No.	Concentration (mg/Kg)
SSW-1	16
SSW-2	150
SSW-3	120
SSW-4	190
SSW-5	137
SSW-6	190
SSW-7	U
SSW-8	U
SSW-9	210
SSW-10	520
SSW-10 (4')	350
SSW-11	128
SSW-12	141
SSW-12 (2')	U
SSW-13	U
SSW-14	U
SSW-15	195
SSW-16	290
SSW-16 (5')	U
SSW-17	U
SSW-18	U
SSW-19	110
SSW-20	157
SSW-21	U
SSW-22	U
SSW-23	U
SSW-24	6.1
SSW-24 **(5')**	U
SSW-25	1,200
SSW-26	U
SSW-27	U
SSW-28	531
SSW-29	350

Sample No.	Concentration (mg/Kg)
SSW-30	359
SSW-31	1.400
SSW-32	U
SSW-33	177
SSW-37	200
SSW-37 (2')	226
SSW-38	212
SSW-39	930
SSW-40	163
SSW-41	354
SSW-42	36
SSW-43	124
SSE-1	U
SSE-2	U
SSE-3	U
SSE-4	26
SSE-5	8.8
SSE-6	U
SSE-6 (2')	U
SSE-7	U
SSE-8	239
SSE-9	U
SSE-10	U
SSE-11	U
SSE-12	U
SSE-13	177
SSE-14	300
SSE-15	360
SED-1	U
SED-2	U
SED-3	U

* Concentration data for samples that are not bolded or highlighted are "adjusted values", based on the observed relationship between the XRF and ICP data (refer to Figure 4).

ICP: inductively coupled plasma
U: not detected by XRF. (Note: Method Detection Limit = 160 mg/Kg).
mg/Kg: milligrams per kilogram

~ Sample numbers in bold type were analyzed for Cr by ICP as part of the TAL metals analysis.
~ Sample numbers in shaded, bold type were analyzed for Cr by ICP for confirmation analysis of the XRF results.

TABLE 6
Analytical Results: Target Analyte List (TAL) Metals
Independent Leather Site
January 2002

Parameter	Sample No.						
	SSE-4	SSE-5	SSW-9	SSW-9 dup	SSW-19	SSW-31	SSW-42
Aluminum	3,400	2,900	3,700	4,000	6,900	4,900	4,300
Antimony	U	U	U	U	U	U	U
Arsenic	42	2.1	63	95	12	39	2.5
Barium	27	13	66	63	150	53	30
Beryllium	U	U	U	U	1.1	U	U
Cadmium	U	U	2.8	2.9	19	1.1	U
Calcium	72,000	37,000	9,800	11,000	48,000	16,000	17,000
Chromium	26	8.8	220	200	110	1,400	36
Cobalt	4.3	2.4	6.1	4.9	21	5.2	3.5
Copper	25	6.9	55	50	470	74	12
Iron	10,000	7,000	29,000	15,000	34,000	10,000	8,600
Lead	36	11	240	210	350	110	41
Magnesium	3,800	3,200	1,500	1,700	3,600	6,500	2,000
Manganese	220	80	220	170	270	78	140
Mercury	0.055	U	0.18	0.24	0.4	0.33	0.043
Nickel	12	3.6	78	70	79	20	11
Potassium	800	350	670	570	760	380	580
Selenium	U	U	U	U	U	U	U
Silver	U	U	U	U	U	U	U
Sodium	220	1,400	64	U	540	120	90
Thallium	U	U	U	U	U	U	U
Vanadium	25	10	170	160	180	140	33
Zinc	45	21	890	860	990	240	58

Concentrations given in milligrams per kilogram (mg/Kg) dry weight.
U: not detected
dup: duplicate sample

TABLE 8
Analytical Results: Semi-Volatile Organic Compounds
Independent Leather Site
January 2002

Compound	Sample No.				
	SSE-4	SSW-9	SSW-9 dup	SSW-19	SSW-31
4-Methylphenol	U	U	U	U	570 J
2,4-Dimethylphenol	U	U	U	U	990 J
Naphthalene	U	U	U	1,500 J	520 J
2-Methylnaphthalene	U	U	U	3,000	U
2,4,6-Trichlorophenol	U	U	U	U	570 J
2,4,5-Trichlorophenol	U	U	U	U	540 J
Acenaphthylene	1,100 J	U	U	1,100 J	U
Dibenzofuran	U	U	U	1,100 J	U
Phenanthrene	2,500	U	2,200 J	8,400	U
Anthracene	1,000 J	U	U	1,500 J	U
Carbazole	520 J	U	U	U	U
Fluoranthene	7,800	4,600	5,000	13,000	U
Pyrene	7,800	4,100	4,400	11,000	U
Benzo(a)anthracene	3,500	2,000 J	2,300 J	7,600	U
Chrysene	4,500	2,700	3,300	8,200	U
Bis(2-Ethylhexyl)phthalate	U	U	U	560 J	U
Benzo(b)fluoranthene	5,200	2,500 J	3,200	8,300	U
Benzo(k)fluoranthene	5,000	2,500 J	2,800	8,200	U
Benzo(a)pyrene	4,200	2,200 J	2,500 J	8,300	U
Indeno(1,2,3-cd)pyrene	2,500	1,200 J	1,400 J	4,400	U
Benzo(g,h,i)perylene	2,500	1,200 J	1,400 J	4,500	U

Concentrations given in micrograms per kilogram (µg/Kg) dry weight.
U: not detected
dup: duplicate sample

J = concentration quantified below Method Detection Limit.

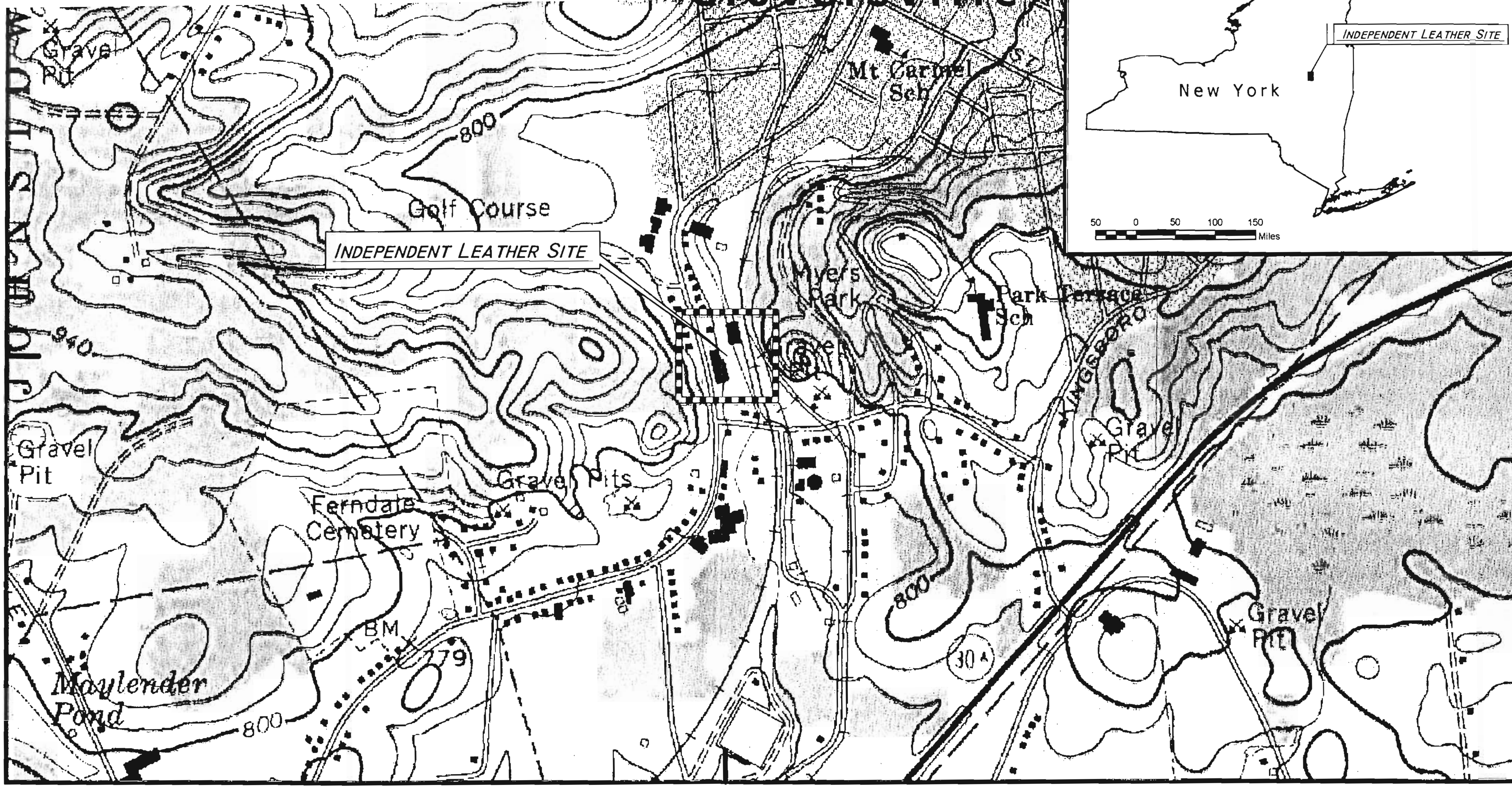
TABLE 7
Analytical Results: Volatile Organic Compounds
Independent Leather Site
January 2002

Compound	Sample No.	
	SSE-5	SSW-19
Acetone	47 J	25
Trichlorofluoromethane	U	1.5
Ethylbenzene	37	U
p&m-Xylene	290	U
o-Xylene	150	U
Isopropylbenzene	6.6	U
n-Propylbenzene	29	U
1,3,5-Trimethylbenzene	56	U
1,2,4-Trimethylbenzene	300	U
sec-Butylbenzene	120	U
p-Isopropyltoluene	210	U

Concentrations given in micrograms per kilogram (µg/Kg) dry weight.
U: not detected

J = concentration quantified below Method Detection Limit.

LATITUDE 43.04 W



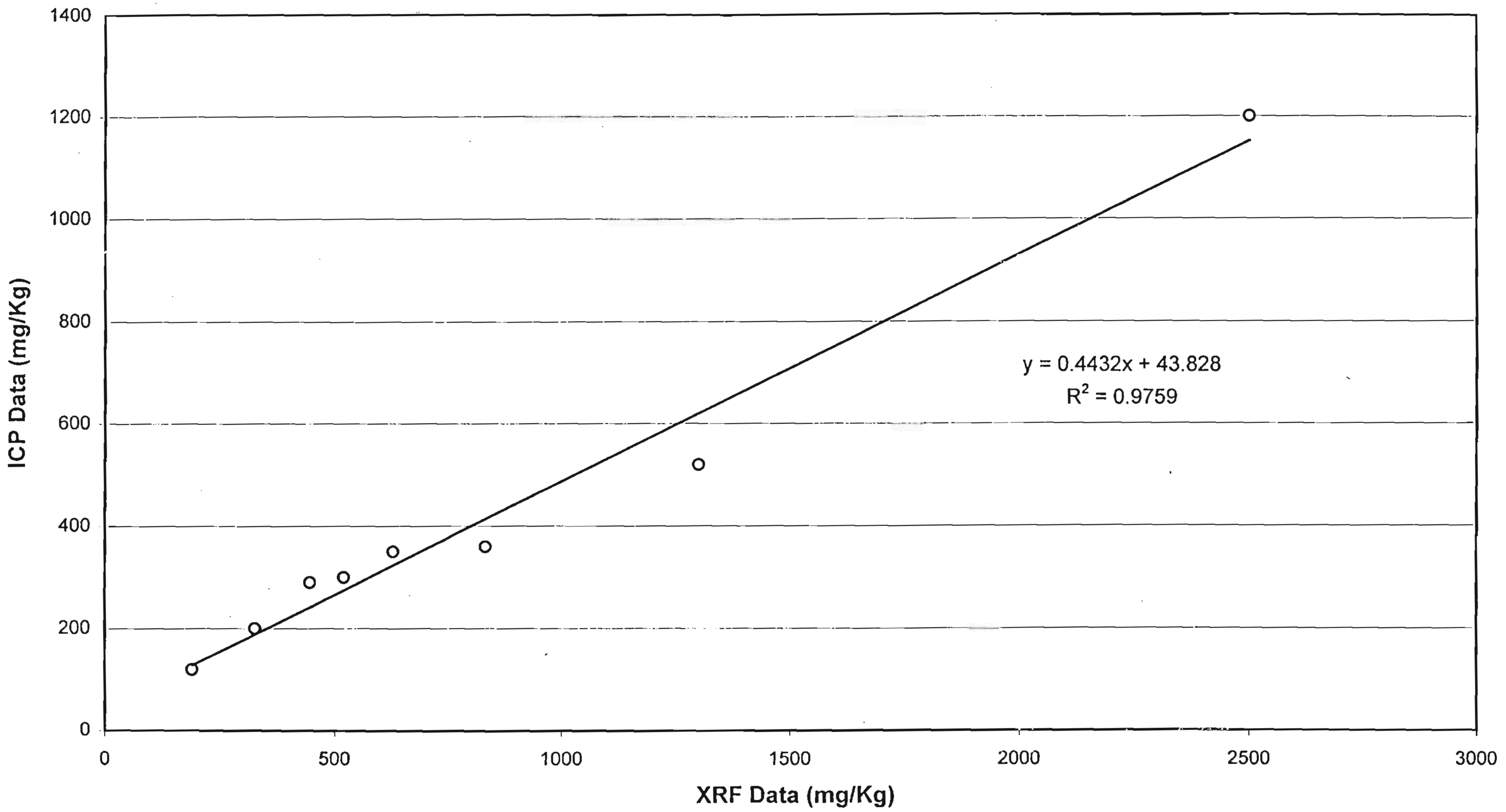
LONGITUDE 74.35 W

BASEMAP DATA ACQUIRED FROM USGS DRG
STATE MAP CREATED FROM TIGER CENSUS 2000 DATA
PROJECTION : UTM ZONE 18N
DATUM : WGS 84

U.S. EPA Emergency Response Team Center
Response Engineering and Analytical Contract
68-C99-223
W.A. # R1A00222

Figure 1
Site Location Map
Independent Leather Sit
Gloversville, New York
January 2002

DATA: G:\ARCVIEWPROJECTS\222
.MXD FILE: G:\ARCINFOPROJECTS\REAC3\R1A00222_IND_LEATHER



U.S. EPA ENVIRONMENTAL RESPONSE TEAM CENTER
RESPONSE ENGINEERING AND ANALYTICAL CONTRACT
68-C99-223
W.O. # R1A00222

FIGURE 4
CHROMIUM RESULTS: XRF vs. ICP DATA
INDEPENDENT LEATHER SITE
JANUARY 2002

APPENDIX A
Final Analytical Reports
Independent Leather Site
January 2002

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LOCKHEED MARTIN

DATE: 4 January 2002

TO: R. Singhvi EPA/ERTC

FROM: D. Miller Analytical Section Leader D Miller

SUBJECT: DOCUMENT TRANSMITTAL UNDER WORK ASSIGNMENT # 0-222

Attached please find the following document prepared under this work assignment:

Independent Leather Site - Analytical Report

Central File WA # 0-222	(w/attachment)
J. Camacho	Work Assignment Manager (w/attachment)
D. Aloysius	Task Leader (w/attachment)
J. Soroka	Data Validation and Report Writing Group Leader (w/o attachment)

0222\DEL\AR\0102\REPORT

ANALYTICAL REPORT

Prepared by
LOCKHEED MARTIN, Inc.

Independent Leather Site
Gloversville, NY

January 2002

EPA Work Assignment No. 0-222
LOCKHEED MARTIN Work Order R1A00222
EPA Contract No. 68-C99-223

Submitted to
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EPA-ERTC

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Analysis by:
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D. Miller Date
Analytical Section Leader

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1/10/02
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0222\DEL\AR\0102\REPORT

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Introduction

REAC in response to WA 0-222, provided analytical support for environmental samples collected from the Independent Leather Site, located in Gloversville, NY as described in the following table. The support also included QA/QC, data review, and preparation of an analytical report containing a summary of the analytical methods, the results, and the QA/QC results.

The samples were treated with procedures consistent with those specified in SOP #1008.

COC #	Number of Samples	Sampling Date	Date Received	Matrix	Analysis	Laboratory	Data Package
01098	5	10/23/01	10/25/01	Soil	Chromium	REAC	K 397
01098	2	10/25/01	10/25/01	Soil	Chromium	REAC	K 397
01098	3	10/26/01	10/25/01	Soil	Chromium	REAC	K 397
04702	2	10/23/01	10/25/01	Soil	VOC	REAC	K 411
04702	1	10/23/01	10/25/01	Soil	BNA	REAC	K 372
04704	16*	10/24/01	10/25/01	Soil	Chromium by XRF	REAC	K 397
04704	2	10/24/01	10/25/01	Soil	TAL Metals	REAC	K 386
04705	3	10/24/01	10/26/01	Soil	VOC	REAC	K 411
04705	2	10/24/01	10/26/01	Soil	BNA	REAC	K 372
04707	3*	10/25/01	10/26/01	Soil	Chromium by XRF	REAC	K 397
04707	4	10/25/01	10/26/01	Soil	TAL Metals	REAC	K 386
04708	6	10/25/01	10/26/01	Soil	VOC	REAC	K 411
04708	4	10/25/01	10/26/01	Soil	BNA	REAC	K 372
04709	13*	10/26/01	10/29/01	Soil	Chromium by XRF	REAC	K 397
04743	18*	10/23/01	10/26/01	Soil	Chromium by XRF	REAC	K 397
04743	1	10/23/01	10/25/01	Soil	TAL Metals	REAC	K 386
04776	12*	10/23/01	10/25/01	Soil	Chromium by XRF	REAC	K 397

The samples for chromium on chains of custody 04704, 04707, 04743 and 04776 were initially analyzed by X-Ray Fluorescence Spectroscopy (XRF) and the results were reported separately. Ten percent of the samples were then analyzed by ICAP to confirm the XRF result and were re-chained to chain of custody 01098. The confirmatory results are reported in this report. Results are reported "as received" because there was insufficient samples to perform a moisture analysis.

Case Narrative

The data in this report have been validated to two significant figures. Any other representation of the data is the responsibility of the user.

VOC in Soil Package K 411

The trip blank, 03659, contained 6.7 µg/kg acetone. The concentration of acetone in sample 03658 should be regarded as not detected.

The trip blank, 03666, contained 7.2 µg/kg acetone. The concentration of acetone in sample 03662 should be regarded as not detected.

The acceptable QC limits for the relative standard deviation of vinyl chloride were exceeded (63%) in the initial calibration of 10/16/01. The concentration of vinyl chloride should be regarded as estimated in SBLK 102601 and samples 03658, 03659, 03661, 03662, 03665, 03666, 03667, 03668, 03670, 03671 and 03672.

The acceptable QC limits for the percent difference of methyl t-butyl ether were exceeded (30%) in the continuing calibration check standard of 10/26/01. The data are not affected as this analyte was not detected in the associated samples.

The acceptable QC limits for the percent difference of 4-methyl-2-pentanone (40%) and 2-hexanone (40%) were exceeded in the continuing calibration check standard of 10/31/01. The data are not affected as these analytes were not detected in the associated samples.

The acceptable QC limits for the percent recovery of one or more surrogates were exceeded for sample 03662. The VOC data for sample 03662 should be regarded as estimated.

The acceptable QC limits for the internal standard areas were exceeded for sample 03671 MSD. The data are not affected.

BNA in Soil Package K 372

On chain of custody 04708, sample 03675 was erroneously listed as a sample when it was intended to be an additional aliquot of material for sample 03673 for the MS/MSD determination.

The acceptable QC limits for the percent difference of hexachlorocyclopentadiene were exceeded (67%) in the continuing calibration check standard of 10/30/01. The non-detected values for hexachlorocyclopentadiene in SBLK 102501, SBLK 102901 and samples 03660, 03663, 03664, 04426, 04427, 03673 and 03674 should be regarded as estimated.

The acceptable QC limits for the percent recovery of one surrogate was exceeded for sample 03664. The data are not affected.

Metals in Soil Package K 386

The acceptable QC limits were exceeded for the percent recovery for antimony, chromium, calcium , manganese, nickel and vanadium in the matrix spike/matrix spike duplicate analysis of sample 04428 as documented in the following table

	04428 MS	04428 MSD
Antimony	56	52
Chromium	Acceptable	224
Calcium	68	Acceptable
Manganese	56	0
Nickel	73	Acceptable
Vanadium	73	Acceptable

The concentrations of chromium, calcium, manganese, nickel and vanadium in samples 04644, 04411, 04412, 04428, 04429, 04434 and 04435 should be regarded as estimated.

The non-detected values for antimony in these samples are not affected.

Chromium in Soil Package K 397

The data were examined and were found to be acceptable.

Summary of Abbreviations

AA	Atomic Absorption						
B	The analyte was found in the blank						
BFB	Bromofluorobenzene						
C	Centigrade						
D	(Surrogate Table) this value is from a diluted sample and was not calculated (Result Table) this result was obtained from a diluted sample						
Dioxin	denotes Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans and/or PCDD and PCDF						
CLP	Contract Laboratory Protocol						
COC	Chain of Custody						
CONC	Concentration						
CRDL	Contract Required Detection Limit						
CRQL	Contract Required Quantitation Limit						
DFTPP	Decafluorotriphenylphosphine						
DL	Detection Limit						
E	The value is greater than the highest linear standard and is estimated						
EMPC	Estimated maximum possible concentration						
ICAP	Inductively Coupled Argon Plasma						
ISTD	Internal Standard						
J	The value is below the method detection limit and is estimated						
LCS	Laboratory Control Sample						
LCSD	Laboratory Control Sample Duplicate						
MDL	Method Detection Limit						
MI	Matrix Interference						
MS	Matrix Spike						
MSD	Matrix Spike Duplicate						
MW	Molecular Weight						
NA	either Not Applicable or Not Available						
NC	Not Calculated						
NR	Not Requested						
NS	Not Spiked						
% D	Percent Difference						
% REC	Percent Recovery						
PQL	Practical Quantitation Limit						
PPBV	Parts per billion by volume						
PPBA	Parts per billion in Air						
QL	Quantitation Limit						
RPD	Relative Percent Difference						
RSD	Relative Standard Deviation						
SIM	Selected Ion Mode						
TCLP	Toxic Characteristics Leaching Procedure						
U	Denotes not detected						
W	Weathered sample; the results should be regarded as estimated						
m^3	cubic meter	kg	kilogram	μg	microgram		
L	liter	g	gram	pg	picogram		
mL	milliliter	mg	milligram				
μL	microliter						
*	denotes a value that exceeds the acceptable QC limit						
	Abbreviations that are specific to a particular table are explained in footnotes on that table						

Revision 10/16/97

Analytical Procedure for VOC in Soil

A modified 524.2 method was used for the analysis of Volatile Organic Compounds in soil. Samples were purged, trapped, and desorbed to a GC/MS system. Prior to purging, the samples were spiked with a three component surrogate mixture consisting of toluene-d_8, 4-bromofluorobenzene and 1,2-dichloroethane-d_4 and a three component internal standard mixture consisting of bromochloromethane, 1,4-difluorobenzene, and chlorobenzene-d_5. The following conditions and parameters were utilized:

The purge and trap unit consisted of: A Tekmar concentrator (3000 series) equipped with an Archon autosampler (Dynateck Corp.) and a VOCARB 3000 trap (Supelco).
The purge and trap instrument conditions were:

Purge	10 min at 35° C
Dry Purge	2 min at 35° C
Desorb Preheat	245° C
Desorb	4 min at 250° C
Purge Flow Rate	40 mL/min
Bake	10 min at 260° C

A Hewlett Packard 5973 GC/MSD equipped with an HP Chem Station data system was used to analyze the data.

The instrument conditions were:

Column:	30 meter x 0.25 mm ID, RTx-Volatiles (Restek Corp.) column with 3.0 µm film thickness.
Temperature:	4 min at 40° C 9° C/min to 165° C, hold for 2 min. 12° C/min to 220° C, hold for 7 min.
Flow Rate	Helium at 1.0 mL/min.
GC/MS Interface	Capillary direct with 1 mL/min helium carrier gas at 250° C.
Mass Spectrometer:	Electron Impact Ionization at a nominal electron energy of 70 electron volts, scanning from 35-300 amu at one scan/sec.

Computer: Preprogrammed to plot Extracted Ion Current Profile (EICP); capable of integrating ions and plotting abundances vs time or scan number. A library search (NBS-Wiley) for tentatively identified compounds was performed on samples.

The GC/MS system was calibrated using 6 VOC standards at 5, 20, 50, 100, 150, and 200 µg/L. (Exception was acetone, calibrated using 5 VOC standards-20, 50, 100, 150 and 200 µg/L) Before analysis each day, the system was tuned with 50-ng BFB and passed a continuing calibration check when analyzing a 50 µg/L standard mixture in which the responses were evaluated by comparison to the average responses of the calibration curve.

The results are in Table 1.1; the tentatively identified compounds are listed in Table 1.2.

The concentrations of the analytes analyzed by the low level method of 5.0 g soil in 5.0 mL of water were calculated using the following equation:

$$C_u = \frac{A_x \times I_{is}}{A_{is} \times RF \text{ (or } RF_{ave}) \times D}$$

where:
C_u = Concentration of target analyte (µg/kg) on a dry weight basis if D is used
A_x = Area of the target analyte
I_{is} = Concentration of specific internal standard in the volume purged (ug/L)
A_{is} = Area of the specific internal standard
RF = Response Factor
RF_{ave} = average Response Factor
D = Decimal percent solids

The concentrations of the analytes analyzed by the medium level method of extracting 5.0 g soil with 5 mL methanol and diluting an aliquot with 5.0 mL prior to analysis, were calculated using the following equation:

$$C_u = \frac{A_x \times I_{is} \times 5.0 \text{ (Nominal Method Mass)}}{A_{is} \times RF \text{ (or } RF_{ave}) \times W_s \times D}$$

where:
C_u = Concentration of target analyte (µg/kg) on a dry weight basis if D is used
A_x = Area of the target analyte
I_{is} = Concentration of specific internal standard in the volume purged (ug/L)
A_{is} = Area of the specific internal standard
RF = Response Factor
RF_{ave} = average Response Factor
W_s = Mass of sample (g) purged
D = Decimal percent solids

The average Response Factor is used when a sample is associated with an initial calibration curve. The Response Factor is used when a sample is associated with a continuing calibration curve. Response Factor calculation:

The response factor (RF) for each specific analyte quantitated is based on the area response from the continuing calibration check as follows:

$$RF = \frac{A_c \times I_{is}'}{A_{is}' \times I_c}$$

where,

RF = Response factor for a specific analyte
A_c = Area of the analyte in the standard
I_{is}' = Concentration of the specific internal standard
A_{is}' = Area of the specific internal standard
I_c = Concentration of the analyte in the standard

$$RF_{ave} = \frac{RF_1 + \ldots + RF_n}{n}$$ and n = number of Standards

Revision of 06/25/01

Analytical Procedure for BNA in Soil

Extraction Procedure

Prior to extraction each sample was spiked with a six component surrogate mixture consisting of nitrobenzene-d_5, 2-fluorobiphenyl, terphenyl-d_{14}, phenol-d_5, 2-fluorophenol, and 2,4,6-tribromophenol. Thirty grams of sample was mixed with 30 g anhydrous sodium sulfate, and Soxhlet extracted for 16 hours with 300 mL of methylene chloride. The extract was concentrated to 1.0 mL, an internal standard mixture consisting of 1,4-dichlorobenzene-d_4, naphthalene-d_8, acenaphthene-d_{10}, phenanthrene-d_{10}, chrysene-d_{12}, and perylene-d_{12} was added, and analyzed.

Analysis Procedure

An HP 6890/5972 Gas Chromatograph/Mass Spectrometer (GC/MS), equipped with a 6890 autosampler and controlled by a PC computer equipped with Enviroquant software was used to analyze the samples.

The instrument conditions were:

Column:	Restek Rtx-5 (crossbonded SE-54) 30 meter x 0.25 mm ID, 0.50 µm film thickness
Injection Temperature:	280°C
Transfer Temperature:	280°C
Source Temperature and Analyzer Temperature:	Controlled by thermal transfer of heat from transfer line
Temperature Program:	50°C for 5 minutes 20°C/min to 295°C; hold for 8.5 minutes 25°C/min to 310°C; hold for 8 minutes
Pulsed Split Injection:	Split time = 2.0 min @ 8:1 split ratio Pressure Pulse = 16 psi for 0.5 minute, then normal
Injection Volume:	1 µL Must use 4 mm ID single gooseneck liners packed with 10 mm plug of silanized and conditioned glass wool.

The GC/MS system was calibrated using 5 BNA standard mixtures at 20, 50, 80, 120, and 160 µg/mL. Before each analysis day, the system was tuned with 50 ng decafluorotriphenylphosphine (DFTPP) and passed a continuing calibration check when analyzing a 50 µg/mL standard mixture in which the responses were evaluated by comparison to the average response of the calibration curve.

The BNA results, based on dry weight, are listed in Table 1.3; the tentatively identified compounds are listed in Table 1.4. The concentration of the detected compounds was calculated using the following equation:

$$C_u = \frac{(A_u)(I_{is})(V_t)(DF)}{(A_{is})(RF\ or\ RF_{ave})(V_i)(W)(D)}$$

where;

C_u = Concentration of target analyte (µg/Kg)
A_u = Area of target analyte
I_{is} = Mass of specific internal standard (ng)
V_t = Volume of extract (µL)
DF = Dilution Factor
A_{is} = Area of specific internal standard
RF = Response Factor (unitless)
RF_{ave} = Average Response Factor
V_i = Volume of extract injected (µL)
W = Weight of sample (g)
D = Decimal per cent solids

The RF_{ave} is used when a sample is associated with an initial calibration curve. The RF is used when a sample is associated with a continuing calibration.

Response Factor calculation:

The RF for each specific analyte is quantitated based on the area response from the continuing calibration check as follows:

$$RF = \frac{(A_C)(I_{IS})}{(A_{IS})(I_C)}$$

where;

RF = Response factor for a specific analyte
A_c = Area of the analyte in the standard
I_{is} = Mass of the specific internal standard
A_{is} = Area of the specific internal standard
I_c = Mass of the analyte in the standard

$$RF_{AVE} = \frac{RF_1 + \ldots + RF_n}{n}$$

and

n = number of Samples

Revision of 3/9/00

Analytical Procedure for Metals in Soil

Sample Preparation

A representative 1-2 g (wet weight) sample, weighed to 0.01 g accuracy, was mixed with 10-mL 1:1 nitric acid, placed in a 50-mL polypropylene digestion cup and digested in nitric acid and hydrogen peroxide according to SW-846, Method 3050 B on a Hot Block digestion system. The final reflux was either nitric acid or hydrochloric acid depending on the metals to be determined. After digestion, the samples were allowed to cool to room temperature, transferred to 100 mL volumetric flasks and diluted to volume with ASTM Type II water. The samples were analyzed for all metals, except mercury, by USEPA SW-846, Method 7000 (Atomic absorption) or Method 6010 (Inductively Coupled Argon Plasma-ICAP) procedures.

A representative 0.25-0.8 g (wet weight) sample was transferred to a 300-mL BOD bottle and prepared according to SW-846, Method 7471. The sample was heated for 1/2 hour on a hot plate at 95° C, cooled to room temperature, and reduced with hydroxylamine hydrochloride ($NH_2OH{:}HCl$). Mercury was then analyzed separately on a Leeman Labs PS200II AA Spectrometer.

A separate sample was used to determine total solids.

A reagent blank and a blank spike sample were carried through the sample preparation procedure for each batch of samples processed. One matrix spike (MS) and one matrix spike duplicate (MSD) were analyzed for each batch or for every ten samples.

Analysis and Calculations

The AA, ICAP and Leeman Labs PS200II instruments were calibrated and operated according to SW-846, Method 7000/7471/6010 and the manufacturers operating instructions. After calibration, initial calibration verification (ICV), initial calibration blank (ICB) and quality control check standards were run to verify proper calibration. The continuing calibration verification (CCV) and continuing calibration blank (CCB) were run after every ten samples to assure proper operation during sample analysis.

The metal concentration in solution , in micrograms per liter (µg/L) was taken from the read-out system of the Atomic Absorption instrument. The results were converted to milligrams per kilogram (mg/kg) by correcting the reading for the sample weight and percent solids. The ICAP results (mg/kg) were corrected for sample weight prior to instrument read-out; the instrument read-out was then corrected for percent solids.
Final concentrations, based on wet weight are given by:

$$\text{mg metal/kg sample} = [(A \times V)/W] \times DF \times CF$$

where:

A = Instrument read-out (µg/L, AA; mg/kg, ICAP)
V = final volume of processed sample (mL, AA; 1.00 ICAP)
W = weight of sample (g, AA; 1.00 ICAP)
DF = Dilution Factor (1.00 for no dilution)
CF = conversion factor (0.001, AA; 1.00, ICAP)

For samples that required dilution to be within the instrument calibration range, DF is given by:

$$DF = (C+B)/C$$

where:

B = acid blank matrix used for dilution (mL)
C = sample blank aliquot (mL)

Final concentrations, based on dry weight, are given by:

$$mg/kg(dry) = [mg/kg\ (wet) \times 100] / S$$

where

S = percent solids

The results for the TAL metals are listed in Table 1.5.
The results for chromium are listed in Table 1.6.

