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CHEM-TROL SITE REMEDIAL INVESTIGATION REPORT HAMBURG, NEW YORK VOLUME I OF II

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PREPARED FOR:
SCA Services, Inc.
East Rochester, New York

PREPARED BY:
GZA GeoEnvironmental of New York
Buffalo, New York

November 1994
File: 5945

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GeoEnvironmental
of New York

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November 22, 1994
File: 5945

Mr. Jeffrey G. Richardson
Project Manager
Waste Management of North America - East
425 Perinton Parkway
Fairport, New York 14450

Re: Chem-Trol Remedial Investigation
NYSDEC Site 9-15-D15
Hamburg, New York

364 Nagel Drive
Buffalo, New York
14225
716-685-2300
FAX 716-685-3629

Dear Mr. Richardson:

Attached herewith is the Remedial Investigation Report prepared by GZA GeoEnvironmental of New York (GZA) for the above-referenced project. The Remedial Investigation (RI) was conducted during the period from October 1992 through June 1994 under contact to SCA Services.

The RI was conducted and this RI Report was prepared in accordance with the New York State Department of Environmental Conservation (NYSDEC) approved Work Plan dated March 1992, and Work Plan Addendums dated June and August 1992. Supplemental studies were also completed as part of this investigation. The supplemental activities were completed in accordance with a NYSDEC approved Work Plan dated April 1994.

It has been a pleasure working with you on this phase of the project. If you have any questions or need additional information, please do not hesitate to call.

A Subsidiary of GZA
GeoEnvironmental
Technologies, Inc.

Very truly yours,

GZA GEOENVIRONMENTAL OF NEW YORK

Stephen H. Blair
Project Engineer

Ernest R. Hanna
Ernest R. Hanna, P.E.
Project Reviewer

Carl W. Eller, P.E.
Associate Principal

Attachments: Volume I and II

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1.00 INTRODUCTION

This report presents the results of the remedial investigation (RI) completed by GZA GeoEnvironmental of New York (GZA) during the period from October 1992 through June 1994 at the Chem-Trol (NYSDEC ID Number 9-15-D15) site under contract to SCA Services, Inc. (SCA). The site is presently listed as Class 2 by the New York State Department of Environmental Conservation (NYSDEC).

This report and the investigations it describes were completed in accordance with our remedial investigation/feasibility study (RI/FS) work plan dated March 1992 and addenda dated June 1992 and August 1992 (Reference 1). This work plan and addenda were reviewed by NYSDEC and approved in an August 28, 1992 letter. Additionally, supplemental studies were completed in accordance with a work plan (Reference 2) dated April 1994 which was reviewed and approved by the NYSDEC in its May 2, 1994 letter.

Interpretations presented within this report are based in part on the investigations described herein as well as previous investigations completed as part of the Phase II study (Reference 3). Limitations and further considerations to this report are presented in Appendix A.

1.10 BACKGROUND

The approximate 17.5-acre Chem-Trol site is located in a residential-commercial section of the Town of Hamburg, New York (Figure 1). It is bound by Electro Abrasives Corporation to the north; the Cheese Factory, Inc., a residential property (4338 Lake Avenue) and the Baltimore and Ohio Railroad to the east; residential properties to the west; and Lake Avenue to the south. An approximately 1-acre parcel, containing the dance studio associated parking lot, is located north of Lake Avenue. This parcel is owned by others but has historically been included within the boundaries of the Chem-Trol site. No other buildings are currently located on the site.

The South Branch of Smokes Creek flows south to north through the western portion of the site and an unnamed tributary to the creek flows from east to west through the northern portion of the site (refer to Figure 2). The southeastern portion of the site is open field; the portion of the site north of the tributary is wooded. The site topography is shown on Figure 2. The southern portion of the site generally slopes gently to the north and west towards Smokes Creek and the unnamed tributary. The ground surface on the western side of the site drops toward the South Branch of Smokes Creek and to a low lying wooded area. The ground surface in the area north of the tributary generally slopes to the south and west towards the tributary.

1.11 Site History

The site history was assessed based upon GZA's review of aerial photographs and on the available file documents (see Reference 3). Copies of the aerial photographs from 1939, 1951, 1966, 1972 (2 photographs) and 1974 are included in Appendix B.

The 1939 aerial photograph indicates that the site was generally covered by grass and wooded areas. No site development or improvements were noted in the 1939 photographs.

Initial development on the site and surrounding areas was observed in the 1951 photos. This development included two buildings located along Lake Avenue, one about 650 feet west of the current railroad tracks and the second about 250 feet west of the tracks. The second building was located east of the site, in an area currently occupied by the Cheese Factory. Disturbed ground was observed in the photos in the area immediately north of these buildings in the 1951 photographs. Scarred ground and several piles, covering an area of about 1/3 acre, were also noted along the South Branch of Smokes Creek about 400 feet north of the western building. It should be noted that South Branch of Smokes Creek also appeared to follow an irregular path about 220 feet east of its current location (shown on Figure 2).

A 1966 aerial photograph indicates that two additional buildings were constructed east of the site. One of these buildings had "L MBER" written on its roof. Additionally, an apparent residential structure, with what appeared to be a swimming pool to the north, was constructed to the west of these buildings. [Note: This structure is in the same location as the residence currently abutting the southeast corner of the site.] Additional earthwork is also evident in an area of about 2 acres north of the buildings.

A 1972 aerial photograph indicates a building to the west of the residence shown on the 1966 photograph (i.e. the Chem-Trol operation's facility building, now removed). The Chem-Trol facilities occupied the portion of the site approximately bounded by Lake Avenue to the south, the property line to the east, the on-site tributary of the South Branch of Smokes Creek to the north and the South Branch of Smokes Creek (original location) to the west (see 1972 aerial photograph in Appendix B). This area, shown on Figure 2, is hereafter referred to as the "former active area".

The 1972 photograph indicates that the former active area contained four surface impoundments (see Reference 3 and Appendix B). Based on the available information (Reference 3) it is reported that the impoundments included:

- One impoundment, about 40 feet wide and 140 feet long, located near the northeast corner of the operations area;

- One approximately round impoundment about 40 feet in diameter located about 60 feet west of the impoundment described above; and

- An impoundment that appeared to contain two chambers. An approximately 40 feet wide by 90 feet long chamber, and an approximately 50 feet wide by 40 feet long chamber located along the western edge of the operational area.

The area surrounding the impoundments contains what appear to be drums and other surface containers.

Two areas of disturbed ground to the north and south of the two chambered impoundment, were also observed in the 1972 photograph (see Appendix B). A third area of disturbed ground was located near the on-site tributary to the South Branch of Smokes Creek along the northern edge of the former active area and a fourth area of disturbed ground was located along the eastern portion of the site south of the northeastern impoundment.

The 1972 aerial photo also reveals that the South Branch of Smokes Creek was relocated to its current flow path. As previously noted, the original alignment appeared to follow an irregular path along the west edge of the formerly active area. The current creek location is generally along the north-south alignment about 220 feet west of the original alignment.

Based upon available correspondence and reports, Chem-Trol purchased the site in October 1969 and reportedly began operations in late 1970. Operations at the Chem-Trol facility reportedly included the treatment or transfer of various industrial waste materials. Waste materials reportedly handled at the site included:

-- Capacitors;
-- Insecticides;
-- Oil Sludges;
-- Paint Sludges;
-- Pesticides;
-- Pickle Liquors;
-- Phenolic Resins;
-- Spent Solvents; and
-- Wastewater from Chemical Processing Facilities.

Waste was typically brought to the site in 55 gallon drums or within liquid tanker trucks (typically 5,000 gallon capacity). Once at the site, the waste materials were stored either in the surficial lagoons, above-ground tanks or 55 gallon drums. The above-ground tanks reportedly included two redwood tanks with a capacity of 5,000 gallons each, reportedly for use in the treatment of metal finishing solutions.

The available information suggests that wastes brought to the site were generally processed in one of four ways including:

-- thermal oxidation (i.e. incineration of waste products);
-- acid neutralization;
-- distillation (used to recover solvents for reuse); and
-- off-site disposal.

Newspaper articles (Buffalo Evening News, July 29, 1972 and Courier Express, July 30, 1972) indicate a fire occurred at the site on July 29, 1972. Reportedly several hundred drums exploded during the fire sending flames 250 feet in the air. The fire was contained by fire fighters with water and foam. It was reported that during the fire fighting activities a bulldozer was used to build a dike to prevent potential contaminated runoff from reaching the South Branch of Smokes Creek.

Subsequent inspection reports prepared by Erie County Department of Health (ECDOH) state that water used in the control of the fire was temporarily contained in the bed of the former South Branch of Smokes Creek. Reportedly, Chem-Trol officials requested permission from the ECDOH to release this water to Smokes Creek. However, the disposition of this water is unclear.

Operations at the Chem-Trol site were reportedly halted in April 1972 and activities shifted to a new hazardous waste disposal facility in Model City, New York. Closure operations at the site apparently continued for a period of several years. These operations reportedly included: the transfer of waste materials (including more than 16,000 55 gallon drums) to the Model City or other waste disposal facilities; dismantling and removal of equipment; and drainage and treating the on-site lagoons, with ferro-lime to neutralize contents and then backfilling the lagoons with slag-like material. Reportedly, 2 feet of soil was removed from the site and subsequently, approximately 2 feet of soil was placed over the operational area and seeded.

The site was sold to Vercant Trucking Company (Vercant) in November 1972. Real estate transaction records reveal that Vercant sold approximately 1 acre of the site (the property at 4800 Lake Avenue currently operated as a dance studio) in July 1975 to Super Bar, Inc. Reportedly, Vercant defaulted on their mortgage for the site and Chem-Trol reacquired the site in 1976. Documentation of Vercant's use of the property is not available.

A 1977 topographic map of the site prepared by McIntosh and McIntosh, P.C. does not reveal the presence of the former surface impoundments or other debris at the site indicative of the site's former use. However, a mound located in the former active portion of the site is suspected to be the result of placement of fill during closure. The map also describes the former Chem-Trol operation's building as a

"house" located at 4818 Lake Avenue. Additionally, an above ground gas tank is shown about 50 feet southeast of this house.

A portion of the site was leased to Accent Stripe, Inc. (Accent) in 1984. It is understood that Accent was a road stripe painting contractor who used the site for, among other things, storage of 55 gallon drums of road tar, bags of dye and miscellaneous road work equipment. It is also known that a fire occurred within a building at the site occupied by Accent.

Current site conditions are depicted in a January 1990 property survey map and a March 1990 topographic survey map both completed by McIntosh and McIntosh, P.C. (used as the base map in Figure 2). As shown, the approximate 17.5 acre site is reputedly owned by SCA Services, Inc. and it consists of wooded and grass covered property.

Two structures are located along Lake Avenue and abut the former Chem-Trol site property. These include the dance studio at 4800 Lake Avenue (reputedly owned by Judith and Joseph Matusak and formerly owned by Super Bar, Inc.). This property includes a building with a large asphalt parking area to the north. This parking area covers portions of the former operational area of the Chem-Trol site. A residence located at 4838 Lake Avenue (reputedly owned by Rose Marie Mazzi and Ingrid Hubenhok and formerly owned by Peter and Maria Lang) is located to the east of the dance studio. [Note: This residence was apparently at this location since at least 1966.] The topographic map reveals that a vacant lot exists at the site today, and there is no visual evidence of the former Chem-Trol operation's building (formerly located at 4818 Lake Avenue).

1.12 Previous Investigations

Previous environmental studies at the Chem-Trol site include a Phase I investigation conducted in 1988 (Reference 4) and a Phase II investigation conducted in 1990 and 1991 (Reference 3). The following sections summarize the scope and findings of these studies.

1.12.1 Phase I Investigation

A Phase I investigation of the Chem-Trol site was completed by Engineering-Science (ES) in association with Dames & Moore in January 1988 for NYSDEC (Reference 4). This investigation included a site visit, a literature review and a preliminary application of the Hazard Ranking System (HRS).

The literature reviewed by ES included field reports and surface water sampling test results completed by the Erie County Department of

Environment and Planning (ECDEP) in September of 1978; field reports and surface water, soil and leachate sampling test results completed by the NYSDEC in November of 1981; a Potential Hazardous Waste Site Preliminary Assessment completed by NUS; and, a Profile Report, prepared by the ECDEP in 1984. These documents are included as appendices within the Phase I report (Reference 4).

The Phase I report states that site inspections completed by ECDEP and NYSDEC revealed unauthorized off-road vehicular traffic, potential erosion problems, leachate outbreaks and suspected drum remnants.

The 1978 ECDEP surface water samples were tested for metals and polychlorinated biphenyls (PCBs). Iron and PCBs were detected above New York State Class D surface water standards. The highest PCB concentration (2.6 μg/l) was reported for a sample collected from the tributary near the culvert beneath the railroad tracks, east of the site (apparently upgradient of the site). The samples collected by the NYSDEC in 1981 were also tested for PCBs and metals. Soil samples collected from the low lying area in the western portion of the site contained detectable levels of PCBs. Iron was detected at concentrations of 0.35 and 0.40 mg/l in two surface water samples collected from the on-site tributary to the South Branch of Smokes Creek.

The Phase I investigation report indicates that a single monitoring well was located in the south central portion of the site. However, the report states that at the time of its completion, no groundwater monitoring was completed at the site.

The ES site visit in April of 1986 included monitoring ambient concentrations of volatile organic compounds (VOCs) at the ground surface using a HNu photoionization detector placed in upwind and downwind locations. VOCs were not detected at concentrations exceeding background levels of 1 ppm.

The potential impact of the site on the environment and human health was initially evaluated by application of the HRS during the Phase I investigation. However, the Phase I investigation indicated that additional data was necessary to characterize the site.

1.12.2 Phase II Investigation

During 1990 and 1991, a Phase II investigation was completed at the Chem-Trol site by GZA for SCA, in cooperation with NYSDEC. The Phase II study (Reference 3) included:

- a literature review;
- topographic mapping;
- site reconnaissance;
- air monitoring;
- geophysical surveys (terrain conductivity, buried metal detection and seismic refraction);
- piezometer and monitoring well installation;
- hydraulic conductivity testing;
- soil, groundwater, surface water and sediment sampling and analysis;
- data validation;
- HRS scoring; and,
- preparation of the Phase II report.

A summary and overview of the Phase II investigation are discussed below.

1.12.2.1 Air Monitoring

Air quality measurements were made on June 26, 1990 using a HNu Model PI-101 photoionization detector to measure ambient total VOC concentrations. A total VOC reading was obtained at each node on a 50 foot grid extending across the site. In addition, GZA made air quality measurements at other locations including depressions, culverts and selected points throughout the site (i.e., near drum remnants, scarred ground etc.). Ambient VOC concentrations were not found to exceed background levels.

1.12.2.2 Geophysical Studies

Gartner Lee, Inc. (GLI) was retained to complete terrain conductivity, buried metal detection and seismic refraction studies. The methodology and results are documented in Appendix E of the Phase II report. Figures showing historical site features, the study area, color contour-plots of the terrain conductivity and buried metal detection test results and geologic cross sections based on seismic refraction test results are also included in the Phase II report (Reference 3).

Six areas of increased terrain conductivity were observed at the site (see Reference 3), four of which appear to correspond to the locations of the four lagoons observed in the April 1972 aerial photograph. Two locations correspond to an area of disturbed ground observed in the 1972 air photo. The increased terrain conductivity at these six locations may be due to the conductivity of the soils used to backfill the site. However, it may also be due in part to concentrations of dissolved electrolytes at these locations.

Eight areas, five of which correspond to areas of increased terrain conductivity, had an electromagnetic response typical of buried metal. This metal may range from small objects buried at a shallow depth to larger objects buried at greater depths. The anomalies at two locations are larger than the others and may represent the ferro-lime used to neutralize the lagoons or several pieces of metal buried together near each other.

Three test pits were excavated during the RI to investigate the nature of the anomalies identified during the geophysical survey. These test pits are discussed in Section 2.60.

One anomaly in the electromagnetic survey is not typical of metal buried at a shallow-depth. This area had an increased in-phase response across a relatively large area and no terrain conductivity response. This type of anomaly suggests the presence of material containing metal buried at the instrument depth limit (i.e. up to 15 feet). This anomaly may be due to many types of materials, including metallic slag or a building foundation. The location of this anomaly corresponds to an area of disturbed ground that may have been used for materials handling observed in the 1972 aerial photo.

The Phase II report (Reference 3) includes geologic sections developed based on the seismic refraction results. Three distinct geologic layers were identified in descending order as follows:

- Layer 1, extending from ground surface to a depth varying between 15 to 30 feet, that is believed to consist of saturated and unsaturated overburden.

- Layer 2, estimated to be about 25 to 30 feet thick, that is believed to consist of weathered shale.

- Layer 3, that is believed to consist of unweathered shale, the thickness of which could not be determined during the seismic refraction study.

1.12.2.3 Piezometer/Monitoring Well Installation

Eight piezometers (P-1 through P-5) and nine monitoring wells (MW-1 through MW-6 clusters) were installed as part of the Phase II study. Locations of monitoring wells and piezometers completed during the Phase II Study, as well as those completed as part of the RI, are shown on Figure 3. A summary of their construction is included on Table 1. Hydraulic conductivity testing of wells and piezometers were done by GZA. Results are included in Table 2.

1.12.2.4 Analytical Test Results

As part of the Phase II study, samples were collected from the former surface impoundments, flood plain sediments, drum remnant locations, soil cutting from piezometer and monitoring well installations and surface water sediment; as well as surface water, overburden groundwater and bedrock groundwater. Each sample collected was analyzed for Target Compound List (TCL) and additional parameters (as required by NYSDEC) using New York State Contract Laboratory Program (CLP) Methods. The TCL includes VOCs, semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs) and inorganics (including metals). Additionally, sulfates, chlorides and octachlorocyclopentene (C-56) were tested. Water samples were also tested in the field for pH, temperature and specific conductance. Phase II surface water, surface water sediment and soil sample locations are shown on Figure 4 (SWS-1 through SWS-9 and FPS-1 and FPS-2).

The results of the Phase II study were used to develop the scope of the RI. The results of the analytical testing for both the Phase II study and RI were combined and presented in Section 4.00 through 6.00.

1.12.2.5 HRS Scoring

The data generated during the Phase II investigation was used to develop a hazard ranking system (HRS) score (Reference 3). This scoring system is designed to quantify the potential risks

associated with a given site based on the contaminants present and potential exposure of the contaminants to the public. Possible exposure to the public was assessed by reviewing potential exposure routes including exposure through groundwater, surface water, air, fire and explosion and direct contact.

The potential for public exposure to contaminants encountered at the site was evaluated for the above noted exposure pathways. The water bearing zone (groundwater) is not known to be a potable source for supply wells within three miles of the site based on a limited waterwell survey conducted during this investigation. Downstream uses of Smokes Creek (surface water) do include recreation, however, no wetland or other critical habitats were identified downgradient of the site. Air monitoring did not suggest the release of contaminants to the air at the site, nor does data reveal or suggest that the site poses a fire or explosion hazard. Therefore, the main exposure pathway is believed to be through direct contact.

The calculated scores for each exposure pathway are given below.

S_m = 3.5 Migration score
S_{gw} = (groundwater) = 5.4
S_{sw} = (surface water) = 2.7
S_a (air) = 0
S_{fe} = 0 Fire and explosion score
S_{dc} = 50 Direct contact score

1.20 PURPOSE

The purpose of this RI is to obtain sufficient data to evaluate risks associated with the Chem-Trol site and to identify a remedial program to reduce these risks to acceptable levels.

1.30 RI SCOPE OF WORK

Based upon the results of the Phase II investigation, preliminary remedial alternatives were identified within the RI/FS Work Plan (Reference 1) and data needs were identified to evaluate these alternatives. The data needs included further definition of the nature and extent of contamination and analyses of the hydrogeology and geology at the site and surrounding area. Other areas requiring additional evaluation included site characteristics such as physical properties of soil, meteorology, ecology, demography, surrounding land use and risks posed by the site.

To accomplish the above-stated purpose the following tasks were completed:

- reviewed results of previous studies;
- engaged a drilling subcontractor to make test borings and install monitoring wells;
- coordinated work effort with SCA services and NYSDEC;
- prepared an RI Work Plan and addenda which were reviewed and approved by SCA and NYSDEC;
- made groundwater flow/seasonal variance measurements;
- made an auger probe survey (including field screening for VOCs and PCBs);
- made test pits;
- completed environmental sampling;
- engaged an environmental chemistry laboratory to do analytical testing on selected soil and water samples;
- engaged a laboratory data validator approved by NYSDEC to conduct data validation;
- made a habitat assessment;
- completed a qualitative health risk assessment;
- and prepared the RI report describing the work completed during these tasks and our findings.

1.40 REPORT ORGANIZATION

The text of this report is divided into six sections. Immediately following the text are the references, tables, figures and appendices.

Section 1.00 Introduction (this section): discusses the purpose of the preliminary RI report, site background including site description, site history and previous studies, scope of work and report organization.

Section 2.00 Site Investigations: discusses the field work and other data collection methods used to make test borings, construct monitoring wells, collect samples etc. and obtain information pertaining to the Chem-Trol site.

Section 3.00 Physical Characteristics: interprets the various data collected and evaluates site conditions (i.e., hydrogeology, geology, hydrology etc.).

Section 4.00 Nature and Extent of Contamination: discusses the types of chemicals detected in the various environmental media. This is divided into source areas, groundwater, surface water and sediments, and floodplains and sediments. Where possible, the transport media are also presented.

Section 5.00 Contaminant Fate and Transport: provides information on the potential routes of migration, chemical persistence and chemical migration.

Section 6.00 Qualitative Risk Assessment: presents the results of a general human health and environmental impact assessment completed at the site. This included an estimation of exposure point concentrations and a comparison of this data with standards and guidance values.

Section 7.00 Summary and Conclusions: summarizes the results of the RI and discusses limitations and recommended remedial action objectives.

2.00 SITE INVESTIGATION

Site investigations completed during this work included:

- Test borings/monitoring well installations;
- Hydraulic conductivity testing;
- Auger probe soil sample field screening;
- Test pits;
- Environmental sampling; and
- Data validation.

The field activities completed during this investigation are described in the following section. As noted, previous studies were completed as part of the Phase II work and the details of the previous work are presented in Reference 3.

A NYSDEC representative was on-site periodically throughout the field work to observe GZA's activities.

2.10 TEST BORINGS/MONITORING WELL INSTALLATION

Monitoring wells were installed at eight locations (MW-7 through MW-14) at the Chem-Trol site as part of the RI. These new well locations (i.e., part of the RI) and the existing well locations (MW-1 through MW-6) are shown on Figure 3. At four of the new locations (MW-7, MW-8, MW-9, MW-10, and MW-12), monitoring well couplets were installed. Each couplet included one well installed in the overburden and one in the upper weathered bedrock. A triplet was installed at MW-9 consisting of one overburden well, one well in the upper weathered bedrock and one well in the more competent bedrock screened between 35 and 60 feet below the top of rock. At the remaining locations (MW-11R, MW-13R and MW-14R), a single monitoring well was installed in the upper weathered of bedrock.

The following rationale was generally used to position the monitoring wells installed as part of the RI.

- MW-7S and MW-7R were installed near Lake Avenue in a location estimated to be upgradient of a known contamination source. This was done to assist in establishing background conditions within the bedrock and overburden.

- MW-11R was installed north of the on-site tributary to the South Branch of Smokes Creek to assist in assessing the quality of groundwater to the north within the bedrock.

- Monitoring well couplets (one bedrock and one overburden) were installed at downgradient locations MW-9 and MW-10 and the deep rock well at MW-9RD to assist in defining the horizontal and vertical extent of migration of site contaminants.

- Monitoring well couplet MW-8 was installed near the South Branch of Smokes Creek to monitor the groundwater near the creek (MW-8S) and to assess the potential hydraulic impact of the creek on deeper groundwater regimes.

- The couplet at location MW-12 was installed to assist in assessing the presence of chemicals on the southern side of the site.

- Rock wells MW-13R and MW-14R were installed to assist in assessing the potential for migration of chemicals west of and beneath the South Branch of Smokes Creek.

Prior to installation, proposed monitoring locations were presented to NYSDEC in the RI work plan (Reference 1), subsequent addenda and the supplemental work plan (Reference 2). NYSDEC concurred with the proposed locations and the work proceeded as discussed below.

Buffalo Drilling Company, Inc. (BDC) of Buffalo, New York was retained to complete test borings and monitoring well installations. Monitoring wells at locations MW-7 through MW-11 were installed between October 20 and November 6, 1992. BDC returned to the site between May 9 and 25, 1994 to install monitoring wells at locations MW-12 through MW-14. BDC mobilized various drill rigs to the site to complete test boring and monitoring well installations. These included a track mounted Mobile B-34, a truck mounted Diedrich D-50 and an ATV mounted CME-55.

Prior to drilling activities and after each boring, the drill rig and associated tools (augers, casings, split spoons, etc.) were steam cleaned at the decontamination pad. Potable water used during steam cleaning was brought to the site by BDC from their shop. As necessary, additional potable water was obtained from 4856 Lake Avenue.

The decontamination pad constructed for use during the Phase II investigation was also used during the RI. The pad consists of a bermed area, about 20 feet wide by 30

feet long, lined with an 80 mil high density polyethylene (HDPE) liner sloped to a sump at one end. The collected washwater was screened with a PID and disposed on-site. Measured levels were below 5 ppm. Levels above 5 ppm were not encountered during RI studies.

GZA representatives were on-site throughout drilling activities to observe the operations, advise the driller and prepare stratigraphic logs. A GZA representative prepared a stratigraphic log describing the samples collected. Each soil sample was classified using the Unified Soil Classification System (USCS) and described in accordance with the system discussed on the boring log legend in Appendix C. Rock core samples were logged by measuring the percent recovery and rock quality designation (RQD - defined as the summation of core pieces greater than 4 inches long divided by the length of the core run and expressed as a percentage) for each core run. Additionally, the rock type, lithology, structure and the locations/orientation of discontinuities were noted on the logs. Rock core samples were placed in wooden core boxes. Each box was labelled with the project name and number, boring number, run number, depth interval of the run and date. Copies of the prepared boring logs are included in Appendix C.

Additionally, a GZA representative served as the site safety officer to monitor compliance with the approved health and safety plan (Reference 1) and to make appropriate in-situ measurements. These measurements included:

- -- Organic vapors (measured using a HNu model PI-101 photoionization detector);
- -- Explosivity (measured using a MSA Model 2A Combustible Gas Indicator); and
- -- Particulates (measured using a Miniram Model MIE PDM-3 light scattering aerosol monitor).

Borings for the monitoring wells were advanced through the overburden using 4-1/4 inch inside diameter (I.D.) continuous flight hollow stem augers (HSAs). The augers were advanced through the overburden to refusal. Split spoon samples were collected (ASTM Method D-1586) in consecutive 2 foot intervals beginning at ground surface. The split spoon sampler was cleaned, between sample locations, with a solution of Alconox (or equivalent) and potable water and rinsed with potable water, methanol and deionized water. Soil samples were placed in clean glass jars and labeled with the job name, job number, the boring number, the sample number, sample depth interval, date of sample collection and blow counts per 6 inches.

The headspace above each of the soil samples collected were screened for VOCs with an organic vapor meter (HNu model PI-101). Prior to use, the meter was calibrated using an isobutylene gas standard obtained from the manufacturer. The headspace screening was done after allowing the samples to equilibrate to room temperature

(approximately 70°F). Test samples were collected by piercing the lid of the sample jar and withdrawing 30 cubic centimeters (cc) of headspace gas with a gas tight syringe. The headspace gas was then injected directly into the organic vapor meter and the highest reading was recorded. A syringe blank was run between each sample to assure the syringe was free of residual VOCs. The results of the soil sample screening are presented on the boring logs contained in Appendix C.

The screened intervals of the overburden monitoring wells were positioned based upon geologic and groundwater conditions observed while advancing the borings. Test boring data indicate that the natural overburden at the site consists of about 9.5 to 16 feet of fine grained glacial till; the bottom 1 to 5 feet of which consists of mixed sand, gravel and silt above bedrock. The mixed sand, gravel and silt zone appeared to be water bearing, thus, the screened intervals of overburden monitoring wells were installed in this zone.

The boreholes at the five overburden monitoring well locations were terminated at auger refusal and bentonite pellets were placed in the bottom 0.5± feet of the borehole to isolate the overburden from the bedrock. The monitoring well materials were then assembled and placed to the desired depth within the boring. The monitoring well was constructed using 2 inch inside diameter, flush joint, Schedule 40, PVC riser and slotted (0.01 inch slot size) well screen. No. 1 silica sand was placed in the annular space to 1 foot above the well.

The filter pack was designed in general accordance with ASTM monitoring well standard D5092. This ASTM standard recommends that for a non-uniform soil, such as those observed at Chem-Trol, the D-30 size (i.e., the soil particle size at which 30 percent of the soil particles are finer) of the sand pack should be six to ten times greater than the D-30 size of the soils around the well. Based on the soils tested during the Phase II piezometer installation, the average D-30 size of the surrounding soil was 0.015 mm. The calculated D-30 size of the filter pack, therefore, would range from 0.09 to 0.15 mm. For monitoring wells MW-7S, MW-8S, and MW-9S, No. 1 silica sand manufactured with a D-30 size of about 0.17 mm was selected and used as filter material. This is the finest grained filter pack commercially available. For monitoring wells MW-9RD and MW-12S, a #00 sand was used. This material has a D-30 size of 0.40 mm.

A 3 foot bentonite pellet seal was place over the sand pack and cement/bentonite grout was then placed to approximately 2 feet below ground surface. The placement depth quantity of each well construction material (i.e., screen, casing, sand, bentonite, cement, etc.) were measured and recorded on the boring logs (see Appendix C).

A locking steel protective casing and concrete surface seal was then constructed to secure the monitoring wells. Additional details regarding the overburden monitoring

well construction are included in Appendix C. Table 1 presents a summary of the monitoring well installations.

At the locations where bedrock monitoring wells were installed in the upper weathered shale, the HSAs were taken to refusal and then replaced with 6 inch flush joint steel casing advanced 0.5 to 1.0 feet into the top of rock. The boring was then advanced a nominal 5 feet into rock using an NX size core barrel and air as the drilling fluid. [It was necessary to use water as a drilling fluid while coring MW-7R since dust emissions while coring with air could not be adequately suppressed.] The hole was reamed to a nominal 6 inch diameter using a tricone bit and a 4 inch diameter polyvinyl chloride (PVC) casing was grouted into the hole and the steel casing was removed.

Bedrock monitoring wells were designed to monitor the uppermost water bearing zone in competent rock. As such, rock core samples were collected from within the 4 inch PVC casing until a depth was reached where water was produced from the hole. Thus, the seven shallow bedrock wells were generally advanced 15 to 26 feet into bedrock. During the supplemental work, well MW-9R was advanced an additional 5 feet (such that it screened the entire fractured rock zone) to a total of 20 feet into rock. Following coring, the open rock hole was flushed with air to remove cuttings.

Bedrock monitoring wells were completed by installing a 5 foot long, 6 inch diameter locking steel protective casing over the 4 inch PVC casing with a concrete surface seal. Bedrock monitoring well installation diagrams are included in Appendix C and summarized in Table 1.

At the deeper competent shale well location (MW-9RD), the 4 inch PVC was set beneath the upper fractured rock zone into more competent rock (as determined by visual observations and packer testing results to a depth of 38 feet). The hole was advanced using an NX size core barrel to about 60 feet into bedrock. To check that the deeper rock zone was monitored, a 1- 1/2 inch PVC well (with a 20 foot No. 10 slot screen) was installed at the bottom of the core hole. The screen was surrounded by No. 000 sand up to 5 feet above the screen. A bentonite slurry seal was tremie placed above the sand to about 10 feet from the ground surface. The well was completed with a cement-bentonite grout and a locking steel casing emplaced in concrete at the ground surface.

Each monitoring well was developed following installation. Development included bailing/pumping of each well until such time that consistent pH (obtained using a Corning Model 103 pH meter), temperature and specific conductivity (measured using a Extech Model 640 conductivity/temperature meter) measurements were obtained. Purge water was collected in 5 gallon pails. The headspace above the pail was screened with a PID. If the measured levels were below 5 ppm, the water was disposed on-site.

Additionally, the turbidity of the water evacuated from the wells was monitored using a Cole Parmer Model 3391 meter. Development continued until a turbidity of 50 N.T.U. or less was achieved or until further development did not result in a decrease in turbidity. Well development data is presented in Appendix D.

Following installation, the location and elevation of new monitoring wells were surveyed by McIntosh and McIntosh, P.C. Horizontal measurements were referenced to the New York State Plane Coordinate, West Zone. Elevation measurements were referenced to the National Geodetic Vertical Datum (NGVD), 1929.

2.20 STANDPIPE ABANDONMENT

Two PVC perforated standpipes were observed at the site. It is believed that these standpipes may have been associated with investigations completed prior to the Phase II work. These standpipes were decommissioned on May 24, 1994 by overdrilling the pipe with 6-1/4 inch HSAs to auger refusal (about 15 feet). The standpipe was pulled from within the HSAs and the HSAs were then cleaned out with the auger center plug. The hole was subsequently tremie grouted with a cement/bentonite grout as the augers were withdrawn. After the grout cured, the borehole was filled to a depth of about 3 feet with auger cuttings.

2.30 HYDRAULIC CONDUCTIVITY TESTING

Following development, the hydraulic conductivity of the material at the monitoring well locations was tested by packer testing and variable head methods. The variable head technique involves increasing the head within the well by lowering the slug into the water. The displaced volume of the slug results in a nearly "instantaneous" rise in head within the well and the subsequent fall of the water level is then monitored. As the water level reaches pre-test levels, the slug is then removed and the rise of water within the well is monitored in a similar fashion. The water levels within the wells were electronically monitored using a precalibrated pressure transducer and a Hermit DM electronic data logger to record head changes with time. The data collected from the slug tests were used to calculate the hydraulic conductivity by methods presented in Hvorslev (1951). Hydraulic conductivity tests results are presented in Appendix E and summarized in Table 2.

In addition to the slug tests, packer testing was used to calculate the hydraulic conductivity of discrete zones within the rock. Packer testing was performed as the core hole was advanced. As such, a packer test was generally done in the uppermost 5 feet of rock and in the interval from 5 to 15 feet into rock (refer to Table 2 for test intervals). Upon coring to the bottom of the predetermined test zone, a single inflatable packer was placed at the top of the test zone. The packer was then inflated, sealing off the test zone. Water was introduced into the hole and observations of the elapsed time, the quantity of flow into the test zone and the pressure were made. The

test was continued until a uniform flow rate was achieved. Data collected during the testing was used to determine the hydraulic conductivity within discrete zones of the bedrock using methods presented in Reference 5.

No flow was measured within several zones in MW-7R, MW-9R and MW-11R through MW-14R (see Table 2). As such, permeabilities could not be calculated in these zones, however, it is anticipated to be low based on the packer testing. In addition, water could not be pumped at a sufficient flow [maximum flow rate possible was about 20 gallons per minute (gpm)] to establish a stable pressure within certain zones of MW-10R and MW-9R (see Table 2). Thus, a hydraulic conductivity could not be calculated, however, based on the maximum flow rate of 20 gpm, the hydraulic conductivity of these zones is believed to be greater than $1x10^{-2}$ centimeters/second (cm/sec).

2.40 GROUNDWATER FLOW/SEASONAL VARIANCE INVESTIGATION

Water levels were measured within the newly installed wells and within existing wells and piezometers to assess groundwater flow direction and seasonal flow variations. The depth of water was measured within wells and piezometers from a monitoring point of known elevation using an electronic water level indicator.

Water levels in the monitoring wells were measured seven times over a period of 16 months. The measurement dates are listed below by year.

1992	1993	1994
December 16	January 25	June 16
	March 12	
	May 17	
	August 5	
	December 16	

Water levels measurements are included on Table 3.

In addition to water level measurements in the wells, the surface water elevation of the South Branch of Smokes Creek was estimated on August 11 and December 16, 1993 and surveyed on June 16, 1994. This was done to assess the hydraulic interaction of the creek and groundwater system. The elevation of the surface water was estimated using a lock level and an adjacent surveyed bench mark (TBM-3) located approximately 10 feet from the creek bank. The approximate location where the surface water elevations were obtained is shown on Figure 3 (SG-1 and SG-2). The creek water elevations are also summarized on Table 3.

2.50 AUGER PROBE SURVEY

Soil samples were collected from across the former active area and analyzed in the field for VOCs and PCBs by GZA. The sections below discuss this work. Data collected during the auger probe survey was previously included in a data report prepared by GZA (Reference 6). Selected drawings from that report summarizing the data are included in Appendix F.

Typically, soil samples were collected from a depth of about 5 feet below the ground surface. Depth profiles were performed at selected locations, starting at 2 to 3 feet below the ground surface and proceeding at approximate 3 foot intervals until tested compounds were not detected.

2.51 VOC Sample Collection and Testing

The first program of VOC screening was completed between October 10, 1992 and December 12, 1992. Following review of the data, it was determined that additional samples were necessary to further define the extent of affected soils. At that time a second program of sampling was proposed in a GZA letter to SCA dated January 20, 1993. The program's sampling included 22 samples collected from 11 locations and was completed between March 2, 1993 and April 2, 1993.

A total of 86 soil samples were collected from 52 locations on the site (see Figure 5). Each sample was analyzed in the field for:

- methylene chloride;
- toluene;
- trichloroethene;
- ethylbenzene;
- m-xylene; and
- o-xylene.

Testing was done using a Photovac 10S50 gas chromatograph (GC) equipped with a photoionization detector. Additional details regarding sampling and analytical methodology may be found in Reference 6.