Revision date: 8/17/2000

Table 1.1 Results of the Analysis for VOC in Soil
WA # 0-222 Independent Leather Site

Sample # :	Soil blank102601		03659		03666		03661		03662	
Location :			Trip blank		Trip blank		SSE-4		SSE-5	
Dil. Fact. :	1		1		1		1		5	
% Solid :	100		100		100		85		84	
Analyte	Conc. µg/Kg	MDL µg/Kg	Conc. µg/Kg	MDL µg/Kg	Conc. µg/Kg	MDL µg/Kg	Conc. µg/Kg	MDL µg/Kg	Conc. µg/Kg	MDL µg/Kg
Dichlorodifluoromethane	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
Chloromethane	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
Vinyl Chloride	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
Bromomethane	U	2.0	U	2.0	U	2.0	U	2.4	U	12
Chloroethane	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
Trichlorofluoromethane	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
Acetone	U	8.0	6.7 J	8.1	7.2 J	8.1	U	9.4	47 J	48
1,1-Dichloroethene	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
Methylene Chloride	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
Carbon Disulfide	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
Methyl-t-butyl Ether	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
trans-1,2-Dichloroethene	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
1,1-Dichloroethane	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
2-Butanone	U	4.0	U	4.0	U	4.0	U	4.7	U	24
2,2-Dichloropropane	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
cis-1,2-Dichloroethene	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
Chloroform	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
1,1-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
1,2-Dichloroethane	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
1,1,1-Trichloroethane	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
Carbon Tetrachloride	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
Benzene	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
Trichloroethene	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
1,2-Dichloropropane	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
Bromodichloromethane	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
Dibromomethane	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
cis-1,3-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
trans-1,3-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
1,1,2-Trichloroethane	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
1,3-Dichloropropane	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
Dibromochloromethane	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
1,2-Dibromoethane	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
Bromoform	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
4-Methyl-2-Pentanone	U	2.0	U	2.0	U	2.0	U	2.4	U	12
Toluene	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
2-Hexanone	U	2.0	U	2.0	U	2.0	U	2.4	U	12
Tetrachloroethene	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
Chlorobenzene	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
1,1,1,2-Tetrachloroethane	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
Ethylbenzene	U	1.0	U	1.0	U	1.0	U	1.2	37	6.0
p&m-Xylene	U	1.0	U	1.0	U	1.0	U	1.2	290	6.0
o-Xylene	U	1.0	U	1.0	U	1.0	U	1.2	150	6.0
Styrene	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
Isopropylbenzene	U	1.0	U	1.0	U	1.0	U	1.2	6.6	6.0
1,1,2,2-Tetrachloroethane	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
1,2,3-Trichloropropane	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
n-Propylbenzene	U	1.0	U	1.0	U	1.0	U	1.2	29	6.0
Bromobenzene	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
1,3,5-Trimethylbenzene	U	1.0	U	1.0	U	1.0	U	1.2	56	6.0
2-Chlorotoluene	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
4-Chlorotoluene	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
tert-Butylbenzene	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
1,2,4-Trimethylbenzene	U	1.0	U	1.0	U	1.0	U	1.2	300	6.0
sec-Butylbenzene	U	1.0	U	1.0	U	1.0	U	1.2	120	6.0
p-Isopropyltoluene	U	1.0	U	1.0	U	1.0	U	1.2	210	6.0
1,3-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
1,4-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
n-Butylbenzene	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
1,2-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
1,2-Dibromo-3-chloropropane	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
1,2,4-Trichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
Hexachlorobutadiene	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
Naphthalene	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0
1,2,3-Trichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.2	U	6.0

Table 1.1 (cont.) Results of the Analysis for VOC in Soil
WA # 0-222 Independent Leather Site

Sample # :	Soil blank102601		03665		03672		03667		03668	
Location :			Field blank		Trip blank		SSW-9		SSW-9 dup.	
Dil. Fact. :	1		1		1		1		1	
% Solid :	100		100		100		67		67	
Analyte	Conc. µg/Kg	MDL µg/Kg	Conc. µg/Kg	MDL µg/Kg	Conc. µg/Kg	MDL µg/Kg	Conc. µg/Kg	MDL µg/Kg	Conc. µg/Kg	MDL µg/Kg
Dichlorodifluoromethane	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
Chloromethane	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
Vinyl Chloride	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
Bromomethane	U	2.0	U	2.0	U	2.0	U	3.0	U	3.0
Chloroethane	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
Trichlorofluoromethane	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
Acetone	U	8.0	U	8.1	U	8.1	U	12	U	12
1,1-Dichloroethene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
Methylene Chloride	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
Carbon Disulfide	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
Methyl-t-butyl Ether	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
trans-1,2-Dichloroethene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
1,1-Dichloroethane	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
2-Butanone	U	4.0	U	4.0	U	4.0	U	6.0	U	6.0
2,2-Dichloropropane	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
cis-1,2-Dichloroethene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
Chloroform	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
1,1-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
1,2-Dichloroethane	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
1,1,1-Trichloroethane	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
Carbon Tetrachloride	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
Benzene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
Trichloroethene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
1,2-Dichloropropane	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
Bromodichloromethane	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
Dibromomethane	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
cis-1,3-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
trans-1,3-Dichloropropene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
1,1,2-Trichloroethane	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
1,3-Dichloropropane	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
Dibromochloromethane	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
1,2-Dibromoethane	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
Bromoform	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
4-Methyl-2-Pentanone	U	2.0	U	2.0	U	2.0	U	3.0	U	3.0
Toluene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
2-Hexanone	U	2.0	U	2.0	U	2.0	U	3.0	U	3.0
Tetrachloroethene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
Chlorobenzene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
1,1,1,2-Tetrachloroethane	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
Ethylbenzene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
p&m-Xylene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
o-Xylene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
Styrene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
Isopropylbenzene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
1,1,2,2-Tetrachloroethane	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
1,2,3-Trichloropropane	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
n-Propylbenzene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
Bromobenzene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
1,3,5-Trimethylbenzene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
2-Chlorotoluene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
4-Chlorotoluene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
tert-Butylbenzene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
1,2,4-Trimethylbenzene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
sec-Butylbenzene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
p-Isopropyltoluene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
1,3-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
1,4-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
n-Butylbenzene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
1,2-Dichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
1,2-Dibromo-3-chloropropane	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
1,2,4-Trichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
Hexachlorobutadiene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
Naphthalene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5
1,2,3-Trichlorobenzene	U	1.0	U	1.0	U	1.0	U	1.5	U	1.5

Table 1.1 (cont.) Results of the Analysis for VOC in Soil
WA # 0-222 Independent Leather Site

Sample # :	Soil blank102601		03670		03671		Soil blank 103101		03658	
Location :			SSW-31		SSW-42				SSW-19	
Dil. Fact. :	1		1		1		1		1	
% Solid :	100		82		79		100		79	
Analyte	Conc. µg/Kg	MDL µg/Kg	Conc. µg/Kg	MDL µg/Kg	Conc. µg/Kg	MDL µg/Kg	Conc. µg/Kg	MDL µg/Kg	Conc. µg/Kg	MDL µg/Kg
Dichlorodifluoromethane	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
Chloromethane	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
Vinyl Chloride	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
Bromomethane	U	2.0	U	2.4	U	2.5	U	2.0	U	2.5
Chloroethane	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
Trichlorofluoromethane	U	1.0	U	1.2	U	1.3	U	1.0	1.5	1.3
Acetone	U	8.0	U	9.8	U	10	U	8.0	25	10
1,1-Dichloroethene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
Methylene Chloride	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
Carbon Disulfide	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
Methyl-t-butyl Ether	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
trans-1,2-Dichloroethene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
1,1-Dichloroethane	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
2-Butanone	U	4.0	U	4.9	U	5.1	U	4.0	U	5.1
2,2-Dichloropropane	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
cis-1,2-Dichloroethene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
Chloroform	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
1,1-Dichloropropene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
1,2-Dichloroethane	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
1,1,1-Trichloroethane	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
Carbon Tetrachloride	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
Benzene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
Trichloroethene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
1,2-Dichloropropane	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
Bromodichloromethane	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
Dibromomethane	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
cis-1,3-Dichloropropene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
trans-1,3-Dichloropropene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
1,1,2-Trichloroethane	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
1,3-Dichloropropane	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
Dibromochloromethane	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
1,2-Dibromoethane	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
Bromoform	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
4-Methyl-2-Pentanone	U	2.0	U	2.4	U	2.5	U	2.0	U	2.5
Toluene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
2-Hexanone	U	2.0	U	2.4	U	2.5	U	2.0	U	2.5
Tetrachloroethene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
Chlorobenzene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
1,1,1,2-Tetrachloroethane	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
Ethylbenzene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
p&m-Xylene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
o-Xylene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
Styrene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
Isopropylbenzene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
1,1,2,2-Tetrachloroethane	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
1,2,3-Trichloropropane	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
n-Propylbenzene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
Bromobenzene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
1,3,5-Trimethylbenzene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
2-Chlorotoluene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
4-Chlorotoluene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
tert-Butylbenzene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
1,2,4-Trimethylbenzene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
sec-Butylbenzene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
p-Isopropyltoluene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
1,3-Dichlorobenzene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
1,4-Dichlorobenzene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
n-Butylbenzene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
1,2-Dichlorobenzene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
1,2-Dibromo-3-chloropropane	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
1,2,4-Trichlorobenzene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
Hexachlorobutadiene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
Naphthalene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3
1,2,3-Trichlorobenzene	U	1.0	U	1.2	U	1.3	U	1.0	U	1.3

Table 1.2 Results of TIC for VOC in Soil
WA # 0-222 Independent Leather Site

Sample #	Compound
03659	No Peaks Found
03666	No Peaks Found
03661	No Peaks Found
03665	No Peaks Found
03672	No Peaks Found
03667	No Peaks Found
03668	No Peaks Found
03670	No Peaks Found
03671	No Peaks Found
Soil blank 103101	No Peaks Found
03658	No Peaks Found

Table 1.2 (cont.) Results of TIC for VOC in Soil
WA # 0-222 Independent Leather Site

# Soil blank 102601		Unit	µg/Kg
# BV4071		Con. Factor	1.0

CAS#	Compound	Q	RT	Conc*
	Unknown		2.19	5

ed Concentration (Response Factor = 1.0)

Table 1.2 (cont.) Results of TIC for VOC in Soil
WA # 0-222 Independent Leather Site

# 03662		Unit		µg/Kg
# BV4075		Con. Factor		6.0

CAS#	Compound	Q	RT	Conc*
638-04-0	cis-1,3-Dimethylcyclohexane	95	13.62	280
	Ethylcyclohexane+unknown		15.19	330
	Trimethylcyclohexane isomer		15.52	160
	Dimethyloctane isomer		16.69	380
	Methylnonane isomer		16.91	800
	Methylethylcyclohexane+unknown		17.56	1900
	Dimethylnonane isomer+unknown		17.79	270
	Dimethyloctene isomer+unknown		18.45	590
	Methyldecane isomer		20.08	710
	Dimethylpropylcyclohexane+unknown		20.84	350
1120-21-4	Undecane	95	21.07	700
	Methylpropylbenzene isomer		21.65	780
	Ethyldimethylbenzene isomer		22.01	550
	Unknown		22.24	840
	Unknown		22.52	140
	Ethyldimethylbenzene isomer		22.84	230
	Diethylmethylbenzene isomer		23.19	170
	Tetramethylbenzene isomer		23.62	280
	Diethylmethylbenzene isomer+unknown		24.17	200
	Dihydrodimethylindene isomer		24.52	64

ed Concentration (Response Factor = 1.0)

Table 1.3 Results of the Analysis for BNA in Soil
WA # 0-222 Independent Leather Site
(Results are Based on Dry Weight)

Sample No.	SBLK102501	03660
Sample Location	Lab Blank	SSW-19
GC/MS File Name	IND002	IND003
Dilution Factor	1	5
% Solid	100	77

Compound Name	Conc. µg/kg	MDL µg/kg	Conc. µg/kg	MDL µg/kg
Phenol	U	330	U	2200
bis(-2-Chloroethyl)Ether	U	330	U	2200
2-Chlorophenol	U	330	U	2200
1,3-Dichlorobenzene	U	330	U	2200
1,4-Dichlorobenzene	U	330	U	2200
Benzyl alcohol	U	330	U	2200
1,2-Dichlorobenzene	U	330	U	2200
2-Methylphenol	U	330	U	2200
bis(2-Chloroisopropyl)ether	U	330	U	2200
4-Methylphenol	U	330	U	2200
N-Nitroso-Di-n-propylamine	U	330	U	2200
Hexachloroethane	U	330	U	2200
Nitrobenzene	U	330	U	2200
Isophorone	U	330	U	2200
2-Nitrophenol	U	330	U	2200
2,4-Dimethylphenol	U	330	U	2200
bis(2-Chloroethoxy)methane	U	330	U	2200
2,4-Dichlorophenol	U	330	U	2200
1,2,4-Trichlorobenzene	U	330	U	2200
Naphthalene	U	330	1500 J	2200
4-Chloroaniline	U	330	U	2200
Hexachlorobutadiene	U	330	U	2200
4-Chloro-3-methylphenol	U	330	U	2200
2-Methylnaphthalene	U	330	3000	2200
Hexachlorocyclopentadiene	U	330	U	2200
2,4,6-Trichlorophenol	U	330	U	2200
2,4,5-Trichlorophenol	U	330	U	2200
2-Chloronaphthalene	U	330	U	2200
2-Nitroaniline	U	330	U	2200
Dimethylphthalate	U	330	U	2200
Acenaphthylene	U	330	1100 J	2200
2,6-Dinitrotoluene	U	330	U	2200
3-Nitroaniline	U	330	U	2200
Acenaphthene	U	330	U	2200
2,4-Dinitrophenol	U	330	U	2200
4-Nitrophenol	U	330	U	2200
Dibenzofuran	U	330	1100 J	2200
2,4-Dinitrotoluene	U	330	U	2200
Diethylphthalate	U	330	U	2200
4-Chlorophenyl-phenylether	U	330	U	2200
Fluorene	U	330	U	2200
4-Nitroaniline	U	330	U	2200
4,6-Dinitro-2-methylphenol	U	330	U	2200
N-Nitrosodiphenylamine	U	330	U	2200
4-Bromophenyl-phenylether	U	330	U	2200
Hexachlorobenzene	U	330	U	2200
Pentachlorophenol	U	330	U	2200
Phenanthrene	U	330	8400	2200
Anthracene	U	330	1500 J	2200
Carbazole	U	330	U	2200
Di-n-butylphthalate	U	330	U	2200
Fluoranthene	U	330	13000	2200
Pyrene	U	330	11000	2200
Butylbenzylphthalate	U	330	U	2200
Benzo(a)anthracene	U	330	7600	2200
3,3'-Dichlorobenzidine	U	330	U	2200
Chrysene	U	330	8200	2200
Bis(2-Ethylhexyl)phthalate	U	330	560 J	2200
Di-n-octylphthalate	U	330	U	2200
Benzo(b)fluoranthene	U	330	8300	2200
Benzo(k)fluoranthene	U	330	8200	2200
Benzo(a)pyrene	U	330	8300	2200
Indeno(1,2,3-cd)pyrene	U	330	4400	2200
Dibenzo(a,h)anthracene	U	330	U	2200
Benzo(g,h,i)perylene	U	330	4500	2200

Table 1.3 (cont.) Results of the Analysis for BNA in Soil
WA # 0-222 Independent Leather Site
(Results are Based on Dry Weight)

Sample No.	SBLK102901		03663		03664		04426		04427	
Sample Location	Lab Blank		SSE-4		SSE-5		SSW-31		SSW-42	
GC/MS File Name	IND006		IND007		IND008		IND009		IND010	
Dilution Factor	1		5		5		5		5	
% Solid	100		84		78		81		78	
Compound Name	Conc. µg/kg	MDL µg/kg	Conc. µg/kg	MDL µg/kg	Conc. µg/kg	MDL µg/kg	Conc. µg/kg	MDL µg/kg	Conc. µg/kg	MDL µg/kg
Phenol	U	330	U	2000	U	2100	U	2100	U	2100
bis(-2-Chloroethyl)Ether	U	330	U	2000	U	2100	U	2100	U	2100
2-Chlorophenol	U	330	U	2000	U	2100	U	2100	U	2100
1,3-Dichlorobenzene	U	330	U	2000	U	2100	U	2100	U	2100
1,4-Dichlorobenzene	U	330	U	2000	U	2100	U	2100	U	2100
Benzyl alcohol	U	330	U	2000	U	2100	U	2100	U	2100
1,2-Dichlorobenzene	U	330	U	2000	U	2100	U	2100	U	2100
2-Methylphenol	U	330	U	2000	U	2100	U	2100	U	2100
bis(2-Chloroisopropyl)ether	U	330	U	2000	U	2100	U	2100	U	2100
4-Methylphenol	U	330	U	2000	U	2100	570 J	2100	U	2100
N-Nitroso-Di-n-propylamine	U	330	U	2000	U	2100	U	2100	U	2100
Hexachloroethane	U	330	U	2000	U	2100	U	2100	U	2100
Nitrobenzene	U	330	U	2000	U	2100	U	2100	U	2100
Isophorone	U	330	U	2000	U	2100	U	2100	U	2100
2-Nitrophenol	U	330	U	2000	U	2100	U	2100	U	2100
2,4-Dimethylphenol	U	330	U	2000	U	2100	990 J	2100	U	2100
bis(2-Chloroethoxy)methane	U	330	U	2000	U	2100	U	2100	U	2100
2,4-Dichlorophenol	U	330	U	2000	U	2100	U	2100	U	2100
1,2,4-Trichlorobenzene	U	330	U	2000	U	2100	U	2100	U	2100
Naphthalene	U	330	U	2000	U	2100	520 J	2100	U	2100
4-Chloroaniline	U	330	U	2000	U	2100	U	2100	U	2100
Hexachlorobutadiene	U	330	U	2000	U	2100	U	2100	U	2100
4-Chloro-3-methylphenol	U	330	U	2000	U	2100	U	2100	U	2100
2-Methylnaphthalene	U	330	U	2000	U	2100	U	2100	U	2100
Hexachlorocyclopentadiene	U	330	U	2000	U	2100	U	2100	U	2100
2,4,6-Trichlorophenol	U	330	U	2000	U	2100	570 J	2100	U	2100
2,4,5-Trichlorophenol	U	330	U	2000	U	2100	540 J	2100	U	2100
2-Chloronaphthalene	U	330	U	2000	U	2100	U	2100	U	2100
2-Nitroaniline	U	330	U	2000	U	2100	U	2100	U	2100
Dimethylphthalate	U	330	U	2000	U	2100	U	2100	U	2100
Acenaphthylene	U	330	1100 J	2000	U	2100	U	2100	U	2100
2,6-Dinitrotoluene	U	330	U	2000	U	2100	U	2100	U	2100
3-Nitroaniline	U	330	U	2000	U	2100	U	2100	U	2100
Acenaphthene	U	330	U	2000	U	2100	U	2100	U	2100
2,4-Dinitrophenol	U	330	U	2000	U	2100	U	2100	U	2100
4-Nitrophenol	U	330	U	2000	U	2100	U	2100	U	2100
Dibenzofuran	U	330	U	2000	U	2100	U	2100	U	2100
2,4-Dinitrotoluene	U	330	U	2000	U	2100	U	2100	U	2100
Diethylphthalate	U	330	U	2000	U	2100	U	2100	U	2100
4-Chlorophenyl-phenylether	U	330	U	2000	U	2100	U	2100	U	2100
Fluorene	U	330	U	2000	U	2100	U	2100	U	2100
4-Nitroaniline	U	330	U	2000	U	2100	U	2100	U	2100
4,6-Dinitro-2-methylphenol	U	330	U	2000	U	2100	U	2100	U	2100
N-Nitrosodiphenylamine	U	330	U	2000	U	2100	U	2100	U	2100
4-Bromophenyl-phenylether	U	330	U	2000	U	2100	U	2100	U	2100
Hexachlorobenzene	U	330	U	2000	U	2100	U	2100	U	2100
Pentachlorophenol	U	330	U	2000	U	2100	U	2100	U	2100
Phenanthrene	U	330	2500	2000	U	2100	U	2100	U	2100
Anthracene	U	330	1000 J	2000	U	2100	U	2100	U	2100
Carbazole	U	330	520 J	2000	U	2100	U	2100	U	2100
Di-n-butylphthalate	U	330	U	2000	U	2100	U	2100	U	2100
Fluoranthene	U	330	7800	2000	U	2100	U	2100	U	2100
Pyrene	U	330	7800	2000	U	2100	U	2100	U	2100
Butylbenzylphthalate	U	330	U	2000	U	2100	U	2100	U	2100
Benzo(a)anthracene	U	330	3500	2000	U	2100	U	2100	U	2100
3,3'-Dichlorobenzidine	U	330	U	2000	U	2100	U	2100	U	2100
Chrysene	U	330	4500	2000	U	2100	U	2100	U	2100
Bis(2-Ethylhexyl)phthalate	U	330	U	2000	U	2100	U	2100	U	2100
Di-n-octylphthalate	U	330	U	2000	U	2100	U	2100	U	2100
Benzo(b)fluoranthene	U	330	5200	2000	U	2100	U	2100	U	2100
Benzo(k)fluoranthene	U	330	5000	2000	U	2100	U	2100	U	2100
Benzo(a)pyrene	U	330	4200	2000	U	2100	U	2100	U	2100
Indeno(1,2,3-cd)pyrene	U	330	2500	2000	U	2100	U	2100	U	2100
Dibenzo(a,h)anthracene	U	330	U	2000	U	2100	U	2100	U	2100
Benzo(g,h,i)perylene	U	330	2500	2000	U	2100	U	2100	U	2100

Table 1.3 (cont.) Results of the Analysis for BNA in Soil
WA # 0-222 Independent Leather Site
(Results are Based on Dry Weight)

Sample No.	3673	03674
Sample Location	SSW-9	SSW-9 Dup
GC/MS File Name	IND011	IND014
Dilution Factor	5	5
% Solid	63	64

Compound Name	Conc. µg/kg	MDL µg/kg	Conc. µg/kg	MDL µg/kg
Phenol	U	2700	U	2600
bis(-2-Chloroethyl)Ether	U	2700	U	2600
2-Chlorophenol	U	2700	U	2600
1,3-Dichlorobenzene	U	2700	U	2600
1,4-Dichlorobenzene	U	2700	U	2600
Benzyl alcohol	U	2700	U	2600
1,2-Dichlorobenzene	U	2700	U	2600
2-Methylphenol	U	2700	U	2600
bis(2-Chloroisopropyl)ether	U	2700	U	2600
4-Methylphenol	U	2700	U	2600
N-Nitroso-Di-n-propylamine	U	2700	U	2600
Hexachloroethane	U	2700	U	2600
Nitrobenzene	U	2700	U	2600
Isophorone	U	2700	U	2600
2-Nitrophenol	U	2700	U	2600
2,4-Dimethylphenol	U	2700	U	2600
bis(2-Chloroethoxy)methane	U	2700	U	2600
2,4-Dichlorophenol	U	2700	U	2600
1,2,4-Trichlorobenzene	U	2700	U	2600
Naphthalene	U	2700	U	2600
4-Chloroaniline	U	2700	U	2600
Hexachlorobutadiene	U	2700	U	2600
4-Chloro-3-methylphenol	U	2700	U	2600
2-Methylnaphthalene	U	2700	U	2600
Hexachlorocyclopentadiene	U	2700	U	2600
2,4,6-Trichlorophenol	U	2700	U	2600
2,4,5-Trichlorophenol	U	2700	U	2600
2-Chloronaphthalene	U	2700	U	2600
2-Nitroaniline	U	2700	U	2600
Dimethylphthalate	U	2700	U	2600
Acenaphthylene	U	2700	U	2600
2,6-Dinitrotoluene	U	2700	U	2600
3-Nitroaniline	U	2700	U	2600
Acenaphthene	U	2700	U	2600
2,4-Dinitrophenol	U	2700	U	2600
4-Nitrophenol	U	2700	U	2600
Dibenzofuran	U	2700	U	2600
2,4-Dinitrotoluene	U	2700	U	2600
Diethylphthalate	U	2700	U	2600
4-Chlorophenyl-phenylether	U	2700	U	2600
Fluorene	U	2700	U	2600
4-Nitroaniline	U	2700	U	2600
4,6-Dinitro-2-methylphenol	U	2700	U	2600
N-Nitrosodiphenylamine	U	2700	U	2600
4-Bromophenyl-phenylether	U	2700	U	2600
Hexachlorobenzene	U	2700	U	2600
Pentachlorophenol	U	2700	U	2600
Phenanthrene	U	2700	2200 J	2600
Anthracene	U	2700	U	2600
Carbazole	U	2700	U	2600
Di-n-butylphthalate	U	2700	U	2600
Fluoranthene	4600	2700	5000	2600
Pyrene	4100	2700	4400	2600
Butylbenzylphthalate	U	2700	U	2600
Benzo(a)anthracene	2000 J	2700	2300 J	2600
3,3'-Dichlorobenzidine	U	2700	U	2600
Chrysene	2700	2700	3300	2600
Bis(2-Ethylhexyl)phthalate	U	2700	U	2600
Di-n-octylphthalate	U	2700	U	2600
Benzo(b)fluoranthene	2500 J	2700	3200	2600
Benzo(k)fluoranthene	2500 J	2700	2800	2600
Benzo(a)pyrene	2200 J	2700	2500 J	2600
Indeno(1,2,3-cd)pyrene	1200 J	2700	1400 J	2600
Dibenzo(a,h)anthracene	U	2700	U	2600
Benzo(g,h,i)perylene	1200 J	2700	1400 J	2600

Table 1.4 Results of TIC for BNA in Soil
WA # 0-222 Independent Leather Site

Sample # SBLK102501
LabFile# IND002

Con. Factor 33.3

	CAS#	Compound	Q	RT	Conc.* µg/kg
1		Unknown		3.75	210
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

* Estimated Concentration (Response Factor = 1)

Table 1.4 (cont.) Results of TIC for BNA in Soil
WA # 0-222 Independent Leather Site

Sample # 03660
LabFile# IND003 Con. Factor 217

	CAS#	Compound	Q	RT	Conc.* µg/kg
1		Methyl-naphthalene isomer		8.08	3700
2		Alkane		8.77	1700
3		Dimethyl-naphthalene isomer		8.81	3000
4		Dimethyl-naphthalene isomer		8.84	2100
5		Alkane + dimethyl-naphthalene isomer		9.63	2700
6		Trimethyl-naphthalene isomer		9.75	2200
7		Trimethyl-naphthalene isomer + alkane		9.93	3300
8		Methyl Dibenzofuran + unknown		10.13	2100
9		Alkane + Methyl-dibenzofuran		10.21	3000
10		PAH isomer		10.77	3100
11		PAH isomer		10.88	1700
12		PAH isomer + alkane		11.74	2800
13		PAH isomer		11.78	4600
14		Methyl-anthracene isomer		11.89	2500
15		Methyl-anthracene isomer		11.92	2400
16		Alkane		12.27	1800
17		Alkane		12.73	2300
18		Alkane		13.18	2100
19		Alkane		13.68	1700
20		Alkane + unknown		14.24	5400

* Estimated Concentration (Response Factor = 1)

Table 1.4 (cont.) Results of TIC for BNA in Soil
WA # 0-222 Independent Leather Site

Sample # SBLK102901
LabFile# IND006

Con. Factor 33

	CAS#	Compound	Q	RT	Conc.* µg/kg
1		Unknown		5.26	170
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

* Estimated Concentration (Response Factor = 1)

Table 1.4 (cont.) Results of TIC for BNA in Soil
WA # 0-222 Independent Leather Site

Sample # 03663

LabFile# IND007 Con. Factor 198

	CAS#	Compound	Q	RT	Conc.* µg/kg
1		PAH isomer		13.18	870
2		PAH isomer		13.24	930
3		PAH isomer		13.40	1500
4		PAH isomer		14.23	1100
5		PAH isomer		14.43	850
6		PAH isomer		14.55	1000
7		PAH isomer		14.61	1000
8		PAH isomer		15.19	810
9		PAH isomer		15.82	790
10		Aldehyde		17.00	3200
11		PAH isomer		18.18	950
12		PAH isomer		18.82	3900
13		Aldehyde + unknown		19.61	1100
14					
15					
16					
17					
18					
19					
20					

* Estimated Concentration (Response Factor = 1)

Table 1.4 (cont.) Results of TIC for BNA in Soil
WA # 0-222 Independent Leather Site

Sample # 3664
LabFile# IND008 Con. Factor 213

	CAS#	Compound	Q	RT	Conc.* µg/kg
1		Alkene/cycloalkane		5.12	5800
2		Alkane		5.33	7800
3		Methyl-alkane		5.54	13000
4		Alkane + alkyl benzene		5.68	11000
5		Alkene/cycloalkane		5.72	7300
6		Methyl-alkane		5.82	8400
7		Methyl-alkane		5.85	6400
8		Methyl-alkane		5.87	9300
9		Methyl-alkane + methyl-methylethyl benzene isomer		5.93	10000
10		Diethyl-benzene + unknown		5.99	5300
11		Possible decahydro naphthalene + unknown		6.03	14000
12		Alkene/cycloalkane		6.26	11000
13		Alkane		6.30	15000
14		Alkane + alkyl benzene		6.39	13000
15		Dimethyl-ethyl-benzene isomer		6.45	11000
16		Possible decahydro-2-methyl-naphthalene + unknown		6.48	12000
17		Alkene/cycloalkane		6.56	13000
18		Methylethyl-methyl-benzene		6.78	8000
19		Alkane		6.94	9500
20		Cholesterol + unknown		22.13	5500

* Estimated Concentration (Response Factor = 1)

Table 1.4 (cont.) Results of TIC for BNA in Soil
WA # 0-222 Independent Leather Site

Sample # 04426
LabFile# IND009 Con. Factor 206

	CAS#	Compound	Q	RT	Conc.* µg/kg
1		Methylethyl-benzene + unknown		5.29	890
2		Alkane		5.33	1000
3		Trimethylbenzene isomer		5.41	2000
4		Alkane + unknown		5.53	1100
5		Trimethylbenzene isomer		5.69	1100
6		Methyl-propyl benzene + unknown		5.88	1600
7		Possible tetramethyl-benzene isomer + alkyl benzene		5.93	2100
8		Alkane + alkyl benzene		6.30	1200
9		Hexadecanoic acid + alkane		11.62	890
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

* Estimated Concentration (Response Factor = 1)

Table 1.4 (cont.) Results of TIC for BNA in Soil
WA # 0-222 Independent Leather Site

Sample # 04427
LabFile# IND010

Con. Factor 213

	CAS#	Compound	Q	RT	Conc.* µg/kg
1		Aldehyde		19.61	1300
2		Aldehyde		22.85	2800
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

* Estimated Concentration (Response Factor = 1)

Table 1.4 (cont.) Results of TIC for BNA in Soil
WA # 0-222 Independent Leather Site

Sample # 3673
LabFile# IND011

Con. Factor 266

	CAS#	Compound	Q	RT	Conc.* µg/kg
1		Aldehyde		17.01	2200
2		Alkane		17.56	2000
3		PAH isomer		18.82	2000
4		Aldehyde		19.61	3500
5		Alkane		20.39	2100
6		Aldehyde/alkene		22.85	2500
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

* Estimated Concentration (Response Factor = 1)

Table 1.4 (cont.) Results of TIC for BNA in Soil
WA # 0-222 Independent Leather Site

Sample # 03674
LabFile# IND014

Con. Factor 260

	CAS#	Compound	Q	RT	Conc.* µg/kg
1		PAH isomer		13.40	1200
2		PAH isomer + alkane		14.24	1100
3		Aldehyde		17.00	2600
4		Alkane		17.56	2200
5		PAH isomer		18.82	2700
6		ALdehyde		19.61	3600
7		Alkane		20.39	3100
8		Aldehyde + alkene/cycloalkane		22.84	2900
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

* Estimated Concentration (Response Factor = 1)

Table 1.5 Results of the Analysis for Metals in Soil
WA # 0-222 Independent Leather Site
Results Based on Dry Weight

Client ID		Method Blank		04644		04411		04412		04428		04429	
Location		Lab		SSW-19		SSE-4		SSE-5		SSW-9MS		SSW-9DUP	
% Solids		NA		79		83		73		69		67	
Parameter	Analysis Method	Conc mg/kg	MDL mg/kg	Conc mg/kg	MDL mg/kg	Conc mg/kg	MDL mg/kg	Conc mg/kg	MDL mg/kg	Conc mg/kg	MDL mg/kg	Conc mg/kg	MDL mg/kg
Aluminum	ICAP	U	18	6900	19	3400	19	2900	19	3700	22	4000	24
Antimony	ICAP	U	6.0	U	6.4	U	6.2	U	6.5	U	7.3	U	7.9
Arsenic	AA-Fur	U	0.50	12	2.9	42	2.5	2.1	1.1	63	3.2	95	3.1
Barium	ICAP	U	1.0	150	1.1	27	1.0	13	1.1	66	1.2	63	1.3
Beryllium	ICAP	U	0.50	1.1	0.54	U	0.51	U	0.54	U	0.61	U	0.66
Cadmium	ICAP	U	0.50	19	0.54	U	0.51	U	0.54	2.8	0.61	2.9	0.66
Calcium	ICAP	U	50	48000	54	72000	51	37000	54	9800	61	11000	66
Chromium	ICAP	U	0.50	110	0.54	26	0.51	8.8	0.54	220	0.61	200	0.66
Cobalt	ICAP	U	1.0	21	1.1	4.3	1.0	2.4	1.1	6.1	1.2	4.9	1.3
Copper	ICAP	U	1.0	470	1.1	25	1.0	6.9	1.1	55	1.2	50	1.3
Iron	ICAP	U	10	34000	11	10000	10	7000	11	29000	12	15000	13
Lead	ICAP	U	4.0	350	4.3	36	4.1	11	4.3	240	4.8	210	5.2
Magnesium	ICAP	U	50	3600	54	3800	51	3200	54	1500	61	1700	66
Manganese	ICAP	U	1.0	270	1.1	220	1.0	80	1.1	220	1.2	170	1.3
Mercury	Cold Vapor	U	0.04	0.4	0.044	0.055	0.036	U	0.036	0.18	0.048	0.24	0.049
Nickel	ICAP	U	1.0	79	1.1	12	1.0	3.6	1.1	78	1.2	70	1.3
Potassium	ICAP	U	200	760	210	800	210	350	220	670	240	570	260
Selenium	AA-Fur	U	0.50	U	1.2	U	1.0	U	1.1	U	1.3	U	1.3
Silver	ICAP	U	0.50	U	0.54	U	0.51	U	0.54	U	0.61	U	0.66
Sodium	ICAP	U	50	540	54	220	51	1400	54	64	61	U	66
Thallium	AA-Fur	U	0.50	U	1.2	U	1.0	U	1.1	U	1.3	U	1.3
Vanadium	ICAP	U	2.0	180	2.1	25	2.1	10	2.2	170	2.4	160	2.6
Zinc	ICAP	U	2.0	990	2.1	45	2.1	21	2.2	890	2.4	860	2.6

Table 1.5 (cont.) Results of the Analysis for Metals in Soil
WA # 0-222 Independent Leather Site
Results Based on Dry Weight

Client ID		04434		04435	
Location		SSW-31		SSW-42	
% Solids		83		78	
Parameter	Analysis Method	Conc mg/kg	MDL mg/kg	Conc mg/kg	MDL mg/kg
Aluminum	ICAP	4900	18	4300	20
Antimony	ICAP	U	6.0	U	6.6
Arsenic	AA-Fur	39	2.6	2.5	1.1
Barium	ICAP	53	1.0	30	1.1
Beryllium	ICAP	U	0.50	U	0.55
Cadmium	ICAP	1.1	0.50	U	0.55
Calcium	ICAP	16000	50	17000	55
Chromium	ICAP	1400	0.50	36	0.55
Cobalt	ICAP	5.2	1.0	3.5	1.1
Copper	ICAP	74	1.0	12	1.1
Iron	ICAP	10000	10	8600	11
Lead	ICAP	110	4.0	41	4.4
Magnesium	ICAP	6500	50	2000	55
Manganese	ICAP	78	1.0	140	1.1
Mercury	Cold Vapor	0.33	0.036	0.043	0.038
Nickel	ICAP	20	1.0	11	1.1
Potassium	ICAP	380	200	580	220
Selenium	AA-Fur	U	1.0	U	1.1
Silver	ICAP	U	0.50	U	0.55
Sodium	ICAP	120	50	90	55
Thallium	AA-Fur	U	1.0	U	1.1
Vanadium	ICAP	140	2.0	33	2.2
Zinc	ICAP	240	2.0	58	2.2

Table 1.6 Results of the Analysis for Chromium in Soil
WA # 0-222 Independent Leather Site
Results Based on Samples as Received

Parameter Analysis Method		Chromium ICAP	
Client ID	Location	Conc mg/kg	MDL mg/kg
Method Blank	Lab	U	0.50
226	SSW-01	16	0.48
228	SSW-03	120	0.49
240	SSW-16DUP	290	0.48
248	SSW-25	1200	0.50
252	SSW-29	350	0.48
291	SSE-14	300	0.49
292	SSE-15	360	0.49
326	SSW-10	520	0.49
329	SSW-24	6.1	0.47
331	SSW-37	200	0.49

QA/QC for VOC

Results of the Internal Standard Areas and Surrogate Percent Recoveries for VOC in Soil

Each sample was spiked with a three component mixture of CLP surrogate standards consisting of toluene-d_8, 4-bromofluorobenzene and 1,2-dichloroethane-d_4. The surrogate percent recoveries, listed in Table 2.1, ranged from 56 to 137. Fifty out of fifty-one values were within the acceptable QC limits. The internal standard areas (for bromochloromethane, 1,4-difluorobenzene, and chlorobenzene-d_5) are also listed in Table 2.1. Forty-eight out of fifty-one areas are within the acceptable QC limits.

Results of the MS/MSD Analysis for VOC in Soil

Samples 03671 and 03667 were chosen for the matrix spike/matrix spike duplicate (MS/MSD) analyses . The percent recoveries, ranging from 76 to 109, are listed in Table 2.2. All twenty values were within the acceptable QC limits. The relative percent differences, also listed in Table 2.2, ranged from 0 (zero) to 25, and 9 out of 10 values were within the acceptable QC limits.

Table 2.1 Results of the Internal Standard Areas and Surrogate Percent Recoveries for VOC in Soil
WA # 0-222 Independent Leather Site

File ID	Sample No.	IS 1	IS 2	IS 3	Surr. 1	Surr. 2	Surr. 3
Cal Check Area	BV4070.D	102258	754422	397270			
BV4071.D	Soil blank 102601	118878	870585	425474	97	106	93
BV4072.D	03659	109361	799176	396116	99	105	92
BV4073.D	03666	106119	783049	387812	99	106	90
BV4074.D	03661	108382	769780	344521	101	115	81
BV4075.D	03662/5x	104115	788152	760129	101	56 *	63
BV4076.D	03665	165470	1212917	569923	89	106	100
BV4077.D	03672	169932	1207358	565900	89	106	103
BV4078.D	03667	127040	902678	362795	88	120	88
BV4079.D	03668	136013	1024274	458749	88	111	95
BV4082.D	03670	103463	737453	302800	95	121	77
BV4083.D	03671	103253	756186	303231	97	124	71
Cal Check Area	BV4124.D	97029	723783	375000			
BV4125.D	Soil blank 103101	91243	693503	346683	102	103	96
BV4126.D	03658	79312	551074	260532	102	107	89
BV4129.D	03671 ms	71091	632262	263083	101	119	73
BV4130.D	03671 msd	35799 *	239568 *	123225 *	105	101	90
BV4134.D	03667 ms	90815	816632	273561	86	137	80
BV4135.D	03667 msd	95552	807472	278074	85	134	82

				QC Limits
IS 1	Bromochloromethane	Surr. 1	1,2-Dichloroethane-d4	70-121
IS 2	1,4-Difluorobenzene	Surr. 2	Toluene-d8	84-138
IS 3	Chlorobenzene-d5	Surr. 3	p-Bromofluorobenzene	59-113

Table 2.2 Results of MS/MSD Analysis for VOC in Soil
WA # 0-222 Independent Leather Site
Based on Dry Weight

Sample ID: 03671

Compound Name	Sample Conc. µg/Kg	MS Spike Added µg/Kg	MSD Spike Added µg/Kg	MS Conc. µg/Kg	MSD Conc. µg/Kg	MS % Rec.	MSD % Rec.	RPD	QC Limits	
									RPD	% Rec.
1,1-Dichloroethene	U	63.3	63.3	65.9	51.1	104	81	25 *	22	59 - 172
Benzene	U	63.3	63.3	51.9	54.8	82	87	6	21	66 - 142
Trichloroethene	U	63.3	63.3	49.3	48.8	78	77	1	24	62 - 137
Toluene	U	63.3	63.3	62.7	54.4	99	86	14	21	59 - 139
Chlorobenzene	U	63.3	63.3	53.3	53.8	84	85	1	21	60 - 133

Sample ID: 03667

Compound Name	Sample Conc. µg/Kg	MS Spike Added µg/Kg	MSD Spike Added µg/Kg	MS Conc. µg/Kg	MSD Conc. µg/Kg	MS % Rec.	MSD % Rec.	RPD	QC Limits	
									RPD	% Rec.
1,1-Dichloroethene	U	74.6	74.6	58.7	56.4	79	76	4	22	59 - 172
Benzene	U	74.6	74.6	57.2	56.7	77	76	1	21	66 - 142
Trichloroethene	U	74.6	74.6	57.6	57.7	77	77	0	24	62 - 137
Toluene	U	74.6	74.6	81.2	78.7	109	105	3	21	59 - 139
Chlorobenzene	U	74.6	74.6	61.5	61.1	82	82	1	21	60 - 133

QA/QC for BNA

Results of the Internal Standard Areas for BNA in Soil

The internal standard areas (for 1,4-dichlorobenzene-d_4, naphthalene-d_8, acenaphthene-d_{10}, phenanthrene-d_{10}, chrysene-d_{12}, perylene-d_{12}) for the soil samples are listed in Table 2.3. All seventy-eight areas were within the acceptable QC limits.

Results of the Surrogate Recoveries for BNA in Soil

Before extraction, each sample was spiked with a six component mixture of CLP surrogate standards consisting of nitrobenzene-d_5, 2-fluorobiphenyl, terphenyl-d_{14}, phenol-d_5, 2-fluorophenol, and 2,4,6-tribromophenol. The surrogate percent recoveries, listed in Table 2.4, ranged from 53 to 114. All seventy-eight values were within the acceptable QC limits. One value was not calculated because of matrix interference.

Results of the MS/MSD Analysis for BNA in Soil

Samples 03660 and 03673 were chosen for the matrix spike/matrix spike duplicate (MS/MSD) analyses. The percent recoveries, ranging from 9 to 141, are listed in Table 2.5. Thirty-seven out of forty values were within the acceptable QC limits. One value was not calculated because the concentration of analyte in the sample was greater than four times the concentration spiked. The relative percent differences are also listed in Table 2.5. All twenty-one values were within the acceptable QC limits. One value was not calculated because the concentration of analyte in the sample was greater than four times the concentration spiked.

Table 2.3 Results of the Internal Standard Areas for BNA in Soil
WA # 0-222 Independent Leather Site

Sample No.	File ID	IS 1	IS 2	IS 3	IS 4	IS 5	IS 6
Cal Check Area	IND001.D	59828	240917	130529	214400	242190	277528
SBLK102501	IND002.D	61475	236919	124817	222472	244236	244188
03660	IND003.D	62271	256747	149661	281922	329256	286550
03660 MS	IND004.D	69022	284940	159695	292406	289487	254241
03660 MSD	IND005.D	51635	219400	127132	246169	265327	220369
SBLK102901	IND006.D	31082	136056	83689	173532	253155	228687
03663	IND007.D	49350	204772	116862	229075	262975	222088
03664	IND008.D	58517	245704	140003	264343	292301	241922
04426	IND009.D	41684	185268	111919	228411	292835	242944
04427	IND010.D	37111	158811	96011	197103	274778	243507
03673	IND011.D	38973	168525	101456	214597	292955	257943
03673 MS	IND012.D	41879	181268	104595	215394	277290	234816
03673 MSD	IND013.D	47694	202671	116424	230927	286525	241813
03674	IND014.D	47048	205198	120822	248872	312917	256877

IS 1 = d4-Dichlorobenzene
IS 2 = d8-Naphthalene
IS 3 = d10-Acenaphthene
IS 4 = d10-Phenanthrene
IS 5 = d12-Chrysene
IS 6 = d12-Perylene

Table 2.4 Results of the Surrogate Recoveries for BNA in Soil
WA # 0-222 Independent Leather Site

Sample No.	File ID	Surr. 1	Surr. 2	Surr. 3	Surr. 4	Surr. 5	Surr. 6
SBLK102501	IND002.D	77	86	88	94	76	96
03660	IND003.D	58	74	80	75	66	85
03660 MS	IND004.D	66	83	88	85	75	104
03660 MSD	IND005.D	72	94	89	91	84	114
SBLK102901	IND006.D	91	106	68	82	54	88
03663	IND007.D	75	89	72	82	53	99
03664	IND008.D	71	93	NC	72	65	87
04426	IND009.D	59	85	76	78	73	92
04427	IND010.D	84	97	68	78	62	80
03673	IND011.D	54	72	59	67	57	75
03673 MS	IND012.D	73	97	78	90	70	96
03673 MSD	IND013.D	57	79	69	77	64	88
03674	IND014.D	56	74	63	71	61	78

Surr 1 = 2-Fluorophenol	25-121
Surr 2 = Phenol-d5	24-113
Surr 3 = Nitrobenzene-d5	23-120
Surr 4 = 2-Fluorobiphenyl	30-115
Surr 5 = 2,4,6-Tribromophenol	19-122
Surr 6 = Terphenyl-d14	18-137

Table 2.5 Results of MS/MSD Analysis for BNA in Soil
WA # 0-222 Independent Leather Site
(Based on Dry Weight)

Sample ID: 03660

Compound Name	Sample Conc. µg/kg	MS Spike Added µg/kg	MSD Spike Added µg/kg	MS Conc. µg/kg	MSD Conc. µg/kg	MS % Rec.	MSD % Rec.	RPD	QC Limits RPD	QC Limits % Rec.
Phenol	U	4350	4350	3500	3810	81	88	9	35	26 - 90
2-Chlorophenol	U	4350	4350	3340	3680	77	85	10	50	25 - 102
1,4-Dichlorobenzene	U	2170	2170	1540	1600	71	74	4	27	28 - 104
N-Nitroso-Di-N-Propylamine	U	2170	2170	2040	2310	94	106	12	38	41 - 126
1,2,4-Trichlorobenzene	U	2170	2170	1770	1900	82	88	7	23	38 - 107
4-Chloro-3-Methylphenol	U	4350	4350	4260	5030	98	116 *	17	33	26 - 103
Acenaphthene	U	2170	2170	2310	2440	106	112	6	19	31 - 137
4-Nitrophenol	U	4350	4350	2240	2600	52	60	15	50	11 - 114
2,4-Dinitrotoluene	U	2170	2170	1930	1930	89	89	0	47	28 - 89
Pentachlorophenol	U	4350	4350	498	387	11 *	9 *	25	47	17 - 109
Pyrene	11053	2170	2170	9715	12014	NC	44	NC	36	35 - 142

Sample ID: 03673

Compound Name	Sample Conc. µg/kg	MS Spike Added µg/kg	MSD Spike Added µg/kg	MS Conc. µg/kg	MSD Conc. µg/kg	MS % Rec.	MSD % Rec.	RPD	QC Limits RPD	QC Limits % Rec.
Phenol	U	5320	5320	4770	3980	90	75	18	35	26 - 90
2-Chlorophenol	U	5320	5320	4830	3870	91	73	22	50	25 - 102
1,4-Dichlorobenzene	U	2660	2660	2230	1850	84	70	19	27	28 - 104
N-Nitroso-Di-N-Propylamine	U	2660	2660	2550	2160	96	81	17	38	41 - 126
1,2,4-Trichlorobenzene	U	2660	2660	2360	2000	89	75	17	23	38 - 107
4-Chloro-3-Methylphenol	U	5320	5320	5820	4900	109 *	92	17	33	26 - 103
Acenaphthene	U	2660	2660	2860	2490	108	94	14	19	31 - 137
4-Nitrophenol	U	5320	5320	4300	3920	81	74	9	50	11 - 114
2,4-Dinitrotoluene	U	2660	2660	1570	1450	59	55	8	47	28 - 89
Pentachlorophenol	U	5320	5320	3020	2880	57	54	5	47	17 - 109
Pyrene	4070	2660	2660	7830	7160	141	116	20	36	35 - 142

QA/QC for Metals

Results of the QC Standard Analysis for Metals in Soil

QC standards QC-7x100, QC-21x100, ERA-438, TMAA #1, TMAA #2 and SDWA-3042 were used to check the accuracy of the calibration curve. The percent recoveries, listed in Table 2.6, ranged from 96 to 115 and all eighteen recovered concentrations for which 95% confidence are available were within these limits. 95% Confidence limits are not available for nineteen values.

Results of the MS/MSD Analysis for Metals in Soil

Sample 04428 was chosen for the matrix spike/matrix spike duplicate analysis (MS/MSD). The percent recoveries, listed in Table 2.7, ranged from 52 to 123. Twenty-one out of twenty-six values were within the acceptable QC limits. Eight other values were not calculated because the concentration of analyte in the sample was greater than four times the concentration spiked. The relative percent differences, also listed in Table 2.7, ranged from 0 (zero) to 20. All thirteen values were within the acceptable QC limits. Four other values were not calculated because the concentration of analyte in the sample was greater than four times the concentration spiked.

Results of the Blank Spike Analysis for Metals in Soil

The results of the blank spike analysis are reported in Table 2.8. The percent recoveries ranged from 91 to 110 and all twenty-three values were within the acceptable QC limits.

Results of the LCS Analysis for Metals in Soil

LCS 250 was also analyzed. The percent recoveries, listed in Table 2.9, ranged from 43 to 126 and all twenty-three recovered concentrations were within the acceptable QC limits.

Table 2.6 Results of the QC Standard Analysis for Metals in Soil
WA # 0-222 Independent Leather Site

Metal	Date Analyzed	Quality Control Standard	Conc. Rec µg/L	Certified Value µg/L	95 % Confidence Interval µg/L	% Rec
Aluminum	11/02/01	QC-7 x100	1023	1000	NA	102
	11/02/01	ERA-438	622	558	458 - 658	111
Antimony	11/02/01	QC-21 x100	995	1000	NA	100
Arsenic	11/08/01	TMAA #1	41.2	40	32.45 - 46.55	103
Barium	11/02/01	QC-7 x100	1021	1000	NA	102
	11/02/01	ERA-438	586	583	478 - 688	101
Beryllium	11/02/01	QC-21 x100	1033	1000	NA	103
	11/02/01	ERA-438	102	95.8	78.6 - 113	106
Cadmium	11/02/01	QC-21 x100	1027	1000	NA	103
	11/02/01	ERA-438	79	75	61.5 - 88.5	105
Calcium	11/02/01	QC-21 x100	1039	1000	NA	104
Chromium	11/02/01	QC-21 x100	1056	1000	NA	106
	11/02/01	ERA-438	563	517	424 - 610	109
Cobalt	11/02/01	QC-21 x100	1081	1000	NA	108
	11/02/01	ERA-438	239	208	171 - 245	115
Copper	11/02/01	QC-21 x100	1010	1000	NA	101
	11/02/01	ERA-438	202	192	157 - 227	105
Iron	11/02/01	QC-21 x100	1077	1000	NA	108
	11/02/01	ERA-438	962	867	711 - 1020	111
Lead	11/02/01	QC-21 x100	1068	1000	NA	107
	11/02/01	ERA-438	326	292	239 - 345	112
Magnesium	11/02/01	QC-21 x100	980	1000	NA	98
Manganese	11/02/01	QC-21 x100	1052	1000	NA	105
	11/02/01	ERA-438	183	171	140 - 202	107
Mercury	10/30/01	SDWA-3042	3.06	3.18	2.23 - 4.13	96
Nickel	11/02/01	QC-21 x100	1092	1000	NA	109
	11/02/01	ERA-438	211	187	153 - 221	113
Potassium	11/02/01	QC-7 x100	9917	10000	NA	99
Selenium	11/08/01	TMAA #1	83	80	65.38 - 88.47	104
Silver	11/02/01	QC-7 x100	1045	1000	NA	105
	11/02/01	ERA-438	81	77.5	63.6 - 91.5	105
Sodium	11/02/01	QC-7 x100	1016	1000	NA	102
Thallium	11/07/01	TMAA #2	63.2	60	50.19 - 68.32	105
Vanadium	11/02/01	QC-21 x100	1027	1000	NA	103
	11/02/01	ERA-438	198	192	157 - 227	103
Zinc	11/02/01	QC-21 x100	1044	1000	NA	104
	11/02/01	ERA-438	485	454	372 - 536	107

Table 2.7 Results of the MS/MSD Analysis for Metals in Soil
WA # 0-222 Independent Leather Site
Results Based on Dry Weight

Sample ID: 04428

Metal	Sample Conc mg/kg	MS Spike Added mg/kg	MS Conc mg/kg	MS % Rec	MSD Spike Added mg/kg	MSD Conc mg/kg	MSD % Rec	RPD	Recommended QC Limits %Rec	Recommended QC Limits RPD
Antimony	U	62.7	35.4	56 *	63.8	33.1	52 *	8	75-125	20
Arsenic	62.8	6.32	62.8	NC	6.16	61.7	NC	NC	75-125	20
Barium	65.5	62.7	118	84	63.8	125	93	11	75-125	20
Beryllium	U	62.7	59.6	95	63.8	63.4	99	4	75-125	20
Cadmium	2.83	62.7	56	85	63.8	58.9	88	4	75-125	20
Chromium	215	62.7	268	NC	63.8	358	NC	NC	75-125	20
Cobalt	6.14	62.7	60.3	86	63.8	64.2	91	5	75-125	20
Copper	55.3	62.7	97.9	68 *	63.8	104	76	12	75-125	20
Lead	244	62.7	321	123	63.8	308	100	20	75-125	20
Manganese	222	62.7	257	NC	63.8	220	NC	NC	75-125	20
Mercury	0.178	0.477	0.686	107	0.477	0.715	113	6	75-125	20
Nickel	77.5	62.7	123	73 *	63.8	134	89	20	75-125	20
Selenium	U	6.32	6.32	100	6.16	5.57	90	10	75-125	20
Silver	U	62.7	52.5	84	63.8	55.6	87	4	75-125	20
Thallium	U	6.32	6.07	96	6.16	5.89	96	0	75-125	20
Vanadium	174	62.7	220	73 *	63.8	227	83	12	75-125	20
Zinc	890	62.7	892	NC	63.8	936	NC	NC	75-125	20

Table 2.8 Results of the Blank Spike Analysis for Metals in Soil
WA # 0-222 Independent Leather Site

Metal	Spiked Conc. mg/kg	Blank Conc. mg/kg	Rec Conc. mg/kg	% Rec	Recommended QC Limits %Rec
Aluminum	400	U	441	110	75-125
Antimony	50.0	U	47	94	75-125
Arsenic	5.00	U	4.56	91	75-125
Barium	50.0	U	48.8	98	75-125
Beryllium	50.0	U	51.4	103	75-125
Cadmium	50.0	U	47.6	95	75-125
Calcium	400	U	394	99	75-125
Chromium	50.0	U	50.7	101	75-125
Cobalt	50.0	U	51	102	75-125
Copper	50.0	U	48.8	98	75-125
Iron	400	U	413	103	75-125
Lead	50.0	U	49.7	99	75-125
Magnesium	400	U	386	97	75-125
Manganese	50.0	U	49.8	100	75-125
Mercury	0.400	U	0.396	99	75-125
Nickel	50.0	U	51.5	103	75-125
Potassium	800	U	732	92	75-125
Selenium	5.00	U	5.12	102	75-125
Silver	50.0	U	46.5	93	75-125
Sodium	400	U	383	96	75-125
Thallium	5.00	U	5.24	105	75-125
Vanadium	50.0	U	49.5	99	75-125
Zinc	50.0	U	48.8	98	75-125

Table 2.9 Results of the LCS Analysis for Metals in Soil
WA # 0-222 Independent Leather Site

Metal	Date Analyzed	LCS Standard (ERA Lot#)	Conc. Rec mg/kg	Certified Value mg/kg	PALs mg/kg	% Rec
Aluminum	11/02/01	LCS 250	6103	5940	3900 - 7990	103
Antimony	11/02/01	LCS 250	34.4	79.9	20.5 - 139	43
Arsenic	11/08/01	LCS 250	151	177	121 - 233	85
Barium	11/02/01	LCS 250	150	151	116 - 186	99
Beryllium	11/02/01	LCS 250	66.3	62.2	48.8 - 75.9	107
Calcium	11/02/01	LCS 250	3035	3140	2350 - 3920	97
Cadmium	11/02/01	LCS 250	177	184	142 - 226	96
Chromium	11/02/01	LCS 250	109	111	88.7 - 133	98
Cobalt	11/02/01	LCS 250	49.5	49.4	39.3 - 59.3	100
Copper	11/02/01	LCS 250	85.7	86	70.4 - 101	100
Iron	11/02/01	LCS 250	10340	11100	5710 - 16600	93
Lead	11/02/01	LCS 250	103	106	80.7 - 131	97
Magnesium	11/02/01	LCS 250	1921	1940	1470 - 2410	99
Manganese	11/02/01	LCS 250	356	359	290 - 427	99
Mercury	10/30/01	LCS 248	6.4	6.21	4.19 - 8.23	103
Nickel	11/02/01	LCS 250	128	127	99.4 - 155	101
Potassium	11/02/01	LCS 250	1795	1900	1300 - 2500	94
Selenium	11/08/01	LCS 250	87.3	89.6	66.4 - 113	97
Silver	11/02/01	LCS 250	231	184	137 - 232	126
Sodium	11/02/01	LCS 250	203	261	157 - 365	78
Thallium	11/07/01	LCS 250	153	157	90.0 - 225	97
Vanadium	11/02/01	LCS 250	74.2	77.2	52.7 - 102	96
Zinc	11/02/01	LCS 250	369	371	287 - 456	99

QA/QC for Chromium in Soil

Results of the QC Standard Analysis for Chromium in Soil

QC standards QC-21x100 and ERA-438 was used to check the accuracy of the calibration curve. The percent recoveries, listed in Table 2.10, ranged from 100 to 109 and the one recovered concentration for which 95% confidence are available was within these limits. 95% Confidence limits are not available for one value.

Results of the MS/MSD Analysis for Chromium in Soil

Sample 04428 was chosen for the matrix spike/matrix spike duplicate analysis (MS/MSD). The percent recoveries, listed in Table 2.11, were 94 and 95. Both values were within the acceptable QC limits. The relative percent difference, also listed in Table 2.11, was 1 (one) and it was within the acceptable QC limits.

Results of the Blank Spike Analysis for Chromium in Soil

The results of the blank spike analysis are reported in Table 2.12. The percent recovery was 97 and it was within the acceptable QC limits.

Results of the LCS Analysis for Chromium in Soil

LCS 250 was also analyzed. The percent recoveries, listed in Table 2.13, was 111 and it was within the acceptable QC limits.

Table 2.10 Results of the QC Standard Analysis for Chromium in Soil
WA # 0-222 Independent Leather Site

Metal	Date Analyzed	Quality Control Standard	Conc. Rec µg/L	Certified Value µg/L	95 % Confidence Interval µg/L	% Rec
Chromium	11/15/01	QC-21 x100	1005	1000	NA	100
		ERA-438	562	517	424 - 610	109

Table 2.11 Results of the MS/MSD Analysis for Chromium in Soil
WA # 0-222 Independent Leather Site
based on as received weight

Sample ID: 329

Metal	Sample Conc mg/kg	MS Spike Added mg/kg	MS Conc mg/kg	MS % Rec	MSD Spike Added mg/kg	MSD Conc mg/kg	MSD % Rec	RPD	Recommended QC Limits %Rec	Recommended QC Limits RPD
Chromium	6.07	46.7	50.2	94	46.7	50.5	95	1	75-125	20

Table 2.12 Results of the Blank Spike Analysis for Chromium in Soil
WA # 0-222 Independent Leather Site.

Metal	Spiked Conc. mg/kg	Blank Conc. mg/kg	Rec Conc. mg/kg	% Rec	Recommended QC Limits %Rec
Chromium	50.0	U	48.6	97	75-125

Table 2.13 Results of the LCS Analysis for Chromium in Soil
WA # 0-222 Independent Leather Site

Metal	Date Analyzed	LCS Standard (ERA Lot#)	Conc. Rec mg/kg	Certified Value mg/kg	PALs mg/kg	% Rec
Chromium	11/15/01	LCS 250	108	111	88.7 - 133	97

REAC, Edison, NJ
(732) 321-4200
EPA Contract 68-C99-223

CHAIN OF CUSTODY RECORD

Project Name: Independent Leather
Project Number: RIA00222
LM Contact: D. Aloysius Phone: 732-321-4200

No: 01098
Sheet 01 of 01 (Do not copy)
(for addnl. samples use new form)

11/05/01

Sample Identification

Analyses Requested

REAC#	Sample No	Sampling Location	Matrix	Date Collected	# of Bottles	Container/Preservative	Cr*				
374	226	SSW-01	S	10/23/01	1	XRF CUP/NONE	X				
375	228	SSW-03									
376	240	SSW-16DUP									
377	248	SSW-25									
378	252	SSW-29									
379	291	SSE-14		10/25/01							
380	292	SSE-15									
381	326	SSW-10		10/26/01							
382	329	SSW-24									
383	331	SSW-37									

048

Matrix:

A- Air
AT-Animal Tissue
DL- Drum Liquids
DS- Drum Solids
GW- Groundwater
O- Oil
PR-Product
PT-Plant Tissue
PW- Potable Water
[✓ S- Soil]
SD- Sediment
SL- Sludge
SW- Surface Water
TX-TCLP Extract
W- Water
X- Other

Special Instructions:

* Chromium by ICP

QC'd by Jay Patel

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #:
XRF CONFIRMATION SAMPLES FROM COC # 01743, 01776, 01707, 01709

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished by	Date	Received by	Date	Time
10/analysis		11-5-01		10/05/01	0930	" " "		10/05/01	Y. E	11-05-01	8:30

REAC, Edison
(732) 321-4200
EPA Contract 68-C99-223

CHAIN OF CUSTODY RECORD

Project Name: INDEPENDENT LEATHER
Project Number: 02A00222
LM Contact: D. ALOYSIUS Phone: (732) 321-4200

No: 04709
Sheet 01 of 01 (Do not copy)
(for addnl. samples use new form)

Sample Identification

Analyses Requested

REAC#	Sample No	Sampling Location	Matrix	Date Collected	# of Bottles	Container/Preservative	*TOTAL Cr				
324	04436	SSW-5	S	10/26/01	1	4OZ JAR/ 4°C	X				
325	04437	SSW-6									
326	04438	SSW-10									
327	04439	SSW-10 (4')									
328	04440	SSW-23									
329	04441	SSW-24									
330	04442	SSW-24 (5')									
331	04443	SSW-37									
332	04444	SSW-37 (2')									
333	04445	SSW-38									
334	04446	SSW-39									
335	04447	SSW-40									
336	04448	SSW-41	↓	↓	↓	↓	↓				

Matrix:

A- Air
AT-Animal Tissue
DL- Drum Liquids
DS- Drum Solids
GW- Groundwater
O- Oil
PR-Product
PT-Plant Tissue

PW- Potable Water
[✓ S- Soil]
SD- Sediment
SL- Sludge
SW- Surface Water
TX-TCLP Extract
W- Water
X- Other

Special Instructions:

*ANALYZE BY XRF. 10% CONFIRMATION BY ICP METHOD.

Reviewed by: D. Aloysius

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #:

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished by	Date	Received by	Date	Time
13/ANALYSIS		10/26/01		10 29 01	0530	41/cr		10 29 01	C Daniels	10/29/01	9:20

EAC, Edison, NJ
732) 321-4200
PA Contract 68-C99-223

CHAIN OF CUSTODY RECORD

Project Name: INDEPENDENT LEATHER
Project Number: R2A00222
LM Contact: D. ALOYSIUS Phone: (732)321-4200

No: 04704
Sheet 01 of 01 (Do not copy)
(for addnl. samples use new form)

2601 —

Sample Identification

REAC#	Sample No	Sampling Location	Matrix	Date Collected	# of Bottles	Container/Preservative	*TOTAL Cr	TAL			
269	04408	SSE-1	S	10/24/01	1	4OZ JAR / 4°C	X				
270	04409	SSE-2	↓	↓	↓	↓	↓				
271	04410	SSE-3	↓	↓	↓	↓	↓				
272	04411	SSE-4	↓	↓	↓	↓		X			
273	04412	SSE-5	↓	↓	↓	↓		X			
274	04413	SSE-6	↓	↓	↓	↓	X				
275	04414	SSE-6 (2')	↓	↓	↓	↓	↓				
276	04415	SSE-6 DUP	↓	↓	↓	↓	↓				
277	04416	SSE-7	↓	↓	↓	↓	↓				
278	04417	SSE-8	↓	↓	↓	↓	↓				
279	04418	SSE-9	↓	↓	↓	↓	↓				
280	04419	SSE-10	↓	↓	↓	↓	↓				
281	04420	SSE-11	↓	↓	↓	↓	↓				
282	04421	SSE-11 DUP	↓	↓	↓	↓	↓				
283	04422	SSE-12	↓	↓	↓	↓	↓				
284	04423	SED-1	SD	↓	↓	↓	↓				
285	04424	SED-2	↓	↓	↓	↓	↓				
286	04425	SED-3	↓	↓	↓	↓	↓				

CHA CHA CHA CHA CHA CHA CHA

Matrix:
A- Air
AT-Animal Tissue
DL- Drum Liquids
DS- Drum Solids
GW- Groundwater
O- Oil
PR-Product
PT-Plant Tissue
PW- Potable Water
[✓ ~~S- Soil~~]
[✓ SD- Sediment]
SL- Sludge
SW- Surface Water
TX-TCLP Extract
W- Water
X- Other

Special Instructions:

0
6

* ANALYZE BY XRF. 10% CONFIRMATION BY ICP METHOD.