As required by the work plan, additional surface soil samples were collected and submitted to an analytical laboratory for testing. In addition, split samples were collected by the NYSDEC. The confirmatory samples collected by GZA were taken from 14 locations and tested by Recra Environmental, Inc. (Recra), Tonawanda, New York for VOCs (Method 8240), semi-VOCs (Method 8270) and PCB/Pesticides (Method 8080). This testing was performed in accordance with 1991 New York State Analytical Services Protocol. The report provided by Recra was previously included within the data report (Reference 6). In addition to the target compounds discussed

above, several other compounds were detected during the confirmatory testing. Confirmatory test results are summarized on Table 11.

The results of the field screening and confirmatory testing were validated in accordance with procedures outlined in the work plan. Separate data validation reports were issued for each program, both of which are included in Reference 6.

2.52 PCB Sample Collection and Testing

A total of 77 samples were collected from 75 locations and analyzed in the field for PCBs. Forty-eight samples were collected from 47 locations during the first program (October 10, 1992 to December 12, 1992). Similar to the VOC field testing, a second program of PCB field testing was considered necessary and completed between March 2, 1993 and April 2, 1993. During the second program, 29 additional samples were collected west and east of the original grid as well as around 4800 Lake Avenue located south of the site. Figure 5 includes the location of each sample collected.

PCB compounds tested included:

- Aroclor 1242
- Aroclor 1248
- Aroclor 1254
- Aroclor 1260

As discussed in Section 2.51, 14 confirmatory samples were collected and submitted for analytical laboratory testing. These samples were also tested for PCBs. Field test results and confirmatory test results were validated in accordance with the work plan. Confirmatory test results are presented in Reference 6 and summarized in Table 11.

2.60 TEST PIT INVESTIGATION

NYSDEC requested that test pits be excavated in the vicinity of three terrain conductivity anomalies denoted as C, K and L in the areas described in Reference 2. Thus, GZA retained the services of BDC to complete the regional test pit excavations. BDC mobilized a Rupp Model 1400B backhoe to the site and dug the test pits on November 20, 1992. Test pit locations are shown on Figure 5.

A GZA representative was present during the excavation to advise the operator, collect soil samples and document findings. The GZA representative prepared a test pit log for each of the three excavation locations. Test pit logs are included in Appendix C.

The test pits were excavated until native soils were encountered or to a depth of approximately 9 feet (i.e., the reach of the backhoe). Several metal pipes were encountered in TP-C at a depth of approximately 2 to 2.5 feet below the ground surface near anomaly C that prevented further excavation. The arrangement of the pipes did not appear to be indicative of a utility trench. It is believed that the pipes were discarded at this location. The pipes were followed approximately 25 feet to the southwest where they ended. The excavation was then advanced to natural soils.

2.70 ENVIRONMENTAL SAMPLING

Samples of soil, groundwater, surface water and surface water sediments were collected during the field program. The collected samples were submitted for testing by Recra, the analytical laboratory. A general description of the various media and the samples collected and tested is provided below, and a summary of the sample type and designations for each media is presented on Tables 4 through 6.

- **Groundwater -** Water samples were collected during two sampling rounds in August 1993 and June of 1994 from selected monitoring wells.

- **Surface Water/ Surface Water Sediments -** Surface water and surface water sediments were sampled in August 1993 from locations along the south branch of Smokes Creek and its on-site tributary.

- **Flood Plain Sediment -** Sediment samples were collected in August 1993 from an area that was suspected to be the former bed of the South Branch of Smokes Creek.

- **Background Soil -** Soil samples were collected in August 1993 from the northern portion of the site and west of the South Branch of Smokes Creek to assist in assessing the naturally occurring concentrations of metals in the soil in the vicinity of the site.

- **Soil Sample -** Additional soil samples were collected in August 1993 from an area of stressed vegetation and of a chalk-like material encountered during the test pit investigation near anomaly L (Test/pit L).

Prior to sampling, proposed sample locations were presented to the NYSDEC within the work plan (Reference 1) and addenda. Additionally, NYSDEC collected split samples from selected locations identified on Tables 4 through 6.

Several operations (i.e., equipment cleaning, container labeling, cooler sealing and chain of custody) were consistent throughout the project. These procedures are described below.

Sampling equipment was cleaned between each use by the following procedures:

1. Wash with solution of Alconox detergent and tap water;
2. Rinse with potable water;
3. Rinse with methanol [Note: High Pressure Liquid Chromatography (HPLC) grade methanol with a reported maximum acetone content of 0.001 percent was used throughout project.];
4. Rinse with deionized water (repeated twice); and
5. Air dry.

Cleaning operations to the extent possible were done in GZA's laboratory and equipment was brought to the site and dedicated throughout the sample round. Separate bailers, cleaned as described above, were dedicated to each well and used throughout the sampling event.

Coolers and sample containers were prepared by the analytical laboratory. Prior to sampling, GZA completed an inventory of the type, number and condition of containers in each cooler. Coolers containing appropriate sample containers were transported to the field based upon the sampling scheduled for each day. Each cooler contained a trip blank prepared by the analytical laboratory.

Sample jars were labeled with the location, designation and date sampled. Other information regarding each sample, such as field test results, sample depth (if appropriate), a visual description of the material, date and time of sampling, weather conditions and individual completing the sample were recorded on a field data form. Upon completion, samples were placed in the coolers and a chain-of-custody form was completed. Coolers remained in GZA's custody until they were transported to Recra.

Quality control samples collected during environmental sampling included the trip blanks (one sample jar per shipment), duplicate samples, matrix spike/matrix spike duplicate (MS/MSD) samples and field blank samples. Duplicate and MS/MSD samples were prepared by collecting additional volume at a particular sample location and placing the samples in containers provided by Recra. These samples were handled similar to the other test samples. The sample location for duplicate samples was not provided to Recra as this was a blind quality control measure. Duplicate and MS/MSD sample locations are indicated on Tables 4 through 6.

Field blanks were prepared to test the potential of cross contamination from sampling equipment. Sampling equipment was first cleaned as described above. Water, provided by Recra, was then poured over the sampling equipment and into sample jars. Field blank samples then accompanied other samples through the shipment and analytical laboratory testing process.

Sampling procedures, specific to the various media that was sampled are discussed below.

2.71 Groundwater

Two water sampling rounds were completed as part of the RI to assess groundwater conditions on the site. The first round was completed between August 10 and 23, 1993, and included collecting water samples from monitoring wells MW-1 through MW-11, with the exception of MW-8S and MW-4S, which did not contain free-standing water during this period, and MW-9RD, which was installed at a later date. Duplicate samples were collected from MW-9S (DUP-1) and MW-10R (DUP-2). The MS/MSD sample was collected from MW-8R (see Figure 3). A field blank was prepared on August 16, 1993. NYSDEC collected split samples of MW-3S and MW-9S (see Table 4).

The second water sampling round was completed between May 31 and June 1, 1994. This round included collecting water samples from monitoring wells MW-1S, MW-1R, MW-8R, MW-9R, MW-9RD, MW-12S, MW-12R, MW-13R and MW-14R. A duplicate sample was collected from MW-8R (DUP-1). The MS/MSD was collected from MW-1R. A field blank was prepared on June 1, 1994. NYSDEC collected split samples at MW-9R, MW-9RD and MW-13R (see Table 4).

Prior to sampling, the static water level and well depth were measured to the nearest 0.01 foot from the monitoring point established on the top of the monitoring well riser pipe. This measurement was made with an electronic water level indicator manufactured by the Slope Indicator Company. Based upon these measurements the standing water volume was calculated and a minimum of three water volumes were bailed/pumped from the well. Purge water was collected in 5-gallon buckets and the air space immediately above the water was screened with a HNu PI-101 for the presence of VOCs. This testing did not indicate the presence of VOCs over 5 ppm and the water was disposed in the decontamination pad in accordance with the project work plan.

Following purging, the water level was allowed to recover to within 10 percent of its original level prior to sample collection. Wells that recovered slowly or did not return to within 10 percent of their pre-purge level during the same day were sampled on the following day, but within 24 hours of their initial purging. [Note that because

of the limited volume of water present at MW-5S, MW-6S, MW-10S, it was necessary to collect these samples over several days.]

Bailers dedicated to each monitoring well were used to collect samples for analytical testing. Samples were placed in appropriate sample containers provided by the analytical laboratory, and placed in coolers containing ice. Measurements of pH, temperature, turbidity and specific conductivity were made. Sampling information and measurements were recorded on a standard form.

2.72 Surface Water/Surface Water Sediment

Surface water (SW) and surface water sediment (SWS) samples were collected on August 18 and 19, 1993, from eleven locations along the South Branch of Smokes Creek and its on-site tributary (SW/SWS 1 through 11). Additionally, a surface water and surface water sediment sample designated SW/SWS-12 was collected from a seep located west of 4800 Lake Avenue (refer to Figure 4). Location SW-3 did not contain water at the time of sampling. As such, only a sediment sample was collected at this location. In addition, at the request of NYSDEC location SW/SWS-1 and SW-SWS-4 were located further upstream during the RI than during the Phase II. Phase II locations are shown on Figure 4 with the suffix "A". A duplicate surface water sample was collected from SW-9. A duplicate surface water sediment sample was collected at SWS-8. Surface water MS/MSD samples were collected at SW-11. Surface water sediment MS/MSD samples were collected at SWS-6 (refer to Figure 4).

Surface water samples consisted of grab samples collected using a pre-cleaned stainless steel cup. The collection procedure consisted of lowering the cup into the surface water and retrieving a test sample. Following collection, the contents were transferred into sample containers. Field measurements of pH, temperature, turbidity and specific conductivity were made during sample collection. After the water sample was collected, sediment samples were collected at the same location using the stainless steel cup. The cup was used to excavate sediment and place it in sample containers. A field blank was prepared on August 8, 1993 by pouring the water provided by Recra into the stainless steel cup and transferring this water directly into sample containers (refer to Table 5).

2.73 Floodplain Sediment

Four samples (refer to Table 6) of floodplain sediment, FPS-3 through FPS-6, were collected using a stainless steel coring device from locations on the South Branch of Smokes Creek flood plain (refer to Figure 4 for locations) on August 19 and 20, 1993. A duplicate sample (DUP-1) was collected from location FPS-4. A field blank (prepared for flood plain samples as well as other soil samples) was prepared on August 19, 1993. This was collected by pouring the contaminant free water provided

by the laboratory over the stainless steel coring device and transferring the retained water directly into sample jars.

Initially, the coring device was advanced through the upper 0.5 feet of soil to a depth above the desired test location. A sample was then collected for analysis from a depth of 0.5 to 2 feet and placed in the sample containers.

2.74 Background Soils

Background soil samples were collected from two locations north of the on-site tributary, BS-2 and BS-3, and one location west of the South Branch of Smokes Creek BS-1 (see Figure 4). This was done to assess the concentrations of metals in non-affected soil in the vicinity of the site. These samples were collected from 0.5 to 2 feet below the ground surface in the same manner as the flood plain sediment samples on August 19 and 20, 1993. As such, the field blank collected on August 19, 1993 was used to assess the background soils data.

2.75 Soil Samples

Two additional soil samples were collected to assess site conditions. The first, SS-1, from 0 to 6 inches was collected near an area of apparent stressed vegetation, along the slope, west of the former active portion of the site. The second sample, SS-2, was collected of a white chalky material believed to be lime encountered while performing Test Pit L (identified during the Phase II terrain conductivity study, see Figure 5) at about 3 feet. These samples were also collected associated with the flood plain samples on August 19 and 20, 1993. As such the field blank collected on August 19, 1993 applies was used to assess these data.

2.80 ANALYTICAL TESTING

Soil, surface water, sediment and the first round of groundwater samples submitted to Recra were analyzed for the parameters listed in Table 7. Water samples were also tested for additional parameters including sulfates, chlorides, pH, specific conductance and temperature for water samples. Selected surface water sediment samples were tested for total leachable sulfate and chloride. The May 31 through June 1, 1994 round of groundwater samples were tested for the VOCs and SVOCs listed in Table 7 as well as pH, temperature and specific conductance field testing.

Analytical testing was done in accordance with New York State Analytical Services Protocol November 1991. Contract required detection limits, as defined by (see Table 7), were obtained where possible. However, in several instances, higher detection limits were required due to matrix interference. These instances are identified in the case narratives included in the full analytical package.

Data reports from the 1994 groundwater sampling round are included in Appendix G. Test results from previous sample rounds were included in previous reports. All data from Phase II and RI sample rounds are summarized on Tables 9 through 14.

In addition, NYSDEC provided analytical test results performed for the split samples they collected. This data is also included on the summary tables.

2.90 DATA VALIDATION

Data validation was completed by Althea Lindell, a quality assurance specialist. Ms. Lindell's data validation qualifications were submitted to and approved by NYSDEC prior to conducting this work.

The data validation program conducted by Ms. Lindell included a review of the data package provided by Recra to check for completeness and, after completeness was verified, a review to check for compliance according to the standards set forth in ASP91. Each review process is summarized below and data validation reports prepared by Ms. Lindell from the 1994 sampling round are included in Appendix G. Data validation reports from previous sample rounds were included in previous reports.

A data package was considered complete if it contained the following components:

- Chain-of-Custody forms for each sample;
- case narratives for each analysis including summary forms;
- QA/QC summaries supporting documentation;
- relevant calibration data including supporting documentation;
- instrument and method performance data;
- documentation showing the laboratories ability to attain the specified method detection limits for analyses stated in the work plan in each matrix (soil and water);
- data reports form for each analysis including example calculations for determining the final concentrations; and
- raw data used in the quantification and identification of each analyte stated in the work plan for each analysis.

If deficiencies were observed, they were reported to Recra. Recra then produced documentation necessary to remove the deficiency.

The data was considered to be in compliance with ASP91, if the following criteria were met:

- data production and reporting in a manner consistent with the quality assurance project plan (QAPP);

- compliance with required QA/QC criteria;
- instrument and calibration requirements for the time frame of the analysis;
- required protocol for initial and continuing calibration;
- data reporting forms completion requirements including requisite flags, sample dilution/concentration factors and premeasurement sample cleanup procedures; and
- inclusion of problems encountered during the analysis and there resolution in the case narratives.

Ms. Lindell prepared a report summarizing the data review process. This report includes the following:

- an assessment of laboratory completeness and compliance;
- deviations to required protocols;
- identification of irreconcilable differences between raw and reported data;
- assessment of data usability;
- laboratory case narrative and summary sheets;
- overall appraisal of data package; and
- data validation chart summarizing project analyses.

3.00 SITE CHARACTERISTICS

The following sections discuss surface features, meteorology, surface water hydrology, regional and site geology, hydrogeology, land use and habitat assessment.

3.10 SURFACE FEATURES

The former active area of the Chem-Trol site consists of approximately 7 acres comprised of an open grass and brush covered field (see Figure 2). The remainder of the site is comprised of a low lying floodplain associated with the South Branch of Smokes Creek and a wooded area. Figure 6 presents the general ground cover at the site. Surface features of each of these areas are discussed below.

The majority of the former active area occupied by Chem-Trol is relatively flat with a ground surface elevation between approximately El. 640 and El. 643 feet NGVD. This area is primarily grass-covered with several smaller areas of brush. The ground surface along the west boundary of the former active area grades downward at a slope varying from about 4 horizontal (H) to 1 vertical (V) to 6H:1V. It is anticipated that the west slope was caused by erosion by the South Branch of Smokes Creek while it flowed along its original alignment and the subsequent placement of soil fill over the

former active portion of the site. The ground surface to the north of the former active area grades downward at a slope varying from 2H:1V to 9H:1V. This slope appears to be the results of erosion by the on-site tributary. Bedrock outcrops are evident along portions of this slope.

The low lying area between the former active portion of the site and the South Branch of Smokes Creek is about 3.2 acres in size and consists of relatively level ground (approximate elevation between El. 617 feet and El. 611 feet NGVD) that slopes gently towards the west. It is believed this low lying area contains the former bed of the South Branch of Smokes Creek and its associated floodplain. This area is generally covered with dense brush and trees and includes areas of standing water. An area of stressed vegetation was also identified by the NYSDEC in this area adjacent to the former active area.

A wooded area is located in the northern portion of the site and it is approximately bound to the west by the South Branch of Smokes Creek and to the south by the on-site tributary. This area is generally level at about elevation El. 640 feet NGVD but slopes to about elevation El. 610 feet NGVD towards the on-site tributary and the South Branch of Smokes Creek. This area is primarily covered with upland trees. Bedrock is exposed along the South Branch of Smokes Creek in this area.

3.20 METEOROLOGY

The climate in the vicinity of the site and Erie County is typified by moderately warm summers and cold, snowy winters. The county is bound to the west by Lake Erie, which impacts the weather conditions at the site. The major weather systems impacting the site emanate from the Great Lakes region, and results in frequently changing weather conditions. Overall, Lake Erie has a moderating effect on the temperature, typically reducing the cooling that occurs at night.

Data regarding monthly average temperatures and precipitation is summarized in Table 8. Information supplied by the Town of Hamburg indicates the average temperature in January is 23.5°F and in July 70.7°F. The average annual rainfall is reported at 37.5 inches. The annual average snowfall is 100 inches. The overall recording period for these averages is unknown.

3.30 SURFACE WATER HYDROLOGY

As previously discussed, two surface water bodies are located on the Chem-Trol site, including the South Branch of Smokes Creek and the unnamed on-site tributary to the South Branch of Smokes Creek (see Figure 2).

The South Branch of Smokes Creek originates near the Village of Orchard Park, approximately 4 miles southeast of the site (see Figure 1). The creek flows northwest-

erly along the face of the Hamburg Marilla Morraine (a glacial deposit), dropping in elevation from about 800 feet near its origin to about 600 feet at its discharge into Lake Erie, approximately 3 miles northwest of the site. The drainage basin of the creek is approximately 2.5 miles wide, extending between Orchard Park and the confluence of the North and South Branches of Smokes Creek. NYSDEC has classified the South Branch of Smokes Creek as a Class C surface water indicating a best usage as "suitable for fishing and all other uses except as a source of drinking water."

On the site, the South Branch of Smokes Creek flows in a general south to north direction. The bottom elevation of the creek slopes from El. 612 to El. 608 feet NGVD. The flow rate of the creek at the site was estimated by GZA to be about 370 gallons per minute (gpm) on August 4, 1990. Flow rates will vary by season, precipitation and other factors.

The on-site tributary to the South Branch of Smokes Creek flows generally from east to west through the northern portion of the site (see Figure 2). This tributary conveys drainage from east of the railroad tracks (i.e., from off-site) via a 4 foot diameter culvert. In addition to flow under the railroad, the tributary is also fed from the north and south by drainage swales located west of the tracks. The southern drainage swale collects surface water from the railroad track area and 4856 Lake Avenue. The northern drainage swale collects surface runoff from the railroad track area, the Electro Abrasives property (located north of the site) and the northern portion of the site. As the tributary flows through the site, it is fed by runoff and groundwater discharge from the adjacent portions of the site. The elevation of the tributary on the site ranges from about El. 630 feet NGVD near the railroad to about El. 610 feet NGVD near its convergence with the South Branch of Smokes Creek.

Two drainage swales exist on the formerly active portion of the site (see Figure 2). One swale is located north of 4800 Lake Avenue parking lot and conveys runoff in a westerly direction to the low-lying area east of the South Branch of Smokes Creek. The other is located near the northeastern corner of the formerly active area and flows in a northerly direction toward low lying areas near the on-site tributary of the South Branch of Smokes Creek. During field activities, surface erosion was observed within the bed of these swales, most notably in areas with steeper grades near the lower lying area north of the formerly active area. Temporary surface ponding was observed within the westerly flowing swale during periods of melting snow.

3.40 REGIONAL GEOLOGY/HYDROGEOLOGY

The bedrock in the Erie-Niagara basin was formed during the Silurian and early Devonian ages as fine grained materials were deposited in ancient seas. The resulting sedimentary rock consists primarily of shale, limestone and dolomite. The various rock

units are found in layers of varying thickness that generally dip to the south at approximately 30 to 40 feet per mile.

The uppermost bedrock unit in the vicinity of the Chem-Trol site is The Ludlowville Formation of the Hamilton Group. This rock consists primarily of shale with occasional limestone and sandstone seams. The Ludlowville formation is generally described as a soft gray fissile shale with limestone beds at the top and bottom. Geologic literature indicates that the formation is reported to be 65 to 130 feet thick (Reference 7).

Groundwater within the shale generally occurs along the thin vertical and horizontal openings, (joints and bedding planes) rather than through the rock mass. These openings may be widened through solutioning along limestone beds, or conversely, sealed through secondary mineralization of calcite. The upper 10± feet of the shale located at the soil/rock contact is typically fractured and weathered. At some locations, this fractured zone may be connected to the overlying glacial till. When this occurs, the fractured rock zone and the overlying glacial till may act as a single water bearing unit.

Water yields within the bedrock have been reported to range from nearly zero to about 40 gallons per minute (gpm) where limestone is present (Reference 7). In general, the bedrock water yield at the site generally ranges from about 10 to 15 gpm.

The majority of the natural soils in the vicinity of the site were deposited by glacial processes during Pleistocene time about 10,000 to 15,000 years ago. Typically, soils to the north of the site are part of the Lake Erie plain. These soils were generally deposited by glacial lakes and they consist of interbedded clay, silt and fine sand. Areas south of the site are part of the Allegheny plateau consisting of non-sorted till deposits of dense silt, clay, sand and gravel. Due to glacial movement, both types of deposits are encountered in the vicinity of the site. It is reported that groundwater wells in these deposits typically yield less than 10 gpm (Reference 7).

3.50 SITE GEOLOGY

The subsurface conditions of the Chem-Trol site were investigated during both the Phase II investigation and the RI. The discussion that follows is based upon test borings, test pits, geophysical studies and site observations completed as part of these investigations. A generalized stratigraphic cross section of the Chem-Trol site is included as Figure 7.

3.51 Overburden

As shown on the cross section (Figure 7), the overburden at the Chem-Trol site consists of topsoil overlying miscellaneous fill or glacial deposits. The following sections discuss topsoil, fill and glacial deposits encountered at the site.

3.51.1 Topsoil

Topsoil was encountered at each location tested during the investigation (i.e., test boring, auger probe or test pit) except in the parking lot of 4800 Lake Avenue where asphalt concrete was present. Generally the topsoil is described as a black silt and clay with little sand and organics. The thickness of the topsoil layer (when encountered) varied between 0.2 feet at MW-3S to 1.7 feet at MW-1S.

3.51.2 Fill

Three types of fill were generally encountered at the site. These fill materials include a slag-like material, a white-gray chalky material and miscellaneous soil fill.

The slag-like fill material was encountered at various auger probe locations beneath 4800 Lake Avenue parking area (shown on Figure 2) and to about 100 feet to the north. This suspected slag material, which is generally described as granular, was typically encountered 1 to 2 feet below the ground surface. The thickness of this material, measured during the auger probe survey, varied from less than 1 foot (N350, W200) to 6 feet (N400, W200). [Note: The hand auger probe locations are identified by their northing and easting/westing distances off of the site-specific grid shown on Figure 5.]. However auger refusal was sometimes encountered in this material and the thickness could not be determined at all locations.

A white-chalky material believed to be lime was encountered at seven (7) auger probe locations (N450, W300), (N450, W100), (N500, W300), (N500, W250), (N500, W200), (N500, W100) and (N550, W100) and in two test pits K and L (see Figure 5). The sample of this material collected from the vicinity of Test Pit L (SS-2) contained 15.4 percent calcium. This indicates that this material is lime. Typically the material was described as being intermixed with brown and black soil fill. The depth to the top of the lime, where encountered, ranged from 0.5 to 3.5 ft. The thickness of the deposit of this material at the auger probe locations ranged from 1 feet to 3.5 feet.

In test pits K and L the deposit was encountered approximately 1.5 and 3 ft. below the ground surface, respectively. The thickness of the layer was approximately 4 ft. At the test pit locations, the material was underlain by black silty clay fill that contained metal fragments in test pit K.

A soil fill consisting of dark brown silty clay containing lesser amounts of sand and gravel, metal and wood was encountered at various boring and auger probes located over a majority of the area of the former active portion of the site, including the area of slag-like fill and the white-gray fill. At several locations the thickness of this material was greater than 5 feet, particularly in the southern portion of the site (south and west of 4800 Lake Avenue building) and along the western and northern slopes of the formerly active portion of the site. While not confirmed, this may be the fill cover placed over the site following closure of the lagoons.

Four to six feet of soil fill (generally clays and silts) were also found to be immediately overlying bedrock at test boring locations within the low lying area between the South Branch of Smokes Creek (i.e., MW-8R, MW-9R, MW-10R and MW-12R through MW-14R). It is believed that this material was placed during the re-routing of the South Branch of Smokes Creek.

3.51.3 Glacial Till Deposits

Glacial till deposits were encountered in each of the test borings completed in the former active area of the site and in MW-11 located in the wooded area north of the on-site tributary. As discussed above, glacial till was not encountered in the explorations made in the low lying area west of the former active area.

The thickness of the glacial deposits, where encountered, varied between 9.5 (MW-7) and 16.2 (MW-2) feet thick. The deposits consisted primarily of silt and clay with varying amounts of sand and gravel. The color of the soil varied from brown near the top to gray near the bottom. Standard penetration test (SPT) N-values indicated the glacial soils were medium to hard.

In general, the sand and gravel content tends to increase with depth. Near the bedrock contact, the soils contained a greater sand and gravel fraction with lesser amounts of silt and clay. The thickness of the coarser till material ranged from 0.5 feet (P-5S) to 4.7 feet (P-2S).

3.52 Bedrock

The bedrock underlying the Chem-Trol site overburden is the Ludlowville Formation. The rock is generally described as gray, medium to hard, slightly to moderately weathered shale with very thin to thin bedding (i.e. breaks along bedding planes spaced from less than 2 inches to about 2 feet) based on core samples retrieved from the site. The bedrock was observed to be moderately to severely weathered to a depth of between 0 (MW-4S and MW-6S) to 2.3 feet (P-2S) below the top of rock. The Ludlowville Formation is reportedly 130 feet thick in the vicinity of the Chem-Trol site and consists of the Wanakah and Ledyard Members (Reference 13).

Based on test boring data, the bedrock surface slopes downward to the west toward the South Branch of Smokes Creek and to the north toward the on-site tributary. Bedrock elevations observed at the site range from about El. 630 feet NGVD at MW-7R to about El. 609 feet NGVD at MW-13R west of the South Branch of Smokes Creek and about El. 624 feet NGVD at MW-6R near the on-site tributary.

Monitoring well MW-9RD was drilled to a depth of 68 feet below the ground surface (El. 549 feet NGVD), providing deeper rock information. At this location, fractured rock, capable of providing water, is present from about 6 feet to 28 feet below the ground surface (about El. 611 to El. 589 feet NGVD). From about 28 feet to 38 feet, the shale is more competent, as indicated by the higher rock quality designation (RQD) values that range from 90 to over 92 percent. Fractures within this depth are typically high angle and are filled with calcite through secondary mineralization. Below this zone, the shale had lower RQDs (25% to 60%) and exhibit fresh to moderately weathered fractures.

As noted above, MW-9RD encountered approximately 22 feet of weathered shale overlying competent shale. As discussed in Section 1.12.2, the geophysical survey suggested that a 25 to 30 foot thick weathered shale unit existing at this location. Specifically, the survey suggested about 26 feet of weathered shale existed in the area of MW-9RD. Thus the information obtained from MW-9RD confirms the subsurface conditions indicated by the geophysical data (i.e., 25 to 30 feet of weathered scale).

Bedrock outcrops along the South Branch of Smokes Creek north of the former active area and the on-site tributary were mapped as part of the Phase II study. Generally these outcrops were observed to consist of a gray fissile shale interbedded with approximately 10 percent limestone and they were severely weathered. Several discontinuous fractures about 2 to 10 feet in length were also observed. These fractures were typically steeply dipping, unmineralized and open less than 1/10 inch. Fractures were generally spaced 5 to 10 feet apart, however, closely spaced fractures (0.25 to 0.5 foot spacing) were observed at one location.

An approximately 15 foot thick outcrop observed along the South Branch of Smokes Creek near the northern edge of the site contained limestone beds with concretions approximately 1 to 7 inches in diameter formed about brachipod nuclei. The strike of the bedding in this outcrop is fairly consistent at approximately N 40°W. Two fracture sets, were observed with strikes approximately N 60°W and approximately N 30° W. The observed dips for these fractures were 80°N to vertical.

During the RI, fractures were also noted within the bed of the South Branch of Smokes Creek. Observations within this area were limited due to sediments overlying the top of rock. The strikes of fractures observed were typically about N 70° E and N 30° W. The fracture spacing varied between 0.2 and 17 feet. The observed fracture patterns in this area appear to be consistent with the nearly orthogonal jointing, typically reported for bedrock in Western New York State.

3.60 HYDROGEOLOGY

As discussed above, the hydrology of three zones were studied at the Chem-Trol site including the lower glacial deposits, the upper weathered shale and the competent shale.

Based on test boring data, the lower glacial deposits are believed to be a 0.5 to 4.7 feet thick layer of relatively coarse grained material occurring over the majority of the site. This zone may, at some locations, include the upper few feet of weathered rock. Monitoring wells installed in this zone have an "S" designation.

The second zone studied occurs within fractures in the weathered shale. Monitoring wells installed in this zone have an "R" designation and have an intake zone of varying lengths between 7 and 22 feet below the top of the rock. It is suspected that this zone is hydraulically with the lower glacial deposits through fractures extending to the rock surface.

The third zone occurs within hairline fractures in the competent shale zone. MW-9RD was extended to sufficient depth to encounter this zone. The intake zone of this well extends from 35 to 60 feet below the top of rock.

The following sections discuss the hydraulic properties and groundwater flow for these three zones.

3.61 Hydraulic Properties

The primary hydraulic properties used to describe groundwater conditions include hydraulic conductivity, porosity and effective porosity. These properties, along with hydraulic gradient are used to estimate groundwater flow quantities and velocity. Hydraulic conductivity is a measure of the ability of a soil or rock deposit to transmit

water. Porosity is a measure of a deposits' void volume. Effective porosity is a measure of a deposits void volume which is able to transmit groundwater.

Hydraulic conductivity testing was conducted in the lower glacial deposits and bedrock. The hydraulic conductivity in the lower saturated glacial deposits was estimated based on in-situ variable head testing (i.e., falling and rising head tests). The hydraulic conductivity of the bedrock was estimated based on variable in-situ head tests as well as packer pressure tests. The results of the hydraulic conductivity testing are summarized in Table 2. The range and geometric mean calculated by the variable head tests are presented below.

	Hydraulic Conductivity (cm/sec)	
	Range	Geometric Mean
Lower Glacial Deposits	$2x10^{-3}$ to $2x10^{-6}$	$9x10^{-5}$
Weathered Shale	$1x10^{-1}$ to $4x10^{-5}$	$3x10^{-3}$
Competent Shale (MW-9RD)	$3x10^{-5}$	--

The hydraulic conductivity of the upper glacial deposits was estimated based upon the density, gradation and Atterberg limit test results done during the Phase II investigations (Reference 3) to be less than $1x10^{-6}$ cm/sec.

The porosity of saturated soils was estimated based upon moisture content test results completed during the Phase II investigations (Reference 3) and the relative soil density estimated. A specific gravity of 2.7 was selected as representative for these soils, and used in this estimate. The estimated porosity of the soil deposits are presented below.

	Porosity	
	Range	Average
Upper Glacial Deposits	0.20 to 0.45	0.30
Lower Glacial Deposits	0.35 to 0.45	0.40

Based upon the relationship between porosity and effective porosity (Reference 8), the effective porosity of the upper glacial and lower glacial soils is expected to be about 0.25 and 0.30, respectively.

The effective porosity of the weathered shale was estimated based upon rock core recoveries and published data for similar rock types (Reference 9). These porosity estimates range from about 0.03 to 0.30 (MW-1R) and an average of 0.15.

3.62 Horizontal Groundwater Flow Patterns and Rates

A groundwater contour map for the overburden was prepared based upon the groundwater elevations measured on June 16, 1994 (see Figure 8). As shown on the groundwater contour map, the groundwater flow within the overburden soils is toward the South Branch of Smokes Creek and the on-site tributary, generally in a west, north-west direction. The hydraulic gradient at the site, measured from Figure 7, ranges from 0.1 ft/ft to the west in the vicinity of MW-4S and MW-10S to 0.04 ft/ft to the northwest in the vicinity of P-1S and MW-6S. Seasonal variations in water elevations across the site observed during this study do not significantly affect the groundwater flow patterns or gradients (refer to groundwater elevations in Table 3).

Based upon average values of hydraulic gradient, hydraulic conductivity and effective porosity, the groundwater flow velocity in the lower glacial soils was estimated utilizing Darcy's law. This estimate indicates that the average groundwater flow rate is about 18 feet per year. It should be recognized, however, that flow velocities may be higher in more permeable areas and less in less permeable areas.

A groundwater contour map of the bedrock monitoring wells was also prepared based upon the June 16, 1994 groundwater elevation measurements (see Figure 9). The groundwater flow pattern in the bedrock is similar to that observed in the overburden. As shown on the groundwater contour map in Figure 9, flow is toward the South Branch of Smokes Creek and the on-site tributary. The average hydraulic gradient in the bedrock, estimated on the groundwater contour map, ranged from 0.06 ft/ft toward the on-site tributary to 0.08 ft/ft toward the South Branch of Smokes Creek.

Groundwater velocities in the bedrock were also estimated using Darcy's law. This estimate indicates that the average groundwater flow rate is about 4,000 ft/year, depending upon the hydraulic gradient. It should be recognized that the method used to estimate velocity is based upon flow through a porous media and may not be totally applicable for the evaluation of flow through fractured rock. Furthermore, it should be recognized that the calculated flow rates in the bedrock are high and that these rates are in part attributable to the estimated hydraulic gradient.

It is likely that these gradients estimated at the site are uncharacteristically high. This is because this gradient was measured between closely spaced wells positioned in close proximity to the lower lying South Branch of Smokes Creek, a discharge point. It is likely that the regional hydraulic gradients (and the corresponding flow rates) are significantly lower in areas away from the site and the South Branch of Smokes Creek. Based upon GZA's experience, a gradient of 0.01 is more representative of the conditions in the region. Using this gradient, a groundwater flow rate of about 600 feet per year would occur.

Based upon the groundwater level measurements made at the well clusters on June 16, 1994 (i.e., locations with an overburden and bedrock monitoring well), there appears to be a downward gradient from the overburden toward the bedrock (refer to the cross section, Figure 7) across much of the site. The difference in hydraulic head between the two zones was observed to be less than a foot at location MW-1 to as much as 10 feet near the top of the slope to the west of the site at MW-4.

One well cluster (MW-9) includes wells in both the upper weathered shale and lower more competent shale. Based on water elevations (see Table 3) made on June 16, 1994 (the only date such data is available), there appears to be an upward hydraulic gradient in the rock in this area. Specifically, the hydraulic head in MW-9RD was about 4 feet higher than that in MW-9R.

3.63 Site Hydrogeologic Conceptual Model

Groundwater flow at and in the area surrounding the Chem-Trol site is controlled by the topography and the soil and rock conditions. These materials at the site typically include surficial soils, such as topsoil and/or miscellaneous fill; glacial till soils; and weathered shale and the more competent shale below. It is anticipated that similar glacial till and rock materials may be found throughout the general area surrounding the Chem-Trol site. Localized ares of fill materials may also be present in areas which have been developed. The bedrock surface at the site, which is generally similar to the surface topography, slopes towards the South Branch of Smokes Creek where it is exposed at the ground surface.

Based on subsurface explorations, it appears that the groundwater flow generally occurs within the lower, more granular, glacial till soils, the weathered shale and the competent shale. The hydraulic properties of these materials were discussed in Sections 3.5 and 3.6 and are summarized below.

Material	Thickness (feet)	Hydraulic Conductivity (cm/sec)
Lower Glacial Till (coarser grained portion)	0.5 to 4.7	$9x10^{-5}$
Weathered Shale	25 to 30	$3x10^{-3}$
Competent Shale	65 to 130	$3x10^{-5}$

It is our opinion that the shallow/local groundwater flow at the site is generally the result of recharge within the South Branch of Smokes Creek watershed. The subsurface data indicates that the groundwater flow at the site either discharges to the South Branch of Smokes Creek and its tributaries or may continue to the west-northwest. Figure 10 presents a conceptualization of this flow system in a cross-sectional view. The cross-section extends one half of the width of the watershed

extending from about 3/4 of a mile from the vicinity of the South Branch of Smokes Creek at the site to Abbott Road.

Recharge to the groundwater system occurs as vertical infiltration through the surficial soils and glacial till (see Figure 10). The amount of infiltration is limited due to the low hydraulic conductivity of this material. It is estimated that the amount of infiltration may be about 5 to 7 inches per year based upon a water balance calculation using average rainfall data.

As the recharging infiltration reaches the lower glacial till it flows along the top of rock to vertical fractures where it enters the more permeable weathered shale (see Figure 10). The head measured in the lower glacial till was above the head measured in the bedrock at each well couplet location in measurements made on June 16, 1994 (refer to Table 3). This indicates that groundwater flow is from the lower glacial till into the bedrock.

Flow within the weathered shale is along fractures and bedding planes. It is believed that the groundwater flow direction in the weathered shale is primarily horizontal under semi-confined conditions. Flow is towards the South Branch of Smokes Creek. Flow in the weathered shale is believed to be the primary flow path across the site due to its relatively high permeability. It is estimated that more than 80 percent of the water that passes across the site originates as upgradient flow in the weathered shale.

The relatively low hydraulic conductivity of the underlying competent shale limits the amount of water that can pass through it. The head in the competent shale was measured at well MW-9RD to be El. 614.3 feet NGVD and the head in the weathered shale at MW-9R was El. 610.9 feet NGVD on June 16, 1994 (refer to Figure 3 for well locations and Table 3 for water level measurements). These groundwater elevations indicate that the groundwater flow is generally upward from the competent shale into the weathered shale in the vicinity of well cluster MW-9. It is believed that a downward gradient from the weathered shale to the competent shale may occur at higher elevations east of the site.

Groundwater from the weathered shale at the site discharges to the on-site tributary and to the South Branch of Smokes Creek. The tributary is cut several feet into the weathered shale. Groundwater elevations in the bedrock groundwater monitoring wells are consistently higher than the surface water elevations in the tributary. This indicates that flow is from the bedrock into the tributary.

Water level measurements made on December 16, 1993 in the South Branch of Smokes Creek at SG-2 and the adjacent well (MW-8R) indicate the flow is generally from the bedrock into the creek (refer to Table 3 for water level measurements). However, on June 16, 1994 nearly equal head levels were measured

in the South Branch of Smokes Creek, MW-8R, and MW-13R. A similar situation was observed at MW-14R where the water elevation in the South Branch of Smokes Creek was equal to the elevation in the well. This may potentially result in groundwater flow from the site passing beneath the creek. As such, based on the data collected to date, it appears that groundwater discharges to the creek, however, the potential exists for groundwater flow past the creek during certain times of the year.

3.70 LAND USE AND DEMOGRAPHY

The Chem-Trol site is located within the Town of Hamburg, New York, in southern Erie County. The township is bound by the City of Buffalo and the Town of West Seneca to the north, the Town of Orchard Park to the east, the Towns of Eden and Evans to the south and Lake Erie to the west. The location map (Figure 1) shows the approximate size and location of the Chem-Trol site.

The Chem-Trol property is located within an urban setting in Hamburg. Zoning maps of Erie County show that there are various industrial zones around the site including heavy and general industrial zones to the north and general and light industrial zones to the east. There are also various commercial and residential properties surrounding the site. According to the Erie County DEP Planning Division, the Chem-Trol site does not lie within an agricultural district.

The Chem-Trol site is located within an urban population center, with the City of Buffalo to the north and Orchard Park to the east. According to the Hamburg Department of Community and Economic Development Research, the population of Hamburg was about 38,077 in 1990, with an annual population growth rate since 1980 of about +0.1 percent.

Results from the 1990 United States Census indicate that the median age within the town was 34 years, the average per capita income was $13,125; and the average household income was $36,531 per year. The census data also reveals that 65.4 percent of the residents in Hamburg were homeowners with 16.6 percent renting; the number of households was 13,681 with a median house value of $44,723 and an average occupancy of 2.8 people.

Background data on employment in the area indicates that 22,353 people in Hamburg were employed in 1980. Of this number, 79.6 percent were employed in the private sector, 15.4 percent were employed by government enterprises, 4.7 percent were self-employed and 0.3 percent were unpaid family workers.

3.80 HABITAT ASSESSMENT

The following habitat assessment is based on information obtained from the Erie County Department of Environment and Planning and the NYSDEC Division of Fish and Wildlife.

3.81 Site Description

Most of the Chem-Trol site is covered with a mixture of grasses, shrubs and small trees. Figure 6 shows the site and the location of wooded, grass and brush areas. The northern and western areas of the site support densely populated nearly mature trees. Aerial photography indicates that these trees may have been at the site since 1939 or before. The remainder of the site is grass or brush covered.

Habitat diversity at the Chem-Trol site is enhanced by the South Branch of Smokes Creek and the on-site tributary as well as the low lying area in the western portion of the site (see Section 3.82). Wildlife is represented by bird and small mammal species. However, a review of significant fish and wildlife habitat maps provided by the ECDEP do not indicate major fish or wildlife populations in the area. The NYSDEC has also stated that the site is not affected by any known significant habitat or threatened or endangered species.

The NYSDEC provided the results of a fish collection survey completed in the South Branch of Smokes Creek at Lake Avenue in August 1987. The following species were identified: Lepomis gibbosus, Cyprinus carpio, Semotilus atromaculatus, Etheostoma nigrum, among others.

A review of New York State Protected Waters maps provided by the ECDEP indicates that there are no NYS protected waters in the area of the Chem-Trol site. However, navigable waters maps of the U.S. Army Corps of Engineers indicate that the South Branch of Smokes Creek is a federally designated navigable waterway.

New York State Protected Plant Habitat maps provided by the ECDEP indicate that the Chem-Trol site lies within a calcareous bedrock region where a calciphilic species of plant life may occur on steep slopes and rock outcrops. The NYSDEC information indicated that Harbinger-of-Spring was found about 2 miles from the site. However, the existence of these species at the Chem-Trol site has not been identified.

The data suggests that, while no known habitats are present on-site, some endangered plants have been identified near the Site. Prior to remedial work on the site, a detailed review of species on the site may be warranted depending on the type of work proposed.

3.82 Floodplains and Wetlands

Flood maps developed by the Federal Insurance Administration (FIA) indicates that portions of the Chem-Trol site east and west of Smokes Creek lie within the 100 and 500 year floodplain. The 100 year flood elevation across the site ranges from El. 617 NGVD at the southern end to El. 615 NGVD at the north. The area where the on-site tributary and Smokes Creek intersect is listed on the FIA map as a Zone B area which indicates that: the area lies between the limits of the 100 and 500 year flood; is an area subject to 100 year flooding with an average depth less than 1 foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood.

A review of the New York State official wetlands maps provided by the ECDEP indicates that no portion of the Chem-Trol or any area downstream of the site are an NYS Regulated Freshwater Wetlands. This was confirmed by Mr. Kenneth Roblee, a senior wildlife biologist with the NYSDEC (Reference 14). However, a review of National Wetlands Inventory (NWI) maps provided by the U.S. Department of the Interior, Fish and Wildlife Service indicates that Smokes Creek is designated as a federal wetlands and that the federal regulatory agency with jurisdiction over wetlands may define and describe the area in a different manner.

The RI scope of work did not include field delineation of wetland areas. As noted above mapable wetland areas may be located within the site boundaries. Issues related to wetlands may have to be addressed during future remedial actions, as appropriate.

4.00 NATURE AND EXTENT OF CONTAMINATION

This section discusses the nature and extent of contamination observed at the Chem-Trol site. The discussion is based on analytical testing performed during Phase II and the Remedial Investigation as well as the historical information compiled during the Phase II studies (Reference 3).

Within the text below, concentration data is provided with a numerical value followed by associated qualifiers and units. Data qualifier definitions are included in Appendix G.

Test results from NYSDEC split sample have been included in the discussions below. Typically distinctions between NYSDEC split and Recra sample test results are not made in the text. It should be noted however that NYSDEC split sample test results have not been validated.

4.10 CONTAMINANT TYPES

Tables 9 through 14 list the chemicals encountered in each media. Table 15 summarizes these chemicals by chemical class. Table 15 also includes commonly associated uses or origins of the chemical classes detected at the site.

Compounds that have similar chemical structures tend to exhibit similar behavior in the environment. Physical properties, such as density, water solubility, vapor pressure, Henry's Law Constant, organic carbon partition coefficient and log octonol/water partition coefficient are defined for pure compounds under laboratory conditions. These properties, in conjunction with field studies, are used to provide an indication of how a given class of chemicals are expected to behave in the environment, as briefly described below. Brief narratives summarizing anticipated behavior of the chemical classes found at the Chem-Trol site are included on Table 15. Discussions of environmental testing results are broken into chemical classes, as appropriate.

4.20 SOURCE AREAS

As discussed in Section 1.21, operations at the Chem-Trol facility included treatment and transfer of various wastes. Liquid chemical wastes are believed to have been stored in lagoons, above ground tanks and 55 gallon drums. Four surface impoundments and three areas of disturbed earth were identified in the formerly active portion of the site based on a 1972 aerial photograph. A drum storage area was observed in the eastern portion of the site. The geophysical study completed during the Phase II study (Reference 3) indicated several anomalies within the formerly active portion of the site. There is some agreement between the geophysical anomalies and the active areas shown on the historic aerial photograph.

It should be noted that the contents of on-site surface impoundments were reportedly drained, treated with ferro-lime and backfilled with a slag-like material, subsequent to the 1972 aerial photograph (Appendix B). In addition, considerable earthwork including the excavation of 2 feet of imported soil from the site followed by placement of 2 feet of soil over the formerly active portion of the site and construction of the existing 4800 Lake Avenue structure and parking lot. As such, these former potential source areas may not be currently identifiable as specific areas. Potential current chemical sources include soils in and around the impoundments formerly used for waste treatment as well as soils which may have been mixed throughout the site during earthwork activities.

4.30 SOILS TESTING RESULTS

Soil testing completed during the Phase II (Reference 3) and RI studies included 25 samples submitted for analytical testing; 86 samples from 52 locations screened in the field for selected VOCs; and, 77 samples from 75 locations screened in the field for

PCBs. Analytical test results are summarized on Table 11. Screening test results are summarized in the figures in Appendix F and confirmatory testing results for the screening are on Table 11. The results of the screening and testing are presented below.

It should be noted that since soil samples were collected from different locations during the Phase II and RI studies, temporal distinctions between samples are not made. For purposes of this discussion, all soil samples tested are assumed to be indicative of current site conditions. This is believed to be a conservative assumption since degradation and leaching will typically reduce chemical concentrations in soils over time.

4.31 VOCs

4.31.1 Halogenated Aliphatic Hydrocarbons

Halogenated aliphatic hydrocarbons (which include common solvents) were detected at 17 of 25 soil sample locations at the site. Some of the more notable compounds detected include tetrachloroethane (PCE), trichloroethene (TCE) chloroform, 1,1,1-trichloroethane (1,1,1-TCA) and 1,1 dichloroethane (1,1-DCE). PCE concentrations ranged between 35,000 μg/kg (N400 W200 at 2.5 feet) and 7 Jμg/kg (SS-1 at the ground surface). TCE concentrations ranged between 8,700 μg/kg (SPMW-1 at 6 to 8 feet) and 2 JBμg/kg (SD-1 at the ground surface). Chloroform concentrations ranged between 34,000 μg/kg (SSI-1 at 5 to 5.3 feet) and 0.4 Jμg/kg (N250 W150 at 5 feet). 1,1,1-TCA concentrations ranged between 8,800 Dμg/kg (N200 W200 at 5 feet) and 4Jμg/kg (N400 W200 at 2.5 feet). 1,1-DCA concentrations ranged between 900 DJμg/kg (N159W211 at 7 feet) and 14 μg/kg (N300 W270 at 5 feet).

Examination of the spatial distribution of this class of VOCs obtained from analytical and screening test results indicates these compounds tend to be elevated in two areas. The first is located along in the southeast portion of the former active area. As discussed above it is believed this area was used for drum storage. The second area of elevated concentrations of halogenated aliphatic hydrocarbons includes the eastern portion of the former active area extending south to include the area surrounding 4800 Lake Avenue. In general, chlorinated ethenes tend to be higher in the former active area of the site [SSI-1, SSI-2 and (N400, W200)] and chlorinated ethanes tend to be higher in closer to 4800 Lake Avenue [samples (N200, W200) and (N159, W211)].

4.31.2 Aromatics

Aromatic compounds, were detected at 17 of 25 soil sample locations. Most notable were toluene, xylenes and ethylbenzene. Concentrations of toluene ranged between 3,100 D μg/kg (N159 W211 at 7 feet) and 0.5 J μg/kg (N650 W150 at 5 feet). Concentrations of total xylenes ranged between 18,000 Jμg/kg (SSI-2 at 4 to 5 feet) and 1BJμg/kg (N100 W250 at 1.5 feet). Concentrations of ethylbenzene ranged between 4,600 Jμg/kg (SSI-2 at 4 to 5 feet) and 0.8 Jμg/kg (N200 W200 at 5 feet).

Examination of the spatial distribution of detectable concentrations of these compounds in the soils indicates higher concentrations (i.e., greater than 100 μg/kg) of these compounds tend to be located in the western portion of the former active area site.

4.31.3 Ketones

Ketones were detected at 9 of 25 soil sample locations. Notable ketone compounds within the soils include acetone and 2-butanone. Acetone concentrations ranged between 440 Dμg/kg (N500 W300 at 2.5 feet) and 8 JB μg/kg (N400 W200 at 2.5 feet). 2-Butanone concentrations ranged between 190 μg/kg (N159 W211 at 7 feet) and 6 Jμg/kg (N400 W200 at 2.5 feet).

Examination of the spatial distribution of detectable concentrations of ketones indicates that trace concentrations (i.e., less than 10 μg/kg) of ketones are detected throughout the site. Higher levels of acetone were detected in the northern part of the formerly active portion of the site, along the western slope; and near 4800 Lake Avenue.

4.31.4 Halogenated Aromatics

Halogenated aromatic VOCs are not prevalent compounds in the soils at the site. However, chlorotoluene (also known as chloromethylbenzene) was detected as a tentatively identified compound (TIC; a compound not specifically tested for but tentatively identified and quantified) at 9 of 25 soil sample locations at the site. Concentrations of this compound ranged between 370,000 Jμg/kg (SSI-1 at 5 to 5.3 feet) and 11 Jμg/kg (SSI-3 at 4 to 4.5 feet and SD-1 at the ground surface).

During well development of monitoring well MW-3S a sample of an emulsion was obtained. When allowed to stand, the emulsion separated

into three phases. These included an aqueous phase and a solid/sediment phase separated by a substance suspected to be a dense non-aqueous phase liquid (DNAPL). The sample was submitted for analytical testing by Recra. Recra centrifuged the sample during preparation in an attempt to test only the suspected DNAPL. The result of testing this sample indicated 960,000 μg/kg of chlorotoluene. A soil sample collected near MW-3S at SPMW-4 indicated 130,000 μg/kg of chlorotoluene in soil from 10 to 14 feet below the ground surface.

Examination of the spatial distribution of detectable concentrations of chlorotoluene indicates this compound is limited primarily to the western portion of the former active area.

4.32 Semi-VOCs

4.32.1 Polynuclear Aromatic Hydrocarbons

PAHs were detected at 12 of 25 sample locations at the site. Some of the more notable PAHs include 2-methylnapthalene, naphthalene, pyrene, benzo(b)flouranthene and benzo(a)pyrene. Concentrations of 2-methylnapthalene ranged between 10,000 μg/kg (SSI-2 at 4 to 5 feet) and 27 Jμg/kg (N500 W100 at 7 feet). Concentrations of naphthalene ranged between 17,000 μg/kg (SSI-2 at 4 to 5 feet) and 30 Jμg/kg (SS-1 at the ground surface). Concentrations of pyrene ranged between 4,100 Dμg/kg (N400 W400 at 5 feet) and 80 Jμg/kg (SD-2 at the ground surface). Concentrations of benzo(b)flouranthene ranged between 4,300 Dμg/kg (N400 W400 at 5 feet) and 86 Jμg/kg (N77 W204 at 5 feet). Concentrations of benzo(a)pyrene ranged between 3,000 μg/kg (N400 W400 at 5 feet) and 230 Jμg/kg (N400 W350 at 5 feet).

Examination of the spatial distribution of PAH compounds indicates that these compounds were most prevalent (i.e., more numerous and at higher concentrations) within samples collected from the slope and the west side of the former active portion of the site.

4.32.2 Phthalates

Phthalates were detected at 21 of 25 soil sample locations. Most notable were bis(2-ethylhexyl) phthalate and butylbenzylphthate. Concentrations of bis (2-ethylhexyl) phthalate ranged between 38,000 Bμg/kg (SSI-2 at 4 to 5 feet) and 34 Jμg/kg (N600 W300 at 8 feet). Concentrations of butylbenzylphthalate ranged from 26,000 Dμg/kg (N100 W250 at 1.5 feet) to 17Jμg/kg (N600 W300 at 8 feet).

It should be noted that phthalates were sometimes detected in blank samples and the data therefore qualified with a "B". Phthalates are commonly used as plasticizers in the plastics manufacturing industry. As such, phthalate may be introduced into samples by sampling and testing equipment (i.e., plastic gloves, bottles, etc.).

No apparent trend in the spatial distribution of phthalates was identified at the site.

4.32.3 Halogenated Aromatic Semi-VOCs

Halogenated aromatic semi-VOCs were detected at 11 of 25 sample locations. Most notable of these compounds include 1,2,4-trichlorobenzene and hexachlorobenzene. Concentrations of 1,2,4-trichlorobenzene ranged between 150,000 μg/kg (SSI-2 at 4 to 5 feet) and 110 μg/kg (N400 W200 at 2.5 feet). Concentrations of hexachlorobenzene ranged between 21,000 μg/kg (SSI-2 at 4 to 5 feet) and 76 Jμg/kg (N500 W100 at 7 feet).

Examination of the spatial distribution of halogenated aromatic semi-VOCs compounds indicates they are primarily located at higher concentrations (i.e., greater than 1,000 μg/kg) in the western portion of the former active area. Lower concentrations, however were also detected in the vicinity of 4800 Lake Avenue.

4.32.4 Phenols

Phenols were detected at 6 of 25 sample locations. Notable phenol compounds detected included phenol, 2-phenol, 4-methylphenol and 2,4-dimethylphenol. Concentrations of phenol ranged between 120,000 Dμg/kg (SSI-2 at 4 to 5 feet) and 51 Jμg/kg (SD-1 at the ground surface). Concentrations of 2-Methylphenol ranged between 14,000 μg/kg (SSI-2 at 4 to 5 feet) and 430 μg/kg (N400 W200 at 2.5 feet). Concentrations of 4-methylphenol ranged between 52,000 μg/kg (SSI-2 at 4 to 5 feet) and 65 Jμg/kg (N100 W250 at 1.5 feet). Concentrations of 2,4-dimethylphenol ranged between 35,000 μg/kg (SSI-2 at 4 to 5 feet) and 160 Jμg/kg (N400 W200 at 2.5 feet). As indicated above, test results from a sample SSI-2 were typically higher than in other samples. Outside of this sample, phenol test results were typically below the matrix detection limit. As such, the distribution of phenol compound appears limited to the vicinity of SSI-2.

4.32.5 Other Semi-VOCs

Other semi-VOCs were detected in various samples at concentrations typically less than 1,000 μg/kg. No apparent spatial distribution trends were identified.

4.33 Pesticides

Pesticides were detected at 10 of 25 sample locations at the site. Most notable were delta and gamma-BHC detected at 46,000 Dμg/kg and 2,600 μg/kg (SSI-2 at 4 to 5 feet). Other reported concentrations were typically less than 100 μg/kg. No apparent trend in the pesticide spatial distribution was noted.

4.34 Polychlorinated Biphenyls

PCBs were detected at 13 of 25 locations at the site. Total PCB concentration ranged between 1,800,000 Dμg/kg (SSI-2 at 4 to 5 feet) and 56 Jμg/kg (N650 W150 at 5 feet). Total PCB concentrations varied, where encountered, generally between 1,000 μg/kg and 5,000 μg/kg.

It should be noted, however, that during the RI, a sample was collected approximately 10 feet away from SSI-2 and screened in the field for PCBs. The test results reveal only 2,100 μg/kg of PCBs in this sample as opposed to 1,800,000 Dμg/kg in the sample from SSI-2.

Examination of the spatial distribution of detectable PCB compounds indicates one main area of PCB contamination within the central and western portions of the formerly active area. PCBs were also detected within 4800 Lake Avenue parking lot and along the northern and western slopes bordering the formerly active portion of the site. Field reports indicate that samples which contained PCBs typically contained a black granular slag-like material.

4.35 Metals

Detectable concentrations of metals were noted in each of the soil samples tested for metals. However, metals are naturally occurring compounds in soil. To distinguish between naturally occurring metal compounds and potential site contaminants, a comparison was made between the metal concentrations observed in the samples and background concentrations. Initially background concentrations were determined by calculating the 95 percent upper confidence limit of the soil samples collected outside the apparent limits of the former active area. However, since only three background samples were collected, and off-site fill that may have higher metals

concentrations was placed over the former active area, published background concentrations were also used in this comparison. These data are presented on Table 10.

Metals concentrations based on this approach, were similar to established background levels. The concentrations of at least one metal exceeded background at most locations, however, most of the metals that were noted for exceedence include calcium, aluminum, magnesium and potassium, which are often present at naturally high concentrations.

The spatial distribution of metals at the site was evaluated using those metals concentrations that exceed both the maximum background concentration and the published ranges. Metals that met both of these conditions were considered as potentially related to former site practices. No apparent trend was identified in the spatial distribution of metals. The difference in observed metals concentrations at the site and background may be attributable to the natural variation occurring within various soil materials, including those brought to the site during closure. Background samples of the imported fill material were not collected.

4.40 FLOODPLAIN SEDIMENT TEST RESULTS

Sediment samples from two floodplain locations were collected during the Phase II investigation (Reference 3) (FPS-1 and FPS-2) in 1990 and from four locations during the RI (FPS-3 through FPS-6) in 1993. Samples collected during the RI, were intended to represent environmental conditions within the former creek bed. The location of these samples are shown on Figure 4. Analytical test results for these samples are summarized on Table 14 and are discussed below. Similar to the discussion of the soil samples, since floodplain sediment samples collected during the Phase II and the RI were from different locations, no temporal distinctions were made between samples. All floodplain sediment samples are assumed to be indicative of current site conditions.

4.41 VOCs

VOCs were detected at 3 of 6 flood plain sediment sample locations. Three VOCs were detected within floodplain sediments each of a different chemical class. These included methylene chloride, a halogenated aliphatic hydrocarbon commonly used as a solvent; acetone, a ketone also used as a solvent; and xylene, an aromatic compound commonly associated with petroleum or solvents. Methylene chloride concentrations ranged between 12 JBμg/kg (FPS-1) and 4 JBμg/kg (FPS-2). Acetone concentrations ranged between 19 μg/kg (FPS-1) and 16 Jμg/kg (FPS-2). Xylene was detected only in the sample from FPS-2 at 7 μg/kg.

It should be noted that both methylene chloride and acetone are commonly used in analytical laboratories and that methylene chloride was detected in blanks during both the Phase II and RI work.

Examination of the spatial distribution of these compound indicates that they tend to be more prevalent in samples from areas outside the former bed of the South Branch of Smokes Creek such as FPS-1 and FPS-2.

4.42 Semi-VOCs

4.42.1 PAHs

PAHs were detected at 4 of the 6 floodplain sediment sample locations. Some of the more notable PAH compounds detected include fluoranthene, chrysene and benzo(a)pyrene. Concentrations of fluoranthene ranged between 4,500 Dμg/kg (FPS-6) and 99 Jμg/kg (FPS-4). Concentrations of chrysene ranged between 2,900 μg/kg (FPS-6) and 62 Jμg/kg (FPS-4) concentrations of benzo(a)pyrene ranged between 1,400 μg/kg (FPS-6) and 48 Jμg/kg (FPS-4).

Examination of the spatial distribution of PAHs within floodplain sediment samples indicates PAHs are present primarily in the former creek bed. Higher concentrations were generally found at location FPS-6, in an area where fill materials may have been placed during the bridge and highway construction activities.

4.42.2 Other Semi-VOCs

Other semi-VOCs including phenols, phthalates and halogenated aromatic compounds were detected in the floodplain sediments. Of note phenol was detected at 65 μg/kg in FPS-2 and hexachlorobenzene ranged between 1,600 μg/kg (FPS-5) and 85 Jμg/kg (FPS-4). No apparent spatial distribution was observed for these classes of compounds.

4.43 Pesticides

Pesticides were detected within each of the floodplain sediments samples. Most notable were delta-BHC, heptachlor expoxide and endrin. Delta-BHC was detected in one sample at a concentration of 6,000 μg/kg (FPS-5). Concentrations of heptachlor expoxide ranged between 350 μg/kg (FPS-5) and 1.9 JPμg/kg (FPS-3). Concentrations of endrin ranged between 19,000 Pμg/kg (FPS-5) and 2.3 JP μg/kg (FPS-3). Excluding one sample collected from location FPS-5, pesticide concentrations were typically below 100 μg/kg.

Examination of the spatial distribution of pesticides in floodplain sediments indicates these compounds are more prevalent in the former creek bed. Unlike PAHs discussed above, higher pesticides concentrations were noted at location FPS-5 rather than FPS-6.

4.44 PCBs

PCBs were detected at 3 of 6 floodplain sediment sample locations. Total PCB concentration ranged between at 3,800 μg/kg (FPS-4) and 790 μg/kg (FPS-3). PCBs were identified only in samples from the former creek bed.

4.45 Metals

Analysis of the metals data for floodplain sediment proceeded in a similar manner as that for soil samples (see Section 4.35). Metals concentrations within floodplain sediments were generally similar to established soil background levels as shown on Table 10. The exception is cadmium concentration, that was detected in FPS-1 and FPS-2. There is no apparent trend in the metals concentrations within the flood plan sediments. Potential metals contamination within floodplain sediments resulting from past activities at the site including fill placement is not apparent.

4.50 SURFACE WATER

Surface water samples were collected from eight locations in 1990 during the Phase II (Reference 3). These included SW-1, SW-2 and SW-9 from the South Branch of Smokes Creek and SW-4, SW-5, SW-6, SW-7 and SW-8 from the on-site tributary. Location SW-3 could not be samples since standing water was not present at the time of collection. Of these, location SW-1, SW-4 and SW-5 are considered to be upstream locations, and therefore not impacted by former site activities. These same locations were sampled again in 1993 during the RI (Note: Locations SW-1 and SW-4 were moved to further upstream locations during the RI at the request of NYSDEC) (See Figure 4). In addition, during the RI, samples were collected from location SW-10 and SW-11, located on the on-site tributary and the South Branch of Smokes Creek, respectively. A sample was also collected from a groundwater seep along the western slope, west of 4800 Lake Avenue at location SW-12 (see Figure 4). Analytical test results are included in Table 12 and discussed below. Data qualifier definitions are included in Appendix G. Since samples were collected from the same location during both Phase II and RI, where appropriate temporal trends are noted.

4.51 Semi-VOCs

Semi-VOCs were detected at least once at 7 of the 11 surface water sample locations. Semi-VOC concentrations at downstream locations were typically at or below upstream concentrations. Most notable was bis(2-ethylhexyl)phthalate which

ranged between 43 μg/l (SW-7, 1990) and 0.5 μg/l (SW-7, 1993) in the on-site tributary. This compound was reported at upgradient location SW-1 at 27 μg/l during the Phase II. No apparent spatial distribution trend was identified associated of semi-VOCs in surface water samples. Semi-VOC concentrations were typically lower during the 1993 than during the 1990 Phase II.

4.52 Pesticides

Two pesticides were detected in the surface water sample collected from the site during the RI. Beta-BHC concentrations ranged between 0l.014 μg/l (SW-6, 1993) and 0.01 μg/l (SW-10, 1993). Alpha-BHC was detected once at 0.006 μg/l (SW-6, 1993). Pesticide compounds were not detected in samples collected during Phase II. No apparent spatial or temporal trends were noted for pesticides in surface water samples.

4.53 Metals

Surface waters naturally contain some concentrations of metals and the underlying sediments may tend to increase the metals concentrations. Upstream samples from both the South Branch of Smokes Creek and the on-site tributary were collected in order, to distinguish between naturally occurring metals concentrations and concentrations which may be considered elevated due to past site activities. Samples SW-1, SW-4 and SW-5 are considered upgradient sampling locations.

In general, samples collected either at or downstream of the former active area were similar to or below the upstream results. However, in the on-site tributary, during Phase II, calcium was detected in samples SW-6 (127,000 μg/l), SW-7 (113,000 μg/l) and SW-8 (129,000 μg/l) at concentrations above upstream concentrations in samples SW-4 (72,300 μg/l) and SW-5 (52,500 μg/l). Calcium in the tributary during the RI was detected above upstream concentrations only at SW-6 (68,200 μg/l).

Examination of temporal variation in the metals results indicates that metals concentrations were typically higher and more metals were detected in surface water samples collected during the Phase II than in samples collected during the RI.

Metals detected in sample SW-12, the seep west of 4800 Lake Avenue, were generally present at higher concentrations than in other surface water samples at the site. Metals detected in this sample include barium (494 μg/l), iron (34,300 μg/l), lead (94.4 μg/l), manganese (3,850 μg/l) and zinc (384 μg/l). These levels are generally an order of magnitude greater than the levels detected in other surface water samples.

4.54 Other Inorganics

Other inorganic compounds detected within surface water samples include chloride and sulfate. These compounds were detected in each sample and the levels typically ranged between about 100 mg/l and 200 mg/l.

4.60 SURFACE WATER SEDIMENTS

Nine surface water sediment samples were collected during Phase II and 12 samples were collected during the RI. The sediment samples were collected from the same locations as surface water samples (see Figure 4). An additional sediment sample, SWS-3, was collected adjacent to the railroad tracks east of the site during both the Phase II and RI. Similar to surface water sampling locations, sample locations SWS-1, SWS-3, SWS-4 and SWS-5 are considered to be upgradient or upstream of the site and representative of background conditions. [Note: Locations SWS-1 and SW-4 were moved further upstream during the RI]. The results of the testing are presented in Table 13.

4.61 VOCs

VOCs were detected at least once within surface water sediments at 10 of 12 locations at the site. These included halogenated aliphatic hydrocarbons (methylene chloride and 1,1-dichloroethane), ketones (acetone and 2-butanone) and aromatics (toluene). VOC concentrations at downstream locations were typically at about or below upstream locations. A notable exception to this was acetone. Within the on-site tributary, acetone was detected between 530 Bμg/kg (SWS-8, 1993) and 11 JB μg/kg (SWS-10, 1993) at downstream locations. At upstream locations within the on-site tributary, this compound was detected at concentrations ranging between 50 μg/lg (SWS-3, 1990) and 11 Jμg/kg (SWS-4, 1990). Within the South Branch of Smokes Creek, acetone was detected at downstream locations, concentrations ranged between 32 μg/kg (SWS-9, 1990) and 94 BJ μg/kg (SWS-9, 1993). At upstream location SWS-1 acetone was detected once at 8 J μg/kg (collected in 1990).

VOC compounds tended to be more prevalent in samples collected during the Phase II than the RI. Increases with time were observed for acetone at location SWS-8 and SWS-9. However, acetone data was often qualified with a "B" indicating this compound was also found in an associated blank sample.

4.62 Semi-VOCs

4.62.1 PAHs

PAH compounds were detected in each of the surface water sediment samples collected. Concentrations of these compounds were typically

less than 1,000 μg/kg. Concentrations at downstream location were typically lower than at upstream locations in both the on-site tributary and the South Branch of Smokes Creek. For example, in the on-site tributary, pyrene concentrations ranged between 2200 μg/kg (SWS-5, 1993) and 74 J μg/kg (SWS-4, 1993) at upstream locations and between 2000 μg/kg (SWS-8, 1993) and 100 J μg/kg (SWS-7, 1990) at downstream locations. In the South Branch of Smokes Creek, pyrene was detected between 3500 D μg/kg (SWS-1, 1993) and 2600 μg/kg (SWS-1, 1990) at upstream locations and between 1600 μg/kg (SWS-9, 1993) and 40 J μg/kg (SWS-2, 1993) at downstream locations.

Test results from samples from the same location were generally similar during the Phase II and the RI, indicating little change in sediment conditions between sampling events. Slight increases are noted overtime at upstream locations SWS-1 and SWS-5 and downstream locations SWS-8 and SWS-9.

PAH concentrations at SWS-12 (the groundwater seep location) were typically lower than other samples tested.

4.62.2 Other Semi-VOCs

Other semi-VOCs detected in surface water sediment samples collected from the site primarily include phthalates, although some phenols, halogenated aromatic hydrocarbons and others were also detected. Concentrations of the compounds at downstream locations were typically low or below upstream locations. Comparison of test results from samples collected from the same location during Phase II and the RI does not indicate any temporal trends.

4.63 Pesticides

Pesticides were detected at least once in samples collected from each of the surface water sediment sample locations. Downstream concentrations of pesticides were typically low, less than 10 μg/kg, or less than upstream locations. Except the NYSDEC split samples collected from locations SWS-8 and SWS-10 collected during the RI. In these samples, endrin was detected in SWS-8 and SWS-10 at 78 μg/kg and 38 μg/kg, respectively. The validated test results of GZA split samples from these locations did not indicate the presence of endrin.

Other pesticides of note include alpha-BHC and 4,4'-DDT, which were detected at 27 μg/kg and 30 μg/kg, respectively at a upstream location SWS-1 in the South Branch of Smokes Creek during Phase II. At downstream locations in the South

Branch of Smokes Creek, these pesticides were reported at one location only, SWS-9 at 31 μg/kg and 27 μg/kg respectively.

Comparison of test results from 1990 and 1993 indicates that while detected pesticides were more numerous during the 1993 sample round, the reported concentrations were typically higher during the 1990 sample round.

4.64 PCBs

PCBs were detected at least once in 5 of the 12 surface water sediment sample locations tested. Total PCBs ranged between 2,800 μg/kg (SWS-6, 1993) and 254 μg/kg (SWS-3, 1993). PCBs were not detected in the South Branch of Smokes Creek. Within the on-site tributary, total PCB concentrations at downstream locations SWS-6 and SWS-8 exceeded that of the upstream location SWS-3 during the RI. No apparent temporal trend in the PCB data can be identified, however PCBs tended to be more prevalent in the RI data during both Phase II and the RI.

4.65 Metals

Metals are naturally occurring within surface water sediments. As such, metals were detected in each of the samples tested. Downstream metals test results were at about or below upstream results in both the on-site tributary and the South Branch of Smokes Creek. One notable exception to this was calcium. Along the South Branch of Smokes Creek, calcium was detected at a upgradient location at 59,000 mg/kg (SWS-1, 1990). At a downgradient location, calcium was detected at 150,000 mg/kg. Calcium was not detected at either location during the 1993 sample round. No temporal trends were noted between the Phase II and RI data.

4.70 OVERBURDEN GROUNDWATER

The locations of overburden monitoring wells are shown on Figure 3. The extent of overburden groundwater contamination related to past activities at the site was assessed by comparing groundwater conditions in the upgradient versus the downgradient monitoring wells. Monitoring well MW-7S in the southeast portion of the site is in a upgradient well location based on interpretation of the water level dates. Monitoring wells MW-1S and MW-12S are side-gradient from the former active area. Monitoring wells MW-5S, MW-6S, MW-8S, MW-9S, MW-10S are located at downgradient locations. Several of the overburden monitoring wells were sampled more than once between 1990 and 1994. Where appropriate temporal trends are noted.

4.71 VOCs

4.71.1 Halogenated Aliphatic Hydrocarbons

Halogenated aliphatic hydrocarbons were detected at least once in 7 of 8 side or downgradient overburden monitoring wells. Some of the more notable compounds include TCE, chloroform and chloroethane. Concentrations of TCE ranged between 970 μg/kg (MW-3S, 1990) and 2 Jμg/kg (MW-1S, 1994) chloroform ranged between 260 Jμg/l (MW-3S, 1993) and 2 Jμg/kg (MW-5S, 1990). Concentrations of chloroethane ranged between 200 μg/l (MW-9S, 1993) and 22 μg/l (MW-12S, 1994).

Examination of the spatial distribution of these compounds within the overburden groundwater indicates these compounds are found primarily in monitoring wells MW-3S and MW-9S. Detectable concentrations of halogenated aliphatic hydrocarbon compounds were also reported in samples from MW-1S and MW-12S, the eastern and southern most overburden monitoring wells, respectively. However, the noted concentrations were low when compared to other observed groundwater conditions at the site.

The extent of these compounds appears relatively well defined within the overburden groundwater at the site. This is due primarily to the physical boundaries at the hydraulically downgradient locations including the unnamed tributary to the north and the South Branch of Smokes Creek to the west.
Examination of temporal variations in concentration data in samples from the same well do not indicate significant changes in overburden groundwater conditions except for MW-6S. Four halogenated aliphatic hydrocarbons were detected in MW-6S during the 1993 sample round, while VOCs were not detected in samples collected from this well in 1990. It should be noted that the data available to make this comparison is limited to wells installed during Phase II and thus does not include monitoring wells MW-9S and MW-12S.

4.71.2 Aromatics

Aromatic compounds, were detected at least once in 4 of 8 down or side-gradient overburden monitoring wells. A most prevalent aromatic compound was toluene and observed concentrations ranged between 240 μg/l (MW-3S, 1990) and 1 Jμg/l (MW-9S, 1993). Aromatic compounds were not detected in upgradient well MW-7S.

MW-3S is the only location where aromatic compounds were detected above trace levels. As such their extent is believed to be generally limited to the former active area of the site. Sufficient data is not available to assess temporal variations of these compounds in the overburden groundwater.

4.71.3 Ketones

Ketones, primarily acetone, were reported at least once in samples collected from 6 of 8 down or side-gradient overburden wells at the site. Concentrations of acetone ranged between 93 μg/l (MW-12S, 1994) and 7 Jμg/l (MW-1S, 1990). Spatial trends were not apparent in the ketone data. However, sampling data the south of MW-12S is not available. Since this is believed to be a side-gradient location, and since other site related VOCs are at relatively low levels in MW-12S, it is not believed that the ketone compounds extend further to the south than MW-12S.

Trends in temporal variations of the ketone data were not apparent.