Reviewed by:

SAMPLES TRANSFERRED FROM

CHAIN OF CUSTODY #:

050

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished by	Date	Received by	Date	Time
18/ANALYSIS	Chris	10/24/01		10 25 01	0450	41/ metals		10 26 01		10 26 01	11:46

REAC, Edison
(732) 321-4200
EPA Contract 68-C99-223

CHAIN OF CUS Y RECORD

Project Name: INDEPENDENT LEATHER
Project Number: R2A00222
LM Contact: D. ALOYSIUS Phone: (732) 321-4200

No: 04707
Sheet 01 of 01 (Do not copy)
(for addnl. samples use new form)

102601-

Sample Identification | **Analyses Requested**

REAC#	Sample No	Sampling Location	Matrix	Date Collected	# of Bottles	Container/Preservative	*TOTAL Cr	TAL			
287	04428	SSW-9ms**	S	10/25/01	2	4oz JAR / 4°C		X			
288	04429	SSW-9 DUP			①			X			
~~289~~	~~04430~~	~~SSW-9 MS**~~						~~X~~	DB		
290	04431	SSE-13					X				
291	04432	SSE-14					X				
292	04433	SSE-15					X				
293	04434	SSW-31						X			
294	04435	SSW-42						X			

CHR

Matrix:

A- Air
AT-Animal Tissue
DL- Drum Liquids
DS- Drum Solids
GW- Groundwater
O- Oil
PR-Product
PT-Plant Tissue
PW- Potable Water
[✓ S- Soil]
SD- Sediment
SL- Sludge
SW- Surface Water
TX-TCLP Extract
W- Water
X- Other

6°

Special Instructions:

* ANALYZE BY XRF. 10% CONFIRMATION BY ICP METHOD.
** MS = MS/MSD SAMPLE
Reviewed by: KAyssing

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #:

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished by	Date	Received by	Date	Time
8/ANALYSIS	Chris	10/25/01		102601	0950	6 TAL metals		102601		10-26-01	11:45

REAC, Edison, NJ
(732) 321-4200
EPA Contract 68-C99-223

CHAIN OF CUSTODY RECORD

Project Name: INDEPENDENT LEATHER
Project Number: R2A00222
LM Contact: P. ALOYESUS Phone (732) 321-4200

No: 04743
Sheet 01 of 01 (Do not copy)
(for addnl. samples use new form)

10 2501—

Sample Identification | * **Analyses Requested**

REAC#	Sample No	Sampling Location	Matrix	Date Collected	# of Bottles	Container/Preservative	TOTAL Cr	TAL METALS			
226	04626	SSW-01	S	10/23/01	1	4oz JAR / 4°C	X				
227	04627	SSW-02									
228	04628	SSW-03									
229	04629	SSW-4									
230	04630	SSW-7									
231	04631	SSW-8									
232	04632	SSW-11									
233	04633	SSW-12									
234	04634	SSW-12 2'									
235	04635	SSW-13									
236	04636	SSW-14									
237	04637	SSW-14 DUP									
238	04638	SSW-15									
239	04639	SSW-16									
240	04640	SSW-16 DUP									
241	04641	SSW-16 5'									
242	04642	SSW-17									
243	04643	SSW-18									
244	04644	SSW-19						X			

Matrix:

A- Air	PW- Potable Water
AT-Animal Tissue	[✓ S- Soil]
DL- Drum Liquids	SD- Sediment
DS- Drum Solids	SL- Sludge
GW- Groundwater	SW- Surface Water
O- Oil	TX-TCLP Extract
PR-Product	W- Water
PT-Plant Tissue	X- Other

Special Instructions:

* TOTAL Cr BY XRF. 10% CONFIRMATION BY ICP METHOD

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #:

Reviewed by T. Aysin

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished by	Date	Received by	Date	Time
19 / ANALYSIS		10/23/01		102501	1000	all/analysis		102501		102501	1040

REAC, Edison
(732) 321-4200
EPA Contract 68-C99-223

CHAIN OF CUS' / RECORD

Project Name: INDEPENDENT LEATHER
Project Number: R2A00222
LM Contact: D. ALOYSIUS Phone (732) 321-4200

No: 04776
Sheet 01 of 01 (Do not copy)
(for addnl. samples use new form)

102501

Sample Identification **Analyses Requested**

REAC#	Sample No	Sampling Location	Matrix	Date Collected	# of Bottles	Container/Preservative	*TOTAL Cr				
245	04645	SSW-20	S	10/23/01	1	4OZ JAR / 4°C	X				
246	04646	SSW-21									
247	04647	SSW-22									
248	04648	SSW-25									
249	04649	SSW-26									
250	04650	SSW-27									
251	03652	SSW-28									
252	03653	SSW-29									
253	03654	SSW-30									
254	03655	SSW-32									
255	03656	SSW-33									
256	03657	SSW-43									

CVR

Matrix:

A- Air	PW- Potable Water
AT-Animal Tissue	[✓ S- Soil]
DL- Drum Liquids	SD- Sediment
DS- Drum Solids	SL- Sludge
GW- Groundwater	SW- Surface Water
O- Oil	TX-TCLP Extract
PR-Product	W- Water
PT-Plant Tissue	X- Other

Special Instructions:

* TOTAL Cr BY XRF. 10% CONFIRMATION BY ICP METHOD

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #:

Reviewed by D Alysius

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished by	Date	Received by	Date	Time
12/ANALYSIS	Chris [illegible]	10/23/01	[illegible]	10 25 01	1000	all/analysis	[illegible]	10 25 01	[illegible]	10 25 01	10:40

REAC, Edison, NJ
(732) 321-4200
EPA Contract 68-C99-223

CHAIN OF CUSTODY RECORD

Project Name: INDEPENDENT LEATHER
Project Number: R2A00222
LM Contact: D. ALOYSIUS Phone: (732) 321-4200

No: 04708
Sheet 01 of 01 (Do not copy)
(for addnl. samples use new form)

10 26 01

Sample Identification **Analyses Requested**

REAC#	Sample No	Sampling Location	Matrix	Date Collected	# of Bottles	Container/Preservative	VOC	BNA			
295	03665	FIELD BLANK	S	10/25/01	1	4oz JAR/4°C	X				
296	03667	SSW-9**MS			2 DJS						
297	03668	SSW-9 DUP			①						
~~298~~	~~03669~~	~~SSW-9 MS**~~						DJS			
299	03670	SSW-31									
300	03671	SSW-42									
301	03672	TRIP BLANK									
302	03673	SSW-9**MS			2 DJS	8oz JAR/4°C		X			
303	03674	SSW-9 DUP			①						
~~304~~	~~03675~~	~~SSW-9 MS**~~						DJS			
305	04426	SSW-31									
306	04427	SSW-42									

CMF

Matrix:

A- Air
AT-Animal Tissue
DL- Drum Liquids
DS- Drum Solids
GW- Groundwater
O- Oil
PR-Product
PT-Plant Tissue

PW- Potable Water
[✓ S- Soil]
SD- Sediment
SL- Sludge
SW- Surface Water
TX-TCLP Extract
W- Water
X- Other

Special Instructions:

** MS = MS/MSD SAMPLE

Reviewed by:

SAMPLES TRANSFERRED FROM CHAIN OF COUSTODY #:

7/00C

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished by	Date	Received by	Date	Time
12/ANALYSIS	Chris	10/25/01		10 26 01	0950	all		10 26 01	Y. Nemesh	10-26-01	11:40
5/BNA	Lyn	10/29/01		10/29/01	10:10 AM						

REAC, Edison
(732) 321-4200
EPA Contract 68-C99-223

CHAIN OF CUS? / RECORD

Project Name: INDEPENDENT LEATHER
Project Number: R1A00222
LM Contact: D. ALOYSIUS Phone (732) 321-4200

No: 04705
Sheet 01 of 01 (Do not copy)
(for addnl. samples use new form)

102601

Sample Identification **Analyses Requested**

REAC#	Sample No	Sampling Location	Matrix	Date Collected	# of Bottles	Container/Preservative	VOC	BNA				
262	03661	SSE-4	S	10/24/01	1	4oz JAR / 4°C	X					
263	03662	SSE-5	↓	↓	↓	↓	X					
264	03663	SSE-4	↓	↓	↓	8oz JAR / 4°C		X				
265	03664	SSE-5	↓	↓	↓	↓		X				
266	03666	~~SD~~ TRIP BLANK	S	10/24/01	1	4oz JAR / 4°C	X					

CHF

Matrix:

A- Air
AT-Animal Tissue
DL- Drum Liquids
DS- Drum Solids
GW- Groundwater
O- Oil
PR-Product
PT-Plant Tissue
PW- Potable Water
[✓ S- Soil]
SD- Sediment
SL- Sludge
SW- Surface Water
TX-TCLP Extract
W- Water
X- Other

Special Instructions:

6°

Reviewed by:

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #:

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished by	Date	Received by	Date	Time
5/ANALYSES		10/24/01		10 26 01	0930	3/voc		10 26 01		10.26.01	11:40
2/BNA		10/29/01									
				10 29 01	10:00						

REAC, Edison, NJ
(732) 321-4200
EPA Contract 68-C99-223

CHAIN OF CUSTODY RECORD

Project Name: INDEPENDENT LEATHER
Project Number: RZA00222
LM Contact: D. ALOYSIUS Phone: (732) 321-4200

No: 04702
Sheet 01 of 01 (Do not copy)
(for addnl. samples use new form)

102501

Sample Identification — **Analyses Requested**

REAC#	Sample No	Sampling Location	Matrix	Date Collected	# of Bottles	Container/Preservative	VOC	BNA			
223	03658	SSW-19	S	10/23/01	1	4oz JAR / 4°C	X				
224	03659	TRIP BLANK	↓	↓	↓	↓	X				
225	03660	SSW-19	S	10/23/01	1	8oz JAR / 4°C		X			

056

Matrix:

A- Air
AT-Animal Tissue
DL- Drum Liquids
DS- Drum Solids
GW- Groundwater
O- Oil
PR-Product
PT-Plant Tissue

PW- Potable Water
[✓ S- Soil]
SD- Sediment
SL- Sludge
SW- Surface Water
TX-TCLP Extract
W- Water
X- Other

Special Instructions:

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #:

Reviewed by TA Lyons

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished by	Date	Received by	Date	Time
2 ANALYSIS		10/23/01		10 25 01	1050	2/VOC		10 25 01		10/25/01	10:53
1/BNA		10/25/01		10-25-01	11:05AM						

Lockheed Martin Technology Services
Environmental Services REAC
2890 Woodbridge Avenue Building 209 Annex
Edison, NJ 08837-3679
Telephone 732-321-4200 Facsimile 732-494-4021

LOCKHEED MARTIN

DATE: 29 November 2001

TO: David Aloysius, REAC Task Leader

THROUGH: Dennis Miller, REAC Analytical Section Leader

FROM: Jay Patel, REAC Inorganic Group Leader Jay Patel

SUBJECT: FPXRF ANALYSES, INDEPENDENT LEATHER SITE
WORK ASSIGNMENT #0-222, FPXRF ACTIVITIES REPORT

BACKGROUND

A Spectrace 9000 Field-Portable X-ray Fluorescence (FPXRF) analyzer, maintained and operated by Response Engineering and Analytical Contract (REAC) personnel, was used to support United States Environmental Protection Agency/Environmental Response Team Center (U.S. EPA/ERTC) activities at the Independent Leather site. REAC personnel analyzed site soil and sediment samples for the primary target element: chromium (Cr).

OBSERVATIONS AND ACTIVITIES

Spectrace 9000 FPXRF Analyses

Samples were received at the REAC laboratory in Edison, New Jersey between 25 and 29 October, 2001. The samples were analyzed to determine the extent of target element contamination utilizing a Spectrace 9000 FPXRF analyzer (S/N Q-011). A total of 62 soil/sediment samples and 7 preparation duplicate samples were analyzed at REAC. The Spectrace 9000 FPXRF measurement times (instrument live-time) were 60 seconds for the cadmium-109 (Cd-109) source, 300 seconds for the iron-55 (Fe-55) source, and 60 seconds for the americium-241 (Am-241) source.

Sample preparation, analysis, and quality assurance/quality control (QA/QC) procedures used in this study conform to those described in the U.S. EPA/ERTC REAC Standard Operating Procedure (SOP) #1713, *Spectrace 9000 Field Portable X-ray Fluorescence Operating Procedure.*

Preliminary results for target elements for all samples were summarized and reported on 01 November 2001. All preliminary FPXRF results are QA1 (screening) level data only.

---

cc: Central File-WA # 0-222
JoAnn Camacho, U.S. EPA/ERTC Work Assignment Manager
Rajeshmal Singhvi, U.S. EPA/ERTC
Dennis Kalnicky, REAC Senior Chemist

Sample Preparation

Soil/sediment samples were received in labeled glass jars. Each sample was mixed with a stainless steel spoon. Stones and debris were removed prior to placing 10-20 grams of the sample into a labeled aluminum weighing dish. The samples were dried in an oven for 1-2 hours as necessary. After drying, the sample was passed through a 10-mesh stainless steel sieve to remove rocks and large organic matter. The sample was then placed in a labeled 31-millimeter (mm) polyethylene X-ray sample cup and sealed with 0.2-mil (5 micrometer) thick polypropylene X-ray window film. Duplicates were prepared for every 10 samples, and the suffix "DUP" was added to the sample ID for the duplicate sample. Prior to XRF analysis, each sample cup was tapped against the tabletop to pack the sample evenly against the film window. The sample cup was placed directly on the probe aperture window of the Spectrace 9000 FPXRF analyzer, the safety shield was closed, and analysis was initiated with the measurement times previously noted.

FPXRF Analysis Results

XRF analysis results for each sample were saved in the Spectrace 9000 internal data logger memory. The data were downloaded and archived on computer disks on a daily basis. Target element results for each analyzed sample and standard were logged into the Spectrace 9000 field logbook (REACIII-L-0261). Target element results were qualified using the field method detection and quantitation limits discussed in this report.

QA/QC Procedures

The reliability of the Spectrace 9000 FPXRF unit and application model was evaluated daily during sample analysis. The energy calibration check and detector resolution check were performed at the beginning of each day to ensure that proper instrument calibration was maintained and that the detector resolution was adequate for producing reliable X-ray intensity measurements. The Spectrace 9000 soil application model was verified at the beginning of each day for the target elements. This was accomplished by analyzing a blank sample and National Institute of Standards and Technology (NIST) Standard Reference Materials (SRMs) #2709, #2710, and #2711, and a synthetic standard, R33. Energy calibration checks, detector resolution checks, and application verification results were recorded in the Spectrace 9000 field logbook (REACIII-L-0261).

Method Detection and Quantitation Limits

A certified standard, NIST SRM #2709, was analyzed at the beginning of each day and periodically during sample analysis to establish statistically derived method detection and quantitation limits for the target elements with minimal interference from other elements. The standard deviation [STD (n-1)] for these analyses was used to calculate the Spectrace 9000 method detection limit (MDL) and method quantitation limit (MQL) for each target element. The MDL was calculated as three times the standard deviation (MDL = 3 x STD) and the MQL was defined as ten times the standard deviation (MQL = 10 x STD) for repeat measurements. An additional NIST standard, SRM #2711, was also used for MDL determination. It has intermediate levels of several soil contaminant metals. The reported Cr MDL (160 mg/kg) was a conservative estimate based on the calculated standard deviation values for both NIST standards.

Spectrace 9000 results less than the MDL (not detected) were qualified by a "U". All preliminary FPXRF results are QA1 (screening) level data only.

Measurement Precision

Spectrace 9000 FPXRF analysis precision for Cr was determined using a synthetic standard, R33. The spiked value in R33 was 1430 milligrams per kilogram (mg/kg). The coefficient of variation (COV) value for Cr (6.8%) was within the specification of 20 percent (U.S. EPA/ERT 1991).

FPXRF Confirmation Samples

In order to obtain Quality Assurance level 2 (QA2) data, a minimum of 10 percent of the samples must be confirmed by a laboratory method such as Inductively-Coupled Plasma (ICP) emission spectroscopy or Atomic Absorption (AA) analysis. A regression analysis between the Spectrace 9000 data (independent) and the confirmatory data (dependent) must yield a coefficient of determination (r^2) greater than 0.7 (U.S. EPA/ERT 1991). The model obtained by the regression may be used to validate or adjust the Spectrace 9000 data.

Approximately 16 percent of the soil/sediment samples (10 samples) analyzed by FPXRF methods were submitted for confirmatory laboratory analysis. To minimize potential sample homogeneity problems, the XRF sample cups were submitted for confirmatory analysis.

Results

Appendix A contains MDL qualified FPXRF results for target elements. Appendix B contains MDL and QA/QC data. Preliminary FPXRF field reports are found in Appendix C. Appendix D contains FPXRF and laboratory data for confirmation samples. Photocopies of field logbook pages and disks with field FPXRF data are in the REAC Central File.

FPXRF Confirmation Sample Results

FPXRF and laboratory results less than the MDL (U) were set equal to zero for regression analysis purposes. Comparisons are based on preliminary FPXRF data and preliminary laboratory data. No QA/QC evaluation was performed for the preliminary laboratory data, and it should be used with caution (Appendix D). Regression analysis results (XRF = independent, Lab = dependent) obtained for Cr are summarized below:

Element	Number of Observations	r^2	Slope	Intercept	Standard Error of Y Estimate
Cr (all data)	10	0.980	0.451	39	52

Regression analysis results indicated that QA2 data quality objectives were met ($r^2 > 0.70$) for FPXRF analysis of Cr using all confirmation data. The slope (0.451) indicates that FPXRF results (total Cr) were approximately 2-times that for laboratory methods (based on acid digestion prior to analysis).

REFERENCES

U.S. EPA/ERT. 1991. Quality Assurance Technical Information Bulletin, "Field-Portable X-Ray Fluorescence", Volume 1, Number 4.

APPENDIX A
MDL Qualified FPXRF Analysis Results
FPXRF Activities Report
Independent Leather Site
November 2001

WA 0-222 Independent Leather site
Spectrace 9000 FPXRF; S/N Q-011
Cd109-60; Fe55-300; Am241-60 seconds
Final FPXRF data; MDL Qualified; 2 Significant Figures
Soil & Sediment

XRF ID	CLIENT ID	LOCATION	DATE ANALYZED	Cr * (mg/kg)
			MDL	160
226	04626	SSW-01	29-OCT-2001	U
227	04627	SSW-02	29-OCT-2001	240
228	04628	SSW-03	29-OCT-2001	190
229	04629	SSW-4	29-OCT-2001	330
230	04630	SSW-7	29-OCT-2001	U
231	04631	SSW-8	29-OCT-2001	U
232	04632	SSW-11	29-OCT-2001	190
233	04633	SSW-12	29-OCT-2001	220
234	04634	SSW-12 2'	30-OCT-2001	U
234DUP	04634	LAB PREP DUP	30-OCT-2001	U
235	04635	SSW-13	30-OCT-2001	U
236	04636	SSW-14	30-OCT-2001	U
237	04637	SSW-14 DUP	30-OCT-2001	U
238	04638	SSW-15	30-OCT-2001	340
239	04639	SSW-16	30-OCT-2001	490
240	04640	SSW-16 DUP	30-OCT-2001	400
241	04641	SSW-16 5'	30-OCT-2001	U
242	04642	SSW-17	30-OCT-2001	U
243	04643	SSW-18	30-OCT-2001	U
245	04645	SSW-20	30-OCT-2001	210
245DUP	04645	LAB PREP DUP	30-OCT-2001	300
246	04646	SSW-21	30-OCT-2001	U
247	04647	SSW-22	30-OCT-2001	U
248	04648	SSW-25	30-OCT-2001	2500
249	04649	SSW-26	30-OCT-2001	U
250	04650	SSW-27	30-OCT-2001	U
251	03652	SSW-28	30-OCT-2001	1100
252	03653	SSW-29	30-OCT-2001	630
253	03654	SSW-30	30-OCT-2001	710
254	03655	SSW-32	30-OCT-2001	U
255	03656	SSW-33	30-OCT-2001	350
255DUP	03656	LAB PREP DUP	30-OCT-2001	250
256	03657	SSW-43	30-OCT-2001	180
269	04408	SSE-1	30-OCT-2001	U
270	04409	SSE-2	30-OCT-2001	U
271	04410	SSE-3	30-OCT-2001	U
274	04413	SSE-6	30-OCT-2001	U
275	04414	SSE-6(2')	30-OCT-2001	U
276	04415	SSE-6 DUP	31-OCT-2001	U
277	04416	SSE-7	31-OCT-2001	U
278	04417	SSE-8	31-OCT-2001	440
279	04418	SSE-9	31-OCT-2001	U
279DUP	04418	LAB PREP DUP	31-OCT-2001	U
280	04419	SSE-10	31-OCT-2001	U
281	04420	SSE-11	31-OCT-2001	U

* - Cr measured with Fe55 source (300 seconds analysis time)

WA 0-222 Independent Leather site
Spectrace 9000 FPXRF; S/N Q-011
Cd109-60; Fe55-300; Am241-60 seconds
Final FPXRF data; MDL Qualified; 2 Significant Figures
Soil & Sediment

MDL 160

XRF ID	CLIENT ID	LOCATION	DATE ANALYZED	Cr * (mg/kg)
282	04421	SSE-11 DUP	31-OCT-2001	U
283	04422	SSE-12	31-OCT-2001	U
284	04423	SED-1	31-OCT-2001	U
285	04424	SED-2	31-OCT-2001	U
286	04425	SED-3	31-OCT-2001	U
290	04431	SSE-13	31-OCT-2001	300
291	04432	SSE-14	31-OCT-2001	520
292	04433	SSE-15	31-OCT-2001	760
292DUP	04433	LAB PREP DUP	31-OCT-2001	910
324	04436	SSW-5	31-OCT-2001	210
325	04437	SSW-6	31-OCT-2001	330
326	04438	SSW-10	31-OCT-2001	1300
327	04439	SSW-10(4')	31-OCT-2001	690
328	04440	SSW-23	31-OCT-2001	U
329	04441	SSW-24	31-OCT-2001	U
330	04442	SSW-24(5')	31-OCT-2001	U
331	04443	SSW-37	31-OCT-2001	300
331DUP	04443	LAB PREP DUP	31-OCT-2001	350
332	04444	SSW-37(2')	31-OCT-2001	410
333	04445	SSW-38	31-OCT-2001	380
334	04446	SSW-39	31-OCT-2001	2000
335	04447	SSW-40	31-OCT-2001	270
336	04448	SSW-41	31-OCT-2001	650
336DUP	04448	LAB PREP DUP	31-OCT-2001	750

MDL - Method Detection Limit; U - Not Detected (less than the MDL)
DUP (end of XRF ID) - sample preparation duplicate

* - Cr measured with Fe55 source (300 seconds analysis time)

* - Cr measured with Fe55 source (300 seconds analysis time)

APPENDIX B
MDL and QA/QC Data
FPXRF Activities Report
Independent Leather Site
November 2001

WA 0-222 Independent Leather site
Spectrace 9000 FPXRF; S/N Q-011
Cd109-60; Fe55-300; Am241-60 seconds
MDL and QA/QC Data
Soil & Sediment

ID	DATE ANALYZED	Cr * (mg/kg)
MDL SAMPLE		
#2709	29-OCT-2001	61.73
#2709	29-OCT-2001	70.44
#2709	29-OCT-2001	-43.86
#2709	29-OCT-2001	-75.43
#2709	29-OCT-2001	-8.1
#2709	29-OCT-2001	21.93
#2709	29-OCT-2001	-22.72
#2709	29-OCT-2001	-32.31
#2709	29-OCT-2001	-60.07
#2709	30-OCT-2001	-13.43
#2709	30-OCT-2001	-14.91
#2709	30-OCT-2001	67.35
#2709	30-OCT-2001	21.60
#2709	31-OCT-2001	35.21
#2709	31-OCT-2001	-20.85
#2709	31-OCT-2001	61.88
#2709	31-OCT-2001	19.87
	AVG	4
	STDS	45
	MDL	135
	MQL	450
	Number of Obs	17

AVG - Average
STDS - Standard Deviation (n-1 method)
MDL - Method Detection Limit
MQL - Method Quantitation Limit

---

* - Cr measured with Fe55 source (300 seconds analysis time)

WA 0-222 Independent Leather site
Spectrace 9000 FPXRF; S/N Q-011
Cd109-60; Fe55-300; Am241-60 seconds
MDL and QA/QC Data
Soil & Sediment

ID	DATE ANALYZED	Cr * (mg/kg)
PRECISION (COV) SAMPLE		
#R33	29-OCT-2001	1233.64
#R33	29-OCT-2001	1443.88
#R33	29-OCT-2001	1396.56
#R33	29-OCT-2001	1396.6
#R33	29-OCT-2001	1429.91
#R33	29-OCT-2001	1467.58
#R33	29-OCT-2001	1319.02
#R33	29-OCT-2001	1352.7
#R33	29-OCT-2001	1444.92
#R33	29-OCT-2001	1445.88
#R33	30-OCT-2001	1508.55
#R33	30-OCT-2001	1355.38
#R33	30-OCT-2001	1454.97
#R33	30-OCT-2001	1532.50
#R33	31-OCT-2001	1521.28
#R33	31-OCT-2001	1640.52
#R33	31-OCT-2001	1548.68
#R33	31-OCT-2001	1570.80

AVG	1448
STDS	98
COV(%)	6.8
Number of Obs	18
Spiked Value (Synthetic Std.)	1430

AVG - Average
STDS - Standard Deviation (n-1 method)
COV(%) - Coefficient of Variation in percent

---

* - Cr measured with Fe55 source (300 seconds analysis time)

WA 0-222 Independent Leather site
Spectrace 9000 FPXRF; S/N Q-011
Cd109-60; Fe55-300; Am241-60 seconds
MDL and QA/QC Data
Soil & Sediment

ID	DATE ANALYZED	Cr * (mg/kg)
QC SAMPLE		
#2710	29-OCT-2001	3.57
#2710	30-OCT-2001	-81.67
#2710	31-OCT-2001	-96.35
	AVG	-58
	STDS	54
	Number of Obs	3
	Certified value	(39)

AVG - Average
STDS - Standard Deviation (n-1 method)
COV(%) - Coefficient of Variation in percent

* - Cr measured with Fe55 source (300 seconds analysis time)

WA 0-222 Independent Leather site
Spectrace 9000 FPXRF; S/N Q-011
Cd109-60; Fe55-300; Am241-60 seconds
MDL and QA/QC Data
Soil & Sediment

ID	DATE ANALYZED	Cr * (mg/kg)
PRECISION (COV) SAMPLE		
#2711	29-OCT-2001	65.5
#2711	30-OCT-2001	62.13
#2711	31-OCT-2001	35.28
#2711	31-OCT-2001	-119.93
#2711	31-OCT-2001	-38.35
#2711	31-OCT-2001	-51.48
#2711	31-OCT-2001	-99.85
#2711	31-OCT-2001	-24.73
#2711	31-OCT-2001	-15.54
#2711	31-OCT-2001	-81.18
	AVG	-27
	STDS	65
	Number of Obs	10
	Certified value	(47)

AVG - Average
STDS - Standard Deviation (n-1 method)
COV(%) - Coefficient of Variation in percent

* - Cr measured with Fe55 source (300 seconds analysis time)

WA 0-222 Independent Leather site
Spectrace 9000 FPXRF; S/N Q-011
Cd109-60; Fe55-300; Am241-60 seconds
MDL and QA/QC Data
Soil & Sediment

ID	DATE ANALYZED	Cr * (mg/kg)
ZERO CHECK SAMPLE: 60 SECONDS PER SOURCE		
#SAND	29-OCT-2001	133.19
#SAND	30-OCT-2001	70.11
#SAND	31-OCT-2001	131.21
	AVG	112
	Number of Obs	3

AVG - Average

---

* - Cr measured with Fe55 source (300 seconds analysis time)

APPENDIX C
Preliminary FPXRF Field Reports
FPXRF Activities Report
Independent Leather Site
November 2001

Lockheed Martin Technology Services Group
Environmental Services REAC
2890 Woodbridge Avenue, Building 209 Annex   Edison, NJ 08837-3679
Telephone 732-321-4200   Facsimile 732-494-4021

LOCKHEED MARTIN

DATE: 01 November 2001

TO: Mr. Raj Singhvi, U.S EPA/ERTC

FROM: Jay Patel, Inorganic Group Leader, REAC   Jay Patel

SUBJECT: Preliminary Results of Project Independent Leather site WA# 0-222

Attached please find the preliminary results of the above referenced project for the following samples.

NO QC EVALUATION HAS BEEN PERFORMED.

Chain of Custody No.	# of samples	Matrix	Analyses
04743	18	Soil	Cr by FPXRF
04776	12	Soil	
04704	16	Soil/sed	
04707	3	Soil	
04709	13	Soil	

CC: Central File # 0-222

Dennis Miller, Analytical Section Leader, REAC
JoAnn Camacho, Work Assignment Manager, U.S EPA/ERTC
D. Aloysius, Task Leader, REAC
J. Ingram Hazardous Waste Co-ordinator, REAC

WA 0-222 Independent Leather site
Spectrace 9000 FPXRF; S/N Q-011
Cd109-60; Fe55-300; Am241-60 seconds
Preliminary FPXRF data; MDL Qualified; 2 Significant Figures
Soil & Sediment

***** PRELIMINARY DATA, NO QA/QC; ALL DATA ARE SUBJECT TO CHANGE *****

			MDL	160
XRF ID	CLIENT ID	LOCATION	DATE ANALYZED	Cr * (mg/kg)
226	04626	SSW-01	29-Oct-2001	U
227	04627	SSW-02	29-Oct-2001	240
228	04628	SSW-03	29-Oct-2001	190
229	04629	SSW-4	29-Oct-2001	330
230	04630	SSW-7	29-Oct-2001	U
231	04631	SSW-8	29-Oct-2001	U
232	04632	SSW-11	29-Oct-2001	190
233	04633	SSW-12	29-Oct-2001	220
234	04634	SSW-12 2'	30-Oct-2001	U
234DUP	04634	LAB PREP DUP	30-Oct-2001	U
235	04635	SSW-13	30-Oct-2001	U
236	04636	SSW-14	30-Oct-2001	U
237	04637	SSW-14 DUP	30-Oct-2001	U
238	04638	SSW-15	30-Oct-2001	340
239	04639	SSW-16	30-Oct-2001	490
240	04640	SSW-16 DUP	30-Oct-2001	400
241	04641	SSW-16 5'	30-Oct-2001	U
242	04642	SSW-17	30-Oct-2001	U
243	04643	SSW-18	30-Oct-2001	U
245	04645	SSW-20	30-Oct-2001	210
245DUP	04645	LAB PREP DUP	30-Oct-2001	300
246	04646	SSW-21	30-Oct-2001	U
247	04647	SSW-22	30-Oct-2001	U
248	04648	SSW-25	30-Oct-2001	2500
249	04649	SSW-26	30-Oct-2001	U
250	04650	SSW-27	30-Oct-2001	U
251	03652	SSW-28	30-Oct-2001	1100
252	03653	SSW-29	30-Oct-2001	630
253	03654	SSW-30	30-Oct-2001	710
254	03655	SSW-32	30-Oct-2001	U
255	03656	SSW-33	30-Oct-2001	350
255DUP	03656	LAB PREP DUP	30-Oct-2001	250
256	03657	SSW-43	30-Oct-2001	180
269	04408	SSE-1	30-Oct-2001	U
270	04409	SSE-2	30-Oct-2001	U
271	04410	SSE-3	30-Oct-2001	U
274	04413	SSE-6	30-Oct-2001	U
275	04414	SSE-6(2')	30-Oct-2001	U
276	04415	SSE-6 DUP	31-Oct-2001	U
277	04416	SSE-7	31-Oct-2001	U
278	04417	SSE-8	31-Oct-2001	440
279	04418	SSE-9	31-Oct-2001	U
279DUP	04418	LAB PREP DUP	31-Oct-2001	U
280	04419	SSE-10	31-Oct-2001	U
281	04420	SSE-11	31-Oct-2001	U

WA 0-222 Independent Leather site
Spectrace 9000 FPXRF; S/N Q-011
Cd109-60; Fe55-300; Am241-60 seconds
Preliminary FPXRF data; MDL Qualified; 2 Significant Figures
Soil & Sediment

***** PRELIMINARY DATA, NO QA/QC; ALL DATA ARE SUBJECT TO CHANGE *****

XRF ID	CLIENT ID	LOCATION	DATE ANALYZED	Cr * (mg/kg)
			MDL	160
282	04421	SSE-11 DUP	31-Oct-2001	U
283	04422	SSE-12	31-Oct-2001	U
284	04423	SED-1	31-Oct-2001	U
285	04424	SED-2	31-Oct-2001	U
286	04425	SED-3	31-Oct-2001	U
290	04431	SSE-13	31-Oct-2001	300
291	04432	SSE-14	31-Oct-2001	520
292	04433	SSE-15	31-Oct-2001	760
292DUP	04433	LAB PREP DUP	31-Oct-2001	910
324	04436	SSW-5	31-Oct-2001	210
325	04437	SSW-6	31-Oct-2001	330
326	04438	SSW-10	31-Oct-2001	1300
327	04439	SSW-10(4')	31-Oct-2001	690
328	04440	SSW-23	31-Oct-2001	U
329	04441	SSW-24	31-Oct-2001	U
330	04442	SSW-24(5')	31-Oct-2001	U
331	04443	SSW-37	31-Oct-2001	300
331DUP	04443	LAB PREP DUP	31-Oct-2001	350
332	04444	SSW-37(2')	31-Oct-2001	410
333	04445	SSW-38	31-Oct-2001	380
334	04446	SSW-39	31-Oct-2001	2000
335	04447	SSW-40	31-Oct-2001	270
336	04448	SSW-41	31-Oct-2001	650
336DUP	04448	LAB PREP DUP	31-Oct-2001	750

MDL - Method Detection Limit; U - Not Detected (less than the MDL)
DUP(end of XRF ID) - sample preparation duplicate

* - Cr measured with Fe55 source (300 seconds analysis time)

AC, Edison, NJ
2) 321-4200
A Contract 68-C99-223

CHAIN OF CUSTODY RECORD

Project Name: INDEPENDENT LEATHER
Project Number: R2A00222
LM Contact: D. ALOYESUS Phone (732) 321-4200

No: 04743
Sheet 01 of 01 (Do not copy)
(for addnl. samples use new form)

2501—

Sample Identification							Analyses Requested				
EAC#	Sample No	Sampling Location	Matrix	Date Collected	# of Bottles	Container/Preservative	* TOTAL Cr	TAL			
26	04626	SSW-01	S	10/23/01	1	4oz JAR / 4°C	X				
227	04627	SSW-02									
228	04628	SSW-03									
229	04629	SSW-4									
230	04630	SSW-7									
231	04631	SSW-8									
232	04632	SSW-11									
233	04633	SSW-12									
234	04634	SSW-12 2'									
235	04635	SSW-13									
236	04636	SSW-14									
237	04637	SSW-14 DUP									
238	04638	SSW-15									
239	04639	SSW-16									
240	04640	SSW-16 DUP									
241	04641	SSW-16 5'									
242	04642	SSW-17									
243	04643	SSW-18									
244	04644	SSW-19						X			

Matrix:

A- Air	PW- Potable Water
AT-Animal Tissue	[✓ S- Soil]
DL- Drum Liquids	SD- Sediment
DS- Drum Solids	SL- Sludge
GW- Groundwater	SW- Surface Water
O- Oil	TX-TCLP Extract
PR-Product	W- Water
PT-Plant Tissue	X- Other

Special Instructions:

* TOTAL Cr BY XRF. 10% CONFIRMATION BY ICP METHOD

SAMPLES TRANSFERRED FROM
CHAIN OF CUSTODY #:

Reviewed by T. Aysin

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished by	Date	Received by	Date	Time
19 / ANALYSIS		10/23/01		10 25 01	1000	all/anlyss		10 25 01		10 25 01	1040

☆ U.S. GPO: 2000-6

2) 321-4200
A Contract 68-C99-223

Project Name: INDEPENDENT LCHIKER
Project Number: 12A00222
LM Contact: R. ALOYSIUS Phone (222) 321-4200

No: 04110
Sheet 01 of 01 (Do not copy)
(for addnl. samples use new form)

02501

Sample Identification / **Analyses Requested**

EAC#	Sample No	Sampling Location	Matrix	Date Collected	# of Bottles	Container/Preservative	*TOTAL Cr				
245	04645	SSW-20	S	10/23/01	1	4OZ-JAR/4°C	X				
246	04646	SSW-21									
247	04647	SSW-22									
248	04648	SSW-25									
249	04649	SSW-26									
250	04650	SSW-27									
251	03652	SSW-28									
252	03653	SSW-29									
253	03654	SSW-30									
254	03655	SSW-32									
255	03656	SSW-33									
256	03657	SSW-43									

CVF

Matrix:

A- Air
AT-Animal Tissue
DL- Drum Liquids
DS- Drum Solids
GW- Groundwater
O- Oil
PR-Product
PT-Plant Tissue
PW- Potable Water
[✓ S- Soil]
SD- Sediment
SL- Sludge
SW- Surface Water
TX-TCLP Extract
W- Water
X- Other

Special Instructions:

* TOTAL Cr BY XRF. 10% CONFIRMATION BY ICP METHOD

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #:

Reviewed by TAlysius

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished by	Date	Received by	Date	Time
12/ANALYSES		10/23/01		10-25-01	1000	all/analysis		10 25 01	Y.	10 25 01	10:40

☆ U.S. GPO: 2000-621-

) 321-4200
. Contract 68-C99-223

Project Name: INDEPENDENT LEATHER
Project Number: 62A00222
LM Contact: D. ALOYSIUS Phone: (732) 321-4200

No:
Sheet 01 of 01 (Do not copy)
(for addnl. samples use new form)

? 2601 —

Sample Identification **Analyses Requested**

EAC#	Sample No	Sampling Location	Matrix	Date Collected	# of Bottles	Container/Preservative	*TOTAL Cr	TCL			
69	04408	SSE-1	S	10/24/01	1	4' JAR/4°C	X				
70	04409	SSE-2									
71	04410	SSE-3									
272	04411	SSE-4						X			
273	04412	SSE-5						X			
274	04413	SSE-6					X				
275	04414	SSE-6 (2')									
276	04415	SSE-6 DUP									
277	04416	SSE-7									
278	04417	SSE-8									
279	04418	SSE-9									
280	04419	SSE-10									
281	04420	SSE-11									
282	04421	SSE-11 DUP									
283	04422	SSE-12									
284	04423	SED-1	SD								
285	04424	SED-2									
286	04425	SED-3									

Matrix:

A- Air	PW- Potable Water
AT- Animal Tissue	S- Soil
DL- Drum Liquids	SD- Sediment
DS- Drum Solids	SL- Sludge
GW- Groundwater	SW- Surface Water
O- Oil	TX- TCLP Extract
PR- Product	W- Water
PT- Plant Tissue	X- Other

Special Instructions

* ANALYZE BY XRF. 10% CONFIRMATION BY ICP METHOD.