4.71.4 Halogenated Aromatics

Halogenated aromatic VOCs, primarily chlorotoluene were detected in 2 of 8 down or side-gradient overburden monitoring wells. This compound was reported as a TIC during the 1990 sample round. Testing was conducted for three separate isomers of this compound (o,m and p) during the 1994 sample round. Therefore, total chlorotoluene concentrations were used for comparative purposes.

Concentrations of chlorotoluene ranged between 130,000 Jμg/l (MW-3S, 1993) and 58 Jμg/l (MW-1S, 1994). Significant concentrations of halogenated aromatic VOCs were detected primarily in MW-3S. As such, the extent of these compounds within the overburden groundwater appears to be limited to the vicinity of MW-3S.

Examination of the temporal variations of these compounds within MW-3S indicates a significant increase in concentrations between the 1990 (5,100 Jμg/l -28,000 JBμg/l) and 1993 (130,000 Jμg/l) test results.

4.72 Semi-VOCs

Semi-VOCs, including PAHs, phthalates, phenols and/or others were detected at least once in 7 of 8 side or downgradient overburden monitoring wells. Notable concentrations of 4-chloro-3-methelphenol were detected in samples collected from MW-3S, ranging between 60 μg/l and 310 μg/l during the 1990 sample round.

Significant concentrations of semi-VOCs within the overburden groundwater appear to be limited to the vicinity of MW-3S.

Semi-volatile data is not sufficient to evaluate temporal variations in overburden groundwater conditions.

4.73 Pesticides

Two pesticides, heptachlor and endosulfan sulfate, were detected in one sample obtained from upgradient monitoring well MW-7S at concentrations of 0.013 JP μg/l and 0.016 JP μg/l, respectively.

4.74 Metals

Since metals are naturally occurring in sediments, they are also naturally occurring in groundwater. To identify elevated metals concentrations, the metals concentration data for the on-site wells were compared with the upgradient well (MW-7S) data.

This comparison revealed that at many locations, test results from downgradient wells consistently exceeded background results. Most notable were concentrations calcium, iron, magnesium, and manganese. These metals were detected at upgradient well MW-7S at 88,400 N*Jμg/l, 1,070 N*J μg/l, 15,700 NJμg/l and 199 NJ μg/l, respectively. At downgradient locations, concentrations of calcium ranged between 713,000 N* μg/l (MW-6S, 1993) and 14,700 BN*J μg/l (MW-9S, 1993). Iron concentrations ranged between 16,300 N*J μg/l (MW-10S, 1993) and 1,380 μg/l (MW-3S, 1990). Magnesium concentrations ranged between 69,900 μg/l (MW-5S, 1990) and 21,900 NJ μg/l (MW-9S, 1990). Manganese concentrations ranged between 2190 NJ μg/l (MW-6S, 1990) and 104 NJ μg/l (MW-5S, 1993).

No spatial or temporal trends were apparent in metals data.

4.80 BEDROCK GROUNDWATER

The locations of bedrock monitoring wells are shown on Figure 3. Similar to the discussion of overburden groundwater conditions, the effect of past site activities on the bedrock groundwater was evaluated by comparing upgradient and downgradient monitoring well sample test results. Based on interpretation of water level data, monitoring well MW-7R is located in an upgradient location within the weathered bedrock. Monitoring well MW-11R located north of the formerly active portion of the site and north of the on-site tributary, is also in an upgradient location.

Monitoring well MW-1R and MW-12 R are side gradient from the formerly active portion of the site. Monitoring wells MW-4R, MW-6R, MW-8R, MW-9R, MW-10R,

MW-13R and MW-14R are located downgradient from suspected source areas within the weathered shale. Monitoring well MW-9RD is located at a greater depth than the other monitoring wells and was installed in order to sample groundwater from the deep bedrock conditions within the competent shale. The results of testing samples from the rock wells are summarized on Table 9 and discussed below.

4.81 VOCs

4.81.1 Halogenated Aliphatic Hydrocarbons

Halogenated aliphatic hydrocarbons were detected at least once in 8 of 9 side or downgradient weathered shale groundwater monitoring wells. These compounds were also not detected in samples collected from competent shale well MW-9RD.

Some of the notable halogenated aliphatic compounds include 1,1,1-trichloroethane (1,1,1-TCA), TCE and 1,1-dichloroethane (1,1-DCA). Concentrations of 1,1,1-TCA ranged between 2,800 Dμg/l (MW-9R, 1994) and 1 Jμg/l (MW-10R, 1993). Concentrations of TCE ranged between 1,500 μg/l (MW-1R, 1994) and 1 Jμg/l (MW-10R, 1993). Concentrations of 1,1-DCA ranged between 1,000 Dμg/l (MW-9R, 1993) and 2 Jμg/l (MW-4R, 1993 and MW-10R, 1993).

Examination of the spatial distribution of these compounds in the weathered shale indicates they are generally encountered in areas west of the former active area. The extent of these compounds appears reasonably defined to the north and south. However, the presence of these compounds in bedrock wells MW-1R and MW-13R indicates that these compounds may exist further to the east and west of the site.

Examination of temporal variations of concentration data indicates an increasing trend of TCE concentrations in samples from collected upgradient well MW-1R. This compound was not detected in a sample from MW-1R collected during 1990 and the concentration increased from 540 μg/l during 1993 to 1,500 μg/l during 1994. The cause of the increased concentrations observed in MW-1R is unknown.

4.81.2 Aromatics

Aromatic compounds were detected at least once at 6 of 9 down or side gradient, weathered shale monitoring well. These compounds were not detected at upgradient locations. Aromatic compounds, notably total xylene, were typically at low concentrations, less than 10 μg/l. Total

xylenes were detected at concentrations ranging between 19 μg/l (MW-4R, 1990) and 0.6 Jμg/l (MW-8R, 1993).

Aromatic compounds were also detected at low concentrations in a sample from the competent shale well MW-9RD.

No spatial or temporal trends were identified for the aromatic data. Since only trace levels of aromatic compounds were detected downgradient of the former active area, the lateral extent of these compounds appears limited to the site.

4.81.3 Ketones

Ketones, notably acetone, were detected at least once at 3 of 9 down or side gradient monitoring wells within the weathered shale. These compounds were not detected at upgradient locations. Concentrations of acetone ranged between 120 μg/l (MW-4R, 1990) and 6 Jμg/l (MW-9R, 1993).

Acetone was also detected within the competent shale monitoring well (MW-9RD) at a concentration of 81 μg/l. No temporal trends were identified for ketones within the bedrock groundwater. The lateral extent of these compounds appears limited to the site.

4.81.4 Halogenated Aromatics

One halogenated aromatic compound, chlorotoluene, was detected at least once in 4 of 9 down or side gradient monitoring wells within the weathered shale. Concentrations of this compound range between 4,200 Dμg/l (MW-8R, 1994) and 58 JB μg/l (MW-6R, 1990). This compound within the weathered shale groundwater was generally encountered at locations west of the former active area. The presence of these compounds at the noted concentrations in MW-13R indicates that they may exist further westward. This compound was not detected in the competent shale monitoring well MW-9RD. No temporal trends were identified for chlorotoluene.

4.82 Semi-VOCs

Relatively low levels of semi-VOCs were detected at least once at 6 of 9 weathered shale groundwater sample locations. Concentrations of these substances including phthalates and phenols and PAH's were relatively low, below 10 μg/l. Of note, 4-chloro-3-methylphenol was detected at concentrations ranging between 14 μg/l

(MW-8R, 1994) and 3 Jμg/l (MW-4R, 1993 and MW-10R, 1993). No spatial or temporal trends were identified for semi-VOCs in the weathered shale groundwater.

4.83 Metals

Metals test results from bedrock groundwater samples were compared with samples obtained from upgradient well MW-7R and with each other. Although some metal concentrations exceeded the background concentration, the reported levels for the on-site wells are generally consistent. Metals concentrations in the groundwater samples that were noticeably impacted by organic compounds as described above were not significantly different from than the levels of the unimpacted samples.

Metal concentrations worthy of note include barium and iron. Concentrations of these compounds in a sample from upgradient MW-7R were 54.8 Bμg/l and 7,180 N*J μg/l, respectively. At down and sidegradient locations, concentrations of barium ranged between 652 μg/l (MW-1R, 1993) and 37.3 B μg/l (MW-1R, 1990). Concentrations of iron ranged between 11,700 N*Jμg/l (MW-6R, 1993) and 1,250 *J μg/l (MW-8R, 1993). It should be noted that metals testing was not completed as part of the 1994 sample round. As such, metals concentration data are not available for MW-12R, MW-13R, MW-14R and MW-9RD.

No temporal or spatial trends were identified for metals within the weathered shale.

5.00 CONTAMINANT FATE AND TRANSPORT

This section discusses the natural mechanisms which may result in migration of chemicals at the Chem-Trol site and the persistence and behavioral characteristics of those chemical substances. This information is then combined with site observations to determine if migration of substances is actually occurring. The following discussion is based on the understanding that the current site conditions are related to the identified source areas and chemical compounds at the site.

Source areas may be characterized as site features such as the former surface impoundments and the drum storage area and residuals from those past site activities. These residuals may include affected soil and groundwater. The Chem-Trol site history (see Section 1.11) indicates that the former surface impoundments and drums were removed from the site, as part of previous remedial activities. Therefore, the materials that may be left at the site are residuals of former site activities.

Additionally, it is reported that earthwork occurred at the site during the previous remedial work that may have moved affected soils from their original location. As such, the former surface impoundments and drum storage areas may not be on-going sources at the site. Rather, it is believed that the residuals remaining at the site may act as a source.

5.10 POTENTIAL ROUTES OF MIGRATION

Natural mechanisms that can result in the migration of chemicals from their source areas on the site include: volatilization; infiltration of rain water; groundwater flow; surface water flow and erosion. Other migration mechanisms at the Chem-Trol site may be from the physical movement of soils and associated chemicals during the facility closure and in addition, site observations and test results indicate a DNAPL may be present at the site. DNAPL flow is considered as a potential route of migration. The impact of any of these mechanisms will vary by source area, and the specific site conditions.

Volatilization is not currently a significant transport mechanism within the former active area based on an ambient air survey completed as part of Phase II. However, air monitoring has not been performed within 4800 Lake Avenue or its basement. Therefore, it is not known if volatilization is occurring this area.

Infiltration of rain water would be expected in areas not covered by a relatively impermeable barrier, such as paved parking lot at 4800 Lake Avenue. However, based on the site history and work completed at the site, a soil cap was placed over the formerly active areas of the site. This may limit infiltration in this area. It would be expected that infiltration would act to cause water soluble compounds present in the unsaturated zone to migrate vertically downward to the water table. In addition, infiltration recharges the groundwater, which may increase groundwater gradients, potentially enhancing migration via groundwater flow.

Groundwater flow would be expected to allow both vertical and lateral migration of chemicals located within the saturated zone as well as chemicals that migrate into the saturated zone from the overlying unsaturated zone due to infiltration. Groundwater flow would be considered a significant transport mechanism for chemicals that are water soluble and that have lesser sorbing characteristics. Migration via groundwater flow can allow chemicals to travel significant distances from their source area.

At this site, the downward gradient in groundwater from the lower glacial till to the weathered shale, groundwater, may allow chemicals to migrate from the overburden into the bedrock. Observed gradients within the weathered shale indicate flow is primarily toward the South Branch of Smokes Creek. Data suggests that the creek may not act as a barrier for the weathered shale groundwater under certain conditions. Thus, migration beneath the creek may be possible. Migration to the deeper

competent shale is not expected due to the upward gradient from the competent shale aquifer.

Surface water flow may be a site mechanism that allows lateral migration of chemicals. Surface water flow at the site occurs primarily during precipitations events as both sheet flow over the ground surface and channelized flow within drainage swales. The surface water flow may also be impacted by flow from groundwater seeps. Chemicals may be introduced and carried with surface water flow via the groundwater seeps and erosion. Other mechanisms, including volatilization, precipitation and biodegradation will also act to reduce the chemical loading within the surface water.

Erosion results in the entrainment of soil particles within the surface water flow. These particles remain suspended in turbulent flows and subsequently settle in more quiescent waters. Thus, erosion via surface water flow is expected to be significant only during and immediately after precipitation events. Conversely, chemicals introduced to surface water via groundwater seeps are typically in a dissolved form, and not significantly impacted by the rainfall intensity and surface water velocities. These are discussed for the various chemical classes in Section 5.20 below.

It is believed that erosion may have been a significant migration pathway prior to placement of the soil cap over the site. The available information indicates that the physical movement of soil occurred during the site closure. It is understood that the lagoons were to be empty prior to any earthwork closure activities. However, there is little written documentation to confirm that this occurred. Thus, it is possible that the distribution of chemicals noted in non-source areas may be related to the closure activities.

A substance resembling DNAPL was reported in monitoring well, MW-3S during the 1993 sampling. There is currently no additional information to confirm the presence of, or to suggest significant migration. However, migration of DNAPL through overburden soils is dependent on several factors, primarily including the surface tension of the DNAPL (resulting in capillary forces retarding its migration) the relative density of the DNAPL and the soil porosity. Generally, DNAPL will migrate downward, provided a sufficient weight of DNAPL is available to overcome capillary forces. If the DNAPL encounters a soil with lower porosity which it cannot penetrate, it will tend to pool, then flow with the slope of the top of the finer soils. If sufficient weight of DNAPL is not available to continue migration, the DNAPL becomes trapped in the soil matrix where it slowly dissolves in groundwater. Due to the nature of DNAPL, it is often difficult to locate.

DNAPL transport in fractured media is complicated, although the same principles apply. DNAPL will enter a fracture if gravitational forces exceed capillary forces. Since the continuity of rock fractures is often difficult to assess, so is the migration of DNAPL.

5.20 CONTAMINANT PERSISTENCE AND BEHAVIORAL CHARACTERISTICS

Numerous classes of chemicals were detected in the various environmental media at the site. In general, chemicals within a given chemical class will behave similarly in the environment. However, significant differences in behavior of chemicals may be observed within a chemical class. Their behavior is dependent on their physical and chemical properties and as well as environmental conditions, such as the presence of bacteria and pH and Eh conditions. This study did not include a detailed investigation on the persistence of chemicals at the site. The following discussion is based on published information on the chemical classes and specific chemicals present at the site and is summarized in Table 15.

5.21 VOCs

5.21.1 Aromatics

Aromatic hydrocarbons (e.g. toluene and xylenes) do not typically degrade into other compounds nor are they especially persistent in the environment. Volatilization is a significant transport mechanism in media exposed to the atmosphere, especially for the unsubstituted benzene ring. These chemicals have moderate sorption tendencies. Biodegradation is currently considered a significant mechanism in the removal of these compounds from the environment. While this class of compounds is not wide-spread at the site, where detected, they appear to be evenly distributed between groundwater, soil and surface water sediments. No such compounds were detected in the surface water, as they would likely be quickly volatilized.

5.21.2 Halogenated Aliphatic Hydrocarbons

Halogenated aliphatic hydrocarbons (e.g., TCE, 1,1-DCA, TCA) are a major class of chemicals present at the site. Due to their moderate water solubility and moderate sorption characteristics, these compounds may leach from soils to enter the groundwater. However, volatilization, which is a transport mechanism in media exposed to air, suggests such compounds would not be stable in the soil's unsaturated zone or in surface waters. Degradation of several compounds results in numerous by-products which may not have been originally placed in the environment (e.g., tetrachloroethane degrades to tri- and di-chloroethanes and eventually to vinyl chloride). On the site, halogenated aliphatic compounds are generally limited to the groundwater and soils.

5.21.3 Ketones

Ketones are solvents that are widely used in industry and environmental laboratories. Due to a high vapor pressure, these compounds volatilize quickly and thus, are not anticipated in the surface water and unsaturated soil zone environments. Many of these compounds are very soluble in water and have a relative low tendency to sorb to soils. This suggests that some ketones may move quickly through the environment through groundwater flow. These chemicals, where detected on site, were noted about evenly distributed between the groundwater, soil and surface water sediments.

5.21.4 Halogenated Aromatic Hydrocarbons

These compounds, which include chloromethylbenzene and hexachlorobenzene, volatilize readily in oxygenated environments and have a strong tendency to sorb onto soil particles. They are very insoluble in water and likely undergo very limited biodegradation. They may also bioaccumulate in the environment. These compounds were detected only in a limited area in the groundwater and soils at the site.

5.22 Semi-VOCs

5.22.1 PAHs

PAHs are found naturally in coal and other carbon compounds and in the environment, are often a by-product of incomplete combustion processes. As such, they are found in many areas. PAHs have low water solubilities, low volatilization rates and strong tendency to sorb to soil. This results in little movement in water media. Due to their size, they are not easily degraded or biodegraded. At the site, they were present in nearly all surface water soil samples. They are generally absent from the groundwater and surface water samples.

5.22.2 Phthalates

Phthalates are used in the manufacture of plastics. They are not typically volatile and only moderately soluble in water. Based on their sorption tendencies it is expected they would be found predominantly in soils and that groundwater would not be a significant transport mechanism. At the site, most of the surface water sediments and soils contained phthalates. However, they were also detected at many locations in the groundwater and surface water samples. It should also be noted that since phthalates are used in plastics they may have been

introduced to collected samples from the sampling and testing equipment (i.e., gloves, containers, etc.).

5.22.3 Phenols

This class of compounds do not readily volatilize and are not significantly sorbed onto soil particles. Therefore, these compounds would be expected to move readily in the environment via groundwater flow. Phenols were found in all media sampled at the site except the flood plain sediments.

5.23 PCBs

PCBs were used as heat resistance additives to oil. Based on their very low water solubilities and high partition coefficients, PCBs have a high tendency to sorb onto soil. Therefore, these compounds would be expected primarily in the soil and groundwater would not be considered a significant transport mechanism for PCBs. PCBs were detected in soil, surface water sediments and flood plain sediment samples only.

5.24 Pesticides

Pesticides behave in the environment similarly to PCBs. However, they are slightly more soluble and may be found more commonly in groundwater media. This is generally confirmed by the distribution of these compounds on the site, as the pesticides were detected primarily in soil, surface water sediments, flood plain sediments and in a few groundwater and surface water samples as well.

5.25 Metals

Metals as a class are highly variable in their general properties and their behavior in the environment. The migration of metals is dependent on the metal's valence, the environment's pH and Eh, the presence of potential anions (such as sulfate, chloride and others), and many other factors. Thus, metals can range from highly immobile to very soluble. As metals are naturally occurring in the various environmental media this study did not include identification of processes that effect transport of individual metals.

5.30 OBSERVED MIGRATION

Potential chemical transport mechanisms, which may be occurring at the Chem-Trol site were, discussed in Section 5.10. Persistence and behavioral characteristics of chemicals at the Chem-Trol site were discussed in Section 5.20. This section combines

this information and the analytical test results to determine if migration of substances is actually occurring at the site.

5.31 Potential Migration Pathways

Based on the conceptual physical and hydrogeological models developed for the site, four principal migration pathways have been identified which may allow chemical substances to migrate from the source areas either off-site or to a point where human exposure is possible. These pathways are identified below, followed by a discussion of the test results, which provide evidence of whether migration is occurring via that pathway. This discussion is not intended to address all potential means of chemical migration of a substance, but rather to identify suspected migration paths that appear to be significant for this site.

- Leaching and Overburden Groundwater Transport
  Substances within soils at the site are leached to the overburden groundwater. The chemicals then migrate with the groundwater via advection to a point of discharge. It is believed that the majority of overburden groundwater discharges to the bedrock, however, a seep has been noted at the site.

- Leaching and Bedrock Groundwater Transport
  Substances within soils at the site are leached to the overburden groundwater. Advection and dispersion processes then cause the substances to continue a downward migration into the bedrock groundwater. The substances then migrate laterally within the bedrock groundwater and either discharge into the on-site tributary or the South Branch of Smokes Creek, or, remain in the bedrock groundwater and continue to flow beneath the creek.

- Erosion and Sediment Transport
  Surficial soils containing chemical substances are entrained within the surface water runoff and transported from the formerly active portion of the site. Soils may then settle out within areas of quiescent water such as the Smokes Creek flood plain or discharge into the on-site tributary or the South Branch of Smokes Creek where, depending on flow conditions, they may be transported off-site or settle out into the stream bottom sediments. The site is currently covered with a soil cover, and the potential for significant migration via erosion is limited drainage swales. Prior to placement of the soil cover, this pathway is believed to have been significant.

- Volatilization and Soil Gas Migration

  VOCs present within the site soil volatilize into the soil gas in the unsaturated zone above the overburden groundwater. Migration of the soil gas occurs through the voids in the overburden, eventually discharging the VOCs into the atmosphere.

5.32 Observed Migration Pathways

The sections below discuss physical and analytical evidence which either supports or refutes the potential constituent migration by the pathway identified above.

5.32.1 Leaching and Overburden Groundwater Transport

The site was reportedly covered with 2 feet of soil during closure. However, the consistency of the surficial soils at the site are variable and it is not known if the soil was placed in a controlled manner (i.e., placed in lifts and compacted) to provide a relatively impermeable barrier. As such, it is anticipated that infiltration is occurring through the soil cover, and that contaminants may be leaching from the on-site soils.

Analytical test results from overburden monitoring wells indicate the presence of several VOCs, including primarily halogenated aliphatic hydrocarbons and aromatic hydrocarbons as well as semi-VOCs. This would indicate that leaching of these compounds from soils at the site is occurring. Halogenated aliphatic compounds were detected in a greater number of overburden groundwater samples at different site locations than were the aromatic and semi-VOCs. This is consistent with the anticipated behavior as the halogenated aliphatic compounds typically have lower partitioning coefficients and thus, are less likely to sorb onto the soils and instead, are likely to leach into the groundwater. The presence of semi-VOCs in the groundwater, in particular PAHs in samples from MW-3S, would indicate that semi-VOCs may be mobile in the area of MW-3S.

As discussed in Section 3.62, groundwater flow velocities within the overburden were estimated at about 18 feet per year. Using a migration period of approximately 20 years, that corresponds to the time since the site was active and disregarding retardation of contaminants due to partitioning, it would be anticipated that substances from suspected on-site source areas may have reached the on-site tributary and the South Branch of Smokes Creek. However, analytical test results from the surface water and surface water sediment samples, including that from

a groundwater seep, do not include the same chemicals as those detected in the overburden groundwater. Therefore, while lateral migration within the overburden groundwater may be possible, the impact on surface water and surface water sediment does not appear to be significant. The majority of overburden groundwater is believed to discharge to the bedrock.

5.32.2 Leaching and Bedrock Groundwater Transport

As discussed above, it appears that chemical substances within the on-site soils in suspected source areas are leaching into the overburden groundwater. Some of the same VOC substances were also detected within bedrock groundwater samples, typically at higher concentrations than in the overburden. This would indicate a hydraulic connection between the overburden and bedrock water bearing zones and the discharge of overburden groundwater into the bedrock groundwater. This is consistent with a downward hydraulic gradient measured at most areas of the site. The presence of VOCs within bedrock monitoring well water samples west of the South Branch of Smokes Creek indicates these compounds are not completely discharged into the surface water at the creek, and that these compounds may be migrating beneath it in the bedrock groundwater.

Bedrock groundwater flow velocities have been estimated at approximately 4000 ft/year. As such, in the approximately 20 years since closure of the site, sufficient time has elapsed for chemical substances in this media to migrate beyond monitoring wells installed as part of this study. This is consistent with the detection of chemicals in water collected from bedrock groundwater wells west of the South Branch of Smokes Creek. Due to the time elapsed since closure, the apparent increase in VOC concentrations observed in MW-1R and MW-8R is not believed to be a result of chemical migration to these areas. It is suspected that the increase may be the result of disturbing the subsurface during well installation.

5.32.3 Erosion and Sediment Transport

The site history indicates that the majority of the site has reportedly been covered with 2 feet of soil. Therefore, erosion is not anticipated to be a significant, active migration pathway. Prior to placement of the soil cover, erosion may have been a significant pathway.

During the RI, erosion has been noted within two swales which drain the former active area of the site (see Figure 2). One swale receives

runoff water from the eastern portion of the former active area and discharges to the north into the on-site tributary. Another exists in the western portion of the former active area, discharging to the low lying floodplain. The erosion noted at these locations is not believed to be deep enough to encounter soils located beneath the 2 foot soil cap, although, the actual depth of the cap is not known. Sediment samples were not collected from the drainage swales as part of these studies. However, eroded materials, once mobilized, may enter the on-site surface water bodies. Erosion of soil from the banks of on-site surface water bodies and within the floodplain may also occur.

Analytical test results for sediment sample SWS-9 collected downstream of the site indicate the presence of primarily PAHs, as well as limited phthalates and pesticides. However, these compounds were detected in several other sediment samples, including upstream sample SWS-1. Therefore, the data does not suggest that off-site contaminant migration via erosion is occurring.

5.32.5 Volatilization and Soil Gas Migration

A PID survey was performed in open areas of the site. VOCs were not detected during this survey. Therefore, volatilization of chemical substances within the unsaturated overburden, with subsequent atmospheric discharge, is not believed to be occurring at a significant rate.

No PID survey was completed within 4800 Lake Avenue or its basement. Since volatile compounds have been detected in the fill material surrounding 4800 Lake Avenue, transport of VOCs via volatilization and soil gas migration to 4800 Lake Avenue basement may potentially occur. However, most of the fill material encountered at the site was relatively fine grained (i.e., silts and clays) and typically, soil gas migration in these soils is considered insignificant.

6.00 QUALITATIVE RISK ASSESSMENT

Based on the information presented in Sections 1.00 through 5.00, a qualitative baseline risk assessment was completed. A human health and environmental assessment were completed. Generally, the human health evaluation involved an exposure assessment, estimation of exposure point concentrations, hazard identification and comparison to Federal Applicable, Relevant and Appropriate Requirements (ARARs) and New York Standards, Criteria and Guidelines (SCGs). The environ-

mental evaluation was completed in a manner similar to the human health assessment with the concentrations compared to SCGs derived for protection of wildlife.

6.10 CHEMICAL SPECIFIC INFORMATION

For informational purposes, toxicological profiles for the majority of compounds found on the site are included in Appendix H. These profiles were compiled from "Chemical, Physical and Biological Properties of Compounds Present at Hazardous Waste Sites, Final Report" prepared by Clement Associates, Inc. for the USEPA. These profiles were not prepared specifically for this report and not all site chemicals were available.

6.20 HUMAN HEALTH EVALUATION

This section discusses the exposure assessment, identification of exposure pathways and an estimation of exposure point concentrations related to potential impacts to human health.

6.21 Exposure Assessment

This exposure assessment discusses potential routes by which chemicals in the environment may be able to reach human receptors. This discussion is based on current site conditions. Alternative future scenarios were not considered because the area around the site is already developed, and the site is owned and operated by SCA. Therefore, it is expected that site usage will remain unchanged prior to the remediation.

A complete exposure pathway must exist for a population to be impacted by the chemicals at the site. A complete exposure pathway consists of four components:

1) a source and mechanism of chemical release;
2) a transport medium;
3) a point of potential human contact with the contaminated medium; and,
4) an exposure route at the contact point.

Section 4.20 discussed potential source areas at the Chem-Trol site. Section 5.10 discussed potential routes of migration of chemical substances from source areas and Section 5.30 discussed observed migration at the site. This section focuses primarily on identifying points of human contact with contaminated media.

The sections below discuss complete exposure pathways identified for the Chem-Trol site. For ease in discussion they are grouped by media.

6.21.1 Subsurface Soils

Subsurface soils may become accessible if erosion or other activities on the site (e.g., children playing) penetrate the soil cover and expose these soils at the ground surface. Once accessible, exposure may occur via incidental ingestion, dermal contact or inhalation. Since erosion has been observed, the likelihood of these potential exposure pathways is considered moderate.

Soil samples collected from the vicinity of 4800 Lake Avenue were reported to contain VOCs. VOCs may volatilize into a vapor phase within the unsaturated overburden and enter 4800 Lake Avenue basement.

6.21.2 Floodplain Sediments

Floodplain sediments may become accessible if the 0.5 feet of topsoil is removed. Exposure to accessible floodplain sediments may occur via ingestion, dermal contact or inhalation. No evidence of excavation into the floodplain sediments was observed during the Phase II study and RI. Thus, the likelihood of contact with these sediments is believed to be low.

6.21.3 Surface Water

Exposure to chemical substances within surface water may occur via ingestion and dermal contact. Since the South Branch of Smokes Creek may be used for recreational purposes, the likelihood of exposure to this surface water body is relatively high. Exposure to the on-site tributary and the surface water seep (SW-12) may occur if people actively seek out these areas; Thus, the exposure to these surface water bodies is considered moderate.

6.21.4 Surface Water Sediments

Exposure to chemical substances within sediments may occur via dermal contact or ingestion. Similar to surface water, since the South Branch of Smokes Creek may be used for recreational purposes, the likelihood of exposure to sediments in this area is considered to be relatively high, and the likelihood of exposure to surface water sediments in other portions of the site is moderate.

6.21.5 Overburden Groundwater

Migration within the overburden groundwater appears limited to the site, primarily due to physical hydrologic barriers. The accessibility of overburden groundwater to human receptors appears limited to groundwater seep areas, (i.e., SW-12) at which time they become surface waters. It is unlikely that a water supply well could be installed within the overburden on the site due to low yield and the current near-term site use. However, should future remedial activities at the site include excavation below the water table, exposure to chemical substances within the overburden groundwater may be possible and occur via incidental ingestion or dermal contact. The likelihood of this exposure is considered to be relatively low.

6.21.6 Bedrock Groundwater

Exposure to bedrock groundwater, if used as a water supply, include ingestion, dermal contact and inhalation of vapors. However, a public water system currently services the area, and although the yield of the weathered shale zone may be sufficient to supply a private water supply well, the apparent need for such a well is not apparent in the vicinity of the site. Thus, the likelihood of use of site groundwater for drinking water and/or other residential purposes is relatively low. The nearest bedrock groundwater well, reportedly used for irrigation purposes is located approximately 3/4 miles northwest of the site.

6.22 Estimation of Exposure Point Concentrations

An estimation of chemical concentrations at the exposure points listed above was made in order to compare the site concentrations to potential ARARs and SCGs. Tables 16 through 21 presents the range of concentrations for each of the chemicals detected in each of the media as well as the computed 95% upper confidence limit. The exposure point concentration is generally considered as the lesser of the 95% upper confidence limit or the maximum reported value.

For potential off-site exposure points such as groundwater ingestion from an off-site well, the chemical concentrations reported for the site were used. This is a conservative approach, since dilution would decrease the off-site concentrations. In addition, for media which were sampled at similar locations during Phase II and the RI (i.e, groundwater, surface water and surface water sediments), only the most recent data were used since these would be most representative of current conditions. Subsurface soils and floodplain sediments were sampled at different locations during Phase II and the RI. Conditions within these media would be less likely to vary with

time. As such, data from both Phase II and the RI were used to assess exposure point concentrations for these media.

In calculating 95 percent confidence limits, where applicable, sample results were averaged with duplicate and/or NYSDEC split samples to result in one concentration for each parameter for each sample location. This was done to eliminate bias in the calculation. It should be noted that NYSDEC data has not been validated. For compounds that were not detected, a value of one half the matrix method detection limit was used. Estimated concentrations were used as reported.

In some instances when a compound was reported as not detected the matrix detection limit was such a high level that using the detection limit value would unduly affect the calculation of the 95 percent confidence limit. For example, 1,1,1-trichloromethane was detected at concentrations ranging between 1 μg/l and 19 μg/l in samples from three overburden groundwater monitoring wells collected during the 1993 and 1994 sample rounds. However, this compound was not detected in a sample collected from MW-3S and the matrix method detection limit for this sample was 1,000 μg/l. Utilizing one half of the matrix method detection limit a value of 500 μg/l in the calculation would potentially result in overestimating the 95 percent confidence limit.

In cases where one half the matrix method detection limit exceeded the maximum reported concentration, the matrix method detection limit based value was omitted from the 95 percent confidence limit calculation. Several factors were considered on a case by case basis prior to omitting a value. Factors which were considered prior to omitting matrix method detection limit based values included the magnitude of exceedence (i.e., how much greater the matrix method detection limit based value was than the maximum value), and how the matrix method detection limit corresponded with matrix method detection limits for other samples. Appropriate notation is included in the tables indicating when the above procedure was implemented.

6.23 Hazard Identification and Comparison to ARARs/SCGs

The site's potential hazards due to human exposures were reviewed based on chemical-specific health exposure based ARARs and SCGs. The ARARs and SCGs varied depending on environmental media. The ARARs and SCGs as well as maximum, minimum and 95 percent confidence limit concentrations, are presented in Table 16 through 21.

The sections below discuss the ARARs and SCGs used for each media and the comparison of anticipated exposure point concentrations to ARARs and SCGs. This information is also presented on Tables 16 through 21. It should be noted that

additional ARARs and SCGs (i.e., non-chemical specific) will likely be identified during the feasibility study.

6.23.1 Soils

The ARARs/SCGs used for site soils include the following.

- "Determination of Soil Cleanup Objectives and Cleanup Levels" NYSDEC Technical and Administrative Guidance Memorandum (TAGM) No. 4046. Criteria in this TAGM are developed for groundwater protection, based on NYSDEC Class GA groundwater quality criteria (see discussion in Section 6.23.5). Soil values are calculated by applying a partitioning model. For purposes of making this calculation, a total organic carbon content of 1% was selected by GZA as representative. In addition to criteria for individual chemicals the following total criteria are also included in this TAGM.

  Total VOCs $\leq$ 10 ppm
  Total Semi-VOCs $\leq$ 500 ppm
  Total Pesticides $\leq$ 10 ppm

  For metals, this TAGM suggests the use of published and site background.

- "Guidance for Superfund Sites with PCB Contamination" EPA's 40G-90.007, August 1990. Guidance within this document recommends a preliminary remediation goal of 10,000-25,000 ppb of total PCBs in area where access is limited by a barrier. Risks associated with this total concentration are demonstrated by USEPA to have a cumulative carcinogenic risk (resulting from ingestion, inhalation and dermal contact) within acceptable ranges.

- Health Effects Assessment Summary Table (HEAST), 4th Quarter, 1990. Values within this table have been calculated based on direct ingestion assumptions of 1 g/day for a 70 kg person for a 70 year exposure period. The values shown correspond to acceptable carcinogenic risk levels.

A comparison of soil ARAR/SCGs and calculated exposure point concentrations is included on Table 16.

Comparison of the calculated exposure point concentrations to ARARs and SCGs indicates several parameters above ARARs/SCGs.

VOC compounds including methylene chloride, chloroform, tetrachloroethane, 1,1,1-trichloromethane, TCE and xylenes have calculated exposure point concentrations above levels specified in TAGM 4046 (i.e., for protection of groundwater) but not above USEPA HEAST (i.e., for ingestion of soils) levels.

PAHs (including benzo(a)anthracene, chrysene, benzo(a)pyrene and dibenz(a,h)anthracene) have calculated concentrations above values set forth in TAGM 4046 and all values except that for chrysene exceed HEAST levels. PAHs, benzo(b)fluoranthene and benzo(k)flouranthene exceeded HEAST levels only. Other semi-VOCs, including phenol, 2-methylphenol, 4-methylphenol and hexchlorobenzene exceed values set forth in TAGM 4046.

Two pesticides (delta BHC and gamma-BHC) and total PCBs (the sum of Aroclors 1242, 1248 and 1254) have calculated exposure point concentrations above TAGM 4046 levels. The total PCBs exceeded USEPA and Superfund guidance levels as well.

Metals, including aluminum, arsenic, beryllium, cadmium, calcium, chromium, copper, iron, magnesium, manganese, silver and sodium exceed concentrations set forth in TAGM 4046 (considered to be either the 95 percent confidence limit of background sample test results or published background concentrations). Only beryllium exceeds the concentration set forth in HEAST.

6.23.2 Flood Plain Sediments

The ARAR/SCGs used for flood plain sediments are similar to those used for soils (i.e., TAGM 4046 and HEAST). A comparison of ARARs/SCGs and calculated exposure point concentrations is presented on Table 17.

Comparison of the calculated exposure point concentrations in floodplain sediments to ARARs and SCGs indicates several semi-VOCs, pesticides, metals and total PCBs exceed ARARs/SCGs. The PAHs, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene and dibenz(a,h)anthracene have calculated exposure concentrations above concentrations specified in TAGM 4046. HEAST concentrations for these compounds are also exceeded, however, values were not available for all the above noted

compounds. Other semi-VOCs including phenol and 2,4-dinitrophenol exceeded the TAGM 4046 specified concentrations but not the HEAST concentration. Hexachlorobenzene exceeded both TAGM 4046 and HEAST concentrations.

Three pesticides, including delta-BHC, heptachlor epoxide and endrin, have anticipated exposure point concentrations exceeding concentrations set forth in TAGM 4046.

Total PCBs, exceeded the concentration specified in HEAST but not those specified in TAGM 4046 and USEPA superfund guidance.

Metals that have calculated exposure point concentrations exceeding TAGM 4046 include berylium, cadmium, chromium, copper and potassium. Only the value of beryllium is above HEAST concentrations.

6.23.3 Surface Water

The ARARs/SCGs used for surface water include the following.

- NYSDEC Class C Surface Water Standards 6 NYCRR Part 701-703. Standards and guidance values have been developed to protect the best usage of this specific class of surface water. Best usage of Class C waters is fishing and fish propagation. Class C waters are suitable for primary and secondary contact recreation.

- USEPA Ambient Water Quality Criteria (AWQC). AWQC are nonregulatory concentrations of water contaminants that provide a reasonable amount of protection to human health and aquatic life. Health based AWQC are based on human ingestion of water (2 liters/day) and aquatic organisms (6.5 grams/day).