Reviewed by:

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #:

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished by	Date	Received by	Date	Time
18/ANALYSIS	Chris	10/24/01		10 25 01	0450	4/ metals		10 26 01		10 26 01	11

32) 321-4200
PA Contract 68-C99-223

Project Name: INDEPENDENT LEATHER
Project Number: K2A00222
LM Contact: D. ALOYSIUS Phone: (732) 321-4200

No: 04101
Sheet 01 of 01 (Do not copy)
(for addnl. samples use new form)

22601-

Sample Identification / **Analyses Requested**

REAC#	Sample No	Sampling Location	Matrix	Date Collected	# of Bottles	Container/Preservative	*TOTAL Cr	TAL			
287	04428	SSW-9ms**	S	10/25/01	~~2~~	4oz JAR / 4°C		X			
288	04429	SSW-9 DUP			1			X			
~~289~~	~~04430~~	~~SSW-9 MS**~~						X	→ DIB		
290	04431	SSE-13					X				
291	04432	SSE-14					X				
292	04433	SSE-15					X				
293	04434	SSW-31						X			
294	04435	SSW-42						X			

CHC

Matrix:

A- Air	PW- Potable Water
AT-Animal Tissue	[✓ S- Soil]
DL- Drum Liquids	SD- Sediment
DS- Drum Solids	SL- Sludge
GW- Groundwater	SW- Surface Water
O- Oil	TX-TCLP Extract
PR-Product	W- Water
PT-Plant Tissue	X- Other

6°

Special Instructions:

* ANALYZE BY XRF. 10% CONFIRMATION BY ICP METHOD.
** MS = MS/MSD SAMPLE
Reviewed by:

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #:

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished by	Date	Received by	Date	Time
8/ANALYSIS		10/25/01		10 26 01	0950	6 11/metals		1026 01		10-26-01	11:43

AC, Edison, NJ
32) 321-4200
A Contract 68-C99-223

Project Name: INDEPENDENT LEATHER
Project Number: 12A00222
LM Contact: D. ALOYSIUS Phone: (732)321-4200

No: 04709
Sheet 01 of 01 (Do not copy)
(for addnl. samples use new form)

Sample Identification | **Analyses Requested**

REAC#	Sample No	Sampling Location	Matrix	Date Collected	# of Bottles	Container/Preservative	*TOTAL Cr				
324	04436	SSW-5	S	10/26/01	1	4oz JAR/ 4°C	X				
325	04437	SSW-6									
326	04438	SSW-10									
327	04439	SSW-10 (4')									
328	04440	SSW-23									
329	04441	SSW-24									
330	04442	SSW-24 (5')									
331	04443	SSW-37									
332	04444	SSW-37 (2')									
333	04445	SSW-38									
334	04446	SSW-39									
335	04447	SSW-40									
336	04448	SSW-41									

Matrix:

A- Air	PW- Potable Water
AT-Animal Tissue	[✓ S- Soil]
DL- Drum Liquids	SD- Sediment
DS- Drum Solids	SL- Sludge
GW- Groundwater	SW- Surface Water
O- Oil	TX-TCLP Extract
PR-Product	W- Water
PT-Plant Tissue	X- Other

Special Instructions:

* ANALYZE BY XRF. 10% CONFIRMATION BY ICP METHOD.

Reviewed by: DJ Aloysius

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #:

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished by	Date	Received by	Date	Time
13/ANALYSES		10/26/01		10/29/01	0530	all/Cr		10/29/01	C Gasser	10/29/01	9:20

APPENDIX D
FPXRF Confirmation Sample Data
FPXRF Activities Report
Independent Leather Site
November 2001

WA #0-222 Independent Leather site
Spectrace 9000; S/N Q-011
Cd109-60; Fe55-300; Am241-60 sec
Confirmation Samples
Preliminary FPXRF and Preliminary Laboratory Results
MDL Qualified; 2 Significant Figures

ID	LOCATION	DATE ANALYZED	Cr (mg/kg) XRF *	Cr (mg/kg) Lab
226	SSW-01	29-OCT-2001	U	16
228	SSW-03	29-OCT-2001	190	120
240	SSW-16 DUP	30-OCT-2001	400	290
248	SSW-25	30-OCT-2001	2500	1200
252	SSW-29	30-OCT-2001	630	350
291	SSE-14	31-OCT-2001	520	300
292	SSE-15	31-OCT-2001	760	360
326	SSW-10	31-OCT-2001	1300	520
329	SSW-24	31-OCT-2001	U	6.1
331	SSW-37	31-OCT-2001	300	200
		MDL	**160**	**0.47**
		MQL	**530**	

MDL - Method Detection Limit; MQL - Method Quantitation Limit
U - Not Detected (less than the MDL)
* - XRF Cr measured with Fe55 source (CrLO)

REGRESSION ANALYSIS: LAB (DEPENDENT) VS. XRF (INDEPENDENT)

Chromium (Cr):

			Cr: all data		
Location	FPXRF*	Lab*	Pred	Res	StdRes
SSW-01	0	16	39	23	0.4
SSW-24	0	6.1	39	33	0.6
SSW-03	190	120	124	4	0.1
SSW-37	300	200	174	-26	-0.5
SSW-16 DUP	400	290	219	-71	-1.4
SSE-14	520	300	273	-27	-0.5
SSW-29	630	350	323	-27	-0.5
SSE-15	760	360	381	21	0.4
SSW-10	1300	520	625	105	2.0
SSW-25	2500	1200	1166	-34	-0.7

* - values less than the MDL (U) set equal to zero

Cr: all data

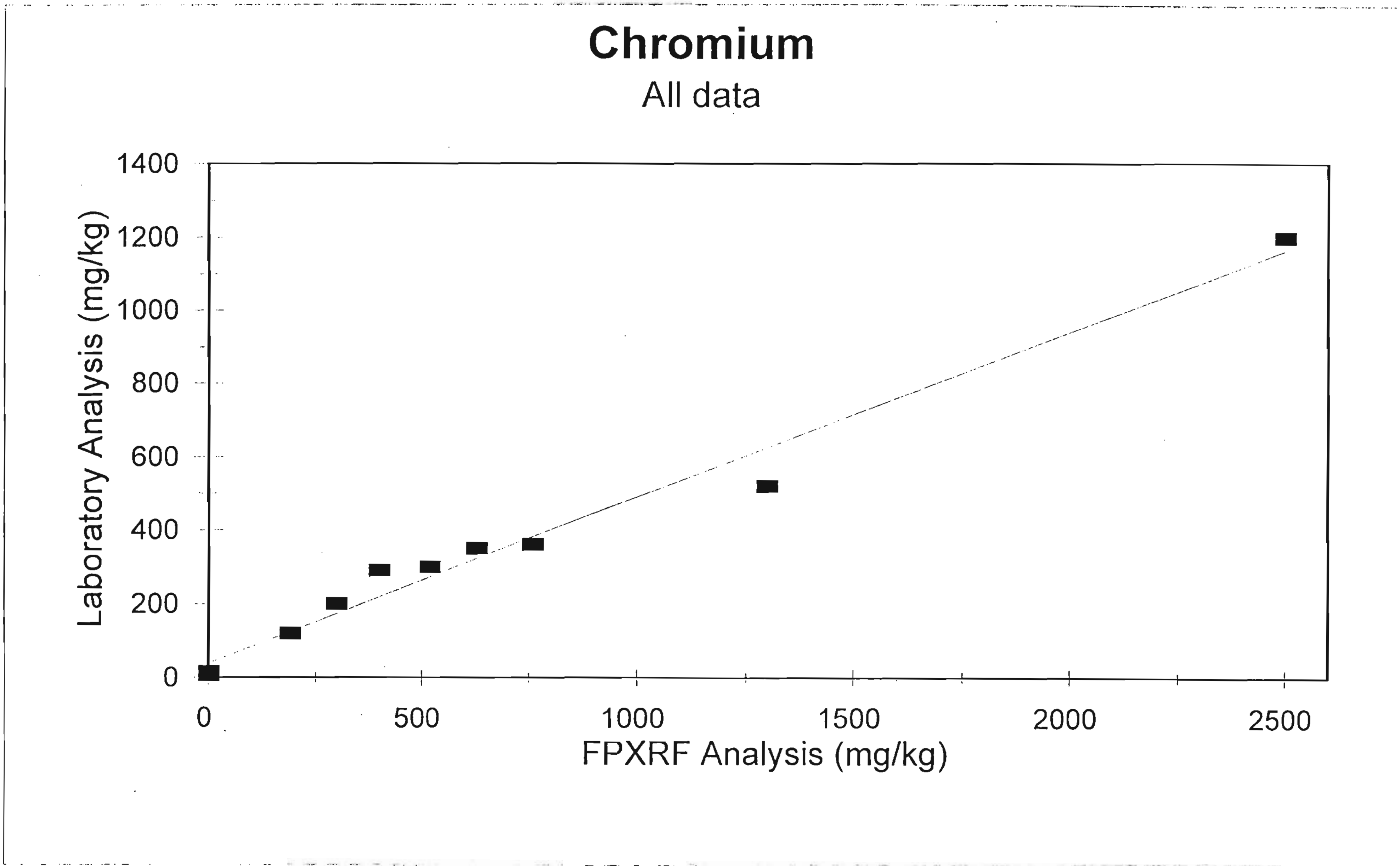
Regression Output:		
Constant		38.6727
Std Err of Y Est		51.7
R Squared		0.97984
No. of Observations		10
Degrees of Freedom		8
X Coefficient(s)	0.45081	
Std Err of Coef.	0.02286	
t-value	19.7211	

Cr: XRF < 1000

Regression Output:		
Constant		31.1105
Std Err of Y Est		35.1507
R Squared		0.94846
No. of Observations		8
Degrees of Freedom		6
X Coefficient(s)	0.49758	
Std Err of Coef.	0.04735	
t-value	10.5076	

Cr: XRF > MDL

Regression Output:		
Constant		54.918
Std Err of Y Est		56.1405
R Squared		0.97626
No. of Observations		8
Degrees of Freedom		6
X Coefficient(s)	0.43949	
Std Err of Coef.	0.02798	
t-value	15.7077	


Chromium
All data
Laboratory Analysis (mg/kg)
0
200
400
600
800
1000
1200
1400
FPXRF Analysis (mg/kg)
0
500
1000
1500
2000
2500

Lockheed Martin Technology Services Group
Environmental Services REAC
2890 Woodbridge Avenue. Building 209 Annex Edison, NJ 08837-3679
Telephone 732-321-4200 Facsimile 732-494-4021

LOCKHEED MARTIN

DATE: 11/16/01

TO: Mr. Raj Singhvi, U.S EPA/ERTC

FROM: Jay Patel, Inorganic Group Leader, REAC J.n Patel

SUBJECT: Preliminary Results of Project Independent Leather WA# 0-222

Attached please find the preliminary results of the above referenced project for the following samples.

NO QC EVALUATION HAS BEEN PERFORMED.

Chain of Custody No.	# of samples	Matrix	Analyses
01098	10	Soil	Chromium Analysis
		(XRF Cups)	
		(10% Confirmation)	

CC: Central File # 0-222

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Table 1.x (cont.) Results of the Analysis for Metals in Soil
WA # 0-222 Independent Leather
Results Based on Samples as Received
NO QC EVALUATION HAS BEEN PERFORMED

Parameter Analysis Method			Chromium ICAP	
Client ID	Location	% Solids	Conc mg/kg	MDL mg/kg
Method Blank*	Lab	100.00	U	0.50
226	SSW-01	100.00	16	0.48
228	SSW-03	100.00	120	0.49
240	SSW-16DUP	100.00	290	0.48
248	SSW-25	100.00	1200	0.50
252	SSW-29	100.00	350	0.48
291	SSE-14	100.00	300	0.49
292	SSE-15	100.00	360	0.49
326	SSW-10	100.00	520	0.49
329	SSW-24	100.00	6.1	0.47
331	SSW-37	100.00	200	0.49

MDL denotes Method Detection Limit
U denotes less than the MDL (not detected)

O QC EVALUATION HAS BEEN PERFORMED.
DATA VALIDITY IS UNSUBSTANTIATED
AND THE DATA SHOULD BE USED
WITH DISCRETION.

EAC, Edison, NJ
732) 321-4200
PA Contract 68-C99-223

Project Name: Independent Leather
Project Number: RIA00222
LM Contact: D. Aloysius Phone: 732-321-4200

No: 01038
Sheet 01 of 01 (Do not copy)
(for addnl. samples use new form)

10/5/01

Sample Identification | **Analyses Requested**

REAC#	Sample No	Sampling Location	Matrix	Date Collected	# of Bottles	Container/Preservative	Cr*				
374	* 226	SSW-01	S	10/23/01	1	XRF cup/NONE	X				
375	228	SSW-03									
376	240	SSW-16DUP									
377	248	SSW-25									
378	252	SSW-29		↓							
379	291	SSE-14		10/25/01							
380	292	SSE-15		↓							
381	326	SSW-10		10/26/01							
382	* 329	SSW-24									
383	331	SSW-37	↓	↓	↓	↓	↓				

Matrix:

A- Air
AT-Animal Tissue
DL- Drum Liquids
DS- Drum Solids
GW- Groundwater
O- Oil
PR-Product
PT-Plant Tissue
PW- Potable Water
[✓ S- Soil]
SD- Sediment
SL- Sludge
SW- Surface Water
TX-TCLP Extract
W- Water
X- Other

Special Instructions:

* Chromium by ICP

QC'd by Jay Patel

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #:

Items/Reason	Relinquished by	Date	Received by	Date	Time	Items/Reason	Relinquished by	Date	Received by	Date	Time
10/analysis		11-5-01		11/05/01	0930	11/ c		11/05/01		11-05-01	8:50

U.S. GPO: 200 '51

RESULTS OF FIELD SAMPLING, TESTING AND GEOCHEMICAL MODELING INDEPENDENT LEATHER SITE

FINAL REPORT
INDEPENDENT LEATHER SITE
GLOVERSVILLE, NEW YORK
RESULTS OF FIELD SAMPLING, TESTING AND GEOCHEMICAL MODELING
MARCH 2003

U.S. EPA Work Assignment No.: 0-222
Lockheed Martin Work Order No.: R1A00222
U.S. EPA Contract No.: 68-C99-223

Prepared by:

Lockheed Martin/REAC

David Aloysius

David Aloysius
REAC Task Leader

3/5/03
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Dennis Miller
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Date

Prepared for:

U.S. EPA/ERTC

JoAnn Camacho
Work Assignment Manager

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1.0 INTRODUCTION

The Independent Leather Site is located in the town of Gloversville, New York, near the city of Johnstown. The site (Figure 1) is physically divided by Cayadutta Creek, which flows in an approximate north-to-south direction across the site. Past activities at the site included leather tanning and related industrial processes. Chromium (Cr) is the primary contaminant in soils at the site, as this metal is associated with leather tanning processes. Other metals, such as arsenic (As), have also been identified in site soils (Lockheed Martin/REAC, 2002).

During October 2001, Response, Engineering and Analytical Contract (REAC) personnel conducted a soil sampling program at the Independent Leather Site. The results of this sampling program were presented in a final report (Lockheed Martin/REAC, 2002) and submitted to the United States Environmental Protection Agency (U.S. EPA), Environmental Response Team Center (ERTC), Work Assignment Manager (WAM). As part of site closure operations, directed by the U.S. EPA Region 2 office, contaminated soil "hot spots" were excavated and removed during the spring of 2002.

This final report describes additional field sampling and testing activities that occurred at the site during June of 2002. The primary purpose of this work was to assess the chemical partitioning and potential mobility of chromium and arsenic in soils and groundwater at the site.

2.0 METHODOLOGY

Between June 18 and 21, 2002, REAC personnel collected groundwater and shallow subsurface soil samples at the Independent Leather Site for chemical analysis and physical property testing. In-situ hydraulic conductivity tests were also performed in several on-site monitor wells as a means for estimating permeability of subsurface soils.

2.1 Groundwater Sampling and Analysis

Groundwater samples were collected from seven out of 11 on-site monitor wells using peristaltic pumps and dedicated Teflon® tubing. The sampling was conducted in accordance with ERT/REAC Standard Operating Procedure (SOP) No. 2007, *Groundwater Well Sampling*. The wells included MW-5, MW-8, MW-9, MW-10, MW-11, MW-12, and MW-14 (illustrated in Figure 1). The wells were installed by a private engineering consulting firm (C.T. Male Associates, 2002) during April 2002 as part of a New York State-funded Brownfield project for the Town of Gloversville.

All monitor wells were constructed of 2-inch inside diameter (ID) polyvinyl chloride (PVC) riser pipe attached to a bottom 10-foot section of 10 slot (0.010 inch), 2-inch ID, PVC screen (C.T. Male, 2002). Well depths ranged from approximately 13 to 18 feet below ground surface (bgs). Construction and subsurface information pertaining to nine monitor wells are summarized in Table 1.

A low flow extraction method was used to purge the wells prior to actual sampling; the average pumping rate was approximately 0.17 gallons per minute (gpm). Prior to purging, static water levels were recorded in each well with a water level indicator probe, using the top of PVC casing as a reference point. During well purging, groundwater field parameters (i.e., pH, specific conductivity, temperature, dissolved oxygen, and redox potential) were periodically monitored using a YSI® 600 XL water quality analyzer. Colorimetric test kits were also used to verify dissolved oxygen (DO) concentrations and to check ferrous iron (Fe^{2+}) concentrations in the groundwater. Stabilization of field parameter readings was used to verify that groundwater conditions were suitable to begin sampling.

Groundwater samples were collected for analysis of the following parameters: hexavalent chromium (Cr^{6+}), silica, carbonate alkalinity, nitrate-nitrogen, orthophosphate, chloride, sulfate, dissolved organic carbon (DOC), total dissolved solids (TDS), and Target Analyte List (TAL) metals (both total and dissolved). Groundwater samples collected for dissolved TAL metals and DOC analyses were filtered in the field, using dedicated in-line 45-micron filter cartridges. Samples for orthophosphate analysis were laboratory-filtered prior to analysis. Unfiltered groundwater samples were used for the analysis of all other chemical parameters, including TAL metals. At the end of each day, groundwater samples were express-shipped to Upstate Laboratories, located in East Syracuse, New York, for analysis.

2.2 Soil Sampling and Testing

Three shallow subsurface soil samples were collected near monitor wells MW-8, MW-10, and MW-11. The sampling was conducted in accordance with ERT/REAC SOP No. 2012, *Soil Sampling*. Sample depths averaged approximately 2 feet bgs.

Prior to sampling near MW-10 and MW-11, an on-site backhoe was used to scrape away and remove surficial debris and soil material. Clean stainless steel trowels were then used to collect soils at each of these locations. A hand auger was used to obtain a subsurface soil sample near MW-8.

Dedicated plastic scoops were used to transfer the soil samples into 8-ounce glass jars (four jars per location). The soil samples were subsequently transported to the REAC Engineering Evaluation Unit (EEU) in Edison, New Jersey for characterization of the following parameters: grain size, bulk density, natural moisture content, pH, and total organic carbon (measured by loss-on-ignition). The methods used for testing are presented in the References section at the end of this report.

2.3 Hydraulic Conductivity Testing

In-situ hydraulic conductivity tests (i.e., rising and constant head tests) were performed in monitor wells MW-8, MW-9, and MW-10. Two separate tests were performed in MW-8. The tests were conducted in accordance with ERT/REAC SOP No. 2046, *Slug Testing*.

Prior to testing, static water levels were manually recorded in each well using a water level indicator. A 2-inch diameter submersible pump was then inserted into each well and positioned approximately 6-inches from the bottom. An automated pressure transducer (miniTroll™, In-Situ, Inc.) was lowered into each well, to the top of the pump. The pressure transducer was used to record water levels during the entire test (i.e., before, during, and after pumping). To begin the actual testing, the pump was turned on in order to draw the water level down as low as possible in each well. When most of the water had been evacuated, or the level had stabilized (in the case of MW-9), the pump was then shut off, and the pressure transducer was allowed to record the change (i.e., rise) in water level in each well over time, until the initial water level was reached. Because the water level in MW-9 had stabilized (constant head) and could not be drawn down any further with the 2-inch pump, it was decided that measuring the flow rate would be useful for estimating permeability. The flow rate was measured using a 5-gallon bucket and stop watch and was determined to be approximately 5 gpm, based on three separate measurements.

Rising head data from MW-8 and MW-10 were analyzed using the Bouwer and Rice Method (Bouwer, 1989). The constant head data from MW-9 were analyzed using the following equation (Heath, 1998):

$$T = 308 (Q/S)$$

where,

T = transmissivity, in square feet per day (sq.ft/d)
Q = pumping rate (5 gpm)
S = water level drawdown (measured at 6.29 feet)

Transmissivity was subsequently converted to hydraulic conductivity using the following equation (Heath, 1998):

$$K = T/b$$

where,

K = hydraulic conductivity, in feet per day (ft/d)
T = transmissivity (using a calculated value of 244.83 sq.ft/d)
b = saturated thickness of the overburden deposits, above glacial till (measured at 8.12 feet)

2.4 Geochemical Model Description

The geochemical code, MINTEQA2 (U.S. EPA, 1991), was used to examine the chemical partitioning and potential mobility of chromium and arsenic in soils and groundwater at the site. Version 3.11 of the code was used for this study. The MINTEQA2 code was originally developed by Battelle Pacific Northwest National Laboratory and later adapted by the U.S. EPA. MINTEQA2 is a geochemical equilibrium speciation code, designed for aqueous systems, that calculates the mass distribution between dissolved, adsorbed, and multiple solid phases under a variety of conditions. The code is very useful for assessing the geochemical behavior of metals in the environment. The code has an extensive and credible thermodynamic database and additionally offers a number of options for modeling sorption processes. The data required to predict equilibrium compositions consists of a thorough chemical analysis of the sample to be modeled. This includes dissolved concentrations for both major and minor elemental components and other relevant measurements for the soil-groundwater system, including pH, redox potential (Eh), temperature, and concentration of solid adsorbent phases. For this study, the code was used to examine:

- The mass distribution of arsenic and chromium between dissolved phases, adsorbed phases (i.e., adsorbed on mineral surfaces), and solid (i.e., mineral) phases;
- The effects of pH and Eh changes on dissolved arsenic concentrations in the groundwater; and
- How different iron oxide concentrations (i.e., as an adsorbent phase) would affect predicted concentrations of arsenic in the soils, based on observed dissolved-phase concentrations.

A diffuse-layer model within the MINTEQA2 code was used to examine the adsorption behavior of arsenic and chromium. The model treats adsorption as a surface complexation reaction and accounts for electrostatic potentials at charged mineral surfaces. The adsorbing surface was modeled as a hydrous iron oxide using surface reactions and their associated stability constants as given by Dzombak and Morel (1990). Iron oxide content is an important factor in controlling metal adsorption in soils.

The iron oxide content in soils (i.e., extractable iron) can be determined by laboratory analysis; however, the resulting values do not distinguish between different iron minerals. In many instances, hematite (Fe_2O_3) is the dominant phase, which has far fewer adsorption sites than a hydrous iron oxide, such as goethite (α-FeO.OH). For this reason, an iron oxide content of 1.0 milligram per gram (mg/g) was arbitrarily selected as an initial concentration to model the data. This concentration represents an intermediate value, as reported in U.S. EPA Soil Screening Guidance documentation (U.S. EPA, 1996). The documentation reports that iron oxide concentrations in soils can range from approximately 0.1 mg/g to 10 mg/g.

Based on an average measured soil density of 1.8 grams per cubic centimeter (g/cc) and an estimated porosity of 0.33, the mass of soil that one-liter of groundwater would be exposed to, was calculated to be approximately 3.65 kilograms per liter (kg/L). This value was used to convert computed concentrations of sorbed and solid phases in the model output to a standard, solid phase concentration, given in milligrams per kilogram (mg/kg).

3.0 RESULTS AND DISCUSSION

3.1 Groundwater Analytical Results

Measurements of groundwater field parameters are summarized in Table 2. Field measurements were additionally obtained on groundwater that was pumped from monitor well MW-7; however, this well was not sampled for analytical parameters. Measurements of pH ranged from 6.48 (MW-7) to 7.37 (MW-11) and averaged approximately 6.98. Eh measurements ranged from -244 millivolts (mV) in MW-11 to 21 mV in MW-14. High ferrous iron concentrations were observed in groundwater from MW-7, which exceeded the range of the colorimetric test kit. The test kit was capable of measuring ferrous iron concentrations up to a maximum of 10 milligrams per liter (mg/L), without dilution. Water from MW-7 also had the highest measured conductivity value, in excess of 25,000 micro-siemens per centimeter (µS/cm). High ferrous iron concentrations were additionally observed in groundwater from MW-10 (approximately 9 mg/L). On a site-wide basis, no significant trends were observed for any of the field parameters (i.e., values appeared to be randomly scattered).

Geochemical results for the groundwater samples are presented in Table 3. The final Groundwater Analytical Report is attached as Appendix A. Only a trace amount of Cr^{6+} was detected in water from MW-9, at a concentration of 0.01 mg/L. A high concentration of nitrate was detected in water from MW-8 (13 mg/L). Of all the wells sampled, MW-11 had the lowest sulfate and chloride concentrations (7 mg/L for both parameters). Concentrations of DOC ranged from 3 mg/L (MW-9) to 37 mg/L (MW-10). A duplicate sample from MW-12 had a reported DOC concentration of 73 mg/L, which appears to be an erroneous value. The total carbonate concentrations reported in Table 3 are calculated (i.e., equilibrated) values that were obtained from the geochemical model, based on carbonate alkalinity measurements.

Dissolved metal results for the groundwater samples are summarized in Table 4. For this study, particular attention was given to examining chromium and arsenic concentrations. Only a trace amount of chromium (i.e., Cr^{3+}) was detected in groundwater from MW-10, at a concentration of 0.06 mg/L. Elevated arsenic concentrations were detected in MW-8 (3.5 mg/L) and MW-11 (0.37 mg/L). Trace concentrations of arsenic were also noted in wells MW-5 and MW-12. Elevated concentrations were not observed for other toxic metals.

Results for total (i.e., unfiltered) metal concentrations are listed in the final Groundwater Analytical Report in Appendix A. Total metal concentrations do not reflect actual dissolved (or mobile) concentrations in the groundwater, because these samples would contain a certain amount of particulate matter. Samples were obtained for total metals analysis to examine any marked differences in concentrations (i.e., in comparison to the dissolved results) and for quality assurance purposes. Only the dissolved metals results were factored into the geochemical model.

A comparison of the major ion concentrations in groundwater samples from the seven monitor wells is graphically illustrated in Figure 2. The major ion concentrations include total carbonate (CO_3^{2-}), sulfate (SO_4^{2-}), chloride (Cl^-), calcium (Ca^{2+}), sodium and potassium ($Na^+ + K^+$), magnesium (Mg^{2+}), and iron and manganese ($Fe^{[total]} + Mn^{[total]}$). As pointed out previously, MW-11 had the lowest sulfate and chloride concentrations. A broad range in concentrations was observed for sodium and potassium, and iron and manganese. As with the field parameters, no significant trends were observed on a site-wide basis for any of the geochemical parameters. The varied concentrations are likely due to chemical and mineralogic changes in the soils across the site.

3.2 Soil Test Results

The soil test results for samples collected near MW-8, MW-10, and MW-11 are presented in Table 5. Values of pH ranged from 7.35 to 7.53, resulting in an average value of 7.47. Total organic carbon (TOC) ranged from 1.78 % (near MW-8) to 4.33 % (near MW-10). The natural moisture content among the three samples averaged approximately 13 %. Soil density, as determined on three re-compacted samples, resulted in an average value of 1.81 g/cc. Particle size analysis indicated that sand was the dominant component in all three samples.

3.3 Hydraulic Conductivity Test Results

Hydraulic conductivity calculations and results are summarized in Table 6. The raw hydraulic conductivity test data are presented in Appendix B.

Derived hydraulic conductivity values for MW-8 were very similar to the value obtained for MW-10. Given the inherent limitations of short-term rising head tests (Bouwer, 1989), the two values obtained at MW-8 are considered to be in close agreement. Based on three tests, the average hydraulic conductivity of soils surrounding MW-8 and MW-10 is estimated to be approximately 13 ft/d.

A zone of higher hydraulic conductivity exists in the vicinity of MW-9 (south of MW-8 and MW-10). This probably results from the presence of coarser-grained materials underlying this location. Based on the collected field data, a hydraulic conductivity of 30.16 ft/d was determined for this location, which is approximately 2.3 times greater than the average value estimated for MW-8 and MW-10. Due to the limited number of wells on site, the lateral and vertical extent of this higher hydraulic conductivity zone cannot be determined at this time.

3.4 Geochemical Background

Prior to presenting the model results, the geochemical behavior of chromium and arsenic in soil-groundwater environments (McLean and Bledsoe, 1992) is briefly discussed below:

Chromium

Chromium exists in two possible oxidation states in soil-groundwater systems: trivalent chromium (Cr^{3+}) and hexavalent chromium (Cr^{6+}). In soils, Cr^{6+} can occur as the chromate ion ($HCrO_4^-$), predominant at pH values less than 6.5 (or CrO_4^{2-}, predominant at a pH of around 6.5), and as the dichromate ion, $Cr_2O_7^{2-}$, predominant at higher concentrations (> 1,000 mg/L), within a pH range of approximately 2 to 6. The dichromate ions pose a greater health hazard than chromate ions. Both Cr^{6+} ions are more toxic than Cr^{3+} ions.

Because of the anionic nature of the chromate and dichromate ions, their association with soil surfaces is limited to positively charged exchange sites, the number of which decreases with increasing soil pH. For instance, iron and aluminum oxide surfaces will adsorb chromate ions (CrO_4^{2-}) at acidic and neutral pH values. In alkaline soils, minimal sorption of Cr^{6+} will occur, making it highly mobile. Parameters that limit the mobility of Cr^{6+} in soils include the amount of free iron oxides that are present, total manganese concentration, and soil pH.

Hexavalent chromium (Cr^{6+}) can be reduced to Cr^{3+} under normal soil pH and redox conditions. In surface soils, soil organic matter has been identified as the principal reducing agent in this reaction. In natural soils, the reduction reaction can be extremely slow, requiring years. The rate of this reduction, however, increases with decreasing soil pH. In subsurface soils, where organic matter occurs in low concentrations, iron-containing minerals can reduce Cr^{6+} to Cr^{3+}.

Trivalent chromium (Cr^{3+}) is normally not very soluble; it is readily adsorbed by soils. Although hexavalent chromium is highly soluble and mobile in soils, it is not very stable in the environment, and the trivalent species is likely to predominate. Thus, the overall mobility of elemental chromium in subsurface soils is low.

Arsenic

In most soil-groundwater environments, aqueous species of arsenic can occur in two forms: as arsenate, As^{5+} (AsO_4^{3-}), or arsenite, As^{3+} (AsO_2^-). Arsenite is the more toxic form of arsenic.

Arsenate forms insoluble precipitates with iron, aluminum, and calcium. Iron in soils is most effective in controlling arsenate's mobility. Maximum adsorption of arsenate by clay minerals, such as kaolinite and montmorillonite, has been found to occur at an approximate pH of 5. Maximum adsorption of arsenate by aluminum and iron oxides occurs at a pH range of 3 to 4, followed by a gradual decrease in adsorption with increasing pH.

Arsenite compounds are reported to be four to ten times more soluble than arsenate compounds. The adsorption of arsenite is also strongly pH-dependent. Increases in sorption of As^{3+} by kaolinite and montmorillonite have been observed over a pH range of 3 to 9. Maximum adsorption of As^{3+} by iron oxide occurs at a pH of 7.

Studies have indicated that iron oxide concentration, redox potential, and pH are the most important factors in controlling arsenic adsorption by soils. At high redox levels, arsenate (As^{5+}) predominates and arsenic mobility is low. As pH increases or redox decreases, arsenite (As^{3+}) predominates. Arsenite is more subject to leaching because of its high solubility. Additionally, arsenite can be oxidized to arsenate in the presence of manganese oxides.

3.5 Geochemical Model Results

Chromium

Chromium was modeled over a pH range of 6.5 to 7.5; similar to the range encountered in the monitor wells. The modeled Eh range extended from -250 mV to 500 mV. Starting concentrations of dissolved chromium, in excess of 6,000 mg/L were incorporated into the model simulations. Results from all model runs indicted that neither Cr^{3+} nor Cr^{6+} were present in any dissolved phases (i.e., at environmentally significant concentrations). The majority of chromium (i.e., Cr^{3+}) was associated with solid, stable mineral phases; namely, chromite ($FeCr_2O_4$) and chromium oxide (Cr_2O_3). Only a small percentage of chromium, approximately 0.3 %, was associated with adsorbed phases (i.e., adsorbed to iron oxide coatings on mineral surfaces). Based on the model simulations, chromium appears to be very stable within the soils at the site and the potential for leaching and mobilization is likely to be minimal.

Arsenic

Model results for the seven monitor wells are summarized in Table 7 showing the equilibrated mass distribution of arsenic in the soils and groundwater. The table shows dissolved, sorbed, and mineral phases for the two different species of arsenic (i.e., As^{3+} and As^{5+}). Dissolved and mineral phases of As^{5+} were not present at significant concentrations for any of the well locations. Dissolved concentrations of As^{3+} reflect the actual measured concentrations in the groundwater samples. The combined concentrations of sorbed and mineral phases reflect predicted "average" concentrations in the soils around each well, across the entire screen interval. Thus, concentrations could be higher near ground surface and decrease with depth, to essentially non-detect concentrations. In all cases where a portion of arsenic was partitioned to a mineral phase, it occurred as orpiment (As_2S_3), an arsenic sulfide mineral.

Of particular importance is MW-8, because it had the highest dissolved arsenic concentration. A previous analysis of subsurface soil (2- to 4-foot interval) collected at MW-8 yielded an arsenic concentration of 252 mg/kg (C.T. Male, 2002). Surface soil at this same location yielded an arsenic concentration of 987 mg/kg. From these results, it was assumed that the arsenic concentrations in the soils around MW-8 should decrease with depth, and that the average value over the well screen interval should certainly be less than what was observed in the shallow subsurface soil sample. The data for MW-8, in Table 7, show a total sorbed (or solid) arsenite concentration of approximately 171 mg/kg, which is based on an iron oxide content of 1.0 mg/g. This is further discussed near the end of this section.

The data in Table 7 indicate an important factor regarding the distribution of arsenic in soils and groundwater at the site. The majority of arsenic is sorbed onto mineral grains within the soils rather than occurring as mineral phases. Sorbed arsenic phases are less stable than the mineral phases of arsenic and are more sensitive to changes in environmental conditions. Additionally, most of the arsenic occurs as arsenite (As^{3+}), which is the more toxic form of arsenic. The data in Table 7 are graphically illustrated in Figure 3.

The dissolved and adsorbed arsenic concentrations (i.e., for As^{3+}) in Table 7 are graphically plotted in Figure 4 to illustrate the adsorption behavior of arsenic. As dissolved arsenic increases, adsorbed arsenic will also increase, but only to a point where all of the available adsorption sites on minerals surfaces have become occupied. From a theoretical standpoint, the graph shows a logarithmic decrease in adsorption energy with increasing surface coverage. In the case of MW-8, the available adsorption sites are likely approaching saturation, which explains the higher dissolved arsenic concentrations in the groundwater relative to the other monitor well locations.

Because MW-8 showed the highest dissolved arsenic concentration in the groundwater, additional model simulations were performed to investigate how changes in pH and Eh would affect dissolved arsenic. Figure 5 shows the effects of pH changes on dissolved As^{3+} concentrations in the groundwater. Arsenic was modeled over a pH range of 6.5 to 7.5; similar to the range encountered in the monitor wells. The observed Eh was held constant, at -105 mV. The starting equilibrium pH, from field observations, was 7.06 (refer to Table 2). The figure shows that as pH decreases from 7.06, there is a slight increase in dissolved arsenic, followed by a sharp decrease. In the opposite direction, as pH increases from 7.06, a slight increase in dissolved arsenic is observed.

Figure 6 illustrates the effects of Eh changes on dissolved arsenic concentrations in the groundwater. Arsenic was modeled over a Eh range of -250 mV to 25 mV; again, similar to the range encountered in the monitor wells. The pH was held constant, at 7.06. The starting equilibrium Eh was -105 mV. The figure shows that as Eh decreases from -105 mV, there is a decrease in dissolved As^{3+}, which levels off at approximately 1.3 mg/L. In the opposite direction, as Eh increases from -105 mV, a gradual increase in dissolved As^{3+} is observed. At a Eh of approximately -50 mV, As^{5+} also comes into solution and sharply increases in concentration as the Eh increases. This results from the oxidation of As^{3+} to As^{5+} with increasing Eh. Additionally, with increasing Eh, a decrease in sorbed As^{3+} concentrations was observed while concentrations of sorbed As^{5+} increased; again, due to the oxidation of As^{3+} to As^{5+}. However, the sorbed concentration of *total* arsenic (As^{3+} + As^{5+}) was found to decrease with increasing Eh.

The above results suggest that Eh will be a very dominant factor (more dominant than pH) in controlling the mobility of arsenic in site soils. In general, DO concentrations in the groundwater are related Eh. As Eh values change from negative to positive, DO concentrations will increase. Thus, if conditions at the site change over time, creating a more oxidizing subsurface environment, dissolved arsenic concentrations (i.e., both As^{3+} and As^{5+}) could potentially increase in the groundwater.

Model simulations were additionally performed, using data from MW-8, to investigate how changes in iron oxide concentration would affect the predicted arsenic concentrations in the subsurface soils. Three different iron oxide contents were modeled: 0.1 mg/g, 1.0 mg/g (used throughout the study), and 5.0 mg/g. Equilibrium values of pH (7.06) and Eh (-105 mV) were used for all model simulations. The modeled results, graphically illustrated in Figure 7, show a linear relationship between iron oxide content and total arsenic concentration in the soil. At a very low iron oxide content of 0.1 mg/g, the model estimated an arsenic concentration of approximately 17 mg/kg. At a moderately high iron oxide content of 5.0 mg/g, the model estimated an arsenic concentration of approximately 854 mg/kg. The latter result does not appear to be realistic (i.e., too high), based on the limited soil analytical data from this location. Likewise, while the low iron oxide content produced an arsenic concentration that could indeed be realistic, the iron oxide content in itself, is not realistic for the type of soil at the site (i.e., the value is too low). The intermediate iron oxide content of 1.0 mg/g appears to be more realistic for the site soils and also produces reasonable concentrations of arsenic that could be expected within the subsurface (i.e., greater than four feet bgs). However, a more realistic scenario is that the iron oxide content probably varies within the soils across the site, just as the groundwater parameters vary from one well location to the next. Therefore, the intermediate iron oxide content should only be treated as a possible average value.

4.0 SUMMARY AND CONCLUSIONS

- Between June 18 and 21, 2002, REAC personnel collected groundwater and shallow subsurface soil samples at the Independent Leather Site for chemical and physical property analysis. In-situ hydraulic conductivity tests were also performed in several on-site monitor wells as a means for estimating permeability of subsurface soils.

- Groundwater samples were collected from seven out of 11on-site monitor wells for analysis of the following geochemical parameters: Cr^{6+}, silica, carbonate alkalinity, nitrate-nitrogen, orthophosphate, chloride, sulfate, DOC, and TDS. Samples were also analyzed for TAL metals.

- No significant trends were observed on a site-wide basis for any of the geochemical parameters or the TAL metals. The varied concentrations are likely due to chemical and mineralogic changes in the soils across the site.

- Soil pH for three shallow subsurface samples collected near MW-8, MW-10, and MW-11 ranged from 7.35 to 7.53, resulting in an average value of 7.47. Particle size analysis indicated that sand was the dominant component in all three samples.

- In-situ hydraulic conductivity tests were performed in monitor wells MW-8, MW-9, and MW-10. An average hydraulic conductivity of soils surrounding MW-8 and MW-10 was estimated to be approximately 13 ft/d. A zone of higher hydraulic conductivity was found to exist in the vicinity of MW-9 (south of MW-8 and MW-10) that probably results from the presence of coarser-grained materials at this location. A hydraulic conductivity of 30.16 ft/d was determined for MW-9, which is approximately 2.3 times greater than the average value estimated for MW-8 and MW-10. Due to the limited number of wells on site, the lateral and vertical extent of this higher hydraulic conductivity zone cannot be determined at this time.

- The geochemical code, MINTEQA2, was used to examine the chemical partitioning and mobility of chromium and arsenic in soils and groundwater at the site.

- Based on model simulations, chromium appears to be very stable within the site soils and the potential for leaching and mobilization is likely to be minimal. The majority of chromium (Cr^{3+}) is associated with solid, stable mineral phases; namely, chromite ($FeCr_2O_4$) and chromium oxide (Cr_2O_3).

- For arsenic, model results indicated that the majority of this metal is sorbed onto mineral grains within the site soils rather than occurring in mineral form. The free iron oxide content in the soils (i.e., as coatings on mineral surfaces) will likely control the degree of arsenic sorption. Sorbed arsenic phases are less stable than the mineral phases of arsenic and are more sensitive to changes in environmental conditions. Additionally, most of the arsenic was found to occur as arsenite (As^{3+}), which is the more toxic form of arsenic.

- Model simulations demonstrated that the amount of dissolved arsenic in groundwater is related to the concentration of adsorbed arsenic in the soils. As dissolved arsenic increases, adsorbed arsenic will also increase, but only to a point where all of the available sorption sites on minerals surfaces have become occupied. In the case of MW-8, the available sorption sites are likely approaching saturation, which explains the higher dissolved arsenic concentrations in the groundwater relative to the other monitor wells that were examined.

- Model results indicted that increases in groundwater pH will result in slight increases in dissolved As^{3+} concentrations. Increases in Eh will also result in gradual increases in dissolved As^{3+} concentrations. Additionally, as Eh increases (i.e., above -50 mV), As^{5+} will come into solution and will sharply increase in concentration with further increases in Eh.

- The results of model simulations suggest that Eh will be a very dominant factor (more dominant than pH) in controlling the mobility of arsenic in site soils. In general, DO concentrations in the groundwater are related to Eh. As Eh values change from negative to positive, DO concentrations in the groundwater will increase. Thus, if conditions at the site change over time, creating a more oxidizing subsurface environment, dissolved arsenic concentrations (i.e., both As^{3+} and As^{5+}) could potentially increase in the groundwater.

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TABLE 1
Monitor Well Data
Independent Leather Site
March 2003

Well No.	Casing Height (1) feet (ags)	Well Depth (1) feet (bgs)	Well Depth (2) feet (bgs)	Ground Change (3) (feet)	Till Depth (1) feet (bgs)	Water Depth feet (bgs)	Date (4)
MW-5	1.91	18.15	16	2.15	15.2	10.53	6/18/2002
MW-6	4.42	12.93	14	-1.07	6.9	8.89	6/18/2002
MW-7	2.30	18.05	14	4.05	13.6	9.92	6/21/2002
MW-8	4.25	16.17	15	1.17	13.2	9.43	6/18/2002
MW-9	2.29	18.21	15	3.21	15.2	10.09	6/18/2002
MW-10	2.78	14.77	15	-0.23	13.8	7.03	6/19/2002
MW-11	2.99	14.61	15	-0.39	11.6	2.12	6/19/2002
MW-12	3.03	14.57	14	0.57	9.6	5.37	6/19/2002
MW-14	3.00	14.76	15	-0.24	9.8	7.51	6/19/2002

ags - above ground surface (top of PVC well riser).
bgs - below ground surface.
(1) - as of 6/21/02.
(2) - original depth (late April to early May 2002).
(3) - ground elevation change due to site grading and closure operations subsequent to well installation.
(4) - dates that water depths were recorded in wells.

TABLE 2
Groundwater Field Parameter Measurements
Independent Leather Site
March 2003

Parameter	MW-5	MW-7	MW-8	MW-9	MW-10	MW-11	MW-12	MW-14
Measurement Date	6/18/2002	6/21/2002	6/18/2002	6/18/2002	6/19/2002	6/19/2002	6/19/2002	6/19/2002
Temperature (degrees C)	13.63	13.89	11.63	10.55	11.04	14.82	11.11	12.11
Conductivity (micro-siemens/cm)	1,780	25,839	3,180	1,404	4,072	993	3,750	1,484
Dissolved Oxygen (mg/L)	0.3	0.42	1.34	8.7	0.56	0.73	1.8	2.67
pH (units)	7.29	6.48	7.06	6.86	6.69	7.37	7.16	6.95
Redox Potential (mV)	-235	-146	-105	20	-195	-244	-186	21
Ferrous Iron (mg/L)	1	>10	2.25	< 0.1	9	3.5	3.5	< 0.1

C - Celsius
cm - centimeter
mg/L - milligrams per liter
mV - millivolts

All parameters reflect stabilized measurements prior to sampling.
MW-7 was not sampled for metals or geochemical parameters.

TABLE 3
Geochemical Results for Groundwater Samples
Independent Leather Site
March 2003

Parameter	MW-5	MW-8	MW-9	MW-10	MW-11	MW-12	DUP	MW-14
Sample Date	6/18/2002	6/18/2002	6/18/2002	6/19/2002	6/19/2002	6/19/2002	6/19/2002	6/19/2002
Hexavalent Chromium	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Silica	4.3	6.6	6.8	13	7.6	6.7	7.6	8.0
Total Carbonate	392	617	398	1,584	335	761	700	358
Nitrate-Nitrogen	< 0.2	13	5.1	< 0.2	< 0.2	0.6	0.3	3.1
Orthophosphate	0.14	2.09	< 0.5	0.19	0.15	< 0.05	< 0.05	< 0.05
Chloride	150	170	72	180	7	360	410	61
Sulfate	100	170	110	180	7	44	37	57
DOC	5	12	3	37	6	21	73	5
TDS	760	5,900	2,100	1,600	440	1,300	1,300	550

All concentrations given in milligrams per liter (mg/L).

DOC - dissolved organic carbon.
TDS - total dissolved solids.
DUP - duplicate sample from MW-12.
Total Carbonate = calculated value

TABLE 4
Dissolved Metal Results for Groundwater Samples
Independent Leather Site
March 2003

Parameter	MW-5	MW-8	MW-9	MW-10	MW-11	MW-12	DUP (MW-12)	MW-14
Sample Date	6/18/2002	6/18/2002	6/18/2002	6/19/2002	6/19/2002	6/19/2002	6/19/2002	6/19/2002
Aluminum	< 0.05	0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.07	< 0.05
Antimony	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Arsenic	0.02	3.5	< 0.01	< 0.01	0.37	0.04	0.06	< 0.01
Barium	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Beryllium	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Cadmium	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Calcium	77	140	160	240	85	56	53	140
Chromium	< 0.05	< 0.05	< 0.05	0.06	< 0.05	< 0.05	< 0.05	< 0.05
Cobalt	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Copper	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Iron	0.80	1.5	0.03	6.8	2.8	2.7	2.3	< 0.03
Lead	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Magnesium	7.7	7.5	14	64	7.3	14	13	9.4
Manganese	0.30	0.33	< 0.02	0.32	0.29	0.18	0.18	0.26
Mercury	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Nickel	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Potassium	2.7	12	2.1	8.8	1.4	9.2	8.8	1.5
Selenium	< 0.01	< 0.01	0.02	0.02	< 0.01	< 0.01	0.02	0.02
Silver	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Sodium	100	230	12	190	11	410	380	10
Thallium	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	0.01	< 0.003	< 0.003
Vanadium	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Zinc	0.03	0.02	< 0.01	0.01	0.05	0.03	0.01	0.02

Concentrations given in milligrams per liter (mg/L).

DUP - duplicate sample from MW-12.

TABLE 5
Soil Test Results
Independent Leather Site
March 2003

Parameter	MW-8	MW-10	MW-11
pH (units)	7.52	7.35	7.53
Total Organic Carbon (% dry weight) *	1.78	4.33	2.53
Moisture Content (% total weight)	11.6	14.6	12.9
Bulk Density (g/cc) **	1.90	1.74	1.79
Gravel (% dry weight)	7.9	8.3	6.7
Sand (% dry weight)	78.3	61.1	79.7
Silt (% dry weight)	12.7	25.7	12.6
Clay (% dry weight)	1.1	4.9	1.0
Total (%)	100.0	100.0	100.0

* Determined by loss-on-ignition method.
** Determined on recompacted samples.

g/cc = grams per cubic centimeter
% = percent, based on range from 0 to 100.

TABLE 6
Hydraulic Conductivity Calculations and Results
Independent Leather Site
March 2003

Well No.	r[eq] (cm)	ln Re/rw	Le (cm)	time (1) (min)	head (1) (cm)	time (2) (min)	head (2) (cm)	time (total) (sec)	discharge (gpm)	K (cm/sec)	K (ft/d)
MW-8 (a)	6.29	2.263	304.8	1.103	5.482	2.630	0.169	91.62	na	5.58E-03	15.78
MW-8 (b)	6.29	2.263	304.8	0.876	5.397	2.786	0.321	114.60	na	3.62E-03	10.24
MW-9	6.29	2.380	304.8	0.119	6.293	8.900	0.005	526.86	5.0	1.06E-02	30.16
MW-10	6.29	2.350	304.8	1.103	5.843	1.753	1.830	39.00	na	4.54E-03	12.85

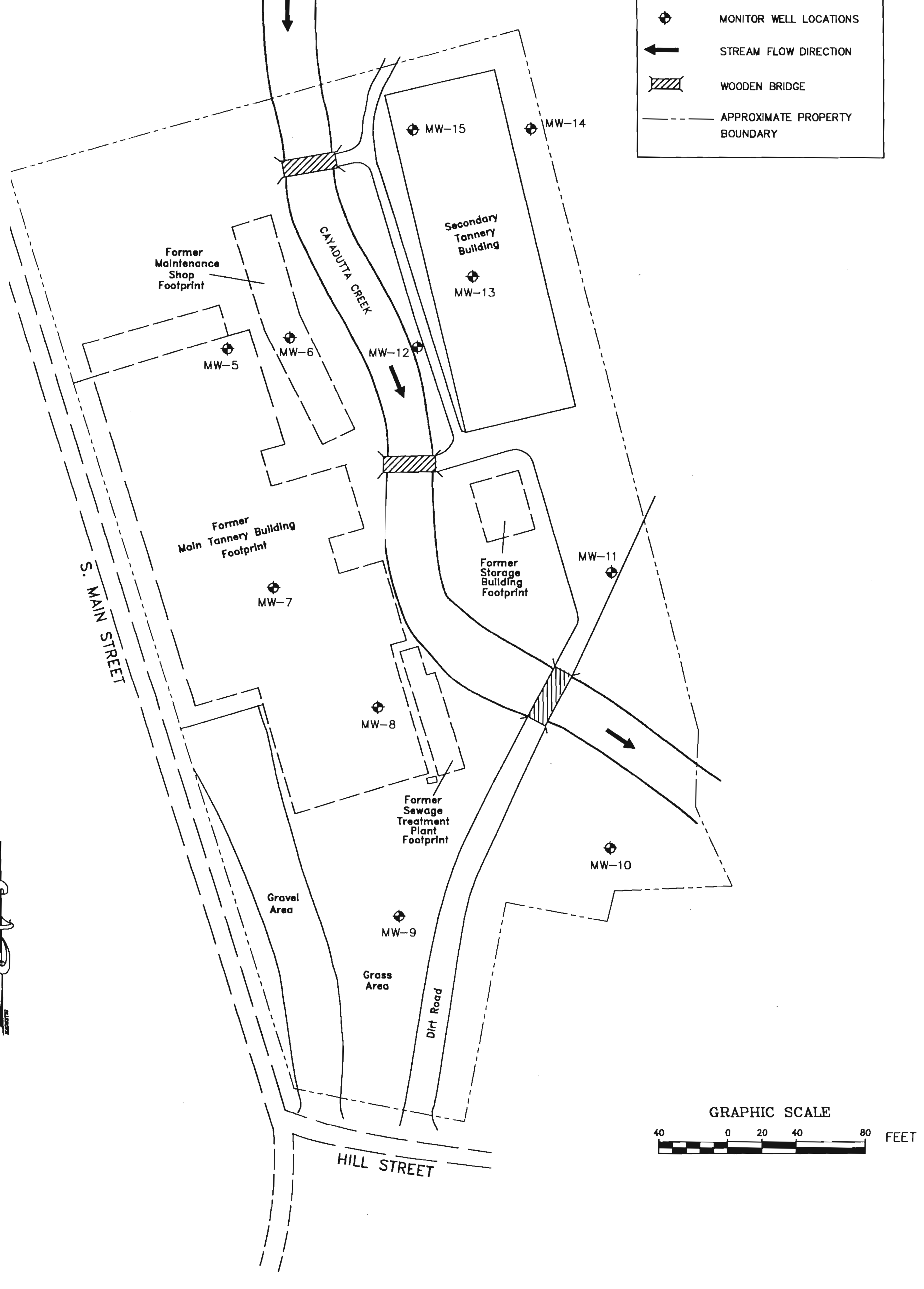
r[eq] = equivalent radius of well screen and surrounding sand pack
Re = effective radial distance over which the change in water level is dissipated
rw = radial distance of undisturbed portion of aquifer from centerline of well
Le = water-saturated length of well screen interval
head = static water level minus nonequilibrium water level
K = hydraulic conductivity
cm/sec = centimeters per second
ft/d = feet per day
gpm = gallons per minute
na = not applicable
(1) = initial reading
(2) = subsequent reading

TABLE 7
Model Results:
Mass Distribution of Arsenic in Soil and Groundwater
Independent Leather Site
March 2003

Well	pH (units)	Eh (mV)	Dissolved As^{3+} (mg/L)	Sorbed As^{3+} (mg/kg)	Sorbed As^{5+} (mg/kg)	As^{3+}: mineral phase (mg/kg)
MW-5	7.29	-235	0.02	9.53	np	14.09
MW-8	7.06	-105	3.50	170.79	0.37	np
MW-9	6.86	20.2	0.01	3.45	20.99	np
MW-10	6.69	-195	0.01	5.33	np	25.69
MW-11	7.37	-244	0.37	94.22	np	1.00
MW-12	7.16	-186	0.06	27.02	np	3.95
MW-14	6.95	21	0.01	3.13	24.56	np

mV - millivolts
np - not present
As^{3+} - arsenite
As^{5+} - arsenate

Note: Dissolved and mineral phases of As^{5+} were not present at significant concentrations.



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W.O.# R1A00222

FIGURE 1
SITE MAP
INDEPENDENT LEATHER SITE
GLOVERSVILLE, NEW YORK
MARCH 2003

REAC3/222/MW_LOCATION.dwg

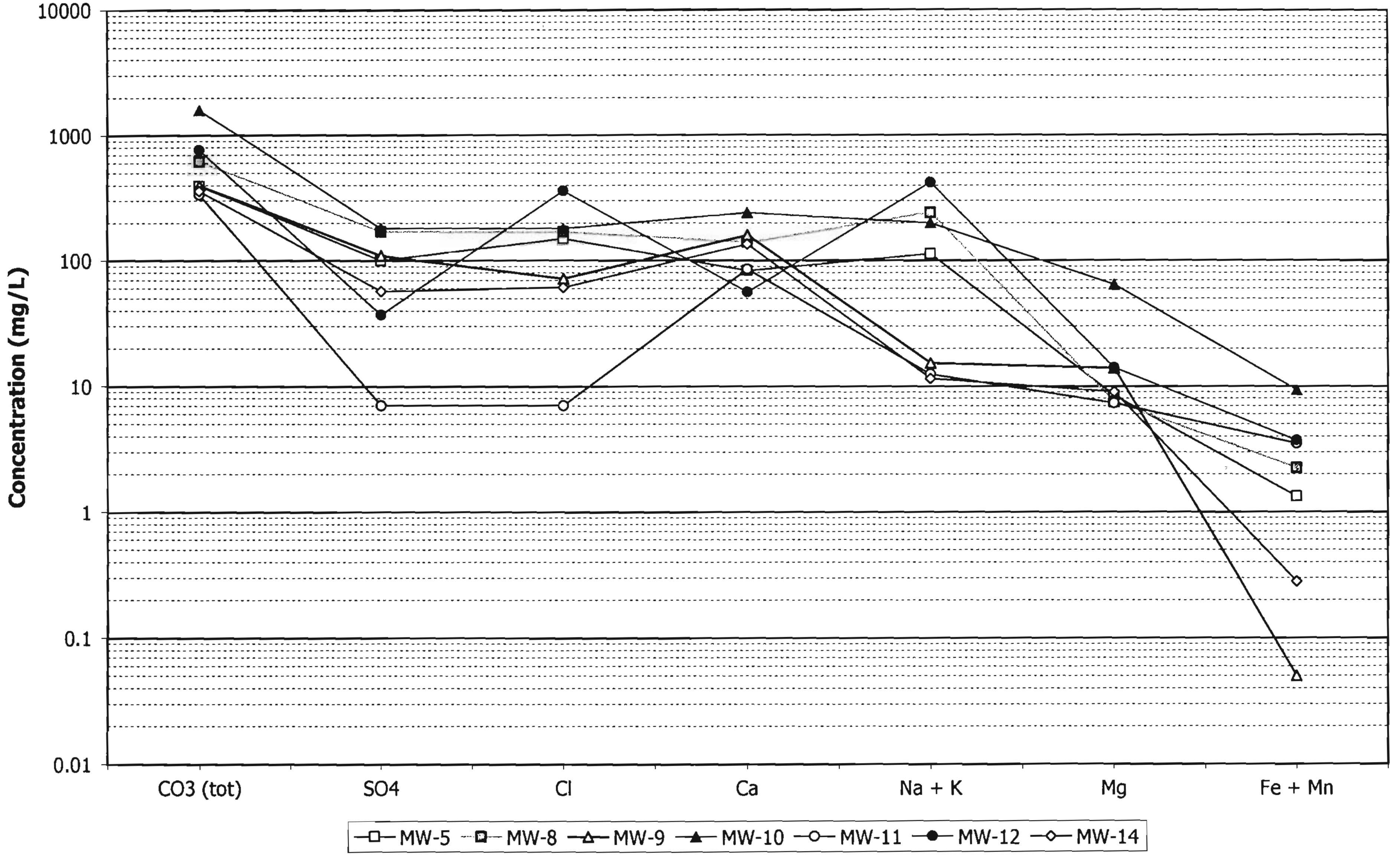

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FIGURE 2
MAJOR ION CONCENTRATIONS IN
GROUNDWATER SAMPLES
INDEPENDENT LEATHER SITE
GLOVERSVILLE, NEW YORK
MARCH 2003

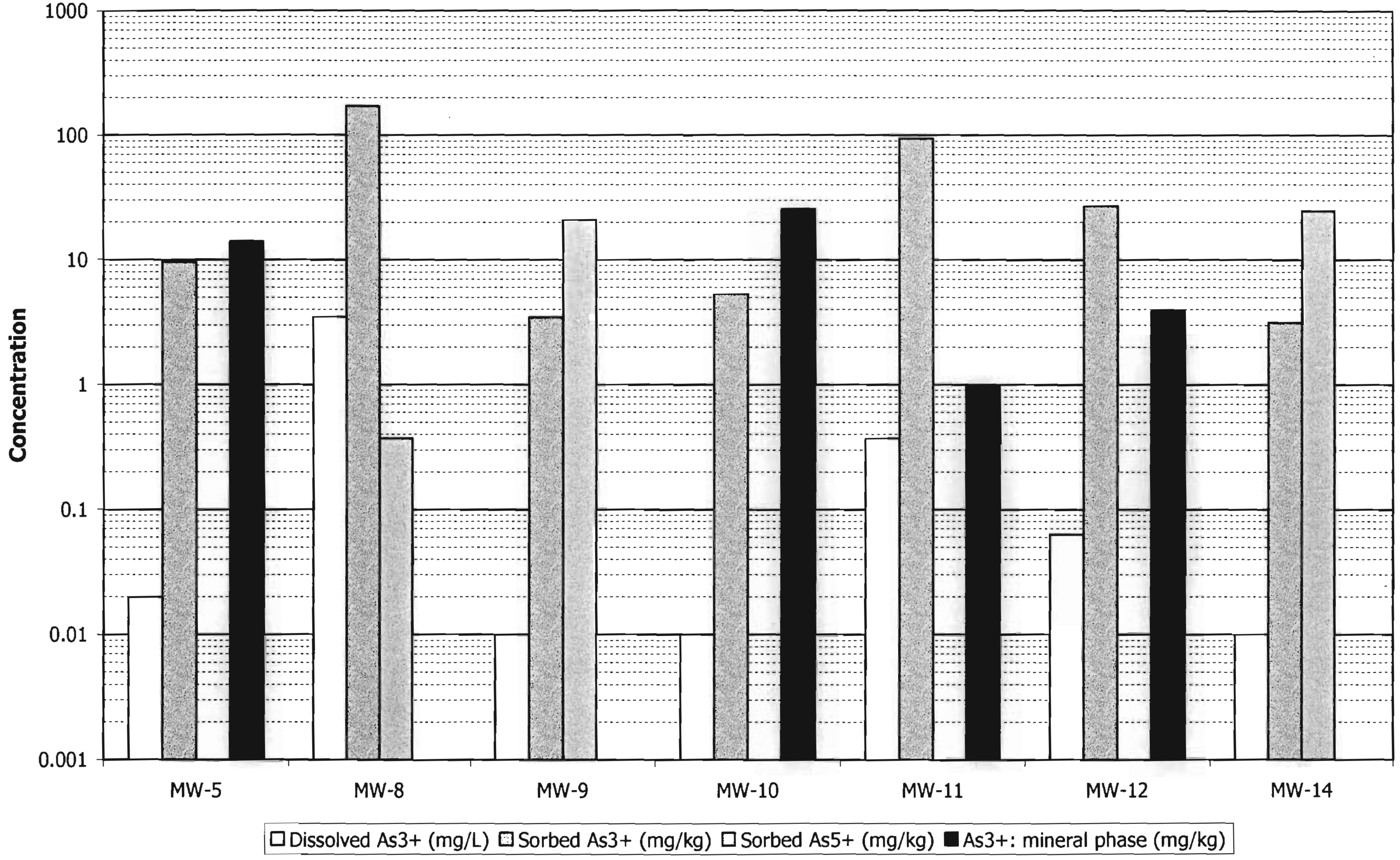

FIGURE 3
MODEL RESULTS: MASS DISTRIBUTION OF
ARSENIC IN SOIL AND GROUNDWATER
INDEPENDENT LEATHER SITE
GLOVERSVILLE, NEW YORK
MARCH 2003

U.S. EPA ENVIRONMENTAL RESPONSE TEAM CENTER
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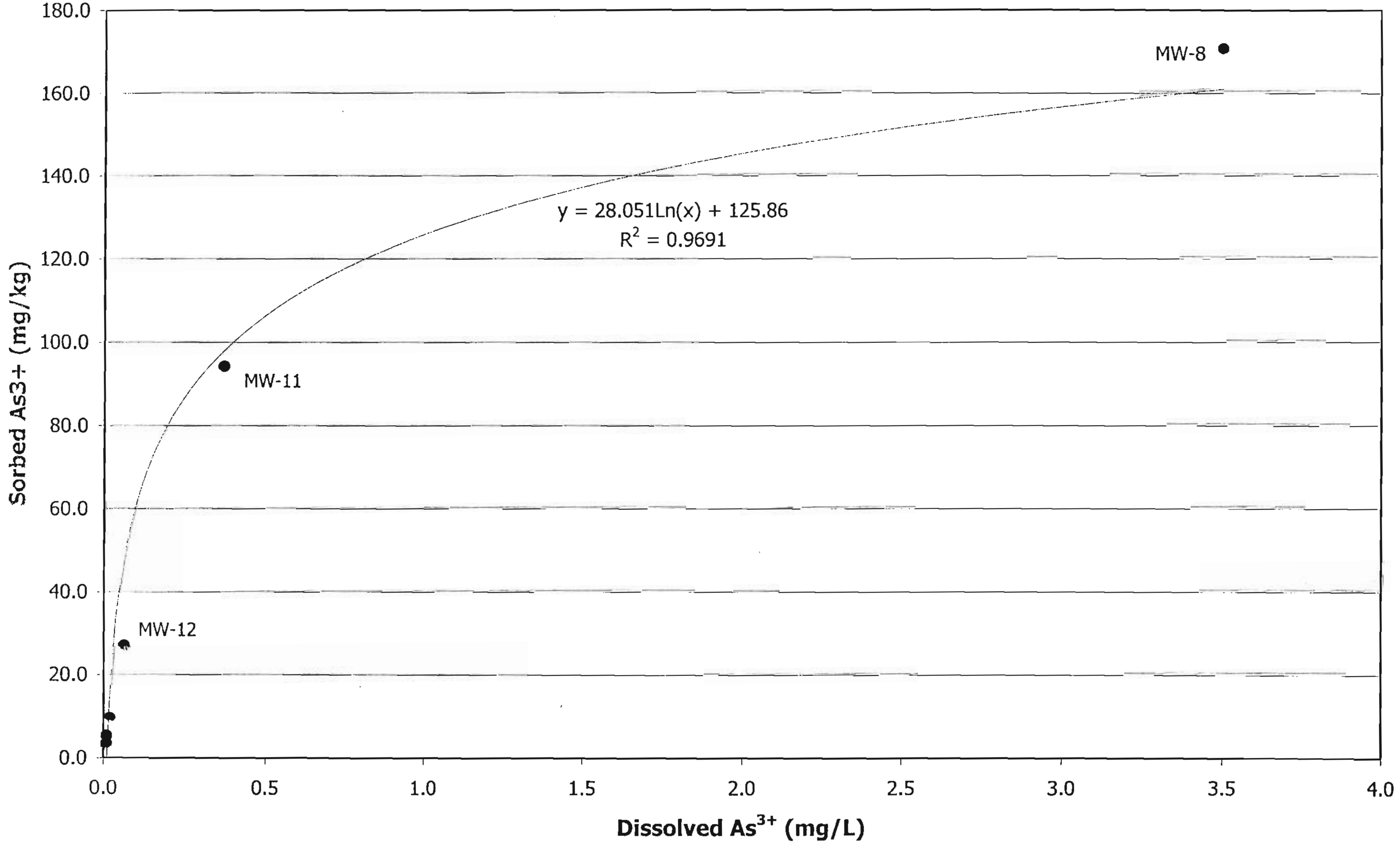

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FIGURE 4
DISSOLVED VS. ADSORBED
As^{3+} CONCENTRATIONS
INDEPENDENT LEATHER SITE
GLOVERSVILLE, NEW YORK
MARCH 2003