To evaluate the impact the site has had on surface water, exposure point concentrations were calculated utilizing data from downstream locations (SW-2, SW-6, SW-7, SW-8, SW-9, SW-10 and SW-12). Due to the prevalence of some chemicals at upstream locations, similar statistical calculations were performed utilizing upstream data (SW-1, SW-4 and SW-5) as well. It is believed that conditions represented by the upstream calculations would be similar to site conditions without site impact. Comparison of calculated surface water exposure point concentrations, ARARs/SCGs and upstream conditions is included on Table 18.

One semi-VOC has an anticipated exposure point concentration slightly exceeding (i.e., by less than 0.5 μg/l) the Class C standard. Seven metals (cobalt, lead, iron, vanadium and cyanide) have calculated exposure point concentrations above the Class C standard. Iron, manganese and nickel exceed the AWQC. Calculated exposure point concentrations for each metal detected downstream exceeded upstream conditions, except vanadium.

It should be noted that elevated metals concentrations are primarily due to test results from an on-site groundwater seep (SW-12). During the 1993 sample round, metals including barium, calcium, cobalt, copper, manganese, nickel, silver and zinc were detected in this sample only. Concentrations of other metals in the sample from SW-12 were typically an order of magnitude higher than other results.

6.23.4 Surface Water Sediments

The ARARs/SCGs used for surface water sediments include TAGM No. 4046; and HEAST discussed in Section 6.23.1; and the following.

- "Guidance for Superfund Sites with PCB Contamination" EPA 540-G-90-007, August 1990. PCB criteria are developed based on AWQC through the use of a equilibrium partitioning model. GZA selected a total organic carbon content of 1 percent within site sediments to calculate the criteria. If AWQC based values are exceeded, additional studies may be needed to determine the prevalence of PCBs in the food chain. If chemical monitoring of biota fails to indicate that uses are impaired, the need for extensive remediation should be reevaluated. These criteria are also applicable to the human health assessment since humans (i.e., hunters, fisherman) may ingest wildlife from the site.

- USEPA Interim Sediment Quality Criteria. These criteria were developed based on AWQC through the use of an equilibrium partitioning model. GZA selected a total organic carbon content of 1 percent within site sediments to calculate the criteria.

Similar to surface water, statistical calculations were performed for upstream (SWS-1, SWS-3, SWS-4 and SWS-5) and downstream (SWS-2, SWS-6, SWS-7, SWS-8, SWS-9, SWS-10, SWS-11 and SWS-12) sample locations. It is believed that conditions represented by the upstream calculations would be similar to site conditions without site impact. Surface water sediment exposure point concentrations, ARARs, SCGs and upstream conditions are compared on Table 19.

Comparison indicates that calculated exposure point concentrations of several semi-VOCs and pesticides, exceed concentrations set forth within TAGM 4046. Generally, upstream concentrations were at higher levels for these compounds, indicating that the presence of these compounds in surface water sediments may not be the result of site impact.

Calculated exposure point concentrations of metals indicate that several metals were above ARARs/SCGs including arsenic, beryllium, cadmium, chromium, iron, lead, manganese, sodium, nickel and zinc. Most of the metals, however, were near or below upstream conditions. Downstream total PCBs have exposure point concentrations exceeding TAGM 4046 and HEAST and Superfund PCB criteria, while lower concentrations were found upstream.

6.23.5 Overburden Groundwater

The ARARs/SCGs used for overburden groundwater at the Chem-Trol site include the following.

- NYSDEC Class GA Groundwater Quality Criteria 6NYCRR Part 701-703. These criteria are developed for waters with a best usage as a potable water supply.

- USEPA Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs). MCLs are enforceable standards which are considered feasible and safe for drinking water supply systems. MCLGs are non-enforceable health goals which water systems should try to achieve.

- USEPA Health Advisories - USEPA health advisories are nonregulatory concentrations of drinking water contaminants considered protective of adverse noncarcinogenic health effects. Health advisories included are those for exposure of a child for one day and longer term (approximately 7 years or 10% of lifetime); and lifetime exposure for an adult.

The data set used to calculate exposure point concentrations included only downgradient monitoring wells (i.e., all but MW-7S). These results, as well as the ARARs/SCGs, calculated exposure point concentrations for overburden groundwater and upgradient results at MW-7S are included on Table 20.

The calculated exposure point concentration of nine VOCs reported within samples from the overburden groundwater exceeded Class GA

criteria. These included chloroethane, acetone, 1,1-dichloroethane, total 1,2-dichloroethene, chloroform, 1,1,1- trichloroethane, trichloroethene, toluene and chloromethyl benzene. Of these, trichloroethene also exceeded the USEPA MCL and MCLG. Chloroform exceeded the USEPA MCL and long term exposure to children health advisory. One semi-VOC (4-chloro-3-methylphenol) exceeded the Class GA criteria.

Five metals, including aluminum, iron, magnesium, manganese and sodium have calculated exposure point concentrations above Class GA criteria. Manganese also exceeded the MCLG. Upgradient concentrations of aluminum, iron and sodium also exceed Class GA criteria. Sulfate also has a calculated exposure point concentration above the class GA criteria.

6.23.6 Bedrock Groundwater

The ARAR/SCGs used for bedrock groundwater are similar to those used for the overburden groundwater, including NYSDEC Class GA criteria, and USEPA MCLs, MCLGs, and human health advisories. It should be noted that the exposure point concentration included only downgradient, shallow bedrock, monitoring well samples. MW-9RD was not included in the analysis as it is not believed to be as accessible as the weathered shale groundwater. Results from MW-7R and MW-11R are considered upgradient. Calculated exposure point concentrations, ARARs/SCGs and results from upgradient wells are included on Table 21.

Thirteen VOCs reported within samples from the weathered shale groundwater have calculated exposure point concentrations that exceed one or more ARAR/SCG. Vinyl chloride, chloroethane, methylene chloride, 1,1- dichloroethene, 1,1-dichloroethane, total 1,2-dichloroethene, chloroform, 1,1,1- trichloroethane, trichloroethene, benzene, toluene and chlorotoluene exceed Class GA criteria. Vinyl chloride, methylene chloride, 1,1-dichloroethene, trichloroethene and benzene, exceed MCLs and/or MCLGs. USEPA health advisories for adult lifetime was exceeded by 1,1-dichloroethene and 1,1,1-trichloroethane and chlorotoluene.

The calculated exposure point concentration of one semi-VOC (4-chloro-3-methylphenol) slightly exceeded Class GA criteria.

Five metals, including aluminum, iron, magnesium, manganese, and sodium have calculated exposure point concentrations exceeding Class

GA criteria. These metals concentrations, except manganese also exceeded criteria for these metals at upgradient locations.

6.30 ENVIRONMENTAL EVALUATION

A qualitative assessment of risks to ecological receptors was also performed for the Chem-Trol site. This assessment evaluates potential impacts to the fish and wildlife species. This assessment was done in accordance with NYSDEC Division of Hazardous Waste Remediation TAGM: Habitat Based Assessment Guidance Document for Conducting Environmental Risk Assessments at Hazardous Waste Sites (Reference 11). Fish and wildlife species native to the Chem-Trol site and surrounding area were discussed in the Habitat Assessment, in Section 3.80.

The qualitative evaluation was performed in a manner similar to that for human health. Exposure point concentrations were estimated utilizing the 95 percent upper confidence limit value or maximum value of data reported during the R.I. (see discussion in Section 6.12). The assessment was completed for site surface water and surface water sediments. Site soils, floodplain sediments, and groundwater are considered relatively inaccessible by fish and wildlife species.

The sections below discuss the ARARs and SCGs used to assess potential impact to fish and wildlife species and the comparison to anticipated exposure point concentrations. Environmental based ARARs and SCGs are included on Tables 22 and 23 with reported maximum, minimum and 95 percent confidence limit concentrations.

6.31 Surface Water

The ARARs/SCGs used to assess potential environmental risks resulting from substances within surface water at the site include NYSDEC water quality criteria for a Class C water body discussed previously and the following:

- USEPA AWQC - USEPA AWQCs are available for protection of fish and plantlife against both acute and chronic toxicity. The value provided is the Lowest Observed Effect Level (LOEL) based on available information.

Comparisons of the downstream data occurrence to ARARs/SCGs indicates that four metals, cobalt, iron, lead, vanadium and cyanide have calculated exposure point concentrations above Class C criteria. In addition; four metals, copper, iron, lead and zinc exceed acute aquatic AWQC and three metals (copper, lead and zinc) and cyanide exceed chronic aquatic AWQC. The upstream occurrence of these metals was typically at lower levels. However, iron, lead, and vanadium exceeded

ARARs/SCGs at upstream locations. As noted above, elevated metals downstream of the site are primarily due to results from one sample SW-12.

6.32 Surface Water Sediments

The ARARs/SCGs used to assess potential environmental risks resulting from substances within the surface water sediments include the previously discussed USEPA Sediment Criteria, USEPA Guidance on Remedial Actions for Superfund Site with PCB contamination and the following:

- NYSDEC Sediment Cleanup Criteria - NYSDEC criteria for organic compounds have been developed for three protection objectives including, aquatic toxicity, human health residue, and wildlife residue based criteria. Exceedence of the aquatic toxicity based criteria for a chemical would be predicted to cause toxicity to benthic or epibenthic life. Exceedence of the human health residue based criteria may indicate accumulation of chemicals in aquatic animals to levels which exceed human health tolerance, action level or cancer risk dose. Exceedence of the wildlife residue based criteria may indicate accumulation of the chemical in aquatic animals that would be harmful to wildlife consumers of the aquatic animals. All three criteria are based primarily on comparisons of approximated interstitial water concentrations with water quality standards. The interstitial water concentration is calculated through the use of a partitioning model. The calculation was made using an organic carbon content of 1 percent.

  NYSDEC guidance for metals, values include background values of pre-industrial Great Lakes sediments, a criteria value with respective "no-effect" and "lowest effect" values included in parentheses, and a limit of tolerance value which would be considered as detrimental to the majority of species.

  NYSDEC guidance further states that remediation be considered necessary if aquatic toxicity based values are exceeded by more than 100 times for organic compounds or the limits of tolerance for metals are exceeded. For those compounds that exceed NYSDEC criteria by less than a factor of 100, NYSDEC guidance states that additional study may be necessary to determine the necessity of remediation.

- "The Potential for Biological Effects of Sediment-Sorbed contaminants tested in the National Status and Trends Program", NOAA Technical Memorandum NOSOMA52, Long and Morgan, 1990.

NOAA values were compiled from an existing information database regarding the effects of contaminated sediments on aquatic biota. NOAA values that were utilized refer to the lower tenth one-(0.1) percentile of sediment chemical concentrations associated with adverse biological effects.

The calculated exposure point concentrations within surface water sediments for alpha-chlordane exceeded the aquatic toxicity value by more than 100 times. The calculated exposure point concentration of this compound is 3.1 μg/kg and the reported matrix detection limit varied between 1.9 μg/kg and 11 μg/kg. The limit of tolerances for metals were not exceeded.

Several other ARARs/SCGs were also exceeded for semi-VOCs (primarily PAHs), pesticides and metals. As was discussed in the human health assessment of site sediments, calculated downstream exposure point concentrations were generally at or below calculated upstream exposure point concentrations. As such, the downstream exceedences may not be associated with site impact. Total PCBs, however, were significantly higher at downstream locations and exceeded NYSDEC human health residue and wildlife, residue criteria, NOAA criteria and superfund cleanup criteria.

7.00 SUMMARY AND CONCLUSIONS

7.10 SUMMARY

A remedial investigation was completed at the approximate 17.5 acre site located in Hamburg, New York. The following presents an overview of that investigation. The site was reportedly operated between October 1970 and April 1972 by Chem-Trol as a treatment and transfer facility for hazardous wastes. During that time, the site accepted wastes in 55-gallon drums and tanker trucks for processing through thermal oxidation and distillation or storage on-site for eventual transport off-site. About four surface impoundments were used in the temporary storage and treatment of wastes; no permanent disposal took place on-site. Wastes were transferred to a licensed disposal facility after operations ceased at the site in April 1972 and following a fire in July 1972. The surface impoundments were backfilled and the site was subsequently covered with approximately 2 feet of soil.

Previous site investigations include a Phase I and Phase II investigation. These studies included mapping, air monitoring, geophysical surveys, and environmental sampling. These studies concluded that the surface water, groundwater and soils at the site contained various chemicals related to former site operations, thus requiring additional investigation to assess clean-up options.

All field work was completed in accordance with work plans submitted to and approved by the NYSDEC. The RI included: installation of test borings and monitoring wells; hydraulic conductivity testing; auger probes to collect soils; completion of test pits; and, various environmental sampling and analysis. All analytical data was validated by an independent data validator.

The former active area of the site is relatively flat and covered with grass and small brush. A wooded area is located north of the former active area, separated from it by an on-site tributary of the South Branch of Smokes Creek. A low-lying flood plain is located west of the former active area, starting at the base of a slope that forms the western boundary of the former active area. The South Branch of Smokes Creek flows north near the western edge of the site. Bedrock outcrops in both the South Branch of Smokes Creek and its on-site tributary.

The site is underlain by 0 to 20 feet of overburden deposits, consisting of topsoil, fill and glacial till. Much of the former active area of the site was covered by a soil cap upon closure. A calcareous shale bedrock is present beneath the overburden, and the upper 25 to 30 feet of which is weathered.

Groundwater flow appears to be limited to the lower glacial till, soils, the weathered shale and the competent shale. Groundwater enters the site from the west and/or southwest portion of the site and flows towards the South Branch of Smokes Creek and its tributaries. Groundwater within the lower glacial till and competent shale is believed to discharge primarily to the weathered shale. Flow in the weathered shale is believed to be the primary flow path across the site due to its relatively high permeability. Groundwater within the weathered shale either discharges to the South Branch of Smokes Creek and its tributaries or passes beneath the creek.

Current sources of chemicals at the site include soils in and around the impoundments used for waste treatment as well as soils which may have been mixed throughout the site during earthwork activities.

Four major transport pathways for site chemicals have been identified. These include:

- leaching of water through impacted soils followed by overburden groundwater transport;
- leaching of water through impacted soils followed by bedrock groundwater transport;
- erosion of soils and sediment transport via surface water; and
- volatilization followed by soil gas migration.

These pathways have resulted in the observed presence of chemicals in the various media tested, as previously described.

Water samples collected from overburden wells include a variety of VOCs as well as semi-VOCs, likely the result of leaching from impacted soils. The majority of VOC compounds detected were halogenated aliphatic compounds, likely due to their higher relative mobility. Semi-VOCs were detected in localized areas, specifically near MW-3S. While sufficient time has passed for these chemicals to reach the South Branch of Smokes Creek, neither sediments nor water samples collected from this water body and an on-site groundwater seep contained chemicals indicative of such a discharge.

The bedrock water contained similar compounds at higher concentrations as compared to that detected in the overburden water. The majority of impacted bedrock wells are west of potential source areas. This is consistent with the hydrologic model presented for the site. The presence of VOCs in bedrock water samples west of the South Branch of Smokes Creek suggests that these compounds may have migrated westward beneath the creek. The western extent of these chemicals beyond the South Branch of Smokes Creek has not been fully defined.

Erosion and sediment transport may have been significant prior to placement of the soil cover during closure. Currently, transport via this mechanism is expected to be limited. Erosion of the soil cover has been observed in swales on the north and west sides of the former active area of the site and surface water sediment samples contain a variety of PAHs, phthalates and pesticides. However, the highest concentrations of PAHs and other chemicals were detected in upstream sampling locations. This suggests the site is not a significant contributor to contamination of the surface water bodies.

VOC chemicals present in the soils and/or groundwater may volatilize and migrate into the soil gas. The soil gas can then act as a pathway for migration of the chemicals. No VOCs were detected in the air survey completed in the open areas of the site. No survey was completed within 4800 Lake Avenue building or basement.

A qualitative risk assessment was completed to assess site conditions, including the likelihood of public exposure to the various media. The potential of exposure to bedrock and overburden groundwater is low based on the current and anticipated future use of the site and the presence of a public water supply in the area. The exposure potential to subsurface site soils is considered moderate, as it would be limited to areas where active erosion may have penetrated the existing site cap. There is a moderate exposure potential to surface water as well as surface water sediments due to the recreational use of the South Branch of Smokes Creek. The exposure potential to subsurface floodplain sediments is considered low.

Two types of standards were used in the assessment of soils conditions. One used a partitioning model to assess the impact that the soil may have on groundwater and the other was based on direct soils ingestion. Selected VOCs, including halogenated aliphatic compounds and aromatic compounds, selected PAHs, selected phenols, one halogenated aromatic semi-VOC, two pesticides, total PCBs and some metals had calculated exposure point concentrations exceeding groundwater-based standards. Only the PAHs, the halogenated aromatic semi-VOC, PCBs and beryllium exceeded ingestion standards. Since groundwater data is available for the site, that data is more indicative of the risks associated with site soils to groundwater than the theoretical leaching groundwater-based soil standards.

Groundwater-based and ingestion based standards were also used in review of floodplain sediments. Generally, PAHs, phenols, pesticides, one halogenated aromatic semi-VOC and metals concentrations in floodplain sediments have calculated exposure point concentrations exceeding the groundwater-based standards. Only PAHs, total PCBs and beryllium concentrations in those sediments exceeded ingestion based standards.

The surface water chemical concentrations were compared to published standards for the specific stream class. Only one organic compound, selected metals and cyanide exceeded those standards. Elevated metals concentrations are primarily attributable to one sample from a groundwater seep.

PAHs, PCBs and metals had calculated exposure point concentrations exceeding ARARs/SCGs for surface water sediments at downstream locations. However, it must be noted that many of these compounds detected in upgradient locations also exceeded ARARs/SCGs. Comparison of downstream and upstream results indicates elevated PAH and metals results may not be a result of site impact.

Anticipated exposure point concentrations for overburden and bedrock groundwater were compared with NYSDEC and USEPA criteria for drinking water sources. For both overburden and bedrock groundwater several VOCs, one semi-VOC and some inorganics were found to exceed appropriate ARARs/SCGs. Some metals within upgradient well also exceed drinking water ARARs/SCGs.

The potential risk to ecological receptors was evaluated in a qualitative environmental risk evaluation. This evaluation considered surface water and surface water sediments, those media considered accessible by aquatic and wildlife receptors. The surface water evaluation indicates the calculated exposure point concentration of one semi-VOC and some metals exceed NYSDEC and/or USEPA criteria. Results of surface water sediment evaluation indicated that although several semi-VOCs, pesticides and metals exceeded environmental ARARs/SCGs, elevated concentrations of these chemicals may not be related to the site. PCBs, however, may be attributable to the site.

7.20 CONCLUSIONS

Based on the RI summarized above, the following conclusions regarding current site conditions and remediation requirements are presented.

- The calculated exposure point concentrations of selected parameters in soil samples collected at the site exceeded ARARs/SCGs. The exceedences noted were generally associated with levels provided in TAGM 4046. Relatively few parameters had an anticipated exposure point concentrations above HEAST levels. This indicates that while the site soils may not necessarily pose a risk to human health, the potential exists for contamination of groundwater. Based on this information the site soils may require future remedial attention.

- Floodplain sediments contain of semi-VOCs, pesticides, one PCB and metals that have an anticipated exposure point concentration that exceeds ingestion-based (HEAST) and/or groundwater protection based (TAGM 4046) ARARs/SCGs (HEAST). Impacted floodplain sediments were limited to those collected during the RI which are representative of conditions within the former creek bed. Based on this information, the floodplain sediments within the former creek bed may require future remedial attention.

- The majority of parameters detected within the surface water bodies on the site do not exceed the ARAR/SCG. Those that do, include one phthalate and selected metals. Elevated metals concentrations are primarily due to test results from one sample collected from a groundwater seep. Surface water in the vicinity of the groundwater seep may require future remedial attention.

- PAHs, PCBs and metals exceed ingestion-based ARARs/SCGs in surface water sediments. Elevated PAH and metal concentrations were noted in upstream locations, suggesting that site conditions are not resulting in elevated concentrations of these parameters in this media. PCB concentrations may be attributable to the site and need to be addressed in future remediation.

- Several VOCs, one semi-VOC and some metals have an anticipated exposure point concentration above ARARs/SCGs in both bedrock and overburden groundwater. The presence of chemical substances within the weathered shale groundwater monitoring wells MW-1R and MW-13R indicates that these may exist further to the east and west of the site. Although groundwater in the vicinity of the Chem-Trol site is not used as a potable water source, based on a limited waterwell survey conducted during the Phase 2 investigation, limited exposure may occur at seeps and at private wells (which are not believed to be in service in the vicinity of the site). Groundwater in both the bedrock and overburden may require future remedial attention.

7.30 DEFINITION OF REMEDIAL ACTION GOALS/OBJECTIVES

In accordance with NYSDEC guidance the goal of remedial activities at the Chem-Trol site is to achieve pre-release conditions. Pre-release conditions are considered to be those conditions that existed prior to the release, discharge, spill, leak or disposal of wastes. Although environmental data is not available for the Chem-Trol site prior to its operation, an indication of pre-release conditions may be obtained from background samples. Where appropriate, environmental data from background samples collected during the RI are considered as such.

At many sites, achieving pre-release conditions is not considered practical and/or insufficient data is available to establish these conditions. At others, analytical testing technology may not be available to determine if the remedial goals are achievable. In these instances, remedial action objectives (RAOs) are defined.

Remedial action objectives (RAOs) are media specific or operable unit specific goals to protect human health and the environment. RAOs are often the most stringent level of cleanup that is believed to be feasible. Typically, a RAO consists of three components including contaminants of concern, exposure routes/receptors and acceptable contaminant concentrations.

The overburden and bedrock groundwater, site soils, surface water, surface water sediments and flood plain sediments at the Chem-Trol site may require remediation. The following sections discuss the development and definition of RAOs for each of these media. This process includes identification of routes of exposure, identification of contaminants of concern and identification of chemical specific cleanup goals. It should be noted that the remedial action objectives described herein may prove to be technically infeasible. Based on proposed selected remedial technology, to be developed during the FS, final site specific cleanup levels will be established.

7.31 Soils

Routes of Exposure

Exposure to chemical substances within the site soils may occur through direct contact with site soils or groundwater, either on or off-site. Direct contact with site soils does not appear likely since the site was previously covered with a reported 2 feet of soil. However, exposure in this manner could occur in areas where the soil cover is diminished through off-road vehicular traffic, erosion etc.

Concentrations of some substances within site soils indicates that the potential exists for these substances to leach to the site groundwater. Although exposure to groundwater is discussed separately below, RAOs for site soils should be defined to reduce the potential of leaching of these substances to protect groundwater.

Contaminants of Concern

Contaminants of Concern (COCs) for site soils include those which have an associated human health risk or those which exhibit a potential of leaching to the groundwater. A human health risk was associated with a specific chemical if the anticipated exposure point concentration (i.e., the lesser of the 95% confidence limit or maximum reported values) exceeded USEPA HEAST concentration. A substance was considered to exhibit a potential to leach to the groundwater if the maximum reported concentration exceeded values specified in NYSDEC TAGM 4046. For metals, this means the maximum reported concentration must be higher than both site and published background values for inclusion as a COC. All PCBs were included as COCs since criteria for PCBs are often developed for total PCB concentrations. A list of contaminants of concern for site soils is included in Table 24.

Chemical Specific Cleanup Objectives

Selection of chemical specific cleanup objectives for site soils was performed in a manner similar to that set forth in TAGM 4046. This TAGM included groundwater protection based values, HEAST values (discussed above) and contact required quantitation limits (CRQLs) for organic compounds. CRQLs are technological limitations on environmental sample testing. For metal compounds, the TAGM recommends HEAST, site or published background concentrations, contract required detection limits (CRDLs: similar to CRQLs for organic compounds) as a cleanup objective.

The procedure for selecting a cleanup objective for organic compounds included selecting the lower of the health based or groundwater protection based values. This value was then compared with the CRQL. If the selected value was lower than the CRQL, the CRQL was selected. This is because a cleanup objective cannot be established which cannot be verified through an approved test procedure. A similar procedure is used for selection of cleanup objectives for metal compounds however, comparison of health based and background levels was first completed and the lower selected. The selected value was then compared with CRDLs. Chemical specific cleanup objectives for site soils are summarized on Table 24.

Remedial Action Objective

The remedial action objective for soils at the Chem-Trol site is to reduce the potential for leaching of contaminants from soils containing chemical substances exceeding concentrations specified on Table 24 and to reduce the potential of human contact with those soils.

7.32 Floodplain Sediments

Routes of Exposure

Potential exposure to chemical substances within the floodplain sediments is similar to that for site soils. However, the potential for direct contact may be lower since no evidence of excavation into the floodplain sediment was observed during the Phase II and RI studies.

Contaminants of Concern

COCs for floodplain sediments include those which have an associated human health risk or which exhibit a potential of leaching to the groundwater. Selection of floodplain COCs proceeded in a manner similar to that for site soils and a list of the COCs is included on Table 25.

Chemical Specific Cleanup Objectives

Determination of chemical specific cleanup objectives for floodplain sediments was performed in a similar manner to that identified for site soils. Chemical specific cleanup goals for floodplain sediments are included on Table 25.

Remedial Action Objective

The remedial action objective for floodplain sediments at the Chem-Trol site is to reduce the potential for contact with or leaching of contaminants from soils containing chemical substances exceeding concentrations specified on Table 25.

7.33 Surface Water

Routes of Exposure

Exposure to chemical substances with the surface water may occur via dermal contact or ingestion. Surface water is also accessible to fish and wildlife.

Contaminants of Concern

COCs for surface water include those which have a downstream exposure point calculation which exceeds human health or environmental based ARARs. These include one phthalate and nine metals. COCs for surface water are listed on Table 25.

Chemical Specific Cleanup Objectives

The procedure for selecting cleanup objectives for surface waters include selecting the lowest of ARARs/SCGs. This value was then compared with the maximum reported upstream concentration and the greater of these two selected. The resulting value is then compared with the CRQL and the greater value selected. Chemical specific cleanup objectives for surface water are summarized on Table 26.

Remedial Action Objective

The remedial action objective for surface water at the Chem-Trol site is to reduce the potential contact with surface water containing chemical substances exceeding concentrations specified on Table 26.

7.34 Surface Water Sediments

Routes of Exposure

Exposure to chemical substances within the surface water sediments may occur via dermal contact or ingestion. In addition, surface water sediments are accessible to fish and wildlife.

Contaminants of Concern

As stated in Section 7.20 PCB concentrations within the surface water sediments may be attributable to past site activities. As such, PCBs are the COCs for surface water sediments.

Chemical Specific Cleanup Objectives

Selection of chemical specific cleanup objectives for PCBs with surface water sediments proceeded in a manner similar to that for site soils. These values are summarized on Table 18.3. It should be noted that the PCB value of 1,000 μg/kg is for total PCBs.

Remedial Action Objective

The remedial action objective for surface water sediments at the Chem-Trol site is to reduce the potential for human or wildlife contact with those sediments containing concentrations of PCBs in excess of those values listed on Table 27.

7.35 Overburden Groundwater

Routes of Exposure

The potential for exposure to chemical substances within the overburden groundwater is considered relatively low. This is because migration within this media is generally limited to the site area and adjacent residences are serviced by a public water supply. Exposure may occur when groundwater seeps to the ground surface or if future activities at the site include excavation within the saturated zone. It is unlikely that a supply well could be installed within the overburden on the site due to the low yield and the current near-term site use. In addition, analytical test results indicate migration from the overburden to the bedrock groundwater. Potential exposure routes within the bedrock groundwater are presented in Section 7.35.

Contaminants of Concern

COCs for overburden groundwater include those chemicals for which calculated downgradient exposure point concentrations exceed ARARs/SCGs. These include primarily VOCs, some metals and sulfate. MCLGs for lead (zero μg/l) were exceeded. However, these compounds were not included as COCs as the exposure point concentrations for these substances were below both NYSDEC Class GA standards and USEPA MCLs. In this case, the use of a MCLG of (0 μg/l) developed for public water supplies is not believed appropriate for comparison to natural groundwater. COCs for overburden groundwater are included on Table 28.

Chemical Specific Cleanup Objectives

Chemical specific cleanup objectives for downgradient overburden groundwater were developed in a manner similar to that used for surface water. Generally, the most stringent ARAR/SCG was used unless this was below the CRQL or upgradient concentration. Cleanup objectives for individual COCs are included on Table 28.

Remedial Action Objective

The remedial action objective for overburden groundwater is to limit the potential for exposure or migration of overburden groundwater containing substances at concentrations exceeding those listed on Table 28.

7.36 Bedrock Groundwater

Routes of Exposure

Similar to the overburden groundwater, the potential for exposure to bedrock groundwater is believed to be relatively low since the surrounding area is serviced by

a public water supply. However, test results indicate that some site related chemicals may be found further to the east and west of the site. No currently in-service private drinking water supply wells were identified in the site proximity during this investigation. However, exposure may occur at seeps or at private wells not known to be in service in the vicinity of the Chem-Trol site.

Contaminants of Concern

Contaminants of concern for the bedrock groundwater were identified in an manner similar to that for the overburden groundwater. MCLGs for tetrachloroethene and lead (zero μg/l) were exceeded. However, these compounds were not included as COCs as exposure point concentrations for these substances are below both NYSDEC Class GA and USEPA MCLs. In this case, the use of a MCLG developed for public water supplies is not believed appropriate for comparison to natural groundwater. COCs for bedrock groundwater are included on Table 29.

Chemical Specific Cleanup Objectives

Chemical specific cleanup objectives for bedrock groundwater were developed in a manner similar to that for overburden groundwater. These are summarized on Table 29.

Remedial Action Objectives

The remedial action objective for bedrock groundwater is to limit the potential for exposure or migration of bedrock groundwater containing substances at concentrations exceeding those listed on Table 29.

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4. "Engineering Investigations at Inactive Hazardous Waste Sites in the State of New York, Phase I Investigations, Chem-Trol, New York. State Site Number 915015, Town of Hamburg, Erie County, New York," Engineering Science, January 1988.

5. Groundwater Manual, U.S. Department of the Interior Water and Resource Service, John Wiley & Sons, 1981.

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11. "Divisional Technical and Administrative Guidance Memorandum (TAGM): Habitat Based Assessment Guidance Document for Conducting Environmental Risk Assessments at Hazardous Waste Site," NYSDEC, December 28, 1989.

12. "The Potential Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program," NOA Technical Memorandum NOSOMA 52, Longand Morgan, 1990.

13. "Stratigraphic Distribution of Ammonoids from the Middle Devonian Ludlowville Formation in New York", Gerald J. Kloc, SUNY at Buffalo Masters Thesis, 1993.

REFERENCES (CONT'D)

14. Letter dated March 1, 1994 from Mr. Kenneth Roblee, Sr. Wildlife Biologist, NYSDEC, to Mr. Thomas R. Heins, P.E., GZA GeoEnvironmental of New York.

TABLES

Table 1
Chem-Trol Remedial Investigation
Hamburg, New York
Summary of Piezometer and Monitoring Well Construction

Location	NYS Plane Coordinate West Zone		NGVD Elevation (ft)		Top of Rock Depth (ft)	Top of Rock Elevation (ft)	Intake Interval			
	Northing	Easting	Ground Surface	Monitoring Point			Top Depth (ft)	Bottom Depth (ft)	Top Elevation (ft)	Bottom Elevation (ft)
P-1S	1019552.7872	441481.8143	640.66	642.80	15.3	625.4	9.2	14.2	631.5	626.5
P-2S	1019439.0163	441330.5231	640.52	642.66	17.0	623.5	11.5	15.5	629.0	625.0
P-2R	1019448.7484	441328.2894	640.87	642.98	18.3	622.6	23.3	31.0	617.6	609.9
P-3S	1019412.2218	441068.4424	637.18	639.46	19.5	617.7	14.0	19.0	623.2	618.2
P-3R	1019418.4111	441079.5231	637.88	639.92	19.3	618.6	24.3	34.1	613.6	603.8
P-4S	1019585.4858	441037.9318	634.42	636.54	14.7	619.7	9.0	14.0	625.4	620.4
P-5S	1019716.7097	441227.8670	635.38	637.54	13.5	621.9	6.9	11.9	628.5	623.5
P-5R	1019717.2149	441245.3767	635.82	637.88	14.0	621.8	19.5	29.5	616.3	606.3
MW-1S	1019439.0472	441470.8991	641.44	643.04	13.7	627.7	10.4	13.4	631.0	628.0
MW-1R	1019445.1916	441470.3205	641.32	642.50	14.0	627.3	19.4	30.8	621.9	610.5
MW-2S	1019334.9741	441305.4093	640.78	642.68	16.7	624.1	13.3	15.3	627.5	625.5
MW-3S	1019497.0940	441058.4215	635.54	637.64	18.5	617.0	13.2	18.2	622.3	617.3
MW-4S	1019608.8426	441051.1914	635.20	637.18	14.0	621.2	8.7	13.7	626.5	621.5
MW-4R	1019600.6753	441054.5250	635.54	637.02	14.0	621.5	18.9	32.1	616.6	603.4
MW-5S	1019697.1449	441160.5744	634.14	636.28	14.0	620.1	8.6	13.6	625.5	620.5
MW-6S	1019723.4153	441387.5286	637.00	638.54	13.7	623.3	7.7	12.7	629.3	624.3
MW-6R	1019720.4410	441372.9671	637.24	638.64	14.0	623.2	18.8	29.0	618.4	608.2
MW-7S	1019144.243	441409.311	640.37	642.85	10.0	630.4	4.8	9.8	635.6	630.6
MW-7R	1019138.521	441410.888	640.46	642.28	10.3	630.2	16.0	36.2	624.5	604.3
MW-8S	1019498.482	440768.722	613.97	617.28	5.3	608.7	4.0	5.0	610.0	609.0
MW-8R	1019490.124	440771.135	614.27	617.38	3.9	610.4	9.8	19.3	604.5	595.0
MW-9S	1019265.672	440936.955	617.12	619.91	8.3	608.8	4.0	8.0	613.1	609.1
MW-9R	1019274.489	440939.495	616.98	619.17	8.0	609.0	13.0	23.4	604.0	593.6
MW-9RD	1019282.549	440942.546	616.70	619.13	8.0	608.7	43.0	68.0	573.7	548.7
MW-10S	1019674.604	440922.406	612.39	615.15	5.0	607.4	3.3	4.8	609.1	607.6
MW-10R	1019667.989	440916.435	612.37	615.47	4.8	607.6	10.6	20.9	601.8	591.5
MW-11R	1019855.059	441250.557	632.62	634.73	8.6	624.0	14.5	23.6	618.1	609.0
MW-12S	1019147.459	440927.023	618.97	621.17	7.9	611.1	4.5	7.9	614.5	611.1
MW-12R	1019148.158	440935.523	619.83	621.59	8.0	611.8	13.2	24.1	606.6	595.7
MW-13R	1019564.179	440697.822	613.39	615.14	4.2	609.2	10.0	20.7	603.4	592.7
MW-14R	1019165.458	440699.0770	616.63	618.55	7.0	609.6	12.0	26.3	604.6	590.3

Note: (1) Depth to top of rock at overburden piezometer/monitoring well locations is assumed to be at auger refusal.
(2) Elevations shown were calculated based on measurements by McIntosh & McIntosh on June 6, 1994 and are referenced to NGVD.

Table 2
Chem-Trol Remedial Investigation
Hamburg, New York
Summary of Hydraulic Conductivity Test Results

Monitoring Well	Test Interval (ft)	Variable Head Tests				Packer Test Data	
		Rising Head (ft/min)	Rising Head (cm/sec)	Falling Head (ft/min)	Falling Head (cm/sec)	(ft/min)	(cm/sec)
Overburden							
P-1S	9.2-14.2	9E-06	5E-06			Not applicable	Not applicable
P-3S	14.0-19.0	6E-04	3E-04			Not applicable	Not applicable
P-4S	9.0-14.0	7E-04	4E-04			Not applicable	Not applicable
MW-1S	10.4-13.4	5E-06	2E-06			Not applicable	Not applicable
MW-2S	13.3-15.3			2E-03	1E-03	Not applicable	Not applicable
MW-3S	13.2-18.2	4E-03	2E-03			Not applicable	Not applicable
MW-7S	4.8-9.8	3E-05	2E-05	5E-05	3E-05	Not applicable	Not applicable
MW-8S	4.0-5.0			5E-06	2E-06	Not applicable	Not applicable
MW-9S	4.0-8.0	2E-03	1E-03	3E-03	1E-03	Not applicable	Not applicable
MW-10S	3.3-4.8	4E-04	2E-04	7E-04	4E-04	Not applicable	Not applicable
MW-12S	4.5-7.9	Insufficient water in well to complete test.				Not applicable	Not applicable
Bedrock							
MW-1R	19.4-30.8			2E-01	1E-01		
MW-4R	18.9-32.1			1E-01	5E-02		
MW-6R	18.8-29.0			1E-02	5E-03		
MW-7R	16-36.2	8E-03	4E-03	7E-03	4E-03		
MW-7RA	13.3-15.6					2E-03	1E-03
MW-7R	18.6-26.3					No Take	No Take
MW-7R	22.6-36.2					6E-03	3E-03
MW-8R	9.8-19.3	8E-02	4E-02	1E-01	7E-02		
"	7.0-9.3					3E-03	1E-03
"	12.7-19.3					6E-03	3E-03
MW-9R (1993)	13-23.4	2E-03	1E-03	3E-03	2E-03		
MW-9R (1994)	13-28	2E-02	9E-03	3E-03	2E-03		
"	10.8-13.0					No Take	No Take
"	15.6-23.4					5E-04	2E-04
"	23.5-28					Pump Capacity	Pump Capacity
MW-9RD	43-68	6E-05	3E-05	3E-05	1E-05		
"	23.5-28.5					No Take	No Take
"	28.5-33.5					No Take	No Take
"	33-37.6					No Take	No Take
"	37-43.2					No Take	No Take
"	43-48.7					No Take	No Take
"	47-53.4					No Take	No Take
"	53-58					No Take	No Take
"	58-63.5					No Take	No Take
"	63-68					No Take	No Take
"	36-68					No Take	No Take
MW-10R	10.6-20.9	2E-03	1E-03	2E-03	1E-03		
"	8.1-10.6					Pump Capacity	Pump Capacity
"	13.1-20.9					8E-04	4E-04
MW-11R	14.5-23.6	3E-02	2E-02	3E-02	1E-02		
"	11.5-14.6					No Take	No Take
"	17.3-23.6					2E-03	9E-04
MW-12R	13.2-24.1	1E-04	5E-05	3E-04	1E-04		
"	9-13.2					Packer did not seal	
"	16-19.1					No Take	No Take
"	19-24.1					No Take	No Take
"	12-24.1					No Take	No Take
MW-13R	10-20.7	3E-02	1E-02	3E-02	1E-02		
"	7.5-10					No Take	No Take
"	10-15					No Take	No Take
"	15-20.7					2E-04	5E-03
MW-14R	12-26.3	8E-05	4E-05	2E-04	9E-05		
"	7-12					Interval too weathered to test	
"	12-16.4					No Take	No Take
"	16-21.1					No Take	No Take
"	21-26.3					No Take	No Take

Note: "No Take" - No flow obtained during packer test.
"Pump Capacity" - A stable presure could not be obtained during packer test.

Table 3
Chem-Trol Remedial Investigation
Hamburg, New York
Summary of Water Level Elevation (1)

Monitoring Point	Date						
	12/16/92	1/25/93	3/12/93	5/17/93	8/5/93	12/16/93	6/16/94
Overburden							
PVC Well	639.2	639.0	639.0	637.1	632.1		abandoned
P-1S	637.2	637.4	637.1	635.1	632.2	636.7	635.4
P-2S	637.2	637.6	637.2	635.3	632.2	636.9	635.2
P-3S	621.8	621.9	621.5	621.3	620.7	622.0	621.4
P-4S	621.9	622.3	621.4	621.0	620.5	622.2	621.0
P-5S	627.0	628.2	627.0	624.8	dry (623.8)	627.2	624.9
MW-1S	638.0	638.3	638.0	636.0	631.6	637.7	636.1
MW-2S	637.5	637.8	637.4	635.5	632.7	637.1	636.0
MW-3S	621.8	622.1	621.5	621.0	620.3	621.7	621.3
MW-4S	618.2	623.4	622.7	622.3	dry (621.5)	623.6	622.6
MW-5S	624.9	625.8	624.0	623.6	622.2	625.5	623.7
MW-6S	629.6	630.2	629.6	628.2	626.3	629.5	628.2
MW-7S	638.6	638.9	638.5	636.3	634.0	638.0	636.3
MW-8S	613.7	612.1	611.5	610.3	dry (609.4)	611.6	610.5
MW-9S	614.1	614.8	613.6	611.3	610.4	613.2	611.6
MW-10S	612.3	612.0	611.7	609.9	608.9	611.7	609.8
MW-12S							612.3
Bedrock							
P-2R	636.6	636.7	636.3	634.5	631.7	635.9	634.8
P-3R	619.2	619.5	619.6	619.8	619.8	619.2	619.9
P-5R	620.4	620.2	619.5	618.7	618.1	618.8	618.7
MW-1R	637.2	637.5	637.1	635.2	632.4	636.7	635.7
MW-4R	612.0	611.7	611.2	610.0	609.0	611.2	610.1
MW-6R	621.5	621.4	620.8	620.2	619.4	620.3	620.3
MW-7R	637.9	637.9	637.5	635.8	633.7	637.3	635.9
MW-8R	611.6	611.2	610.5	609.4	608.7	610.2	609.5
MW-9R	612.4	612.4	611.8	610.6	609.7	611.6	610.9
MW-9RD							614.3
MW-10R	611.3	611.4	610.6	609.5	608.7	610.6	609.5
MW-11R	620.7	620.5	619.7	619.2	618.5	Not Accesible	619.2
MW-12R							611.7
MW-13R							609.2
MW-14R							611.3
Surface Water							
SG-1						609.0	destroyed
SG-2						609.6	destroyed
Smokes Creek at TBM-3(2)					609.0		
Smokes Creek Opposite MW-13R(3)							609.1
Smokes Creek Opposite MW-14R(3)							611.3

Notes: (1) Elevations shown were calculated based on measurements and are referenced to NGVD.
(2) Elevation in South Branch of Smokes Creek at TBM-3 measured by GZA on 8/11/93 and 8/20/93.
(3) Elevations in South Branch of Smokes Creek opposite monitoring wells measured by McIntosh & McIntosh on June 16, 1994.

Table 4
Chem-Trol Remedial Investigation
Hamburg, New York
Summary of Monitoring Well Samples

Sample Location	Date	Sample Device	Sample Code	Duplicate Sample	Matrix Spike/ Matrix Spike Dulicate	Remarks
MW-1S	8/11/93	Bailer	CT-08113-1S-GWS			
	05/31/94	Bailer	MW-1S			VOCs and Semi-VOCs only
MW-1R	8/12/93	Bailer	CT-08123-1R-GWS			
	05/31/94	Bailer	MW-1R		MW-1S-MS/MSD	VOCs and Semi-VOCs only
MW-2S	8/10/93	Bailer	CT-08103-2S-GWS			
MW-3S	8/19/93	Bailer	CT-08193-3S-GWS			NYSDEC Split Sample.
MW-4S						Well dry.
MW-4R	8/11/93	Bailer	CT-08163-4R-GWS			
MW-5S	8/11/93	Bailer	CT-08113-5S-GWS			Sampled VOC and Metals
	8/13/93	Bailer	CT-08133-5S-GWS			Sampled PCB/Pest Sulfate and Chloride
	8/19/93	Bailer	CT-08193-MW-5S-GWS			Sampled Semi-VOC
MW-6S	8/11/93	Bailer	CT-08113-6S-GWS			Sampled VOC, Metals, Sulf. and Chlor.
	8/13/93	Bailer	CT-08133-6S-GWS			Sampled PCB/Pest and Semi-VOC
MW-6R	8/16/93	Bailer	CT-08163-6R-GWS			
MW-7S	8/12/93	Bailer	CT-08123-7S-GWS		CT-08123-7S-GWS	Sampled VOC, Metals, Sulf. and Chlor.
	8/16/93	Bailer	CT-08163-7S-GWS		CT-08163-7S-GWS	Sampled PCB/Pest and Semi-VOC
MW-7R	8/12/93	Bailer	CT-08123-7R-GWS			
MW-8S						Well dry.
MW-8R	8/16/93	Bailer	CT-08163-8R-GWS		CT-08163-8R-GWS	
	05/31/94	Bailer	MW-8R	DUP-1		VOCs and Semi-VOCs only
MW-9S	8/11/93	Bailer	CT-08113-9S-GWS	CT-08113-DUP-1		NYSDEC Split Sample.
MW-9R	8/13/93	Bailer	CT-08133-9R-GWS			
	05/31/94	Bailer	MW-9R			VOCs and S-VOCs only; NYSDEC split sample
MW-9RD	05/31/94	Bailer	MW-9RD			VOCs and S-VOCs only; NYSDEC split sample
MW-10S	8/11/93	Bailer	CT-08113-10S-GWS			Sampled VOC
	8/13/93	Bailer	CT-08133-10S-GWS			Sampled Metals
	8/16/93	Bailer	CT-08163-10S-GWS			Sampled Cyanide
	8/23/93	Bailer	CT-08233-10S-GWS			Sampled Semi-VOC, PCB/Pest., Sulf. and Chlor.
MW-10R	8/13/93	Bailer	CT-08133-10R-GWS	CT-08133-DUP-2		
MW-11R	8/13/93	Bailer	CT-08133-11R-GWS			
MW-12S	05/31/94	Bailer	MW-12S			VOCs and Semi-VOCs only
MW-12R	05/31/94	Bailer	MW-12R			VOCs and Semi-VOCs only
MW-13R	05/31/94	Bailer	MW-13R			VOCs and S-VOCs only; NYSDEC split sample
MW-14R	05/31/94	Bailer	MW-14R			VOCs and Semi-VOCs only

Notes: Table includes only those samples collected as part of the RI.

Table 6
Chem-Trol Remedial Investigation
Hamburg, New York
Summary of Surface Water and Surface Water Sediment Samples

Sample Location	Date	Sample Device	Surface Water Sample Code	urface Water Sedimen Sample Code	Duplicate Sample	Matrix Spike/ Matrix Spike Dulicate	Remarks
SW/SWS-1	8/19/93	Stainless Cup	CT-08193-SW-1	CT-08193-SWS-1			
SW/SWS-2	8/19/93	Stainless Cup	CT-08193-SW-1	CT-08193-SWS-1			
SW/SWS-3	8/18/93	Stainless Cup		CT-08183-SWS-3			Suface Water not available.
SW/SWS-4	8/18/93	Stainless Cup	CT-08183-SW-4	CT-08183-SWS-4			
SW/SWS-5	8/18/93	Stainless Cup	CT-08183-SW-5	CT-08183-SWS-5			
SW/SWS-6	8/18/93	Stainless Cup	CT-08183-SW-6	CT-08183-SWS-6		CT-08183-SWS-6	
SW/SWS-7	8/18/93	Stainless Cup	CT-08183-SW-7	CT-08183-SWS-7			
SW/SWS-8	8/18/93	Stainless Cup	CT-08183-SW-8	CT-08183-SWS-8	CT-08183-DUP1-SWS		NYSDEC Split Sample - SW
SW/SWS-9	8/18/93	Stainless Cup	CT-08183-SW-9	CT-08183-SWS-9	CT-08183-DUP1-SW		
SW/SWS-10	8/18/93	Stainless Cup	CT-08183-SW-10	CT-08183-SWS-10			NYSDEC Split Sample - SWS
SW/SWS-11	8/18/93	Stainless Cup	CT-08183-SW-11	CT-08183-SWS-11		CT-08183-SW-11	
SW/SWS-12	8/18/93	Stainless Cup	CT-08183-SW-12	CT-08183-SWS-12			

Table 6
Chem-Trol Remedial Investigation
Hamburg, New York
Summary of Soil Samples

Sample Location	Date	Sample Device	Sample Code	Duplicate Sample	Matrix Spike/ Matrix Spike Dulicate	Remarks
Floodplain Sediment Samples						
FPS-3	8/20/93	Stainless Auger	CT-08203-FPS-3		CT-08203-FPS-3	
FPS-4	8/20/93	Stainless Auger	CT-08203-FPS-4	CT-08203-FPS-DUP1		NYSDEC Split Sample.
FPS-5	8/19/93	Stainless Auger	CT-08193-FPS-5			
FPS-6	8/20/93	Stainless Auger	CT-08203-FPS-6			
Background Soil Samples						
BS-1	8/19/93	Stainless Auger	CT-08193-BS-1			
BS-2	8/20/93	Stainless Auger	CT-08203-BS-2			
BS-3	8/20/93	Stainless Auger	CT-08203-BS-3			
Soil Samples						
SS-1	8/20/93	Stainless Auger	CT-08203-SS-1			
SS-2	8/20/93	Stainless Auger	CT-08203-SS-2			

TABLE 7
Chem-Trol
Remedial Investigation
Target Compound List for ASP91

CAS Number	Parameter	Contract Required Quantitation Limits	
		Water (ug/l)	Low Soil/Sediment (ug/kg)
	Volatile Organic Compounds		
74-87-3	Chloromethane	10	10
74-83-9	Bromomethane	10	10
75-01-4	Vinyl chloride	10	10
75-00-3	Chloroethane	10	10
75-09-2	Methylene chloride	5	5
67-64-1	Acetone	10	10
75-15-0	Carbon Disulfide	5	5
75-35-4	1,1-Dichloroethene	5	5
75-34-3	1,1-Dichloroethane	5	5
540-59-0	1,2-Dichloroethene(Total)	5	5
67-66-3	Chloroform	5	5
107-06-2	1,2-Dichloroethane	5	5
78-93-3	2-Butanone	10	10
71-55-6	1,1,1-Trichloroethane	5	5
56-23-5	Carbon Tetrachloride	5	5
75-27-4	Bromodichloromethane	5	5
78-87-5	1,2-Dichloropropane	5	5
10061-01-5	cis-1,3-Dichloropropene	5	5
79-01-6	Trichloroethene	5	5
124-48-1	Dibromochloromethane	5	5
79-00-5	1,1,2-Trichloroethane	5	5
71-43-2	Benzene	5	5
10061-02-6	trans-1,3-Dichloropropene	5	5
75-25-2	Bromoform	5	5
108-10-1	4-Methyl-2-Pentanone	10	10
591-78-6	2-Hexanone	10	10
127-18-4	Tetrachloroethene	5	5
79-34-5	1,1,2,2-Tetrachloroethane	5	5
108-88-3	Toluene	5	5
108-90-7	Chlorobenzene	5	5
100-41-4	Ethylbenzene	5	5
100-42-5	Styrene	5	5
1330-20-7	Xylene (total)	5	5
	Semi-Volatile Organic Compounds		
108-95-2	Phenol	10	330
111-44-4	bis(2-Chloroethyl) Ether	10	330
95-57-8	2-Chlorophenol	10	330
541-73-1	1,3-Dichlorobenzene	10	330
106-46-7	1,4-Dichlorobenzene	10	330
95-50-1	1,2-Dichlorobenzene	10	330
95-48-1	2-Methylphenol	10	330
	2,2'-oxybis (1-Chloropropane)		
106-44-5	4-Methylphenol	10	330
621-64-7	N-Nitroso-Di-n-Propylamine	10	330
67-72-1	Hexachloroethane	10	330
98-95-3	Nitrobenzene	10	330
78-59-1	Isophorone	10	330
88-75-5	2-Nitrophenol	10	330
105-67-9	2,4-Dimethylphenol	10	330
111-91-1	bis(2-Chloroethoxy)Methane	10	330
120-83-2	2,4-Dichlorophenol	10	330
120-82-1	1,2,4-Trichlorobenzene	10	330
91-20-3	Naphthalene	10	330
106-47-8	4-Chloroaniline	10	330
87-68-3	Hexachlorobutadiene	10	330

TABLE 7
Chem-Trol
Remedial Investigation
Target Compound List for ASP91

CAS Number	Parameter	Contract Required Quantitation Limits	
		Water (ug/l)	Low Soil/Sediment (ug/kg)
	Semi-Volatile Organic Compounds		
59-50-7	4-Chloro-3-Methylphenol	10	330
91-57-6	2-Methylnaphthalene	10	330
77-47-4	Hexachlorocyclopentadiene	10	330
88-06-2	2,4,6-Trichlorophenol	10	330
95-95-4	2,4,5-Trichlorophenol	50	1600
91-58-1	2-Chloronaphthalene	10	330
88-74-4	2-Nitroaniline	50	1600
131-11-3	Dimethyl Phthalate	10	330
208-66-8	Acenaphthylene	10	330
606-20-2	2,6-Dinitrotoluene	10	330
99-09-2	3-Nitroanilene	10	330
83-32-9	Acenaphthene	10	330
51-28-5	2,4-Dinitrophenol	50	1600
100-02-07	4-Nitrophenol	50	1600
132-64-9	Dibenzofuran	10	330
121-14-2	2,4-Dinitrotoluene	10	330
84-66-2	Diethylphthalate	10	330
7005-72-3	4-Chlorophenyl-phenyl ether	10	330
86-73-7	Fluorene	10	330
100-01-6	4-Nitroaniline	50	1600
534-62-1	4,6-Dimitro-2-Methyphenol	50	1600
86-30-6	N-Nitrosodiphenylamine (1)	10	330
101-55-3	4-Bromophenyl-phenylether	10	330
118-74-1	Hexachlorobenzene	10	330
87-86-5	Pentachlorophenol	50	1600
85-01-8	Phenanthrene	10	330
120-12-7	Anthracene	10	330
	Carbazole	10	330
84-74-2	Di-n-Butylphthalate	10	330
206-44-0	Fluoranthene	10	330
129-00-0	Pyrene	10	330
85-68-7	Butylbenzylphthalate	10	330
91-94-1	3,3'-Dichlorobenzidine	20	660
56-55-3	Benzo (a) Anthracene	10	330
218-01-9	Chrysene	10	330
117-81-7	Bis (2-Ethylhexyl) Phthalate	10	330
117-84-0	Di-n-Octyl Phthalate	10	330
205-99-2	Benzo (b) Fluoranthene	10	330
207-08-9	Benzo (k) Fluoranthene	10	330
50-32-8	Benzo (a) Pyrene	10	330
193-39-5	Indeno (1,2,3-cd) Pyrene	10	330
53-70-3	Dibenzo (a,h) Anthracene	10	330
191-24-2	Benzo(g,h,i) Perylene	10	330
	Pesticides		
319-84-6	alpha-BHC	0.05	8.0
319-85-7	beta-BHC	0.05	8.0
319-86-8	delta-BHC	0.05	8.0
58-89-9	gamma-BHC	0.05	8.0
76-44-8	Heptachlor	0.05	8.0
309-00-2	Aldrin	0.05	8.0
1024-57-3	Heptaclor Epoxide	0.05	8.0
959-98-8	Endosulfan I	0.05	8.0
60-57-1	Dieldrin	0.10	16.0
72-55-9	4,4'-DDE	0.10	16.0
72-20-8	Endrin	0.10	16.0
33213-65-9	Endosulfan II	0.10	16.0
72-54-8	4,4'-DDD	0.10	16.0

TABLE 7
Chem-Trol
Remedial Investigation
Target Compound List for ASP91

CAS Number	Parameter	Contract Required Quantitation Limits	
		Water (ug/l)	Low Soil/Sediment (ug/kg)
	Pesticides		
50-29-3	4,4'-DDT	0.10	16.0
72-43-5	Methoxychlor	0.5	80.0
53594-70-5	Endrin Ketone	0.10	16.0
	Endrin Aldehyde		
5103-71-9	alpha-Chlordane	0.5	80.0
5103-74-2	gamma-Chlordane	0.5	80.0
8001-35-2	Toxaphene	1	160.0
	PCB's		
12674-11-2	Aroclor-1016	0.5	80.0
11104-28-2	Aroclor-1221	0.5	80.0
11141-16-5	Aroclor-1232	0.5	80.0
53469-21-9	Aroclor-1242	0.5	80.0
12672-29-6	Aroclor-1248	0.5	80.0
11097-69-1	Aroclor-1254	1	160.0
11096-82-5	Aroclor-1260	1	160.0
	Metals		
	Aluminum	200	2000
	Antimony	60	60000.0
	Arsenic	10	1000.0
	Barium	200	20000
	Berylium	5	500
	Cadmium	5	500
	Calcium	5000	500000
	Chromium	10	1000.0
	Cobalt	50	5000.0
	Copper	25	2500.0
	Iron	100	10000
	Lead	5	500
	Magnesium	5000	500000
	Manganese	15	1500
	Mercury	0.2	100
	Nickel	40	4000.0
	Potassium	5000	500000
	Selenium	5	500
	Silver	10	1000.0
	Sodium	5000	500000
	Thallium	10	1000.0
	Venadium	50	5000.0
	Zinc	20	2000.0
	Cyanide	10	500

Notes: (1) Medium Contract Required Quantitation Limits for Volatile TCL Compounds are 125 times the individual low Soil/Sediment CRQL.
(2) Medium Soil/Sediment Contract Required Quantitation Limits for Semi-Volatile TCL Compounds are 60 times the individual Low Soil/Sediment CRQL.
(3) Medium Soil/Sediment Contract Required Quantitation Limits for PCB/Pesticide TCL Compounds are 15 times greater the individual Low Soil/Sediment CRQL.
(4) Specific quantitation limits are highly matrix dependent. The quntitation limits listed herein are provided for guidance and may not always be achievable.
(5) Quantitation limits for soil/sediments are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry wight basis, as required by the contract, will be higher.
(6) Cannot be separated from Diphenylamine.

Table 8
Chem-Trol Remedial Investigation
Hamburg, New York
Temperature and Precipitation

(Recorded in the period 1951-77 at Buffalo, New York)

	Temperature					Precipitation				
Month	Average Daily Maximum (F)	Average Daily Minimum (F)	Average Daily (F)	2 Years in 10 Will Have Maximum Temperature Higher Than (F)	2 Years in 10 Will Have Minimum Temperature Lower Than (F)	Average (in)	2 Years in 10 Will Have Less Than (in)	2 Years in 10 Will Have More Than (in)	Average Number of Days with < = 0.1 inch or More (in)	Average Snowfall (in)
January	30.5	17.3	23.9	58	-6	2.85	1.85	3.74	10	24.5
February	32.6	18.5	25.6	59	-5	2.5	1.44	3.36	8	18.2
March	40.8	25.8	33.3	74	5	3	1.86	4.01	9	13
April	54.6	36.3	45.5	82	20	3.12	2.21	3.95	9	3.6
May	65.8	46.1	56	87	31	2.95	1.82	3.95	7	0.1
June	76.1	56.6	66.3	92	41	2.64	1.18	3.82	6	0
July	80.3	61.3	70.8	93	48	2.97	1.71	3.98	6	0
August	78.4	59.5	69	91	44	4.12	2.28	5.62	7	0
September	71.3	52.8	62.1	89	35	3.2	1.71	4.42	7	0
October	60.6	43.1	51.9	82	25	2.8	0.98	4.24	7	0.4
November	47	33.8	40.4	71	12	3.72	2.79	4.58	10	13.5
December	35.1	22.9	29	64	-1	3.44	2.36	4.42	10	23.4
Yearly Average Total	56.1	39.5	47.8			37.31	32.61	41.83	96	96.7

Reference: United States Soil Conservation Service, "Soil Survey of Erie County, New York", December, 1986.

Table 9
Chem-Trol
Remedial Investigation
Summary of Groundwater Analytical Test Results

Parameter	MW-1R 8/8/90	Q	MW-1R 8/12/93	Q	MW-1R 8/1/94	Q	MW-1S 8/8/90	Q	MW-1S NYSDEC 8/8/90	SPLIT Q	MW-1S 8/11/93	Q	MW-1S 8/1/94	Q	MW-2S 8/8/90	Q	MW-2S 8/10/93	Q	MW-3S 8/8/90	Q	MW-3S 8/9/90	DUP Q	MW-3S NYSDEC 8/9/90	SPLIT Q
VOLATILE ORG. COMPOUNDS (ug/l)																								
Vinyl chloride																								
Chloroethene			5	J																				
Methylene Chloride																								
Acetone			15	J					7	J													36	J
Carbon Disulfide																								
1,1-Dichloroethene																								
1,1-Dichloroethene			3	J																				
1,2-Dichloroethene(Total)			24		26	J					1	J	1	J										
Chloroform																								
1,2-Dichloroethene																								
2-Butanone			9	J							8	J												
1,1,1-Trichloroethene															2	J								
Trichloroethene			540	D	1500		15		18		3	J	2	J					660		770		970	
1,1,2-Trichloroethene																								
Benzene																								
Tetrachloroethene																								
Toluene																			170		200		240	
Chlorobenzene																			22	J	24	J	32	J
Ethylbenzene																			12	J	15	J	11	J
m-Xylene																			38	J(2)	35	J(2)	52	(2)
o+p Xylene																			38	J(2)	35	J(2)	52	(2)
Chlorotoluene(1)							58	J											5100	J	20000	JD		
o-Chlorotoluene																								
m-Chlorotoluene																								
p-Chlorotoluene																								
SEMI-VOL. ORG. COMPOUNDS (ug/l)																								
2-Methylphenol																							8	J
4-Methylphenol															41									
Benzoic Acid																								
2,4-Dimethylphenol																								
4-Chloro-3-Methylphenol																			310		250		60	
Dibenzofuran																								
Diethylphthalate																			38		33		15	
Butylbenzylphthalate																							8	J
Bis (2-ethylhexyl) Phthalate							12		39										180		100			
Di-n-butylphthalate	5	J																	8	J	8	J		
PAHs (ug/l)																								
2-Methylnaphthalene																			51		48			
Naphthalene																			11		11			
Acenaphthene																								
Phenanthrene																			14		12			
Fluorene																								
Carbazole																								
Fluoranthene																								
Pyrene																								
PESTICIDES (ug/l)																								
Heptachlor					NT								NT											
Endosulfan Sulfate					NT								NT											
METALS (ug/l)																								
Aluminum	1130	*E	88.8	BN*J	NT		2220		2890		7520	N*J	NT		963	*E	1230	N*J	316		300		347	
Arsenic					NT		2.8	BJW			10		NT											
Barium	37.3	B	652		NT		85.4	BE			124	B	NT		101	B	115	B	203	E	207	E	200	
Cadmium					NT						0.2	B	NT											
Calcium	162000		144000	BN*J	NT		156000		163000		144000	BN*J	NT		143000		174000	BN*J	203000		206000		200000	
Chromium					NT		6	B					NT											
Copper					NT		8.3	B					NT						7.1	B	6.9	B		
Iron	1760	E	1730	N*J	NT		10600	E	9250		11800	N*J	NT		2920	E	2690	N*J	1610	E	1650	E	1380	
Lead					NT		2.4	B	3.2	BS	20	*J	NT										20.6	S
Magnesium	38600		19500	NJ	NT		35500		39600		27800	NJ	NT		31700		35300	NJ	53700		54500		61300	
Manganese	56.3		19.7	NJ	NT		407		387		221	NJ	NT		422		194	NJ	217		220		208	
Mercury					NT								NT											
Nickel					NT								NT											
Potassium	1220	BE	3060	B	NT		3980	B			4060	B	NT		1900	BE	1980	B	3760	B	3820	B		
Sodium	8200		13300	NJ	NT		36800		33600		97000	NJ	NT		13200		18000	NJ	15600		15700		15100	
Vanadium					NT		12	B					NT						12.4	B	11.9	B		
Zinc	23.9	J			NT		41.3	J					NT		21.2	J			18.3	BJ	13.9	BJ		
INORGANICS (mg/l)																								
Chloride	34.1		21		NT		35.8		37		25		NT		27.5		24		210		211.1		153	
Sulfate	224.9		118		NT		215		247		149		NT		133		152		168		164		218	

Note:1. (1) Chlorotoluene reported as a tentatively identified compound (TIC) for 1990 and 1993 samples under the name of chloromethybenzene. The TIC concentration is considered to be a total of m,p,ando chlorotoluene isomers.
2. See appendix G for qualifier definitions.

Table 9
Chem-Trol
Remedial Investigation
Summary of Groundwater Analytical Test Results

Parameter	MW-3S 8/19/93	Q	MW-3S NYSDEC 8/19/93	SPLIT Q	MW-4R 8/9/90	Q	MW-4R NYSDEC 8/9/90	SPLIT Q	MW-4R 8/16/93	Q	MW-5S 8/15/90	Q	MW-5S 8/13/93	Q	MW-6R 8/9/90	Q	MW-6R 8/16/93	Q	MW-6S 8/15/90	Q	MW-6S 8/11/93	Q	MW-7R 8/12/93	Q
VOLATILE ORG. COMPOUNDS (ug/l)																								
Vinyl chloride			NT																					
Chloroethane			NT																					
Methylene Chloride			NT				1				3	J												
Acetone			NT		120		52																	
Carbon Disulfide																								
1,1-Dichloroethene			NT																					
1,1-Dichloroethene			NT						2	J											20			
1,2-Dichloroethene(Total)			NT		16		17		13						17		10				7	J		
Chloroform	260	J	NT				2				2	J												
1,2-Dichloroethane			NT																					
2-Butanone			NT										8	J							9	J		
1,1,1-Trichloroethane			NT																		3	J		
Trichloroethene	470	J	NT		4	J	4								4	J	1	J			29			
1,1,2-Trichloroethane			NT																					
Benzene			NT																					
Tetrachloroethene			NT				1																	
Toluene	120	J	NT		2	JB	1				8										2	J		
Chlorobenzene			NT																					
Ethylbenzene			NT		2	J	2																	
m-Xylene			NT		17	(2)	10	(2)																
o + p Xylene			NT		17	(2)	10	(2)																
Chlorotoluene(1)	130000	J	NT												58	JB								
o-Chlorotoluene																								
m-Chlorotoluene																								
p-Chlorotoluene																								
SEMI-VOL. ORG. COMPOUNDS (ug/l)																								
2-Methylphenol	18	J	NT																18	J				
4-Methylphenol			NT																36	J				
Benzoic Acid			NT																					
2,4-Dimethylphenol																								
4-Chloro-3-Methylphenol	270	D	NT						3	J														
Dibenzofuran			NT																					
Diethylphthalate	6	J	NT																					
Butylbenzylphthalate			NT																					
Bis (2-ethylhexyl) Phthalate			NT				28				4	JB							5	JB				
Di-n-butylphthalate			NT																					
PAHs (ug/l)																								
2-Methylnaphthalene	2	J	NT																					
Naphthalene	1	J	NT																					
Acenaphthene			NT																					
Phenanthrene			NT																					
Fluorene			NT																					
Carbazole			NT																					
Fluoranthene			NT																					
Pyrene			NT																					
PESTICIDES (ug/l)																								
Heptachlor																								
Endosulfan Sulfate																								
METALS (ug/l)																								
Aluminum	2390	*J	NT		4240		8490		1170	N*J	1130		250	N*J	6200		9520	N*J			135	N*	5460	N*J
Arsenic			NT		1.8	B									1.3	B					5	BW	5	B
Barium	172	B	NT		105	BJE			157	B	54.7	B	36.5	B	72.5	BE	249		23	BE			54.8	B
Cadmium			NT										0.2	B	0.2	B	0.2	B			0.2	B	0.2	BJ
Calcium	293000	BNJ	NT		121000		123000		152000	*J	3E+05		3E+05	BN*J	124000		235000	*J	1E+05		7E+05	N*	120000	BN*
Chromium			NT				16.6				271						13.7	*J	11				39.7	*J
Copper	31.9		NT		6	B					141				10.4	B			6	B				
Iron	7300	*J	NT		5360	JE	10200		1490	N*J	4100	E	1480	N*J	7960	E	11700	N*J	13200	E	2060	N*	7180	N*J
Lead			NT		7.9		7				7.1				4.5	BJ	3	*J					12.2	B*J
Magnesium	59100		NT		49200		58100		38400	NJ	60900		20400	NJ	39000		34100	NJ	28300		1E+05	NJ	16800	NJ
Manganese	468		NT		184		214		176	NJ	584		104	NJ	154		232	NJ	473		336	NJ	215	NJ
Mercury											0.1	B												
Nickel			NT		11.9	B					131				15.9	B					33.3	B		
Potassium	2460	B	NT		7580		9530		3830	B	15700		3300	B	5890		6640		7980		4380	B	4240	B
Sodium	47200		NT		62000		63200		66100	NJ	4E+05		75300	NJ	39800		65200	NJ	2E+05		2E+05	NJ	23000	NJ
Vanadium					14.5	B					14.2	B			17.6	B			4.9	B				
Zinc					14	BJ	24.5		89.1	*	62.4	J			20.2	J			41.7	J				
INORGANICS (mg/l)																								
Chloride	108	*	NT		105		105		113	*	465		30		67.2		107	*	237		49		251	*
Sulfate	197		NT		176		184		132		412		234		178		94		725		1550		154	

Note:1. (1) Chlorotoluene reported as a tentatively identified compound (TIC) for 1990 and 1993 samples under the name of chloromethybenzene. The TIC concentration is considered to be a total of m,p,ando chlorotoluene isomers.
2. See appendix G for qualifier definitions.

Table 9
Chem-Trol
Remedial Investigation
Summary of Groundwater Analytical Test Results

Parameter	MW-7S 8/12/93	Q	MW-8R 8/16/93	Q	MW-8R 6/1/94	Q	MW-8R 6/1/94	Q	DUP	MW-9S 8/11/93	Q	MW-9S 8/11/93	Q	DUP	MW-9S NYSDEC 8/11/93	SPLIT Q	MW-9R 8/13/93	Q	MW-9R 6/1/94	Q	MW-9RD 6/1/94	Q	MW-10R 8/13/93	Q	MW-10R 8/13/93	Q	DUP	MW-106 8/11/93-8/13/93	Q	MW-11R 8/13/93	Q
VOLATILE ORG. COMPOUNDS (ug/l)																															
Vinyl chloride					3	J	3	J							NT		3	J	1	J											
Chloroethene			26		52		51			200		190			NT		60		39												
Methylene Chloride					0.8	J	0.8	J							NT				26												
Acetone															NT		6	J			81										
Carbon Disulfide															NT																
1,1-Dichloroethene			30		66		67								NT		120	D	130												
1,1-Dichloroethene			160	D	380	DJ	370	D		68		51			NT		1000	D	860	D			2	J	2	J					
1,2-Dichloroethene(Total)			6	J	13		14								NT		52		24				3	J	3	J					
Chloroform					2	J	2	J							NT		2	J	130												
1,2-Dichloroethene															NT		2	J													
2-Butanone															NT		9	J										7	J		
1,1,1-Trichloroethene			130		580	D	520	D		2	J	1	J		NT		1300	D	2800	D			1	J	1	J					
Trichloroethene			30		170		160								NT		330	D	300	D			1	J	2	J					
1,1,2-Trichloroethene							0.9	J							NT		5	J	2	J											
Benzene															NT		1	J													
Tetrachloroethene					0.8	J	0.7	J							NT				4	J											
Toluene					4	J	4	J				1	J		NT		1	J	4	J	9	J	1	J	1	J					
Chlorobenzene															NT																
Ethylbenzene															NT						0.8	J									
m-Xylene							0.6	J(2)							NT				2	J(2)	7	J(2)									
o + p Xylene							0.6	J(2)							NT				2	J(2)	7	J(2)									
Chlorotoluene(1)															NT		150	J													
o-Chlorotoluene					4700	DJ	2500	DJ							NT				820	DJ											
m-Chlorotoluene															NT																
p-Chlorotoluene															NT																
SEMI-VOL. ORG. COMPOUNDS (ug/l)																															
2-Methylphenol							0.4	J							NT																
4-Methylphenol							0.4	J							NT																
Benzoic Acid															NT																
2,4-Dimethylphenol							0.2	J																							
4-Chloro-3-Methylphenol			5	J	14		4	J							NT								3	J	4	J					
Dibenzofuran										3	J	3	J		NT																
Diethylphthalate							0.2	J							NT				1	J											
Butylbenzylphthalate															NT																
Bis (2-ethylhexyl) Phthalate			4	J			0.6	J							NT																
Di-n-butylphthalate															NT						2	BJ									
PAHs (ug/l)																															
2-Methylnaphthalene										0.8	J				NT																
Naphthalene					1	J	1	J							NT				4	J											
Acenaphthene										3	J	3	J		NT																
Phenanthrene															NT																
Fluorene										4	J	4	J		NT																
Carbazole										5	J	5	J		NT				0.4	J											
Fluoranthene										2	J	3	J		NT																
Pyrene										1	J	2	J		NT																
PESTICIDES (ug/l)																															
Heptachlor	0.013	JP			NT		NT												NT		NT										
Endosulfan Sulfate	0.016	JP			NT		NT												NT		NT										
METALS (ug/l)																															
Aluminum	366	N*J	662	*J	NT		NT			1070	N*J	2070	N*J		NT		143	BN*J	NT		NT		2630	N*J	2220	N*J		7250	N*J	3540	N*J
Arsenic					NT		NT			9	B	8	B		NT				NT		NT							10			
Barium	34	B	80.7	B	NT		NT			136	B	128	B		NT		87.4	B	NT		NT		79.1	B	76.5	B		129	B	104	B
Cadmium					NT		NT					0.3	B		NT				NT		NT							0.5	B	0.3	B
Calcium	88400	N*J	108000	BNJ	NT		NT			14700	BN*J	1E+05	BN*J		NT		226000	BN*J	NT		NT		130000	BN*J	127000	BN*J		300000	BN*J	142000	BN*J
Chromium	21	*			NT		NT								NT				NT		NT							11.4	*J		
Copper			5.4	B	NT		NT								NT				NT		NT										
Iron	1070	N*J	1250	*J	NT		NT			8300	N*J	9810	N*J		NT		1930	N*J	NT		NT		2370	N*J	2400	N*J		16300	N*J	4600	N*J
Lead	3	*J			NT		NT			2	B*J	5	*J		NT				NT		NT		3	*J	2	B*J		7	*J	10	*J
Magnesium	15700	NJ	19900		NT		NT			22900	NJ	21900	NJ		NT		38500	NJ	NT		NT		32900	NJ	31500	NJ		24900	NJ	37900	NJ
Manganese	199	NJ	472		NT		NT			1340	NJ	1220	NJ		NT		1160	NJ	NT		NT		95.8	NJ	92.5	NJ		2190	NJ	67.9	NJ
Mercury					NT		NT								NT				NT		NT										
Nickel					NT		NT								NT				NT		NT							33.6	B		
Potassium	4020	B	4510	B	NT		NT			15400		14900			NT		5650		NT		NT		4300	B	4000	B		6970		6030	
Sodium	31700	NJ	67800		NT		NT			67600	NJ	66400	NJ		NT		35100	NJ	NT		NT		59400	NJ	56800	NJ		46000	NJ	54000	NJ
Vanadium					NT		NT								NT				NT		NT										
Zinc			22.2		NT		NT					40.6	*J		NT				NT		NT										
INORGANICS (mg/l)																															
Chloride	30	*	145	*	NT		NT			129	*	132	*		NT		84		NT		NT		99	*	96	*		90		93	
Sulfate	74		104		NT		NT			11		9.7			NT		98		NT		NT		62		64			179		82	

Note:1. (1) Chlorotoluene reported as a tentatively identified compound (TIC) for 1990 and 1993 samples under the name of chloromethybenzene. The TIC concentration is considered to be a total of m,p,ando chlorotoluene isomers.