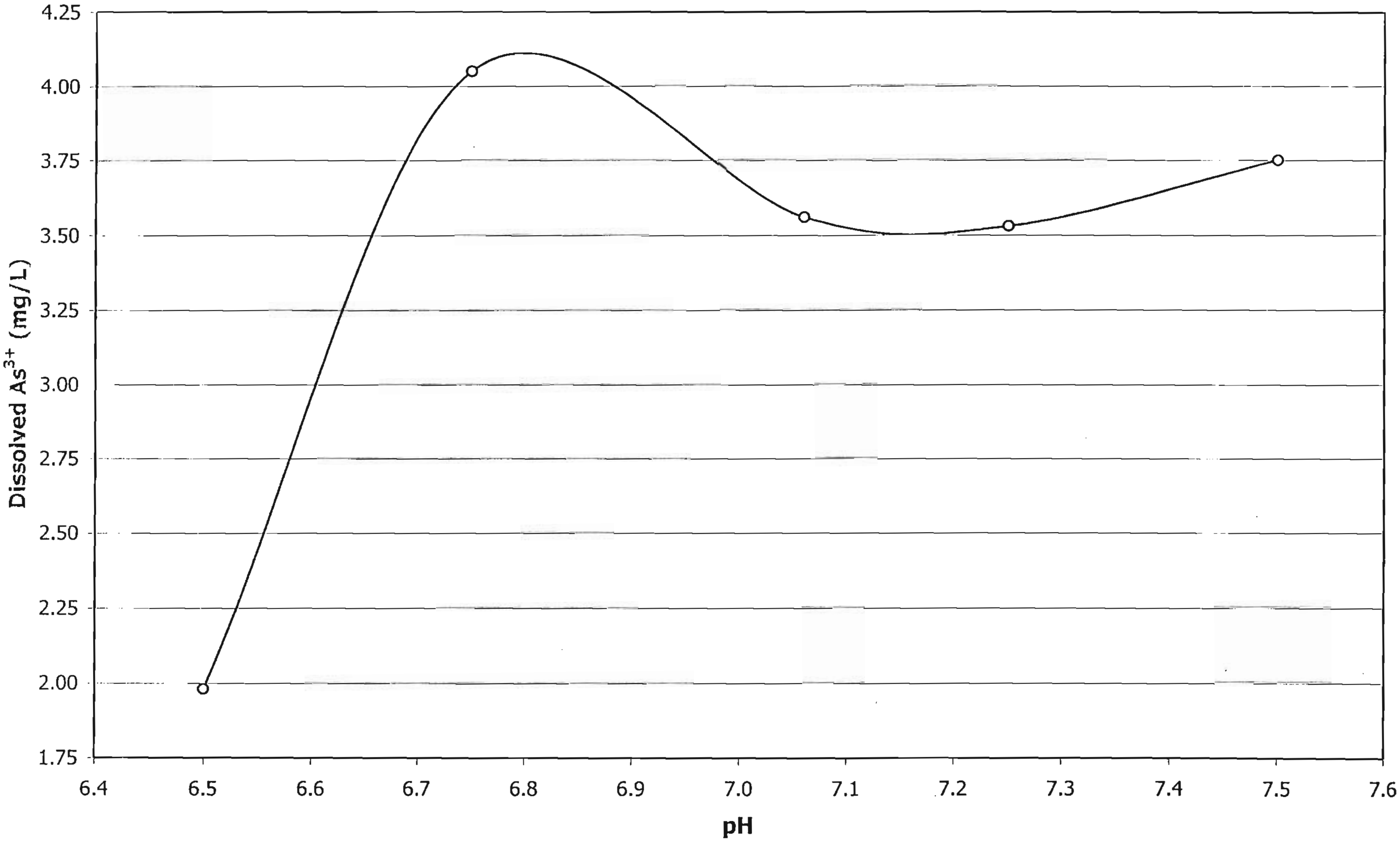

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FIGURE 5
MW-8: EFFECT OF pH CHANGES ON
DISSOLVED ARSENIC CONCENTRATIONS
INDEPENDENT LEATHER SITE
GLOVERSVILLE, NEW YORK
MARCH 2003

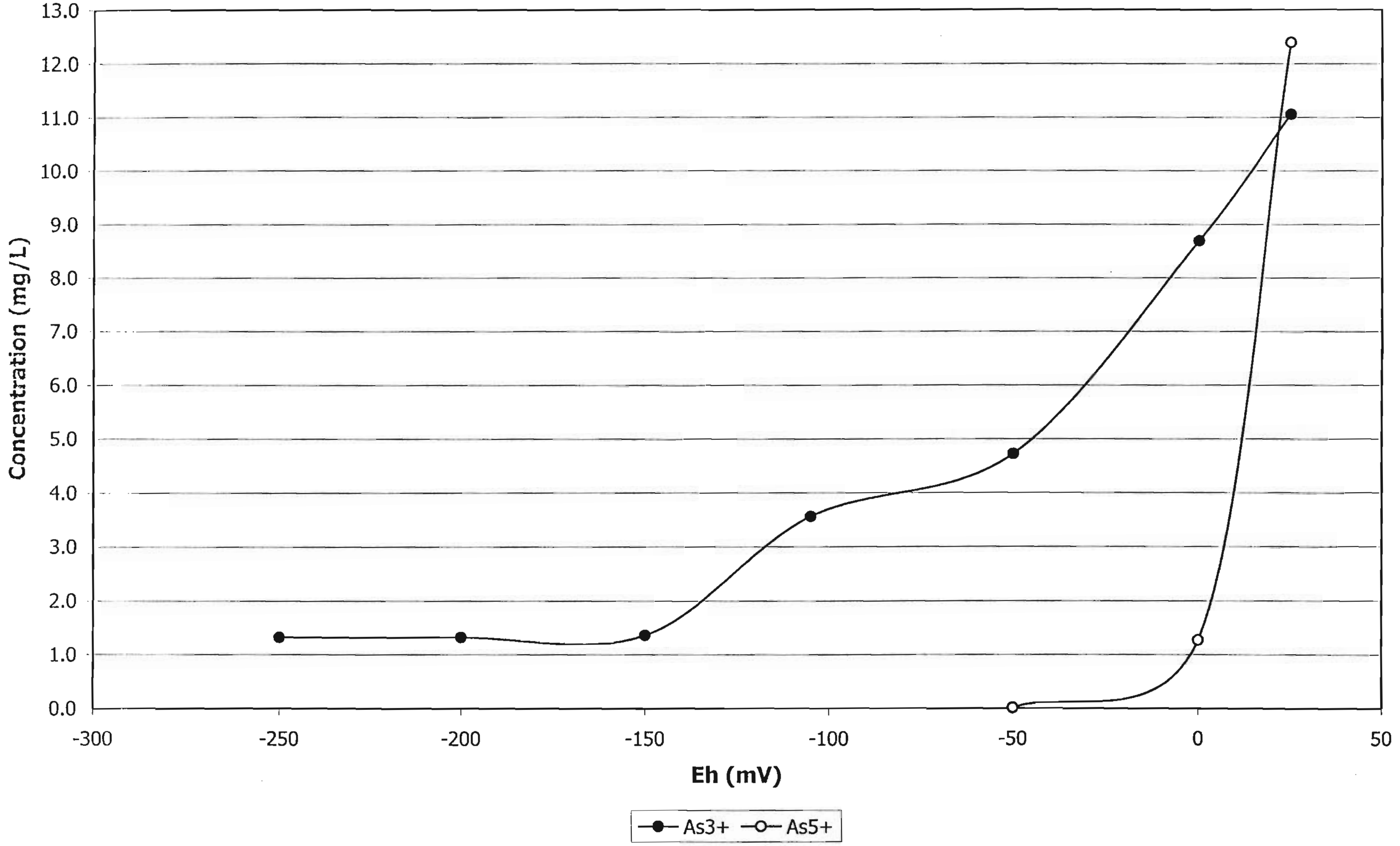

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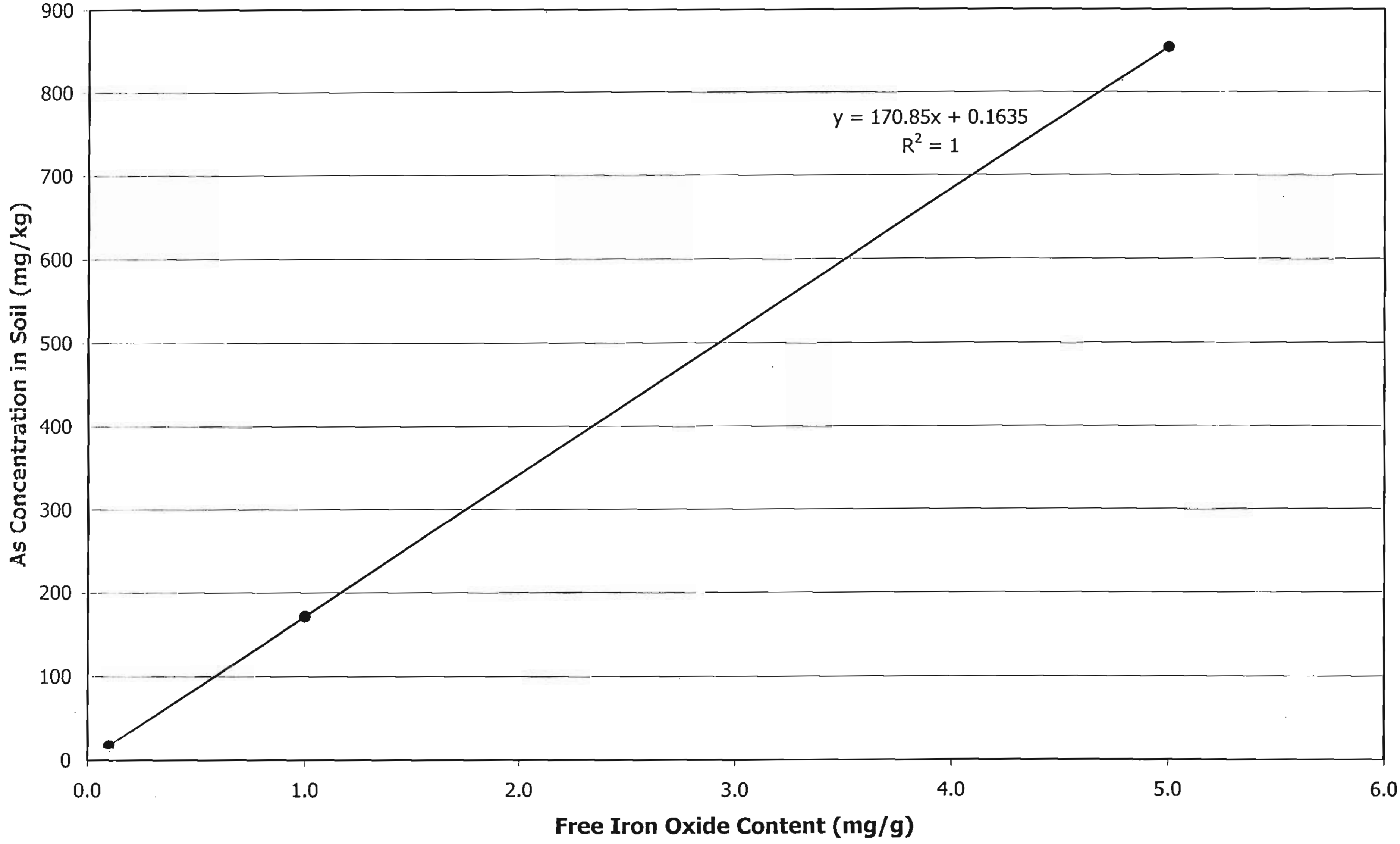
FIGURE 6
MW-8: EFFECT OF Eh CHANGES ON
DISSOLVED ARSENIC CONCENTRATIONS
INDEPENDENT LEATHER SITE
GLOVERSVILLE, NEW YORK
MARCH 2003



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W.O. # R1A00222

FIGURE 7
MW-8: EFFECT OF IRON OXIDE CONTENT ON
PREDICTED ARSENIC CONCENTRATIONS IN SOILS
INDEPENDENT LEATHER SITE
GLOVERSVILLE, NEW YORK
MARCH 2003

APPENDIX A
Groundwater Analytical Report
Independent Leather Site
March 2003

Upstate Laboratories inc.

Shipping: 6034 Corporate Dr. • E. Syracuse, NY 13057-1017 • (315) 437-0255 • Fax (315) 437-1209
Mailing. Box 289 • Syracuse, NY 13206
Albany (518) 459-3134
Binghamton (607) 724-0478
Buffalo (716) 649-2533
Rochester (716) 436-9070
New Jersey (201) 343-5353

July 11, 2002

Ms. Lane McCann
Earth Tech
7870 Villa Park Dr.
Suite 400
Richmond, VA 23228

Re: Analysis Report #17002097 - Independent Leather

Dear Ms. McCann:

Please find enclosed the results for your samples which were received on June 19, 2002.

We have included the Chain of Custody Record as part of your report. You may need to reference this form for a more detailed explanation of your sample. Samples will be disposed of approximately one month from final report date.

Should you have any questions, please feel free to give us a call.

Thank you for your patronage.

Sincerely,

UPSTATE LABORATORIES, INC.

Anthony J. Scala

Anthony J. Scala
Director

AJS/jd

Enclosures: report, invoice

cc/encs: N. Scala, ULI
file
M. Kromis, Earth Tech (data deliverables to follow)

Note: Faxed results were given to your office on 7/2 and 7/3/02. AJS

Disclaimer: The test results and procedures utilized, and laboratory interpretations of data obtained by ULI as contained in this report are believed by ULI to be accurate and reliable for sample(s) tested. In accepting this report, the customer agrees that the full extent of any and all liability for actual and consequential damages of ULI for the services performed shall be equal to the fee charged to the customer for the services as liquidated damages.

DATE: 07/11/02

Upstate Laboratories, Inc.
Analysis Results
Report Number: 17002097
Client I.D.: EARTH TECH
Sampled by:

APPROVAL:
QC:
Lab I.D.: 10170

INDEPENDENT LEATHER
MW-8 1215H 06/18/02

ULI I.D.: 17002097

Matrix: Water

	PARAMETERS	RESULTS	TIME	DATE ANAL.	KEY	KEY	FILE#
	Hexavalent Chromium	<0.01mg/l	0850	06/19/02			WD9696
	Nitrate-Nitrogen	13mg/l	0900	06/19/02			WD9718
	Ortho-Phosphorus	2.09mg/l		06/19/02			WD9834
	Total Alkalinity	<10mg/lCaCO3		06/24/02			WD9837
	Chloride	170mg/l		07/02/02			WD9895
	Dissolved Organic Carbon	12mg/l		06/27/02			WD9872
	Sulfate	170mg/l		06/26/02			WD9920
	Total Dissolved Solids	5900mg/l		06/22/02			WD9759
	Silica	6.6mg/l		06/21/02			ME5178
Total	Aluminum	0.58mg/l		06/21/02			ME5176
Total	Antimony by Low Level	<0.3mg/l		06/21/02			ME5176
Total	Arsenic by Low Level	6.2mg/l		06/21/02			ME5176
Total	Barium	<0.3mg/l		06/21/02			ME5176
Total	Beryllium	<0.005mg/l		06/21/02			ME5176
Total	Cadmium	<0.005mg/l		06/21/02			ME5176
Total	Calcium	110mg/l		06/21/02			ME5177
Total	Chromium	<0.05mg/l		06/21/02			ME5175
Total	Cobalt	<0.05mg/l		06/21/02			ME5176
Total	Copper	<0.02mg/l		06/21/02			ME5176
Total	Iron	2.1mg/l		06/21/02			ME5176
Total	Lead by Low Level	<0.1mg/l		06/21/02			ME5176
Total	Magnesium	5.7mg/l		06/21/02			ME5177
Total	Manganese	0.23mg/l		06/21/02			ME5176
Total	Mercury	<0.0004mg/l		06/24/02			MH4650
Total	Nickel	<0.03mg/l		06/21/02			ME5176
Total	Potassium	11mg/l		06/21/02			ME5177
Total	Selenium by Low Level	<0.01mg/l		06/21/02			ME5176
Total	Silver	<0.05mg/l		06/21/02			ME5176
Total	Sodium	260mg/l		06/21/02			ME5177
Total	Thallium by Low Level	<0.003mg/l		06/21/02			ME5176
Total	Vanadium	<0.3mg/l		06/21/02			ME5176
Total	Zinc	0.02mg/l		06/21/02			ME5176
Dissolved	Aluminum	0.05mg/l		06/21/02			ME5176
Dissolved	Antimony by Low Level	<0.3mg/l		06/21/02			ME5176
Dissolved	Arsenic by Low Level	3.5mg/l		06/21/02			ME5176
Dissolved	Barium	<0.3mg/l		06/21/02			ME5176
Dissolved	Beryllium	<0.005mg/l		06/21/02			ME5176
Dissolved	Cadmium	<0.005mg/l		06/21/02			ME5176
Dissolved	Calcium	140mg/l		06/21/02		15	ME5177
Dissolved	Chromium	<0.05mg/l		06/21/02			ME5176

DATE: 07/11/02

Upstate Laboratories, Inc.
Analysis Results
Report Number: 17002097
Client I.D.: EARTH TECH
Sampled by:

APPROVAL:
QC:
Lab I.D.: 10170
INDEPENDENT LEATHER
MW-8 1215H 06/18/02

ULI I.D.: 17002097

Matrix: Water

PARAMETERS	RESULTS	TIME	DATE ANAL.	KEY	KEY	FILE#
Dissolved Cobalt	<0.05mg/l		06/21/02			ME5176
Dissolved Copper	<0.02mg/l		06/21/02			ME5176
Dissolved Iron	1.5mg/l		06/21/02			ME5176
Dissolved Lead by Low Level	<0.1mg/l		06/21/02			ME5176
Dissolved Magnesium	7.5mg/l		06/21/02		15	ME5177
Dissolved Manganese	0.33mg/l		06/21/02		15	ME5176
Dissolved Mercury	<0.0004mg/l		06/24/02			MB4650
Dissolved Nickel	<0.03mg/l		06/21/02			ME5176
Dissolved Potassium	12mg/l		06/21/02		15	ME5177
Dissolved Selenium by Low Level	<0.01mg/l		06/21/02			ME5176
Dissolved Silver	<0.05mg/l		06/21/02			ME5176
Dissolved Sodium	230mg/l		06/21/02			ME5177
Dissolved Thallium by Low Level	<0.003mg/l		06/21/02			ME5176
Dissolved Vanadium	<0.3mg/l		05/21/02			ME5176
Dissolved Zinc	0.02mg/l		06/21/02			ME5176

DATE: 07/11/02

Upstate Laboratories, Inc.
Analysis Results
Report Number: 17002097
Client I.D.: EARTH TECH
Sampled by:

APPROVAL:
QC:
Lab I.D.: 10170

INDEPENDENT LEATHER
MW-9 1030H 06/18/02

ULI I.D.: 17002098

Matrix: Water

PARAMETERS		RESULTS	TIME	DATE ANAL.	KEY	KEY	FILE#
	Hexavalent Chromium	0.01mg/l	0850	06/19/02			WD9696
	Nitrate-Nitrogen	5.1mg/l	0900	06/19/02			WD9718
	Ortho-Phosphorus	<0.5mg/l		06/19/02			WD9894
	Total Alkalinity	490mg/lCaCO3		06/24/02			WD9837
	Chloride	72mg/l		07/02/02			WD9895
	Dissolved Organic Carbon	3mg/l		06/27/02			WD9872
	Sulfate	110mg/l		06/26/02			WD9820
	Total Dissolved Solids	2100mg/l		06/22/02			WD9759
	Silica	6.8mg/l		06/21/02			ME5178
Total	Aluminum	0.05mg/l		06/21/02			ME5176
Total	Antimony by Low Level	<0.3mg/l		06/21/02			ME5176
Total	Arsenic by Low Level	0.02mg/l		06/21/02			ME5176
Total	Barium	<0.3mg/l		06/21/02			ME5176
Total	Beryllium	<0.005mg/l		06/21/02			ME5176
Total	Cadmium	<0.005mg/l		06/21/02			ME5176
Total	Calcium	160mg/l		06/21/02			ME5177
Total	Chromium	<0.05mg/l		06/21/02			ME5176
Total	Cobalt	<0.05mg/l		06/21/02			ME5176
Total	Copper	<0.02mg/l		06/21/02			ME5176
Total	Iron	0.06mg/l		06/21/02			ME5176
Total	Lead by Low Level	<0.1mg/l		06/21/02			ME5176
Total	Magnesium	14mg/l		06/21/02			ME5177
Total	Manganese	<0.02mg/l		06/21/02			ME5175
Total	Mercury	<0.0004mg/l		06/24/02			ME4650
Total	Nickel	<0.03mg/l		06/21/02			ME5176
Total	Potassium	2.3mg/l		06/21/02			ME5177
Total	Selenium by Low Level	0.02mg/l		06/21/02			ME5176
Total	Silver	<0.05mg/l		06/21/02			ME5176
Total	Sodium	13mg/l		06/21/02			ME5177
Total	Thallium by Low Level	<0.003mg/l		06/21/02			ME5176
Total	Vanadium	<0.3mg/l		06/21/02			ME5176
Total	Zinc	0.02mg/l		06/21/02			ME5176
Dissolved	Aluminum	<0.05mg/l		06/21/02			ME5176
Dissolved	Antimony by Low Level	<0.3mg/l		06/21/02			ME5176
Dissolved	Arsenic by Low Level	<0.01mg/l		06/21/02			ME5176
Dissolved	Barium	<0.3mg/l		06/21/02			ME5176
Dissolved	Beryllium	<0.005mg/l		06/21/02			ME5176
Dissolved	Cadmium	<0.005mg/l		06/21/02			ME5176
Dissolved	Calcium	160mg/l		06/21/02			ME5177
Dissolved	Chromium	<0.05mg/l		06/21/02			ME5176

DATE: 07/11/02

Upstate Laboratories, Inc.
Analysis Results
Report Number: 17002097
Client I.D.: EARTH TECH
Sampled by:

APPROVAL:
QC:
Lab I.D.: 10170

INDEPENDENT LEATHER
MW-9 1030H 06/18/02

ULI I.D.: 17002098

Matrix: Water

PARAMETERS		RESULTS	TIME	DATE ANAL.	KEY	KEY	FILE#
Dissolved	Cobalt	<0.05mg/l		06/21/02			ME5176
Dissolved	Copper	<0.02mg/l		06/21/02			ME5176
Dissolved	Iron	0.03mg/l		06/21/02			ME5176
Dissolved	Lead by Low Level	<0.1mg/l		06/21/02			ME5176
Dissolved	Magnesium	14mg/l		06/21/02			ME5177
Dissolved	Manganese	<0.02mg/l		06/21/02			ME5176
Dissolved	Mercury	<0.0004mg/l		06/24/02			MB4650
Dissolved	Nickel	<0.03mg/l		06/21/02			ME5176
Dissolved	Potassium	2.1mg/l		06/21/02			ME5177
Dissolved	Selenium by Low Level	0.02mg/l		06/21/02			ME5176
Dissolved	Silver	<0.05mg/l		06/21/02			ME5176
Dissolved	Sodium	12mg/l		06/21/02			ME5177
Dissolved	Thallium by Low Level	<0.003mg/l		06/21/02			ME5176
Dissolved	Vanadium	<0.3mg/l		06/21/02			ME5176
Dissolved	Zinc	<0.01mg/l		06/21/02			ME5176

DATE: 07/11/02

Upstate Laboratories, Inc.
Analysis Results
Report Number: 17002097
Client I.D.: EARTH TECH
Sampled by:

APPROVAL:
QC:
Lab I.D.: 10170

INDEPENDENT LEATHER
MW-5 1550H 06/18/02

ULI I.D.: 17002099

Matrix: Water

PARAMETERS	RESULTS	TIME	DATE ANAL.	KEY	KEY	FILE#
Hexavalent Chromium	<0.01mg/l	0850	06/19/02			WD9696
Nitrate-Nitrogen	<0.2mg/l	0900	06/19/02			WD9718
Ortho-Phosphorus	0.14mg/l		06/19/02			WD9894
Total Alkalinity	430mg/lCaCO3		06/24/02			WD9837
Chloride	150mg/l		06/25/02			WD9775
Dissolved Organic Carbon	5mg/l		06/27/02			WD9872
Sulfate	100mg/l		06/26/02			WD9820
Total Dissolved Solids	760mg/l		06/22/02			WD9755
Total Silica	4.3mg/l		06/21/02			ME5178
Total Aluminum	0.29mg/l		06/21/02			ME5176
Total Antimony by Low Level	<0.3mg/l		06/21/02			ME5176
Total Arsenic by Low Level	0.01mg/l		06/21/02			ME5176
Total Barium	<0.3mg/l		06/21/02			ME5176
Total Beryllium	<0.005mg/l		06/21/02			ME5176
Total Cadmium	<0.005mg/l		06/21/02			ME5176
Total Calcium	83mg/l		06/21/02			ME5177
Total Chromium	<0.05mg/l		06/21/02			ME5176
Total Cobalt	<0.05mg/l		06/21/02			ME5176
Total Copper	<0.02mg/l		06/21/02			ME5176
Total Iron	1.2mg/l		06/21/02			ME5176
Total Lead by Low Level	<0.1mg/l		06/21/02			ME5176
Total Magnesium	8.4mg/l		06/21/02			ME5177
Total Manganese	0.32mg/l		06/21/02			ME5176
Total Mercury	<0.0004mg/l		06/24/02			MB4650
Total Nickel	<0.03mg/l		06/21/02			ME5176
Total Potassium	3.1mg/l		06/21/02			ME5177
Total Selenium by Low Level	0.02mg/l		06/21/02			ME5176
Total Silver	<0.05mg/l		06/21/02			ME5176
Total Sodium	110mg/l		06/21/02			ME5177
Total Thallium by Low Level	0.05mg/l		06/21/02			ME5176
Total Vanadium	<0.3mg/l		06/21/02			ME5176
Total Zinc	0.03mg/l		06/21/02			ME5176
Dissolved Aluminum	<0.05mg/l		06/21/02			ME5176
Dissolved Antimony by Low Level	<0.3mg/l		06/21/02			ME5176
Dissolved Arsenic by Low Level	0.02mg/l		06/21/02		15	ME5176
Dissolved Barium	<0.3mg/l		06/21/02			ME5176
Dissolved Beryllium	<0.005mg/l		06/21/02			ME5176
Dissolved Cadmium	<0.005mg/l		06/21/02			ME5176
Dissolved Calcium	77mg/l		06/21/02			ME5177
Dissolved Chromium	<0.05mg/l		06/21/02			ME5176

DATE: 07/11/02

Upstate Laboratories, Inc.
Analysis Results
Report Number: 17002097
Client I.D.: EARTH TECH
Sampled by:

APPROVAL:
QC:
Lab I.D.: 10170

INDEPENDENT LEATHER
MW-5 1550H 06/18/02

ULI I.D.: 17002099

Matrix: Water

PARAMETERS		RESULTS	TIME	DATE ANAL.	KEY	KEY	FILE#
Dissolved	Cobalt	<0.05mg/l		06/21/02			ME5176
Dissolved	Copper	<0.02mg/l		06/21/02			ME5176
Dissolved	Iron	0.80mg/l		06/21/02			ME5176
Dissolved	Lead by Low Level	<0.1mg/l		06/21/02			ME5176
Dissolved	Magnesium	7.7mg/l		06/21/02			ME5177
Dissolved	Manganese	0.30mg/l		06/21/02			ME5176
Dissolved	Mercury	<0.0004mg/l		06/24/02			MB4650
Dissolved	Nickel	<0.03mg/l		06/21/02			ME5176
Dissolved	Potassium	2.7mg/l		06/21/02			ME5177
Dissolved	Selenium by Low Level	<0.01mg/l		06/21/02			ME5176
Dissolved	Silver	<0.05mg/l		06/21/02			ME5176
Dissolved	Sodium	100mg/l		06/21/02			ME5177
Dissolved	Thallium by Low Level	<0.003mg/l		06/21/02			ME5176
Dissolved	Vanadium	<0.1mg/l		06/21/02			ME5176
Dissolved	Zinc	0.03mg/l		06/21/02			ME5176

DATE: 07/11/02

Upstate Laboratories, Inc.
Analysis Results
Report Number: 17002097
Client I.D.: EARTH TECH
Sampled by:

APPROVAL:
QC:
Lab I.D.: 10170

INDEPENDENT LEATHER
MW-10 0900H 06/19/02

ULI I.D.: 17102001

Matrix: Water

	PARAMETERS	RESULTS	TIME	DATE ANAL.	KEY	KEY	FILE#
	Hexavalent Chromium	<0.01mg/l	2030	06/19/02			WD9696
	Nitrate-Nitrogen	<0.2mg/l	0900	06/19/02			WD9718
	Ortho-Phosphorus	0.19mg/l		06/19/02			WD9894
	Total Alkalinity	1100mg/lCaCO3		07/01/02			WD9926
	Chloride	180mg/l		06/25/02			WD9775
	Dissolved Organic Carbon	37mg/l		06/29/02			WD9883
	Sulfate	180mg/l		06/28/02			WD9857
	Total Dissolved Solids	1600mg/l		06/22/02			WD9759
Total	Aluminum	0.08mg/l		06/24/02			ME5182
Total	Antimony by Low Level	<0.3mg/l		06/24/02			ME5182
Total	Arsenic by Low Level	<0.01mg/l		06/24/02			ME5182
Total	Barium	<0.3mg/l		06/24/02			ME5182
Total	Beryllium	<0.005mg/l		06/24/02			ME5182
Total	Cadmium	<0.005mg/l		06/24/02			ME5182
Total	Calcium	240mg/l		06/24/02			ME5183
Total	Chromium	0.06mg/l		06/24/02			ME5182
Total	Cobalt	<0.05mg/l		06/24/02			ME5182
Total	Copper	<0.02mg/l		06/24/02			ME5182
Total	Iron	6.7mg/l		06/24/02			ME5182
Total	Lead by Low Level	<0.1mg/l		06/24/02			ME5182
Total	Magnesium	62mg/l		06/24/02			ME5183
Total	Manganese	0.31mg/l		06/24/02			ME5182
Total	Mercury	<0.0004mg/l		06/24/02			MB4650
Total	Nickel	<0.03mg/l		06/24/02			ME5182
Total	Potassium	7.7mg/l		06/24/02			ME5183
Total	Selenium by Low Level	<0.01mg/l		06/24/02			ME5182
Total	Silica	13mg/l		06/24/02			MB4652
Total	Silver	<0.05mg/l		06/24/02			ME5182
Total	Sodium	170mg/l		06/24/02			ME5183
Total	Thallium by Low Level	<0.003mg/l		06/24/02			ME5182
Total	Vanadium	<0.3mg/l		06/24/02			ME5182
Total	Zinc	0.01mg/l		06/24/02			ME5182
Dissolved	Aluminum	<0.05mg/l		06/24/02			ME5182
Dissolved	Antimony by Low Level	<0.3mg/l		06/24/02			ME5182
Dissolved	Arsenic by Low Level	<0.01mg/l		06/24/02			ME5182
Dissolved	Barium	<0.3mg/l		06/24/02			ME5182
Dissolved	Beryllium	<0.005mg/l		06/24/02			ME5182
Dissolved	Cadmium	<0.005mg/l		06/24/02			ME5182
Dissolved	Calcium	240mg/l		06/24/02			ME5183
Dissolved	Chromium	0.06mg/l		06/24/02			ME5182

DATE: 07/11/02

Upstate Laboratories, Inc.
Analysis Results
Report Number: 17002097
Client I.D.: EARTH TECH
Sampled by:

APPROVAL:
QC:
Lab I.D.: 10170
INDEPENDENT LEATHER
MW-10 0900H 06/19/02

ULI I.D.: 17102001 Matrix: Water

PARAMETERS		RESULTS	TIME	DATE ANAL.	KEY	KEY	FILE#
Dissolved	Cobalt	<0.05mg/l		06/24/02			ME5182
Dissolved	Copper	<0.02mg/l		06/24/02			ME5182
Dissolved	Iron	6.8mg/l		06/24/02		15	ME5182
Dissolved	Lead by Low Level	<0.1mg/l		06/24/02			ME5182
Dissolved	Magnesium	64mg/l		06/24/02		15	ME5183
Dissolved	Manganese	0.32mg/l		06/24/02		15	ME5182
Dissolved	Mercury	<0.0004mg/l		06/24/02			MH4650
Dissolved	Nickel	<0.03mg/l		06/24/02			ME5182
Dissolved	Potassium	8.8mg/l		06/24/02		15	ME5183
Dissolved	Selenium by Low Level	0.02mg/l		06/24/02		15	ME5182
Dissolved	Silver	<0.05mg/l		06/24/02			ME5182
Dissolved	Sodium	190mg/l		06/24/02		15	ME5183
Dissolved	Thallium by Low Level	<0.003mg/l		06/24/02			ME5182
Dissolved	Vanadium	<0.3mg/l		06/24/02			ME5182
Dissolved	Zinc	0.01mg/l		06/24/03			ME5182

DATE: 07/11/02

Upstate Laboratories, Inc.
Analysis Results
Report Number: 17002097
Client I.D.: EARTH TECH
Sampled by:

APPROVAL:
QC:
Lab I.D.: 10170

INDEPENDENT LEATHER
MW-11 1100H 06/19/02

ULI I.D.: 17102002

Matrix: Water

	PARAMETERS	RESULTS	TIME	DATE ANAL.	KEY	KEY	FILE#
	Hexavalent Chromium	<0.01mg/l	2030	06/19/02			WD9696
	Nitrate-Nitrogen	<0.2mg/l	0900	06/19/02			WD9718
	Ortho-Phosphorus	0.15mg/l		06/19/02			WD9894
	Total Alkalinity	320mg/lCaCO3		07/01/02			WD9926
	Chloride	7mg/l		06/25/02			WD9775
	Dissolved Organic Carbon	6mg/l		06/27/02			WD9872
	Sulfate	7mg/l		06/28/02			WD9857
	Total Dissolved Solids	440mg/l		06/22/02			WD9755
Total	Aluminum	0.08mg/l		06/24/02			ME5182
Total	Antimony by Low Level	<0.3mg/l		06/24/02			ME5182
Total	Arsenic by Low Level	0.34mg/l		06/24/02			ME5182
Total	Barium	<0.3mg/l		06/24/02			ME5182
Total	Beryllium	<0.005mg/l		06/24/02			ME5182
Total	Cadmium	<0.005mg/l		06/24/02			ME5182
Total	Calcium	74mg/l		06/24/02			ME5183
Total	Chromium	<0.05mg/l		06/24/02			ME5182
Total	Cobalt	<0.05mg/l		06/24/02			ME5182
Total	Copper	<0.02mg/l		06/24/02			ME5182
Total	Iron	2.8mg/l		06/24/02			ME5182
Total	Lead by Low Level	<0.1mg/l		06/24/02			ME5182
Total	Magnesium	6.4mg/l		06/24/02			ME5183
Total	Manganese	0.26mg/l		05/24/02			ME5182
Total	Mercury	<0.0004mg/l		06/24/02			MB4650
Total	Nickel	<0.03mg/l		06/24/02			ME5182
Total	Potassium	1.3mg/l		06/24/02			ME5183
Total	Selenium by Low Level	<0.01mg/l		06/24/02			ME5182
Total	Silica	7.6mg/l		06/24/02			MB4652
Total	Silver	<0.05mg/l		06/24/02			ME5182
Total	Sodium	10mg/l		06/24/02			ME5183
Total	Thallium by Low Level	<0.003mg/l		06/24/02			ME5182
Total	Vanadium	<0.3mg/l		06/24/02			ME5182
Total	Zinc	0.01mg/l		06/24/02			ME5182
Dissolved	Aluminum	<0.05mg/l		06/24/02			ME5182
Dissolved	Antimony by Low Level	<0.3mg/l		06/24/02			ME5182
Dissolved	Arsenic by Low Level	0.37mg/l		06/24/02		15	ME5182
Dissolved	Barium	<0.3mg/l		06/24/02			ME5182
Dissolved	Beryllium	<0.005mg/l		06/24/02			ME5182
Dissolved	Cadmium	<0.005mg/l		06/24/02			ME5182
Dissolved	Calcium	85mg/l		06/24/02		15	ME5183
Dissolved	Chromium	<0.05mg/l		06/24/02			ME5182