2. See appendix G for qualifier definitions.

Table 9
Chem-Trol
Remedial Investigation
Summary of Groundwater Analytical Test Results

Parameter	MW-12R 5/31/94	Q	MW-12S 5/31/94	Q	MW-13R 5/31/94	Q	MW-14R 5/31/94	Q
VOLATILE ORG. COMPOUNDS (ug/l)								
Vinyl chloride					2	J		
Chloroethane	24		22		22			
Methylene Chloride					1	J		
Acetone			93					
Carbon Disulfide			2	J	26			
1,1-Dichloroethene	2	J	1	J	270	D		
1,1-Dichloroethane	32		54		6	J		
1,2-Dichloroethene(Total)					9	J		
Chloroform								
1,2-Dichloroethane								
2-Butanone			15					
1,1,1-Trichloroethane	34		19		280	D		
Trichloroethene					49			
1,1,2-Trichloroethane								
Benzene					2	J		
Tetrachloroethene					0.5	J		
Toluene	0.9	J			7	J		
Chlorobenzene								
Ethylbenzene								
m-Xylene					4	J(2)		
o + p Xylene					4	J(2)		
Chlorotoluene(1)								
o-Chlorotoluene					1700	DJ		
m-Chlorotoluene								
p-Chlorotoluene								
SEMI-VOL. ORG. COMPOUNDS (ug/l)								
2-Methylphenol			4	J				
4-Methylphenol								
Benzoic Acid								
2,4-Dimethylphenol								
4-Chloro-3-Methylphenol					9	J		
Dibenzofuran								
Diethylphthalate								
Butylbenzylphthalate								
Bis (2-ethylhexyl) Phthalate			1	J				
Di-n-butylphthalate								
PAHs (ug/l)								
2-Methylnaphthalene					0.5	J		
Naphthalene			10	J				
Acenaphthene			0.4	J				
Phenanthrene			2	J				
Fluorene			0.7	J				
Carbazole			0.9	J				
Fluoranthene								
Pyrene								
PESTICIDES (ug/l)								
Heptachlor	NT		NT		NT		NT	
Endosulfan Sulfate I	NT		NT		NT		NT	
METALS (ug/l)								
Aluminum	NT		NT		NT		NT	
Arsenic	NT		NT		NT		NT	
Barium	NT		NT		NT		NT	
Cadmium	NT		NT		NT		NT	
Calcium	NT		NT		NT		NT	
Chromium	NT		NT		NT		NT	
Copper	NT		NT		NT		NT	
Iron	NT		NT		NT		NT	
Lead	NT		NT		NT		NT	
Magnesium	NT		NT		NT		NT	
Manganese	NT		NT		NT		NT	
Mercury	NT		NT		NT		NT	
Nickel	NT		NT		NT		NT	
Potassium	NT		NT		NT		NT	
Sodium	NT		NT		NT		NT	
Vanadium	NT		NT		NT		NT	
Zinc	NT		NT		NT		NT	
INORGANICS (mg/l)								
Chloride	NT		NT		NT		NT	
Sulfate	NT		NT		NT		NT	

Note:1. (1) Chlorotoluene reported as a tentatively identified compound (TIC) for 1990 and 1993 samples under the name of chloromethylbenzene. The TIC concentration is considered to be a total of m,p, and o chlorotoluene isomers.
2. See appendix G for qualifier definitions.

Table 10
Chem-Trol
Remedial Investigation
Summary of Background Soils Analytical Test Results

Parameter	BS-1 8/20/93	Q	BS-2 8/20/93	Q	BS-3 8/20/93	Q	95% Conf. Limit	Eastern USA Ranges
Metals (mg/kg)								
Aluminum	9980		14500		10700		16653	33000
Arsenic	6.2		6.1		5.3		8	3-12
Barium	59.4		40.1	B	46.7		69	15-600
Cadmium	0.4	B	0.19	B	0.57	BS	0.77	0.1-1
Calcium	50200	B*J	11800	B*J	2330	*J	72865	130-35000
Chromium	21.7		16		13.1		26	1.5-40
Cobalt	11.8	B	6.7	B	6	B	15	2.5-60
Copper	37.9	N*J					55	1-50
Iron	25300		26000		18900		31337	2000-550000
Lead			43.6	*+J	60.4	*J	97	**
Magnesium	5920	*	2300	*	1700	*	7938	100-5000
Manganese	678	*	205	*	295	*	902	50-5000
Nickel	38.4		17.7		14.7		50	0.5-25
Potassium	1280	B	887	B	837	B	1493	8500-43000
Silver					0.12	BWJ	0.06	none available
Vanadium	15.6		27.9		23.5		35	1-300
Zinc	156	*J	89.3	*J	106	*J	188	34607

Note: See Appendix G for Qualifier Definitions
Eastern USA ranges as published in NYSDEC TAGM 4046.
+ Indicates value specific to New York State.
** Background levels vary widely. Average levels in rural, undeveloped areas may range from 4-61 ppm. Average levels in metropolitan or suburban areas or near highways are much higher and typically range from 200 to 500 ppm.
95% Conf. Limit = 95% upper confidence limit which assumes a normal distribution of the data. A value of one half the matrix detection limit was used in the calculation if the metal was not detected.

Table 11
Chem-Trol
Remedial Investigation
Summary of Soil Sample Analytical Test Results

Parameter	SSI-1 8/2/90 5-5.3'	Q	SSI-1 8/2/90 NYSDEC	SPLIT Q	SSI-2 8/2/90 4-6'	Q	SSI-3 8/3/90 4-4.5'	Q	SSI-4 8/3/90 4-4.5'	Q	SD-1 8/2/90 0-4"	Q	SD-2 8/2/90 0-4"	Q	SPMW-1 6-8'	Q	SPMW-2 4-6'	Q	SPMW-2 Dup 4-6'	Q
VOLATILE ORG. COMPOUNDS (ug/kg)																				
Chloroethane																				
Methylene Chloride			8000	B	210	JB	5	JB			4	JB	17	B	870	B	4	J	4	J
Acetone													20	B			13			
Carbon Disulfide																				
1,1-Dichloroethene																				
1,1-Dichloroethane																				
Total 1,2 Dichloroethenes																				
Chloroform	14000		34000								2	JB	8	B						
1,2-Dichloroethane																				
2-Butanone																				
1,1,1-Trichloroethane																				
Carbon Tetrachloride																				
1,2 Dichloropropane																				
Trichloroethene	500	J			3000	J					2	JB	4	JB	8700					
1,1,2-Trichloroethane																				
Benzene											4	JB	7	B						
4 Methyl 2 Pentanone																				
2-Hexanone																				
Tetrachloroethene																				
1,1,2,2-Tetrachloroethane																				
Toluene					1200	J							11				3	J		
Chlorobenzene																	2	J		
Ethylbenzene					4000	J														
m-xylene					18000	J(2)					10	JB(2)	20	(2)						
o-p xylene					18000	J(2)					10	JB(2)	20	(2)						
Chlorotoluene	180000	J	370000	J	13000	J	11	J			11	J	11	BJ			23000	J	13000	J
SEMI-VOL. ORG. COMPOUNDS (ug/kg)																				
Phenol					120000	D					51	J								
2-Chorophenol																				
1,3-Dichlorobenzene					500	J														
1,4-Dichlorobenzene					520	J														
2-Methylphenol					14000															
4-Methylphenol					52000															
Hexachloroethane																				
Isophorone											66	J								
2,4-Dimethylphenol					35000															
Benzoic Acid	600	J																		
1,2,4-Trichlorobenzene					150000															
Hexachlorobutadiene																				
4-Chloro-3-methylphenol																				
Dimethyl phthalate																				
Dibenzofuran					150	J														
Diethylphthalate																				
Hexachlorobenzene					21000		94	J			940									
Di-n-butylphthalate															57	JB	60	JB	76	JB
Butylbenzylphthalate																				
Bis (2-ethylhexyl) Phthalate	840				38000	B	680				940				350	JB	300	JB	330	JB
Di-n-octylphthalate																				
PAHs (ug/kg)																				
Naphthalene					17000															
2-Methylnaphthalene					10000															
Acenaphthylene																				
Acenaphthene																				
Fluorene																				
Phenanthrene													67	J						
Anthracene																				
Carbazole																				

Note: 1. See Appendix G for qualifier definitions.
2. Chlorotoluene detected as a tentatively identified compound (TIC) under the name chloromethylbenzene.

Table 11
Chem-Trol
Remedial Investigation
Summary of Soil Sample Analytical Test Results

Parameter	SSI-1 8/2/90 5-5.3'	Q	NYSDEC SSI-1 8/2/90 5-5.3'	Q	SSI-2 8/2/90 4-5'	Q	SSI-3 8/3/90 4-4.5'	Q	SSI-4 8/3/90 4-4.5'	Q	SD-1 8/2/90 0-4'	Q	SD-2 8/2/90 0-4'	Q	SPMW-1 8-8'	Q	SPMW-2 4-6'	Q	SPMW-2 Dup 4-6'	Q
Fluoranthene					420	J							110	J						
Pyrene					400	J							80	J						
Benzo (a) Anthracene																				
Chrysene													66	J						
Benzo (b) Fluoranthene													100	J						
Benzo (k) Fluoranthene																				
Benzo (a) Pyrene																				
Indeno (1,2,3-cd) Pyrene																				
Dibenz(a,h)anthracene																				
Benzo(g,h,i) Perylene																				
PESTICIDES (ug/kg)																				
alpha-BHC	32										40		33							
beta-BHC																				
delta-BHC					46000	D														
gamma-BHC					2600															
Aldrin																				
Heptachlor Epoxide																				
Endosulfan I																				
Dieldrin																				
4,4'-DDE																				
Endrin																				
4,4'-DDT	33																			
Methoxychlor																				
Endrin Ketone																				
Endrin Aldehyde																				
gamma-Chlordane																				
PCBs (ug/kg)																				
Aroclor 1242					1100000	D														
Aroclor-1248											2100									
Aroclor-1254					700000	D					1400		250							
Aroclor-1260													410							
METALS (mg/kg)																				
Aluminum	17400		16700	*	14600		17900	*	7070	*E	10400		14200		13800	J*	13200	J*	17900	J*
Antimony																				
Arsenic	13.6		13.3	NS	4.9		11.3		11.1		4.5		12.5		7.3		12	S	10.2	
Barium	98.5		84.4		72		73.4		55.7		83.3		90.7		79.9		81.9		100	
Beryllium	0.8	B			1.9		0.8	B	0.3	B	0.6	B	0.5	B	0.5	B	0.5	B	0.6	B
Cadmium	10.1	E	4.5		6.2	E	0.8	B	0.3	B	14.2	E	11.2	E	0.8	B	0.6	B	0.8	B
Calcium	3390		3300	*	88700		30500		38800		73100		33100		34800		20500		21100	
Chromium	20.5		21.8	*	65.2		68.7	*E	10.5	*E	44.9		125		16.7	J*E	16.6	J*E	22.2	J*E
Cobalt	13.5		12.8		5.1	B	8.9	B	9.3	B	10.1		8.7	B	13.8		14.2		14.3	
Copper	38.1		36.2	N*	230		688		33		86.9		132		30.8		34.7		42.4	
Iron	40400		35100		18400		41800		20600		57500		42900		31500		30900		38100	
Lead	15.7		19.4	S	65.7		15.9	N	15.7	N	17.3		50.3		14.3	N	20.1	N	20.4	JN
Magnesium	4780		5470	*	14900		5490	N	9800	N	14400		9810		9300	N	9290	N	11200	JN
Manganese	513		610		975		277	N	395	N	634		591		449	N	397	N	490	JN
Mercury	0.08	BN			0.3	N							0.09	BN						
Nickel	38.2		40.3	*	18.1		35		21		23.8		23.9		30.3		33.2		37.7	
Potassium	1220		1780		972	B	500	B	522	B	1350		1490		1200		1140		1400	
Selenium					0.9	BJW														
Silver					2.4						2.8		1.4	B						
Sodium	17.7	B			389	B	118	B	538	B	38.8	B	32.8	B	15.1	B	20.5	B	67.2	B
Thallium																	0.4	B		
Vanadium	31.8		31.3		22.8		34.3		17		27.1		32.8		20.4		20.3		31.8	
Zinc	91.8		84.7	N*E	91.7		84.1		58.9		89.2		108		82.5		85.1		98.2	
Cyanide					1.3								0.8	B						

Note: See Appendix G for Qualifier Definitions

Table 11
Chem-Trol
Remedial Investigation
Summary of Soil Sample Analytical Test Results

Parameter	SPMW-4 10-14'	Q	SS-1 8/20/93 0-6'	Q	SS-2 8/20/93 3I'	Q	N400 W200 2.5'	Q	N400 W200 NYSDEC	SPLIT Q	N400 W350 5'	Q	N400 W350 NYSDEC	SPLIT Q	N500 W100 7'	Q	N500 W100 NYSDEC	SPLIT Q	N500 W300 2.5'	Q
VOLATILE ORG. COMPOUNDS (ug/kg)																				
Chloroethane																				
Methylene Chloride	22	J					5	J	3	J									5	J
Acetone									8	JB					200		55	JB	440	D
Carbon Disulfide							4	J	2	J										
1,1-Dichloroethene	12	J					3	J	1	J										
1,1-Dichloroethane	10	J																		
Total 1,2 Dichloroethenes							4	J	3	J									7	J
Chloroform							8500	D	4500	D									8	J
1,2-Dichloroethane							3	J												
2-Butanone							8	J											130	
1,1,1-Trichloroethane							4	J												
Carbon Tetrachloride							1	J												
1,2-Dichloropropane							2	J												
Trichloroethene	350	J					1100	DJ	650	JD									8	J
1,1,2-Trichloroethane							53		52											
Benzene																			8	J
4-Methyl-2-Pentanone															88				77	
2-Hexanone																			10	
Tetrachloroethene			1	J			35000	D	22000	D	2	J	4	J					35	
1,1,2,2-Tetrachloroethane							100		90											
Toluene	88	J			6	J	17		10						9	J	14	J	140	B
Chlorobenzene	21	J																		
Ethylbenzene							15		23						130		55	J	68	B
m-xylene	10	(2)					170	(2)	280	(2)			5	(2)	900	(2)	200	(2)	210	(2)BD
o-p xylene	10	(2)					170	(2)	200	(2)			5	(2)	900	(2)	200	(2)	210	(2)BD
Chlorotoluene	130000	J					5800	J	5300	J					5400	J	850	NJ	1000	J
SEMI-VOL. ORG. COMPOUNDS (ug/kg)																				
Phenol																				
2-Chorophenol															130	J				
1,3-Dichlorobenzene																				
1,4-Dichlorobenzene							58	J												
2-Methylphenol							430													
4-Methylphenol									870	J										
Hexachloroethane							85	J												
Isophorone	31	J																		
2,4-Dimethylphenol							180	J	1300	J										
Benzoic Acid																				
1,2,4-Trichlorobenzene							110	J	180	J									180	J
Hexachlorobutadiene							130	J	260	J										
4-Chloro-3-methylphenol	130	J																		
Dimethyl phthalate																				
Dibenzofuran													82	J						
Diethylphthalate																				
Hexachlorobenzene			180	J	1800		2000	J	4100		110	J	250	J			78	J	2700	
Di-n-butylphthalate	81	JB							900	J										
Butylbenzylphthalate															49	J				
Bis (2-ethylhexyl) Phthalate	540	JB	640	B			1400	J	1500	JB	2200		270	JB	100	J	100	JB	720	
Di-n-octylphthalate																				
PAHs (ug/kg)																				
Naphthalene			30	J			110	J					160	J			85	J	83	J
2-Methylnaphthalene							190	J	340	J			82	J			27	J	110	J
Acenaphthylene											82	J	220	J						
Acenaphthene											24	J	59	J					18	J
Fluorene			32	J									73	J						
Phenanthrene			400								340	J	500				58	J	260	J
Anthracene			85	J							45	J	210	J						
Carbazole											28	J	85	J						

Note: 1. See Appendix G for qualifier definitions.
2. Chlorotoluene detected as a tentatively identified compound (TIC) under the name chloromethylbenzene.

Table 11
Chem-Trol
Remedial Investigation
Summary of Soil Sample Analytical Test Results

Parameter	SPMW-4 10-14'	Q	SS-1 8/20/93 0-6'	Q	SS-2 8/20/93 3I'	Q	N400 W200 2.5'	Q	N400 W200 NYSDEC	SPLIT Q	N400 W350 5'	Q	N400 W350 NYSDEC	SPLIT Q	N500 W100 7'	Q	N500 W100 NYSDEC	SPLIT Q	N500 W300 2.5'	Q
Fluoranthene			550		35	J					500		1200						91	J
Pyrene			490								360	J	940						120	J
Benzo (a) Anthracene			270	J							230	J	630							
Chrysene			280	J							250	J	630						75	J
Benzo (b) Fluoranthene			290	J							300	J	580							
Benzo (k) Fluoranthene			280	J							140	J	540							
Benzo (a) Pyrene			250	J							230	J	480							
Indeno (1,2,3-cd) Pyrene			150	J							210	J	370	J						
Dibenz(a,h)anthracene											39	J	37	J						
Benzo(g,h,i) Perylene			91	J							140	J	300	J						
PESTICIDES (ug/kg)																				
alpha-BHC																				
beta-BHC					3.3	JP														
delta-BHC																			29	J
gamma-BHC					1.5	J									2	J				
Aldrin					1.8	JP							120	P						
Heptachlor Epoxide			3.9	JP																
Endosulfan I			22												1.1	J				
Dieldrin			6.9	JP																
4,4'-DDE			17	JP					21	P										
Endrin			7.8	JP																
4,4'-DDT			6.2	JP					55	P			10	P	2.2	J				
Methoxychlor													13	JP						
Endrin Ketone			12	JP																
Endrin Aldehyde			5	JP																
gamma-Chlordane			24	P																
PCBs (ug/kg)																				
Aroclor 1242																				
Aroclor-1248			1300	P	170	JP	6300		13000	DC	1000		2900	DC	66	J			1600	
Aroclor-1254			630	P	30	JP	5600	J	2600	C	920	J	580	PC					750	J
Aroclor-1260			500	P	90	J			1400	PC			330	C						
METALS (mg/kg)																				
Aluminum	5120		12800		12600		NT		29100	*	NT		12800	*	NT		4570		NT	
Antimony							NT		7	BN	NT				NT				NT	
Arsenic	3.5		4.5		5.1		NT		8.6	*	NT		9.3	*	NT		3.8		NT	
Barium	30.1	B	98.5		44.3	B	NT		170	*	NT		78.7	*	NT		20.1	B	NT	
Beryllium	0.3	B					NT		5.5	*	NT		0.79	*	NT		0.53	B	NT	
Cadmium	3.7	E	0.26	B	0.19	B	NT				NT				NT				NT	
Calcium	81600		18000		154000		NT		170000	*	NT		38400	*	NT		261000		NT	
Chromium	8.7		20.2		53.5		NT		25.5	N*	NT		54.2	N*	NT		61.9		NT	
Cobalt	5.9	B	14.2		8.8	B	NT		3.8	B	NT		9.8		NT		9.3	B	NT	
Copper	14.5		7.3		36.9		NT		14.1	N*	NT		60.2	N*	NT		1390		NT	
Iron	12000		23800		19800		NT		7010	*	NT		96700	*	NT		71000		NT	
Lead	7.8		33.2		35.4	S	NT		91.2		NT		46.8		NT		7.8		NT	
Magnesium	27500		14800	EJ	4090	EJ	NT		54600	*	NT		5460	*	NT		2070		NT	
Manganese	298		869		350		NT		2940	*	NT		1170	*	NT		442		NT	
Mercury	0.05	BN			0.15		NT				NT		0.09	BN	NT				NT	
Nickel	13		27.1		17.4		NT		17.9	EN*	NT		35.8	EN*	NT		102		NT	
Potassium	894	B	1970		1440		NT		2380	*	NT		1100	*	NT		359	B	NT	
Selenium							NT		2	SN	NT		0.37	BWN	NT		0.24	BW	NT	
Silver	2.1						NT				NT				NT				NT	
Sodium	55.6	B					NT		1300		NT		203	B	NT		119	B	NT	
Thallium													0.36	B						
Vanadium	16.5		24.8		24.4		NT		11.3	*	NT		34.1	*	NT		14.3		NT	
Zinc	45.7		74.9		60.7		NT		66	N*	NT		80.4	N*	NT		70.6		NT	
Cyanide									2.9								2.9			

Note: See Appendix G for Qualifier Definitions

Table 11
Chem-Trol
Remedial Investigation
Summary of Soil Sample Analytical Test Results

Parameter	N600 W300 8'	Q	N650 W150 5'	Q	N300 W270 6'	Q	N300 W270 NYSDEC	SPLIT Q	N200 W200 5'	Q	N200 W200 NYSDEC	SPLIT Q	N100 W250 1.5'	Q	N250 W150 5'	Q	N77 W204 5'	Q	N150 W211 7'	Q	N200 E100 5'	Q	N400 W400 5'	Q
VOLATILE ORG. COMPOUNDS (ug/kg)																								
Chloroethane																			30					
Methylene Chloride					2	J			22										4	J				
Acetone					59		93		39								57		210					
Carbon Disulfide																								
1,1-Dichloroethene					3	J			210		36				220				61					
1,1-Dichloroethane					14				600	DJ	87				92				900	DJ				
Total 1,2 Dichloroethenes					160		25	J	650	DJ	140				13	J			10	J				
Chloroform					2	J			2	J					0.4	J			2	J			14	
1,2-Dichloroethane									2	J									18					
2-Butanone					13				10	J							20		190					
1,1,1-Trichloroethane					41				6800	D	540	D			250	D			7500	D				
Carbon Tetrachloride																								
1,2-Dichloropropane																								
Trichloroethene					640	D	140		2700	D	270				88				95				4	J
1,1,2-Trichloroethane									9	J					1	J			78					
Benzene					5	J			2	J														
4 Methyl-2 Pentanone					7	J	41	J	4	J									28					
2-Hexanone																								
Tetrachloroethene									2	J	9	J			11	J			13				32	
1,1,2,2-Tetrachloroethane																								
Toluene			0.5	J	28	B	48	J	12	B			3	BJ			2	J	3100	D				
Chlorobenzene																			0.8	J				
Ethylbenzene					63		190		0.8	J					2	J			2	J				
m-xylene					420	(2)	1500	(2)	8	J(2)			1	BJ(2)	8	J(2)	8	J(2)	21	(2)				
o-p xylene					420	(2)	1500	(2)	8	J(2)			1	BJ(2)	8	J(2)	8	J(2)	21	(2)				
Chlorotoluene																								
SEMI-VOL. ORG. COMPOUNDS (ug/kg)																								
Phenol																								
2-Chorophenol																								
1,3-Dichlorobenzene																								
1,4-Dichlorobenzene																								
2-Methylphenol																								
4-Methylphenol													65	J										
Hexachloroethane																								
Isophorone																								
2,4-Dimethylphenol																								
Benzoic Acid																								
1,2,4-Trichlorobenzene																	130	J						
Hexachlorobutadiene																								
4-Chloro-3-methylphenol																								
Dimethyl phthalate													31	J										
Dibenzofuran													88	J									100	J
Diethylphthalate									50	BJ														
Hexachlorobenzene																	230	J					370	J
Di-n-butylphthalate					45	J	400	B			730	B					130	J	91	J				
Butylbenzylphthalate	17	J			28	J	170	JB			210	JB	28000	D			22	J						
Bis (2-ethylhexyl) Phthalate	34	J	140	J	810		370	JB	180	BJ	360	JB			180	J	440		95	J	860		2900	D
Di-n-octylphthalate			83	J									10000	DJ										
PAHs (ug/kg)																								
Naphthalene					540		110	J					110	J									700	
2-Methylnaphthalene													99	J									110	J
Acenaphthylene													60	J									1100	
Acenaphthene													240	J									30	J
Fluorene													120	J									310	J
Phenanthrene													2000				60	J					2000	
Anthracene													1800										820	
Carbazole																							220	J

Note: 1. See Appendix G for qualifier definitions.
2. Chlorotoluene detected as a tentatively identified compound (TIC) under the name chloromethylbenzene.

Table 11
Chem-Trol
Remedial Investigation
Summary of Soil Sample Analytical Test Results

Parameter	N600 W300 8'	Q	N650 W150 5'	Q	N300 W270 5'	Q	N300 W270 NYSDEC	SPLIT	Q	N200 W200 5'	Q	N200 W200 NYSDEC	SPLIT	Q	N100 W250 1.5'	Q	N250 W150 5'	Q	N77 W204 5'	Q	N159 W211 7'	Q	N200 E100 5'	Q	N400 W400 5'	Q
Fluoranthene															2600				92	J					5500	D
Pyrene															2900	DJ									4100	D
Benzo (a) Anthracene																			40	J					2900	D
Chrysene															2700				72	J					2300	D
Benzo (b) Fluoranthene															2200				66	J					4300	D
Benzo (k) Fluoranthene															800										1400	
Benzo (a) Pyrene															950										3000	
Indeno (1,2,3-cd) Pyrene																									1400	
Dibenz(a,h)anthracene																									77	J
Benzo(g,h,i) Perylene																									30	J
PESTICIDES (ug/kg)																										
alpha-BHC																										
beta-BHC																										
delta-BHC																										
gamma-BHC																										
Aldrin																										
Heptaclor Epoxide																										
Endosulfan I																										
Dieldrin																										
4,4'-DDE																										
Endrin																										
4,4'-DDT																										
Methoxychlor																										
Endrin Ketone																										
Endrin Aldehyde																										
gamma-Chlordane																										
PCBs (ug/kg)																										
Aroclor 1242																			700						970	
Aroclor-1248																										
Aroclor-1254															2100	J										
Aroclor-1260			56	J															2500	PJ					660	PJ
METALS (mg/kg)																										
Aluminum	NT		NT		NT		14400			NT		16000			NT		NT		NT		NT		NT		NT	
Antimony	NT		NT		NT					NT					NT		NT		NT		NT		NT		NT	
Arsenic	NT		NT		NT		9.9			NT		9.4			NT		NT		NT		NT		NT		NT	
Barium	NT		NT		NT		66.7			NT		90.4			NT		NT		NT		NT		NT		NT	
Beryllium	NT		NT		NT		0.67			NT		0.93	B		NT		NT		NT		NT		NT		NT	
Cadmium	NT		NT		NT					NT		0.69	B		NT		NT		NT		NT		NT		NT	
Calcium	NT		NT		NT		2060			NT		4200			NT		NT		NT		NT		NT		NT	
Chromium	NT		NT		NT		19.1			NT		25			NT		NT		NT		NT		NT		NT	
Cobalt	NT		NT		NT		9.7			NT		16.2			NT		NT		NT		NT		NT		NT	
Copper	NT		NT		NT		35.4			NT		48.8			NT		NT		NT		NT		NT		NT	
Iron	NT		NT		NT		26300			NT		33000			NT		NT		NT		NT		NT		NT	
Lead	NT		NT		NT		14.2			NT		19.5			NT		NT		NT		NT		NT		NT	
Magnesium	NT		NT		NT		4050			NT		5330			NT		NT		NT		NT		NT		NT	
Manganese	NT		NT		NT		355			NT		667			NT		NT		NT		NT		NT		NT	
Mercury	NT		NT		NT					NT		0.05	B		NT		NT		NT		NT		NT		NT	
Nickel	NT		NT		NT		29.5			NT		56			NT		NT		NT		NT		NT		NT	
Potassium	NT		NT		NT		1170			NT		1420			NT		NT		NT		NT		NT		NT	
Selenium	NT		NT		NT					NT					NT		NT		NT		NT		NT		NT	
Silver	NT		NT		NT					NT					NT		NT		NT		NT		NT		NT	
Sodium	NT		NT		NT		77.5	B		NT		65.2	B		NT		NT		NT		NT		NT		NT	
Thallium							0.26	B				0.73	B													
Vanadium	NT		NT		NT		20.2			NT		24.8			NT		NT		NT		NT		NT		NT	
Zinc	NT		NT		NT		69.1			NT		108			NT		NT		NT		NT		NT		NT	
Cyanide																										

Note: See Appendix G for Qualifier Definitions

Table 12
Chem-Trol
Remedial Investigation
Summary of Surface Water Sample Analytical Test Results

Parameter	SW-1 7/31/90	Q	SW-1 8/19/93	Q	SW-2 8/1/90	Q	SW-2 8/1/90	DUP Q	SW-2 8/19/93	Q	SW-4 7/30/90	Q	SW-4 8/18/93	Q	SW-5 7/30/90	Q	SW-5 8/18/93	Q	SW-6 7/31/90	Q	SW-6 8/18/93	Q
SEMI-VOL. ORG. COMPOUNDS (ug/l)																						
Benzyl Alcohol					9	J																
2,4-Dimethylphenol																	0.7	J				
Diethylphthalate	2	J																				
Bis (2-ethylhexyl) phthalate	27				26		16												3	J		
Di-n-butylphthalate	6	J			5	J																
Di-n-octylphthalate							2	J														
PAHs (ug/l)																						
Fluoranthene																	0.6	J				
PESTICIDES (ug/l)																						
alpha-BHC																					0.006	JP
beta-BHC																					0.014	JP
METALS (ug/l)																						
Aluminum	447	*E			43.7	B*E	24.2	B*E			3580	*E			2870	*E			333	*E		
Arsenic											1.8	BJW			3	B						
Barium	46.7	B			53.3	B	56				47.6	B			53.6	B			48.6	B		
Calcium	72200				82900		86600				72300				52500				127000		68200	NJ
Chromium																	11.1					
Cobalt																						
Copper	8.3	B									8.9	B			10.4	B			10.4	B		
Iron	691	E	131	*J	215	JE	103	JE	126	*J	3130	E			4480	E	3730	*J	328	E		
Lead	2.7	BJW					2	B	2	BWNJ	12.8				8		8	N	2.7	B		
Magnesium	9920				12500		13100				10800				11800				10500			
Manganese	16.6				9.2	B	8.3	B			122				313				31.7			
Nickel															11.4	B						
Potassium	3610	BE			3300	B	3530	BE			6070	E			5050	E			5220	E		
Silver																						
Sodium	54200				57300		60800				98000				68100				76700			
Vanadium											10	B			42.6	B	49	B	7.1	B		
Zinc	19.5	BJ			11.6	BJ	9.5	BJ			48.8	J			54.4	J			31.1	J		
Cyanide																						
INORGANICS (mg/l)																						
Chloride	85.2		115	*	97.5		99		117	*	150		124	*	99		206	*	107		116	*
Sulfate	113		105		147		141		109		105		95		76		87		209		108	

Note: See Appendix G for Qulaifier Definitions.

Table 12
Chem-Trol
Remedial Investigation
Summary of Surface Water Sample Analytical Test Results

Parameter	SW-7 7/31/90	Q	SW-7 8/18/93	Q	SW-8 8/1/90	Q	SW-8 8/18/93	Q	SW-8 NYSDEC SPLIT	Q	SW-9 8/1/90	Q	SW-9 8/18/93	Q	SW-9 DUP 8/18/93	Q	SW-10 8/18/93	Q	SW-11 8/18/93	Q	SW-12 8/19/93	Q
SEMI-VOL. ORG. COMPOUNDS (ug/l)																						
Benzyl Alcohol																						
2,4-Dimethylphenol									NT													
Diethylphthalate									NT													
Bis (2-ethylhexyl) phthalate	43		0.5	J	31				NT		5	J			1	J						
Di-n-butylphthalate											3	J										
Di-n-octylphthalate																						
PAHs (ug/l)																						
Fluoranthene									NT													
PESTICIDES (ug/l)																						
alpha-BHC																	0.01	JP				
beta-BHC																						
METALS (ug/l)																						
Aluminum	260	*E			215	*E			NT		53	B*E										
Arsenic																						
Barium	41.1	B			54	B			NT		49.1	B									494	
Calcium	113000				129000				NT		74700											
Chromium			10						NT								30.7				99	
Cobalt									NT												21.2	B
Copper	5.3	B			8.4	B			NT		6.8	B									55.3	
Iron	313	E	678	*J	485				NT		92.5	B					617	*J			34300	*J
Lead	3.2	B	3	NJ	2.5	B			NT		2.3	B					3	NJ			94.4	N+J
Magnesium	11200				14500				NT		12100											
Manganese	73.5				277				NT		6.8	B									3850	
Nickel									NT												126	
Potassium	4420	BE			3940	BE			NT		3250	B										
Silver									NT						0.3	BWNJ						
Sodium	62400				69800				NT		56500											
Vanadium	10.4	B							NT												24.2	B
Zinc	34.3	J			33.9	J			NT		28	J									384	
Cyanide			13.6						NT										16.6			
INORGANICS (mg/l)																						
Chloride	88		137	*	112		124	*	NT		99		109	*	109	*	134	*	111	*	64	
Sulfate	167		97		194		104		NT		151		126		120		102		119		51	

Note: See Appendix G for Qulaifier Definitions.