DATE: 07/11/02

Upstate Laboratories, Inc.
Analysis Results
Report Number: 17002097
Client I.D.: EARTH TECH
Sampled by:

APPROVAL:
QC:
Lab I.D.: 10170

INDEPENDENT LEATHER
MW-11 1100H 06/1[illegible]/02

ULI I.D.: 17102002

Matrix: Water

PARAMETERS		RESULTS	TIME	DATE ANAL.	KEY	KEY	FILE#
Dissolved	Cobalt	<0.05mg/l		06/24/02			ME5182
Dissolved	Copper	<0.02mg/l		06/24/02			ME5182
Dissolved	Iron	2.8mg/l		06/24/02			ME5182
Dissolved	Lead by Low Level	<0.1mg/l		06/24/02			ME5182
Dissolved	Magnesium	7.3mg/l		06/24/02		15	ME5183
Dissolved	Manganese	0.29mg/l		06/24/02		15	ME5182
Dissolved	Mercury	<0.0004mg/l		06/24/02			MB4650
Dissolved	Nickel	<0.03mg/l		06/24/02			ME5182
Dissolved	Potassium	1.4mg/l		06/24/02		15	ME5183
Dissolved	Selenium by Low Level	<0.01mg/l		06/24/02			ME5182
Dissolved	Silver	<0.05mg/l		06/24/02			ME5182
Dissolved	Sodium	11mg/l		06/24/02		15	ME5183
Dissolved	Thallium by Low Level	<0.003mg/l		06/24/02			ME5182
Dissolved	Vanadium	<0.3mg/l		06/24/02			ME5182
Dissolved	Zinc	0.05mg/l		06/24/02		15	ME5182

DATE: 07/11/02

Upstate Laboratories, Inc.
Analysis Results
Report Number: 17002097
Client I.D.: EARTH TECH
Sampled by:

APPROVAL:
Q
Lab I.D.: 10170
INDEPENDENT LEATHER
MW-12 1410H 06/19/02

ULI I.D.: 17102003

Matrix: Water

	PARAMETERS	RESULTS	TIME	DATE ANAL.	KEY	KEY	FILE#
	Hexavalent Chromium	<0.01mg/l	2030	06/19/02			WD9714
	Nitrate-Nitrogen	0.6mg/l	0900	06/19/02			WD9718
	Ortho-Phosphorus	<0.05mg/l		06/19/02			WD9854
	Total Alkalinity	290mg/lCaCO3		07/01/02			WD9526
	Chloride	360mg/l		06/25/02			WD9775
	Dissolved Organic Carbon	21mg/l		06/29/02			WD9883
	Sulfate	44mg/l		06/28/02			WD9857
	Total Dissolved Solids	1100mg/l		06/22/02			WD9755
Total	Aluminum	0.38mg/l		06/24/02			ME5182
Total	Antimony by Low Level	<0.2mg/l		06/24/02			ME5182
Total	Arsenic by Low Level	0.05mg/l		06/24/02			ME5182
Total	Barium	<0.3mg/l		06/24/02			ME5182
Total	Beryllium	<0.005mg/l		06/24/02			ME5182
Total	Cadmium	<0.005mg/l		06/24/02			ME5182
Total	Calcium	55mg/l		06/24/02			ME5183
Total	Chromium	<0.05mg/l		06/24/02			ME5182
Total	Cobalt	<0.05mg/l		06/24/02			ME5182
Total	Copper	<0.02mg/l		06/24/02			ME5182
Total	Iron	2.3mg/l		06/24/02			ME5182
Total	Lead by Low Level	<0.1mg/l		06/24/02			ME5182
Total	Magnesium	12mg/l		06/24/02			ME5183
Total	Manganese	0.19mg/l		06/24/02			ME5182
Total	Mercury	<0.0004mg/l		06/24/02			MB4653
Total	Nickel	<0.03mg/l		06/24/02			ME5182
Total	Potassium	7.9mg/l		06/24/02			ME5183
Total	Selenium by Low Level	<0.01mg/l		06/24/02			ME5182
Total	Silica	5.7mg/l		06/24/02			MB4652
Total	Silver	<0.05mg/l		06/24/02			ME5182
Total	Sodium	250mg/l		06/24/02			ME5183
Total	Thallium by Low Level	0.02mg/l		06/24/02			ME5182
Total	Vanadium	<0.3mg/l		06/24/02			ME5182
Total	Zinc	0.03mg/l		06/24/02			ME5182
Dissolved	Aluminum	<0.05mg/l		06/24/02			ME5182
Dissolved	Antimony by Low Level	<0.3mg/l		06/24/02			ME5182
Dissolved	Arsenic by Low Level	0.04mg/l		06/24/02			ME5182
Dissolved	Barium	<0.3mg/l		06/24/02			ME5182
Dissolved	Beryllium	<0.005mg/l		06/24/02			ME5182
Dissolved	Cadmium	<0.005mg/l		06/24/02			ME5182
Dissolved	Calcium	56mg/l		06/24/02		15	ME5183
Dissolved	Chromium	<0.05mg/l		06/24/02			ME5182

DATE: 07/11/02

Upstate Laboratories, Inc.
Analysis Results
Report Number: 17002097
Client I.D.: EARTH TECH
Sampled by:

APPROVAL:
QC:
Lab I.D.: 10170
INDEPENDENT LEATHER
MW-12 1410H 06/19/02

ULI I.D.: 17102003

Matrix: Water

	PARAMETERS	RESULTS	TIME	DATE ANAL.	KEY	KEY	FILE#
Dissolved	Cobalt	<0.05mg/l		06/24/02			ME5182
Dissolved	Copper	<0.02mg/l		06/24/02			ME5182
Dissolved	Iron	2.7mg/l		06/24/02		15	ME5182
Dissolved	Lead by Low Level	<0.1mg/l		06/24/02			ME5182
Dissolved	Magnesium	14mg/l		06/24/02		15	ME5183
Dissolved	Manganese	0.18mg/l		06/24/02			ME5182
Dissolved	Mercury	<0.0004mg/l		06/24/02			MB4650
Dissolved	Nickel	<0.03mg/l		06/24/02			ME5182
Dissolved	Potassium	9.2mg/l		06/24/02		15	ME5183
Dissolved	Selenium by Low Level	<0.01mg/l		06/24/02			ME5182
Dissolved	Silver	<0.05mg/l		06/24/02			ME5182
Dissolved	Sodium	410mg/l		06/24/02		15	ME5184
Dissolved	Thallium by Low Level	0.01mg/l		06/24/02			ME5182
Dissolved	Vanadium	<0.3mg/l		06/24/02			ME5182
Dissolved	Zinc	0.03mg/l		06/24/02			ME5182

DATE: 07/11/02

Upstate Laboratories, Inc.
Analysis Results
Report Number: 17002097
Client I.D.: EARTH TECH
Sampled by:

APPROVAL
QC:
Lab I.D.: 10170

INDEPENDENT LEATHER
MW-14 1530H 06/19/02

ULI I.D.: 17102004

Matrix: Water

	PARAMETERS	RESULTS	TIME	DATE ANAL.	KEY	KEY	FILE#
	Hexavalent Chromium	<0.01mg/l	2030	06/19/02			WD9714
	Nitrate-Nitrogen	3.1mg/l	0900	06/19/02			WD9718
	Ortho-Phosphorus	<0.05mg/l		06/19/02			WD9854
	Total Alkalinity	320mg/lCaCO3		07/01/02			WD9926
	Chloride	61mg/l		06/25/02			WD9775
	Dissolved Organic Carbon	5mg/l		06/27/02			WD9872
	Sulfate	57mg/l		06/28/02			WD9857
	Total Dissolved Solids	550mg/l		06/22/02			WD9758
Total	Aluminum	<0.05mg/l		06/24/02			ME5182
Total	Antimony by Low Level	<0.3mg/l		06/24/02			ME5182
Total	Arsenic by Low Level	<0.01mg/l		06/24/02			ME5182
Total	Barium	<0.3mg/l		06/24/02			ME5182
Total	Beryllium	<0.005mg/l		06/24/02			ME5182
Total	Cadmium	<0.005mg/l		06/24/02			ME5182
Total	Calcium	130mg/l		06/24/02			ME5183
Total	Chromium	<0.05mg/l		06/24/02			ME5182
Total	Cobalt	<0.05mg/l		06/24/02			ME5182
Total	Copper	<0.02mg/l		06/24/02			ME5182
Total	Iron	0.08mg/l		06/24/02			ME5182
Total	Lead by Low Level	<0.1mg/l		06/24/02			ME5182
Total	Magnesium	8.6mg/l		06/24/02			ME5183
Total	Manganese	0.25mg/l		06/24/02			ME5182
Total	Mercury	<0.0004mg/l		06/24/02			MB4650
Total	Nickel	<0.03mg/l		06/24/02			ME5182
Total	Potassium	1.5mg/l		06/24/02			ME5183
Total	Selenium by Low Level	0.03mg/l		06/24/02			ME5182
Total	Silica	8.0mg/l		06/24/02			MB4652
Total	Silver	<0.05mg/l		06/24/02			ME5182
Total	Sodium	10mg/l		06/24/02			ME5183
Total	Thallium by Low Level	<0.003mg/l		06/24/02			ME5182
Total	Vanadium	<0.3mg/l		06/24/02			ME5182
Total	Zinc	0.01mg/l		06/24/02			ME5182
Dissolved	Aluminum	<0.05mg/l		06/24/02			ME5182
Dissolved	Antimony by Low Level	<0.3mg/l		06/24/02			ME5182
Dissolved	Arsenic by Low Level	<0.01mg/l		06/24/02			ME5182
Dissolved	Barium	<0.3mg/l		06/24/02			ME5182
Dissolved	Beryllium	<0.005mg/l		06/24/02			ME5182
Dissolved	Cadmium	<0.005mg/l		06/24/02			ME5182
Dissolved	Calcium	140mg/l		06/24/02		15	ME5183
Dissolved	Chromium	<0.05mg/l		06/24/02			ME5182

DATE: 07/11/02

Upstate Laboratories, Inc.
Analysis Results
Report Number: 17002097
Client I.D.: EARTH TECH
Sampled by:

APPROVAL:
QC:
Lab I.D.: 10170
INDEPENDENT LEATHER
MW-14 1530H 06/19/02

ULI I.D.: 17102004

Matrix: Water

PARAMETERS		RESULTS	TIME	DATE ANAL.	KEY	KEY	FILE#
Dissolved	Cobalt	<0.05mg/l		06/24/02			ME5182
Dissolved	Copper	<0.02mg/l		06/24/02			ME5182
Dissolved	Iron	<0.03mg/l		06/24/02			ME5182
Dissolved	Lead by Low Level	<0.1mg/l		06/24/02			ME5182
Dissolved	Magnesium	9.4mg/l		06/24/02		15	ME5183
Dissolved	Manganese	0.26mg/l		06/24/02		15	ME5182
Dissolved	Mercury	<0.0004mg/l		06/24/02			MB4650
Dissolved	Nickel	<0.03mg/l		06/24/02			ME5182
Dissolved	Potassium	1.5mg/l		06/24/02			ME5183
Dissolved	Selenium by Low Level	0.02mg/l		06/24/02			ME5182
Dissolved	Silver	<0.05mg/l		06/24/02			ME5182
Dissolved	Sodium	10mg/l		06/24/02			ME5183
Dissolved	Thallium by Low Level	<0.003mg/l		06/24/02			ME5182
Dissolved	Vanadium	<0.3mg/l		06/24/02			ME5182
Dissolved	Zinc	0.02mg/l		06/24/02		15	ME5182

DATE: 07/11/02

Upstate Laboratories, Inc.
Analysis Results
Report Number: 17002097
Client I.D.: EARTH TECH
Sampled by:

APPROVAL:
QC:
Lab I.D.: 10170
INDEPENDENT LEATHER
DUP 1420H 06/19/02

ULI I.D.: 17102005

Matrix: Water

	PARAMETERS	RESULTS	TIME	DATE ANAL.	KEY	KEY	FILE#
	Hexavalent Chromium	<0.01mg/l	2030	06/19/02			WD9714
	Nitrate-Nitrogen	0.3mg/l	0900	06/19/02			WD9718
	Ortho-Phosphorus	<0.05mg/l		06/19/02			WD9894
	Total Alkalinity	700mg/lCaCO3		07/08/02			WD9970
	Chloride	410mg/l		06/25/02			WD9775
	Dissolved Organic Carbon	73mg/l		06/27/02			WD9872
	Sulfate	37mg/l		06/28/02			WD9857
	Total Dissolved Solids	1300mg/l		06/22/02			WD9758
Total	Aluminum	1.1mg/l		06/24/02			ME5182
Total	Antimony by Low Level	<0.3mg/l		06/24/02			ME5182
Total	Arsenic by Low Level	0.10mg/l		06/24/02			ME5182
Total	Barium	<0.3mg/l		06/24/02			ME5182
Total	Beryllium	<0.005mg/l		06/24/02			ME5182
Total	Cadmium	<0.005mg/l		06/24/02			ME5182
Total	Calcium	52mg/l		06/24/02			ME5183
Total	Chromium	<0.05mg/l		06/24/02			ME5182
Total	Cobalt	<0.05mg/l		06/24/02			ME5182
Total	Copper	<0.02mg/l		05/24/02			ME5182
Total	Iron	3.8mg/l		06/24/02			ME5183
Total	Lead by Low Level	<0.1mg/l		06/24/02			ME5182
Total	Magnesium	12mg/l		06/24/02			ME5183
Total	Manganese	0.19mg/l		06/24/02			ME5182
Total	Mercury	<0.0004mg/l		06/24/02			MB4650
Total	Nickel	<0.03mg/l		06/24/02			ME5182
Total	Potassium	9.0mg/l		06/24/02			ME5183
Total	Selenium by Low Level	<0.01mg/l		06/24/02			ME5182
Total	Silica	7.6mg/l		06/24/02			MB4652
Total	Silver	<0.05mg/l		06/24/02			ME5182
Total	Sodium	380mg/l		06/24/02			ME5184
Total	Thallium by Low Level	<0.003mg/l		06/24/02			ME5182
Total	Vanadium	<0.3mg/l		06/24/02			ME5182
Total	Zinc	0.02mg/l		06/24/02			ME5182
Dissolved	Aluminum	0.07mg/l		06/24/02			ME5182
Dissolved	Antimony by Low Level	<0.3mg/l		06/24/02			ME5182
Dissolved	Arsenic by Low Level	0.06mg/l		06/24/02			ME5182
Dissolved	Barium	<0.3mg/l		06/24/02			ME5182
Dissolved	Beryllium	<0.005mg/l		06/24/02			ME5182
Dissolved	Cadmium	<0.005mg/l		06/24/02			ME5182
Dissolved	Calcium	53mg/l		06/24/02		15	ME5183
Dissolved	Chromium	<0.05mg/l		06/24/02			ME5182

DATE: 07/11/02

Upstate Laboratories, Inc.
Analysis Results
Report Number: 17002097
Client I.D.: EARTH TECH
Sampled by:

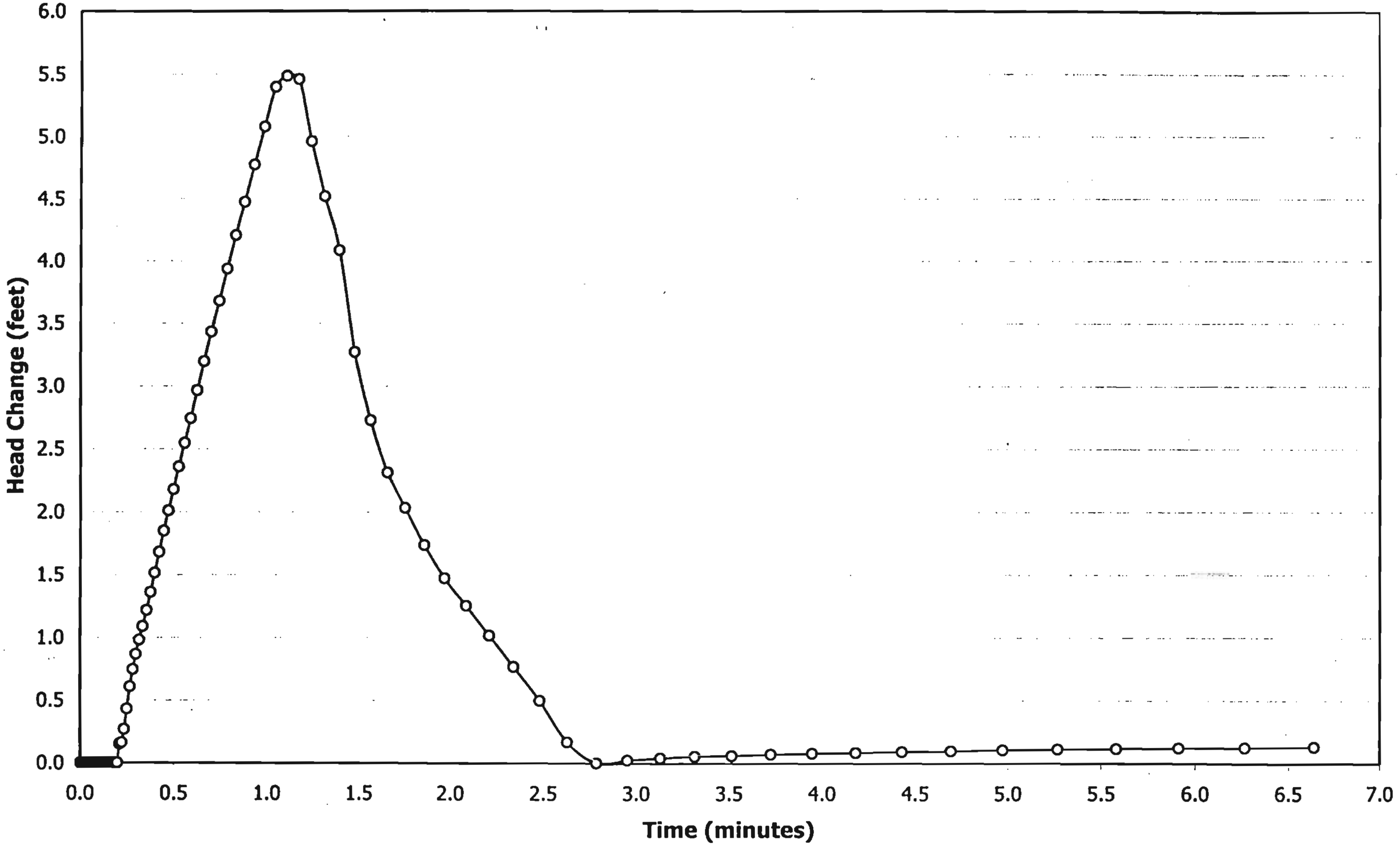
APPROVAL:
QC:
Lab I.D.: 10170

INDEPENDENT LEATHER
DUP 1420H 06/19/02

ULI I.D.: 17102005 Matrix: Water

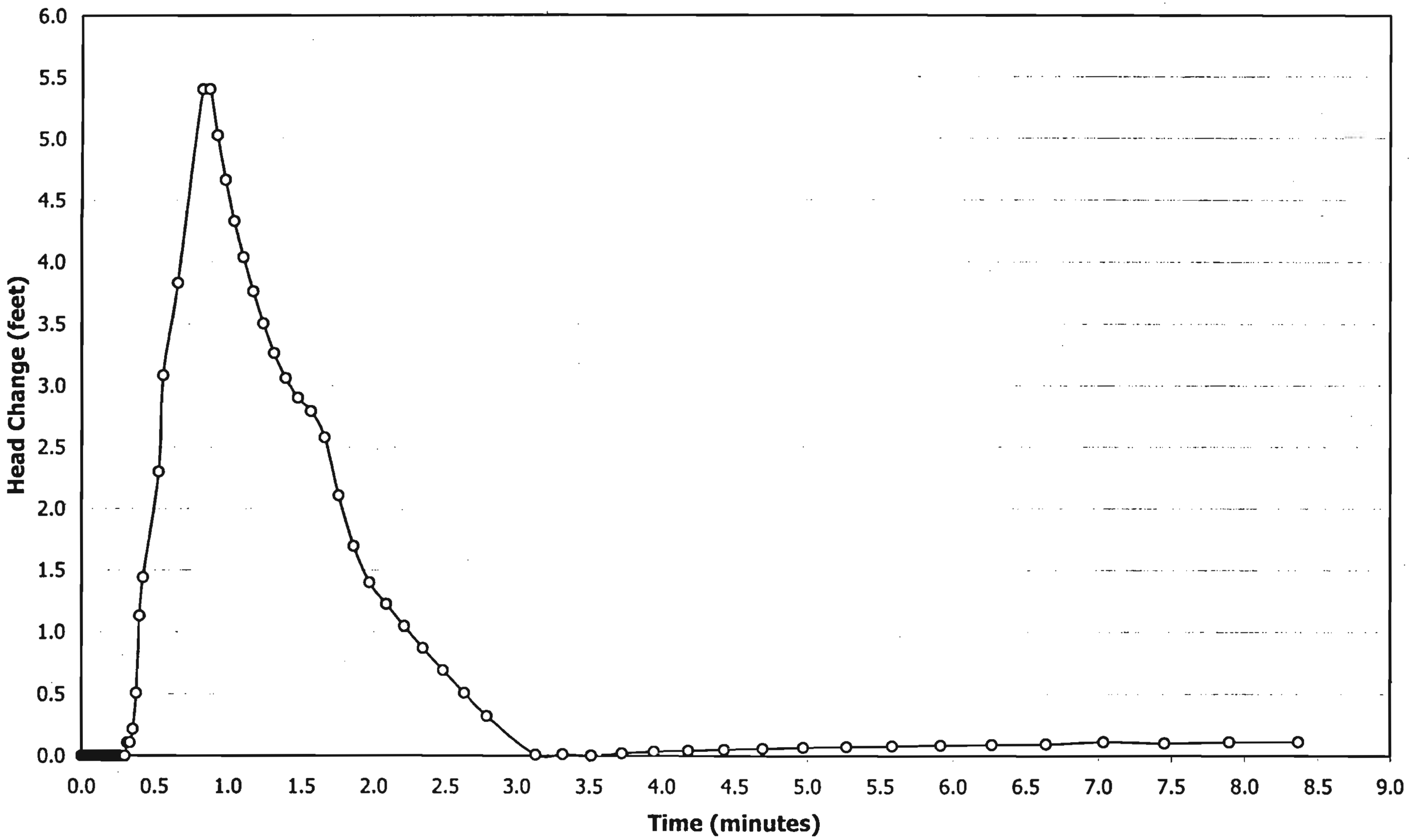
PARAMETERS		RESULTS	TIME	DATE ANAL.	KEY	KEY	FILE#
Dissolved	Cobalt	<0.05mg/l		06/24/02			ME5182
Dissolved	Copper	<0.02mg/l		06/24/02			ME5182
Dissolved	Iron	2.3mg/l		06/24/02			ME5182
Dissolved	Lead by Low Level	<0.1mg/l		06/24/02			ME5182
Dissolved	Magnesium	13mg/l		06/24/02		15	ME5183
Dissolved	Manganese	0.18mg/l		06/24/02			ME5182
Dissolved	Mercury	<0.0004mg/l		06/24/02			MB4650
Dissolved	Nickel	<0.03mg/l		06/24/02			ME5182
Dissolved	Potassium	6.8mg/l		06/24/02			ME5183
Dissolved	Selenium by Low Level	0.02mg/l		06/24/02		15	ME5182
Dissolved	Silver	<0.05mg/l		06/24/02			ME5182
Dissolved	Sodium	380mg/l		06/24/02			ME5184
Dissolved	Thallium by Low Level	<0.003mg/l		06/24/02			ME5182
Dissolved	Vanadium	<0.3mg/l		06/24/02			ME5182
Dissolved	Zinc	0.01mg/l		06/24/02			ME5182

APPENDIX B
Hydraulic Conductivity Test Data
Independent Leather Site
March 2003



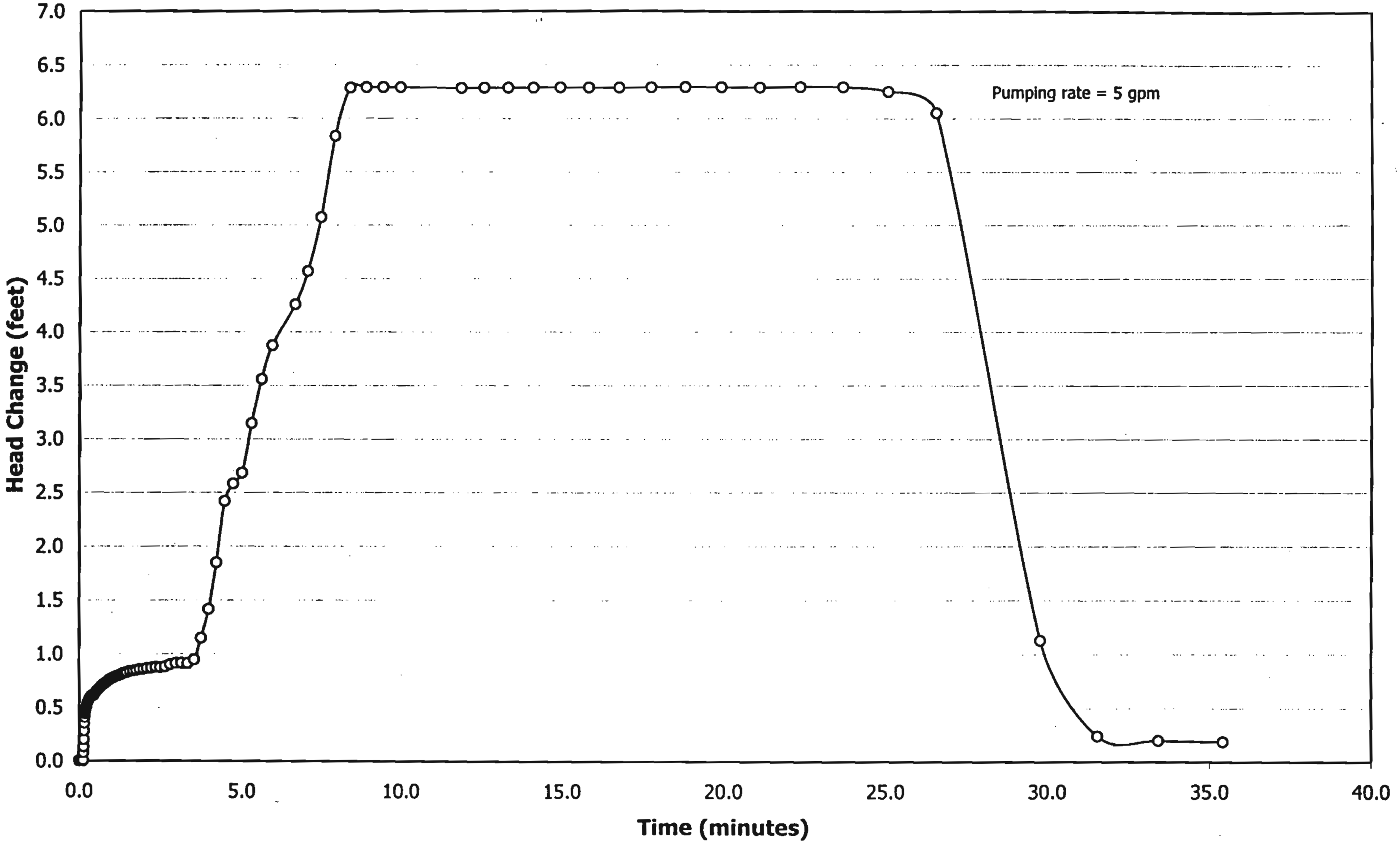
U.S. EPA ENVIRONMENTAL RESPONSE TEAM CENTER
RESPONSE ENGINEERING AND ANALYTICAL CONTRACT
68-C99-223
W.O. # R1A00222

MW-8 (TEST A)
HYDRAULIC CONDUCTIVITY TEST:
RISING HEAD DATA
INDEPENDENT LEATHER SITE
GLOVERSVILLE, NEW YORK
MARCH 2003



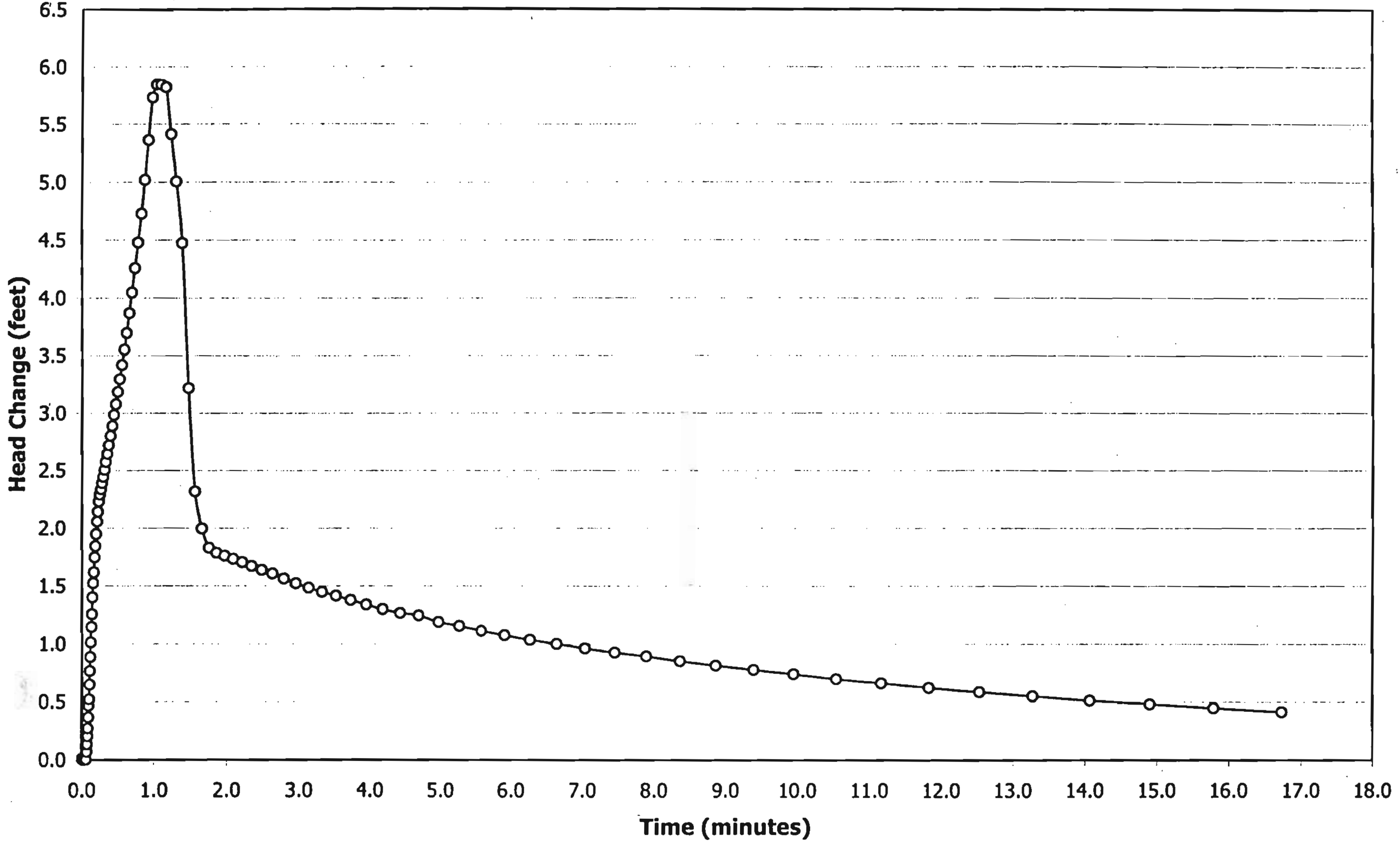
U.S. EPA ENVIRONMENTAL RESPONSE TEAM CENTER
RESPONSE ENGINEERING AND ANALYTICAL CONTRACT
68-C99-223
W.O. # R1A00222

MW-8 (TEST B)
HYDRAULIC CONDUCTIVITY TEST:
RISING HEAD DATA
INDEPENDENT LEATHER SITE
GLOVERSVILLE, NEW YORK
MARCH 2003



U.S. EPA ENVIRONMENTAL RESPONSE TEAM CENTER
RESPONSE ENGINEERING AND ANALYTICAL CONTRACT
68-C99-223
W.O. # R1A00222

MW-9
HYDRAULIC CONDUCTIVITY TEST:
CONSTANT PUMPING DATA
INDEPENDENT LEATHER SITE
GLOVERSVILLE, NEW YORK
MARCH 2003



U.S. EPA ENVIRONMENTAL RESPONSE TEAM CENTER
RESPONSE ENGINEERING AND ANALYTICAL CONTRACT
68-C99-223
W.O. # R1A00222

MW-10
HYDRAULIC CONDUCTIVITY TEST:
RISING HEAD DATA
INDEPENDENT LEATHER SITE
GLOVERSVILLE, NEW YORK
MARCH 2003