Table 13
Chem-Trol
Remedial Investigation
Summary of Surface Water Sediment Sample Analytical Test Results

Parameter	SWS-1 8/1/90	Q	SWS-1 8/19/93	Q	SWS-2 8/1/90	Q	SWS-2 8/1/90 DUP	Q	SWS-2 8/19/93	Q	SWS-3 7/31/90	Q	SWS-3 8/18/93	Q	SWS-4 7/30/90	Q	SWS-4 8/18/93	Q	SWS-5 7/30/90	Q	SWS-5 8/18/93	Q	SWS-6 7/31/90	Q	SWS-6 8/18/93	Q
VOLATILE ORG. COMPOUNDS (ug/kg)																										
Methylene Chloride	4	JB			5	JB	12	B			13	B			5	JB			6	JB						
Acetone	8	J			17						50				11	J			42						54	BJ
Carbon Disulifide																					5	J				
1,1-Dichloroethane																										
2-Butanone											220															
Toluene											4	J							25							
SEMI-VOL. ORG. COMPOUNDS (ug/kg)																										
Phenol					47	J	36	J							54	J							62	J		
1,3-Dichlorobenzene																										
Benzoic Acid																										
Dibenzofuran	140	J	150	J																						
Diethylphthalate																										
Hexachlorobenzene																										
Di-n-Butylphthalate									29	J																
Butylbenzylphthalate															510											
Bis (2-ethylhexyl) Phthalate	1000																60	J	480	J	1300				120	J
Di-n-octylphthalate																										
PAHs (ug/kg)																										
2-Methylnaphthalene	66	J	48	J							76	J	53	J									52	J		
Naphthalene	52	J											33	J												
Acenaphthylene			73	J																						
Acenaphthene	200	J	230	J																	150	J	51	J		
Fluorene	270	J	600																							
Phenanthrene	2400		4700	D	87	J	87	J	26	J	260	J	200	J	130	J	34	J	170	J	510	J	590		100	J
Anthracene	410	J	900																		98	J	170	J		
Carbazole			150	J																	120	J				
Fluoranthene	3500		4500	D	130	J	100	J	45	J	440	J	290	J	280	J	63	J	510	J	2100		1100		140	J
Pyrene	2600		3500	D	100	J	83	J	40	J	380	J	300	J	230	J	74	J	420	J	2200		860		280	J
Benzo (a) Anthracene	1100		1800		66	J					150	J	150	J	120	J		J	180	J	710	J	470	J	88	J
Chrysene	1400		2100		96	J	75	J	66	J	260	J	240	J	170	J	53	J	300	J	1200		630		130	J
Benzo (b) Fluoranthene	1800		1700				63	J	32	J	340	J	240	J	200	J	58	J	520	J	2700		590		150	J
Benzo (k) Fluoranthene			1200						31	J			160	J			48	J			840	J			130	J
Benzo (a) Pyrene	960		1400								170	J	190	J	150	J	38	J	160	J	800	J	470	J	120	J
Indeno (1,2,3-cd) Pyrene	790		1100								170	J	180	J	100	J	22	J	170	J	980		280	J	76	J
Dibenz (a,h) Anthracene	490		500																		370	J				
Benzo(g,h,i) Perylene	940		670								210	J	93	J	110	J			160	J	460	J	300	J		

Note: See Appendix G for qualifier definitions

Table 13
Chem-Trol
Remedial Investigation
Summary of Surface Water Sediment Sample Analytical Test Results

Parameter	SWS-1 8/1/90	Q	SWS-1 8/19/93	Q	SWS-2 8/1/90	Q	SWS-2 DUP 8/1/90	Q	SWS-2 8/19/93	Q	SWS-3 7/31/90	Q	SWS-3 8/18/93	Q	SWS-4 7/30/90	Q	SWS-4 8/18/93	Q	SWS-5 7/30/90	Q	SWS-5 8/18/93	Q	SWS-6 7/31/90	Q	SWS-6 8/18/93	Q
PESTICIDES (ug/kg)																										
alpha-BHC	27												1.1	JP							3.8	JP			8.4	JP
delta-BHC	13		3	P					0.24	JP			1.2	JP												
Heptachlor			0.48	JP					0.4	J																
Aldrin													0.45	JP												
Heptaclor Epoxide													1.3	JP												
Endosulfan I			0.52	JP																					9.7	J
Dieldrin			0.49	JP																						
4,4'-DDE																	0.56	JP								
Endrin																										
Endosulfan II			0.38	JP																					1.1	JP
4,4'-DDD	30												1.6	JP			7									
4,4'-DDT													2.2	JP												
Methoxychlor													2.5	JP			1	J								
Endrin Ketone			0.23	JP									0.43	JP												
alpha-Chlordane																										
gamma-Chlordane																										
PCBs (ug/kg)																									2800	P
Aroclor-1242													140	P												
Aroclor-1248													27	JP												
Aroclor-1254													87	P												
Aroclor-1260																										
METALS (mg/kg)																										
Aluminum	6550		7860		4870		5630	*	11100		24900		12600		7090		13700		9590		7340		10100		9860	
Arsenic	4.6		5.6		5		6.1		1.6	B	11.7		9.8		11.1		18.8	S	7.2		4.9	B	8.7		6.9	
Barium	45.6		71.6		23.8	B	25.9	B			137		84.3		56.1		86.1		46.4				58.2			
Berylium	0.7	B			0.3	B	0.3	B			1.2				1				0.5	B			0.8	B		
Cadmium	14.5	E	0.17	B	4	E			0.11	B	13.6	E	1.7	B	5.3	E	0.39	B	5.8	E	0.86	B	6	JE	0.35	B
Calcium	59000				64900		30500				16700				68100				21400				28100			
Chromium	51.8		16.1		8.8		7.8	*E	19.4		35.9		22.2		31.8		23.5		20.1		25.7		29.3		21.6	
Cobalt	5.9	B	14.2		5.3	B	13.1		10.1	B	14.9		15		3.3	B	15.1	B	10.5		12.5	B	9.5	B	10.9	B
Copper	59.2		20	N*J	20.6		22.5		24	N*J	64.5		25.4	N*J	18.6				35.9		28.5	N*J	47.7			
Iron	58700		24300		16400		18300		21900		45200		24600		18200		23900		22800		14500		22100		22000	
Lead	122		34	*+	11.1		17.7	N	33.4	*+	153		72.4	*J	52.6		60.3	+	28		205	*+	69.2		64.9	+
Magnesium	7940				2760		2940	N			6220				20500				5440				5260			
Manganese	1130		574	*	261		428	N	252	*	791		685	*	1510		1050	*	266				1040		704	*
Mercury											0.1	BN			0.06	BN										
Nickel	25.4		37.4		19		24.7		40		49		34.7		11.9		30.8		38.4		46.9		22.5		40.8	
Potassium	590	B			708	B	596	B			2410				414	B			713	B			769	B		
Selenium											1.1	JW	1.3	BSNJ												
Silver	2.6												0.14	B	2.1											
Sodium	159	B			107	B	54.4	B			213	B			179	B			89.2	B			197	B		
Vanadium	23.6		12.2	B	13.1		10.1		17.7		45.9		22.1		25.5		26.3		62		53.9		24.5		13.8	B
Zinc	210		73.3	*J	47		60.6		74.1	*J	378		208	*J	104		98.9	*J	212		355	*J	182		98.9	*J
Cyanide	0.7	B			0.6	B	0.5	B							0.9	B							0.8	B		
LEACHABLE INORGANICS (ug/g)																										
Leachable Chloride	NT		210		NT		NT		289		NT		129		NT		448		NT		512		NT		102	
Leachable Sulfate	NT				NT		NT		417		NT		400		NT				NT		10200		NT		784	

Note: See Appendix G for qualifier definitions

Table 13
Chem-Trol
Remedial Investigation
Summary of Surface Water Sediment Sample Analytical Test Results

Parameter	SWS-7 7/31/90	Q	SWS-7 8/18/93	Q	SWS-8 8/1/90	Q	SWS-8 NYSDEC SPLIT	Q	SWS-8 8/18/93	Q	SWS-8 DUP 8/18/93	Q	SWS-8 NYSDEC SPLIT	Q	SWS-9 8/1/90	Q	SWS-9 8/18/93	Q	SWS-10 8/18/93	Q	SWS-10 NYSDEC SPLIT	Q	SWS-11 8/18/93	Q	SWS-12 8/19/93	Q
VOLATILE ORG. COMPOUNDS (ug/kg)																										
Methylene Chloride					8	JB	8	BJ					13	JB	5	JB					9	JB				
Acetone					170		49	B					530	B	32		94	BJ			11	JB				
Carbon Disulifide																	6	J							3	J
1,1-Dichloroethane					3	J																				
2-Butanone					120								47													
Toluene																										
SEMI-VOL. ORG. COMPOUNDS (ug/kg)																										
Phenol					68	J	160	J																		
1,3-Dichlorobenzene					69	J																				
Benzoic Acid							280	J																		
Dibenzofuran									56	J													28	J		
Diethylphthalate																									130	BJ
Hexachlorobenzene									300	J																
Di-n-Butylphthalate													48	J							37	J			58	J
Butylbenzylphthalate																									370	J
Bis (2-ethylhexyl) Phthalate			140	J	550	J	550	J	560	J	850	J	590	J			880		590		630	J	100	J	430	BJ
Di-n-octylphthalate																	120	J	150	J						
PAHs (ug/kg)																										
2-Methylnaphthalene									47	J																
Naphthalene																										
Acenaphthylene																							30	J		
Acenaphthene									96	J													61	J		
Fluorene	64	J	54	J	410	J	350	J	1000		810	J	170	J	380	J	860		350	J	100	J	380		160	J
Phenanthrene					110	J			170	J	120	J			60	J	93	J	57	J			73	J		
Anthracene									170	J	150	J					130	J					36	J		
Carbazole	120	J	100	J	970		780	J	1900		1900		460	J	600		1700		670		280	J	430		300	J
Fluoranthene	100	J	120	J	790		650	J	2000	J	2000		400	J	350	J	1600		740		250	J	410		200	J
Pyrene			49	J	400	J	350	J	380	J	910	J	210	J	190	J	620		340	J	120	J	180	J	130	J
Benzo (a) Anthracene	88	J	81	J	550	J	450	J	1100	J	1200		310	J	250	J	990		530	J	200	J	240	J	200	J
Chrysene	110	J	61	J	530	J	400	J	1600	J	2300		310	J	310	J	1200		760		190	J	190	J	220	J
Benzo (b) Fluoranthene			87	J			400	J	1100	J	920	J	230	J			790		370	J	160	J	230	J	210	J
Benzo (k) Fluoranthene			70	J	370	J	360	J	990	J	1100		260	J	160	J	820		470	J	160	J	190	J	160	J
Benzo (a) Pyrene			56	J	390	J	240	J	760	J	980	J	250	J			770		610	J	160	J	150	J	130	J
Indeno (1,2,3-cd) Pyrene									340	J																
Dibenz (a,h) Anthracene					460	J	270	J	390	J	640	J	240	J			320	J	310	J			73	J		
Benzo(g,h,i) Perylene																										

Note: See Appendix G for qualifier definitions

Table 13
Chem-Trol
Remedial Investigation
Summary of Surface Water Sediment Sample Analytical Test Results

Parameter	SWS-7 7/31/90	Q	SWS-7 8/18/93	Q	SWS-8 8/1/90	Q	SWS-8 NYSDEC SPLIT	Q	SWS-8 8/18/93	Q	SWS-8 DUP 8/18/93	Q	SWS-8 NYSDEC SPLIT	Q	SWS-9 8/1/90	Q	SWS-9 8/18/93	Q	SWS-10 8/18/93	Q	SWS-10 NYSDEC SPLIT	Q	SWS-11 8/18/93	Q	SWS-12 8/19/93	Q
PESTICIDES (ug/kg)																										
alpha-BHC			1.6	JP	50				3.3	JP	1.8	JP			31				2.6	JP						
delta-BHC													15				6.8				6.8				31	P
Heptachlor									0.67	JP									0.74	JP						
Aldrin																										
Heptaclor Epoxide																									1.9	J
Endosulfan I									2	JP							0.73	JP	1.8	JP						
Dieldrin									9.5	J	3	J					1.9	J	9.6	J			0.46	JP	2.8	JP
4,4'-DDE			2.6	JP					2.2	JP			78				0.62	JP			38				1.2	JP
Endrin																										
Endosulfan II													13				0.99	J								
4,4'-DDD			0.93	JP																	5.6		0.55	JP		
4,4'-DDT			0.88	JP					3.8	JP			9.1		23											
Methoxychlor									3.5	JP									2.9	JP						
Endrin Ketone			1.7	JP															3.7	JP					1.7	JP
alpha-Chlordane									5.4	J	1.6	JP							4.2	JP	3.4	P				
gamma-Chlordane																									2	JP
PCBs (ug/kg)																										
Aroclor-1242									1700	J	450	PJ													110	
Aroclor-1248					620														940	P					74	JP
Aroclor-1254					320																				72	J
Aroclor-1260																										
METALS (mg/kg)																										
Aluminum	12400		12200		14400		6440	*	8110		12000		10500		11200		10100		14700		11800		11800		14400	
Arsenic	7.5		6.5		10.6		7.2		7		6.3		10.4		5.5	B	3.6	B	12.9		6.8		8.5	S	6.2	
Barium	60.4		62.5	B	64.4		34.5	B			81.1	B			34.3	B	92.4	B							185	
Berylium	0.9	B	0.85	B	0.7	B									0.6	B										
Cadmium	6.2	E	0.28	B	8.1	E	2.1		1.2	BS	1	BS			8.4	E	0.67	B	0.67	B			0.19	B	1.8	B
Calcium	38400				20700		9900	*					24400		150,000						34400					
Chromium	26.6		46.9		39.2		23.4	*	29.7		38.3		38		35.2		27.4		38.3		37.8		23.1		31.6	
Cobalt	10.9		16.4		12.2				16	B	13.6	B			12.6		15.7	B	17.1	B			14.4		14.4	B
Copper	29.4		40.7	N*J	68.8		35.2	N*	37.2	N*J	49.9	N*J	62.7		44.8		35	N*J	45.4	N*J	42.1		31.7	N*J	42.3	N*J
Iron	23000		33400		30400		18200		19400		25600		27300		34500		21400		35300		30100		32300		41600	
Lead	46.9		22.1	S*J	102		63.3	S	99.5	*J	101	*J	102		17.2		23.4	*J	117	*+	49.2		18.1	*J	317	S*J
Magnesium	6410				5360		2910	*					5420		6960						7260					
Manganese	992		1430	*	614		276	N*E	718	*	799	*	827		1360		509	*	1100	*	862		598	*	703	*
Mercury	0.06	BN			0.1	BN																				
Nickel	26.8		51.2		36.4		18.2		30.2		41.8		35.9		41.7		43.2		52.8		36.6		55.7		51	
Potassium	1120				1410		974	B							1080											
Selenium					0.7	B																				
Silver															2.5											
Sodium	157	B			164	B					606	B			206	B										
Vanadium	27.9		31.4		36.9		18.9		31.7		42.2		35		24.1		20.9	B	37.2				15.2		24.6	B
Zinc	168		135	*J	219		80	N*E	248	*J	332	*J	353		111		280	*J	274	*J	214		146	*J	341	*J
Cyanide	0.7	B					0.91	B																		
LEACHABLE INORGANICS (ug/g)																										
Leachable Chloride	NT		214		NT		NT		212		146		NT		NT		266		226		NT		46		228	
Leachable Sulfate	NT				NT		NT		1170		1180		NT		NT		6480		1940		NT		358		2210	

Note: See Appendix G for qualifier definitions

Table 14
Chem-Trol
Remedial Investigation
Summary of Flood Plain Sample Analytical Test Results

Parameter	FPS-1 8/2/90	Q	FPS-2 8/2'90	Q	FPS-3 8/20/93	Q	FPS-4 8/20/93	Q	FPS-4 DUP 8/20/93	Q	FPS-5 8/20/93	Q	FPS-5 NYSDEC	SPLIT Q	FPS-6 8/20/93	Q
VOLATILE ORG. COMPOUNDS (ug/kg)																
Methylene Chloride	12	BJ	4	JB									7	JB		
Acetone	16	J	19													
Xylene			7													
Semi-Volatile Org. Compounds (ug/kg)																
Phenol			65	J												
1,2,4-Trichlorobenzene											50	J				
2,4-Dinitrophenol															1800	R
Dibenzofuran															210	J
Hexachlorobenzene							85	J			1600		440			
Di-n-Butylphthalate					32	J	26	J							24	J
Bis (2-ethylhexyl) Phthalate	270	J			800	BJ					880		670			
PAHs (ug/kg)																
2-Methylnaphthalene															86	J
Naphthalene															120	J
Acenaphthylene															56	J
Acenaphthene															300	J
Fluorene					35	J									400	
Phenanthrene					390	J	62	J	160	J	83	J	130	J	2700	D
Anthracene					56	J					80	J			630	
Carbazole					39	J									570	
Fluoranthene					470	J	99	J	210	J	110	J	160	J	4500	D
Pyrene					480	J	92	J	150	J	140	J	110	J	3200	D
Benzo (a) Anthracene					230	J	44	J	76	J	59	J	72	J	2800	
Chrysene					260	J	62	J	110	J	88	J	93	J	2900	
Benzo (b) Fluoranthene					220	J	61	J	110	J	100	J	75	J	2300	D
Benzo (k) Fluoranthene					250	J	59	J	110	J	75	J	66	J	2300	
Benzo (a) Pyrene					220	J	48	J	76	J	66	J	67	J	2900	
Indeno (1,2,3-cd) Pyrene					150	J	32	J	55	J	51	J			2300	
Dibenz (a,h) Anthracene															1200	
Benzo(g,h,i) Perylene					100	J									1100	
Pesticides (ug/kg)																
alpha-BHC	13		44								15	JP				
delta-BHC													6000			
Heptachlor															3.7	JP
Heptaclor Epoxide					1.9	JP	7.7	JP	8.7	JP			350			
Endosulfan I					4.1	P	38	P	41	P						
Dieldrin							17	JP	18	JP	13	JP				
4,4'-DDE					11	P	39	P	42	P	82		470	P	4.7	JP
Endrin					2.3	JP	15	JP	16	JP			19000	P		
Endosulfan II					7.2	P	36	P	39	P						
4,4'-DDD					0.74	JP							720			
Endosulfan Sulfate							5	JP								
4,4'-DDT			33		5.7	JP	18	JP	19	JP	90	P	560			
Methoxychlor															15	JP
Endrin Ketone					10	P	26	JP	27	JP	57	JP				
Endrin Aldehyde									15	JP	11	JP				
alpha-Chlordane											32	JP				
gamma-Chlordane					4.9		60		65							
PCBs (ug/kg)																
Aroclor-1248					300		1900		1900						720	P
Aroclor-1254					180	P	1800		1900						270	JP
Aroclor-1260					310											
Metals (mg/kg)																
Aluminum	13700		11200		13000		15900		15000		12800		10800		14800	
Arsenic	5.2		7.3		6.9		6.9		6.7		5.9		7		4.3	
Barium	74.7		83.4		101		82.6		77.7		99.1		81.1		81.5	
Berylium	0.7	B	0.6	B							0.7	B			0.88	B
Cadmium	7	E	6.3	E	1.1	B	0.93	B	0.67	B	0.49	BS			0.26	B
Calcium	2980		2690		14400	B	24600	*J	20300	*J	7600	B*J	4970		22200	*J
Chromium	20.1		16		25.1		30.7		28.4		30.4		34.1		23.3	
Cobalt	11.8		11.6		11.8	B	11.5	B	13.2		15.2		15.2		14.4	
Copper	31.2		23.9		43.7		78.3	N*J	65.1	N*J	54.7	N*J	69.4		30.2	N*J
Iron	24900		22800		28800		31200		29200		28200		25900		29800	
Lead	25.7		23		70.2	J+	38.6	*J	50.4	*+J	42	*+	32.1		30.7	S*J
Magnesium	4430		3400		6040	EJ	7110	*	6700	*	4960	*	4380		7240	*
Manganese	255		291		819		516	*	432	*	394	*	417		694	*
Mercury	0.05	BN	0.06	BN												
Nickel	43		33.1		43.4		45.5		38.7		41.5		37.7		49	
Potassium	1330		513	B	1460	B	1750		1770		1210				1660	
Sodium	123	B	51.2	B												
Vanadium	23.2		18.5		22.5		24.6		24.2		20.5				17.8	
Zinc	94.3		78.9		167		133	*J	129	*J	103	*J	100		79.3	*J
Leachable Inorganics (ug/g)																
Leachable Chloride	NT		NT		NT		NT		NT		59		NT		NT	

Note: See Appendix G for Qualifier Definitions
NT - Not Tested

Table 15
Chem-Trol
Remedial Investigation
Overview of Properties of Chemicals Detected at Chem-Trol Site

CHEMICAL CLASS	EXAMPLES	COMMON USE/ ORIGIN	BEHAVIORAL CHARACTERISTICS IN THE ENVIRONMENT	NO. LOCATIONS DETECTED/MEDIA TYPE (TOTAL SAMPLE LOCATIONS PER MEDIA)					
				GW					
				Overburden (9)	Weatherd Bedrock (11)	SOIL (25)	SW (12)	SWS (12)	FPS (6)
Volatile Organic Compound Compounds									
Aromatic Hydrocarbons 1Y	Benzene Toluene Xylenes	Petroleum Products Solvents	Less dense than water, these compounds, in pure form, tend to float (LNAPL). Due to a high Henry's Law constant, volatilization may play a significant role in transport of this chemical class. Water solubility and partitioning coefficients indicate most compounds in this class have the potential to leach from soils and migrate in surface and ground waters.	4	6	17	0	2	1
Halogenated Aliphatic Hydrocarbons	Trichloroethene Tetrachloroethene 1,1,1-Trichloroethane	Industrial Solvents	Some of these compounds are more dense than water, such pure products would sink in the environment (DNAPL). Due to a relatively high Henry's Law constant, volatilization may play a significant role in tranport of this chemical class. Water solubility and partitioning coefficients indicate most compounds in this class have the potential to leach from soils and to migrate in surface and ground waters.	7	8	17	0	8	3
Ketones	Acetone 2-butanone 4-methyl-2-pentanone	Industrial Solvents Laboratory Solvent	High vapor pressures indicate volatility of this chemical class. Water solubility and partition coefficients indicate a high potential for leaching from soils and to migrate in surface and ground waters.	6	3	9	0	9	2
Halogenated Aromatic Hydrocarbons	Chlorobenzene Chlorotoluene	Chemical Intermediate	While these compounds have low vapor pressures volatilization of this chemical class may be rapid. Low water solubility and the high partition coefficient suggests a tendency of these compounds to sorb onto solids. The densities are generally greater than that of water.	2	4	10	0	0	0

Table 15
Chem-Trol
Remedial Investigation
Overview of Properties of Chemicals Detected at Chem-Trol Site

CHEMICAL CLASS	EXAMPLES	COMMON USE/ ORIGIN	BEHAVIORAL CHARACTERISTICS IN THE ENVIRONMENT	NO. LOCATIONS DETECTED/MEDIA TYPE (TOTAL SAMPLE LOCATIONS PER MEDIA)					
				GW					
				Overburden (9)	Weatherd Bedrock (11)	SOIL (25)	SW (12)	SWS (12)	FPS (6)
Semi-Volatile Organic Compounds									
Polynuclear Aromatic Hydrocarbons	Pyrene Anthracene Naphthalene Fluorene	Coal Burning By-product By-product of Internal Combustion Processes	Low water solubilities and high partition coefficient indicate a relatively low potential for leaching and migration. PAHs typically display low volatilization rates. Absorption is likely high.	3	3	12	1	12	4
Phthalates	bis(2-ethyhexyl) phthalate butylbenzyl phthalate Di-n-octyl phthalate	Plastic Manufacturing Plasticizers	Vapor pressures of this chemical class are relatively low, indicating volatilization is not a significant transport mechanism. Water solubility ranges from low to moderate; partition coefficients are high. This suggests significant leaching to and transport by surface and ground waters to be minimal.	4	5	22	6	11	5
Halogenated Aromatic Hydrocarbons	1,2,4-Trichlorobenzene Hexachlorobenzene 1,4-Dichlorobenzene	Chemical Intermediates	While these compounds have low vapor pressures volatilization of this chemical class may be rapid. Low water solubility and the high partition coefficient suggests a tendency of these compounds to sorb onto solids. The densities are generally greater than that of water.	0	0	11	0	1	2
Phenols	Phenol 2-Methylphenol 4-Methylphenol 4-Chloro-3-methyl phenol	Chemical Intermediates	A moderately low vapor pressure and high water solubility suggests little volatilization. A low partition coefficient suggests minimal sorption onto solids. This class of compounds can readily leach from soils and migrate in surface and ground waters.	4	4	6	1	4	1
Miscellaneous SVOCs	Benzoic Acid	Chemical Intermediates	These miscellaneous compounds are considered SVOCs, and thus are typically characterized by a low water solubility, low vapor pressures and high partition coefficients. Additional details are presented in Appendix G.		Varies by specific compound of interest.				

Table 15
Chem-Trol
Remedial Investigation
Overview of Properties of Chemicals Detected at Chem-Trol Site

CHEMICAL CLASS	EXAMPLES	COMMON USE/ ORIGIN	BEHAVIORAL CHARACTERISTICS IN THE ENVIRONMENT	NO. LOCATIONS DETECTED/MEDIA TYPE (TOTAL SAMPLE LOCATIONS PER MEDIA)					
				GW					
				Overburden (9)	Weatherd Bedrock (11)	SOIL (25)	SW (12)	SWS (12)	FPS (6)
PCBs and Pesticides									
Polychlorinated Biphenyls	Arochlor 1242 Arochlor 1248 Arochlor 1250 Arochlor 1260	Heat resistance additives to oil.	Although vapor pressures of PCBs are low, atmospheric transport may occur as an aerosol. PCBs have low water solubilities and high partition coefficients, thus do not tend to migrate in groundwater. Migration may result from their tendency to bioaccumulate.	0	0	13	0	5	3
Pesticides	BHCs 4,4'-DDT Endosulfan Isophrone	Agricultural Pest Control	Pesticides typically have low vapor pressures, low water solubility and high partition coefficients. Thus, significant migration of pesticides within groundwater is not anticipated.	1	0	10	2	12	6
Metals									
Metals	Iron Lead Zinc Manganes	Paints and Pigments Naturally Occuring	Physical and chemical properties affecting the transport of metals vary with the metal and the environmental conditions (pH, Eh, alkalinity, etc.) as well as the presence of other compounds such as sulfate, chlorides, etc. Depending on these conditions, metals vary from highly immobile to very soluble.		Varies depending on specific metal of interest.				

Notes: GW = Groundwater; SW = Surface Water; SWS = Surface Water Sediment; FPS = Flood Plain Sediments
See Appendix H for properties of specific chemicals within toxological profiles.
See Tables 9, 11,12, 13 and 14 for analytical test data.
Only 14 wells were sampled for PCBs, pesticides and metals.

Table 16
Chem-Trol
Remedial Investigation
Summary of Health Based Soil ARARs/SCGs

Parameter	Site Occurance			ARAR/SCG		
	MAX	MIN	95% Conf. Limit	TAGM #4046	Superfund PCB Cleanup	USEPA HEAST
VOLATILE ORG. COMPOUNDS (ug/kg)						
Chloroethane	39	39	15	1900		540000
Methylene Chloride	8900	2	1142	100		93000
Acetone	440	8	94	200		6000000
Carbon Disulfide	4	2	11	2700		8000000
1,1-Dichloroethene	220	1	47	400		12000
1,1-Dichloroethane	900	14	157	200		8000000
Total 1,2 Dichloroethenes	650	3	66	300		800000
Chloroform	34000	0.4	3549	300		110000
1,2-Dichloroethane	18	2	12	100		7700
2-Butanone	190	6	45	300		4000000
1,1,2-Trichloroethane	76	1	21			120000
Tetrachloroethene	35000	1	3999	1400		14000
1,1,1-Trichloroethane	8800	4	1387	800		7000000
1,1,2,2-Tetrachloroethane	100	96	21	600		270000
Carbon Tetrachloride	1	1	11	600		5400
1,2-Dichloropropane	2	2	11			10000
Trichloroethene	8700	2	1370	700		64000
Toluene	3100	0.5	497	1500		20000000
Benzene	7	2	11	60		24000
4-Methyl-2-Pentanone	77	4	23	1000		
2-Hexanone	16	16	14			
Chlorobenzene	21	0.6	12	1700		2000000
Ethylbenzene	4600	0.8	630	5500		8000000
Total Xylenes	18000	1	2492	1200		200000000
Chlorotoluene	370000	11	110595			2000000
SEMI-VOL. ORG. COMPOUNDS (ug/kg)						
Phenol	120000	51	14896	30 or MDL		50000000
2-Chorophenol	130	130	246	800		400000
1,3-Dichlorobenzene	590	590	279	1600		
1,4-Dichlorobenzene	520	58	266	8500		29000
Diethylphthalate	50	50	251	7100		60000000
2-Methylphenol	14000	14000	1910	100 or MDL		
4-Methylphenol	52000	65	6565	900		
Hexachloroethane	85	85	247	50000		80000
Isophorone	96	31	248	4400		1800000
2,4-Dimethylphenol	35000	160	4490	50000		2000000
Benzoic Acid	590	590	1102	50000		300000000
1,2,4-Trichlorobenzene	150000	110	18558	50000		2000000
Hexachlorobutadiene	260	130	212	50000		90000
Dimethyl phthalate	31	31	250	2000		80000000
Dibenzofuran	190	62	246	6200		
Hexachlorobenzene	21000	76	3055	410		410
4-Chloro-3-methylphenol	130	130	252	240 or MDL		
Di-n-butylphthalate	900	45	255	8100		8000000
Butylbenzylphthalate	26000	17	3498	50000		20000000
Bis (2-ethylhexyl) Phthalate	38000	34	5181	50000		50000
Di-n-octylphthalate	10000	83	1469	50000		2000000
PAHs (ug/kg)						
2-Methylnaphthalene	10000	27	1391	36400		
Naphthalene	17000	30	2281	13000		300000
Acenaphthylene	1100	50	336	41000		300000
Acenaphthene	240	16	244	50000		5000000
Fluorene	310	32	252	50000		3000000
Phenanthrene	2900	56	688	50000		
Anthracene	1600	45	431	50000		2000000
Carbazole	220	28	277	50000		8300

Table 16
Chem-Trol
Remedial Investigation
Summary of Health Based Soil ARARs/SCGs

Parameter	Site Occurance			ARAR/SCG		
	MAX	MIN	95% Conf. Limit	TAGM #4046	Superfund PCB Cleanup	USEPA HEAST
Fluoranthene	5500	35	1029	50000		3000000
Pyrene	4100	80	896	50000		2000000
Benzo (a) Anthracene	2900	40	574	224 or MDL		220
Chrysene	2700	66	686	400		
Benzo (b) Fluoranthene	4300	86	866	1100		220
Benzo (k) Fluoranthene	1400	140	421	1100		220
Benzo (a) Pyrene	3000	230	624	61 or MDL		61
Indeno (1,2,3-cd) Pyrene	1400	150	381	3200		
Dibenz(a,h)anthracene	77	37	248	14 or MDL		14
Benzo(g,h,i) Perylene	140	30	245	50000		
PESTICIDES (ug/kg)						
alpha-BHC	40	32	14	110		110
beta-BHC	3.3	3.3	9	200		3900
delta-BHC	46000	29	5888	300		
gamma-BHC	2600	1.5	338	60		5400
Aldrin	120	1.6	16	41		41
Heptaclor Epoxide	3.9	3.9	9	20		770
Endosulfan I	22	1.1	15	900		4000
Dieldrin	6.9	6.9	17	44		44
4,4'-DDE	17	17	18	2100		2100
Endrin	21	7.8	17	100		200000
4,4'-DDT	55	2.2	21	2100		2100
Methoxychlor	13	13	52	10000		80000
Endrin Ketone	12	12	10			
Endrin Aldehyde	5	5	36			
gamma-Chlordane	24	24	58	540		5400
PCBs (ug/kg)						
Aroclor 1242	1100000	700	140825			
Aroclor-1248	13000	66	1716			
Aroclor-1254	700000	30	86258			
Aroclor-1260	2500	56	587			
Total PCBs (7)				10000	10000	1000
METALS (mg/kg)						
Aluminum	29100	4570	16594	16653		
Antimony	7	7	3			30
Arsenic	13.6	3.5	10	8.1 (7.5)		80
Barium	170	20.1	95	68.6 (300)		4000
Beryllium	5.5	0.3	2	(0.16)		0.16
Cadmium	14.2	0.19	5	0.77 (1)		80
Calcium	261000	2860	102958	72864		
Chromium	125	8.7	56	25.8 (10)		8000
Cobalt	16.2	3.8	12	14.6 (30)		
Copper	1390	7.3	368	55.1 (25)		
Iron	96700	7010	47794	31337 (2000)		
Lead	91.2	7.8	42	6.8 (200-500)		250
Magnesium	54600	2670	18978	7938		
Manganese	2940	277	6090	902		20000
Mercury	0.3	0.05	0.1	0.1		20
Nickel	102	13	44	49.8(13)		2000
Potassium	2380	359	1491	1493		
Selenium	2	0.24	1	(2)		
Silver	2.6	1.4	1	0.12		200
Sodium	1300	15.1	388	381		
Thallium	0.73	0.26	0			6
Vanadium	34.3	11.3	28	35 (150)		600
Zinc	108	45.7	88	187.5 (20)		2000
Cyanide	2.9	0.6	1			2000

Notes:

(1) Site Occurance includes maximum and minimum detected values of the respective test parameters. The 95% confidence limit values were calculated using reported concetrations and one half the method detection limit for parameters not detected. Dupliacte and spilt samples were averaged pnor to performing the calculation. Elevated method detection limits for VOCs in sample SSI-1, SSI-2 and SPMW-1, semi-VOCs in samples SSI-1 and SSI-2 and pesticides in samples SSI-2 and N400W200 were omitted from the calculation.

(2) TAGM 4046 = "Division of Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objective Levels," prepared by NYSDEC, January 24, 1994. For organic compounds, values are based on a TOC of 1 %. For metals, a site background (the 95% confidence limit of test results from three background soil samples) is provided with TAGM # 4046 concentrations presented in parenthesis.

(3) USEPA HEAST = Health Effects Assessment Summary Table.

(4) HEAST values for endsulfan and chlordane were used for endosulfan I and II and alpha and gamma chlordane respectively.

(5) The HEAST value for chromium assumes trivalent chromium.

(6) Superfund PCB Cleanup values based on Guidance on Remedial Actions for Superfund Sites with PCB contaminatiuon.

(7) Criteria for PCBs provided for total PCBs.

Table 17
Chem-Trol
Remedial Investigation
Summary of Floodplain Sediments Health-based ARARs/SCGs

Parameter	Site Conditions			ARARs/SCGs		
	MAX	MIN	95% Conf. Limit	NYSDEC TAGM #4046	USEPA SUPERFUND PCB CLEANUP	USEPA HEAST
VOLATILE ORG. COMPOUNDS (ug/kg)						
Methylene Chloride	12	4	18	100		93000
Acetone	19	16	16	200		6000000
Xylene	7	7	8	1200		200000000
Semi-Volatile Org. Compounds (ug/kg)						
Phenol	65	65	258	30 or MDL		50000000
1,2,4-Trichlorobenzene	50	50	253			2000000
2,4-Dinitrophenol	1800	1800	1015	200 or MDL		200000
Dibenzofuran	210	210	245	6200		
Hexachlorobenzene	1600	65	692	410		410
Di-n-Butylphthalate	32	24	226	8100		8000000
Bis (2-ethylhexyl) Phthalate	880	270	720	50000		50000
PAHs (ug/kg)						
2-Methylnaphthalene	86	86	261	36400		
Naphthalene	120	120	254	13000		5000000
Acenaphthylene	56	56	268	50000		300000
Acenaphthene	300	300	277	50000		300000
Fluorene	400	35	335	50000		3000000
Phenanthrene	2700	62	1696	50000		
Anthracene	630	56	455	50000		2000000
Carbazole	570	39	426			8300
Fluoranthene	4500	99	2779	50000		3000000
Pyrene	3200	92	2005	50000		2000000
Benzo (a) Anthracene	2800	44	1733	224 or MDL		220
Chrysene	2900	62	1798	400		
Benzo (b) Fluoranthene	2300	61	1438	1100		220
Benzo (k) Fluoranthene	2300	59	1439	1100		220
Benzo (a) Pyrene	2900	48	1791	61		61
Indeno (1,2,3-cd) Pyrene	2300	32	1431	3200		
Dibenz (a,h) Anthracene	1200	1200	804	14 or MDL		14
Benzo(g,h,i) Perylene	1100	100	734	50000		
Pesticides (ug/kg) (6)						
alpha-BHC	44	13	31	110		110
delta-BHC	6000	6000	1794	300		
Heptachlor	3.7	3.7	14	100		160
Heptaclor Epoxide	350	1.9	112	20		770
Endosulfan I	41	38	27	900		4000
Dieldrin	18	13	17	44		44
4,4'-DDE	470	4.7	171	2100		2100
Endrin	19000	2.3	5670	100		200000
Endosulfan II	39	7.2	35	900		4000
4,4'-DDD	720	0.74	231	2900		2900
Endosulfan Sulfate	5	5	28	1000		
4,4'-DDT	560	5.7	200	2100		2100
Methoxychlor	15	15	140	10000		80000
Endrin Ketone	57	10	41	Not Avail.		
Endrin Aldehyde	15	11	15			
alpha-Chlordane	32	32	49	540		540
gamma-Chlordane	65	4.9	59	540		540
PCBs (ug/kg) (6)						
Aroclor-1248	1900	300	1302			
Aroclor-1254	1900	180	1196			
Aroclor-1260	310	310	333			
Total PCBs (8)				10000	10000	1000
Metals (mg/kg)						
Aluminum	15900	10800	15607	16653		
Arsenic	7.3	4.3	7	8.1 (7.5)		80
Barium	101	74.7	95	68.6 (300)		4000
Beryllium	0.88	0.6	0.8	(0.16)		0.16
Cadmium	7	0.26	6	0.77 (1)		80
Calcium	24600	4970	21448	72865		
Chromium	34.1	16	31	25.8 (10)		8000
Cobalt	15.2	11.5	14	14.6 (30)		
Copper	78.3	23.9	64	55.1(25)		
Iron	31200	22800	30335	31337 (2000)		
Lead	70.2	23	57	96.8		250
Magnesium	7240	3400	7041	7938		
Manganese	819	291	725	902		20000
Mercury	0.06	0.05	0.07	0.1		20
Nickel	49	33.1	47	49.8 (13)		2000
Potassium	1770	32.1	1772	1493 (4000)		
Sodium	123	51.2	477	381		
Vanadium	24.6	17.8	24	35 (150)		600
Zinc	167	78.9	145	188 (20)		2000
Leachable Inorganics (ug/g)						
Leachable Chloride	59	59	NA (7)			

Notes:
(1) Site Occurance includes maximum and minimum detected values of the respective test parameters. The 95% confidence limit values were calculated using reported concetrations and one half the method detecton limit for parameters not detected. Duplicate and split samples were averaged prior to performing the calculation. Elevated method detection limits for PCBs and pesticides in sample FPS-5 were omitted from the calculation.
(2) TAGM 4046 = "Division of Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objective Levels," prepared by NYSDEC, January 24, 1994. For organic compounds, values are based on a TOC of 1 %. For metals, a site background (the 95% confidence limit of test results from three background soil samples) is provided with TAGM # 4046 concentrations presented in parenthesis.
(3) USEPA HEAST = Health Effects Assessment Summary Table.
(4) HEAST values for endsulfan and chlordane were used for endosulfan I and II and alpha and gamma chlordane respectively.
(5) The HEAST value for chromium assumes trivalent chromium.
(6) Superfund PCB Cleanup values based on Guidance on Remedial Actions for Superfund Sites with PCB contaminatiuon.
(7) Leachable Chloride tested in one sample only.
(8) PCB criteria provided for Total PCBs.

Table 18
Chem-Trol
Remedial Investigation
Summary of Health Based Surface Water ARARs/SCGs

Parameter	Downstream Occurance MAX	Downstream Occurance MIN	Downstream Occurance 95% Conf. Limit	Upstream Occurance MAX	Upstream Occurance MIN	Upstream Occurance 95% Conf. Limit	ARAR/SCG NYSDEC Class C Waters	ARAR/SCG USEPA AWQC Health
SEMI-VOL. ORG. COMPOUNDS (ug/l)								
2,4-Dimethylphenol				0.7	0.7	10		
Bis (2-ethylhexyl) phthalate	1	0.5	6				0.6	
PAHs (ug/l)								
Fluoranthene				0.6	0.6	10		310
PESTICIDES (ug/l)								
alpha-BHC	0.0056	0.0056	0.03					
beta-BHC	0.014	0.0099	0.03					
METALS (ug/l)								
Barium	494	494	220					1000
Calcium	68200	68200	47534					
Chromium	99	10	48	11.1	11.1	16	* 440	170000
Cobalt	21.2	21.2	15				5	
Copper	65.3	65.3	25				* 26	1000
Iron	34300	126	14602	3730	131	6350	300	30
Lead	94.4	2	41	8	8	13	*10	50
Manganese	3850	3850	1635					50
Nickel	126	126	62				*192	13.4
Silver	0.3	0.3	0.1				0.1	50
Vanadium	24.2	24.2	16	49	49	79	14	
Zinc	384	384	168				*180	5000
Cyanide	16.6	13.6	11				5.2	200
INORGANICS (mg/l)								
Chloride	137000	64000	132899	206000	116000	272906		
Sulfate	126000	61000	120171	105000	87000	118072		

Notes:

(1) Site Occurance includes maximum and minimum detected values of the respective test parameters. The 95% confidence limit values were calculated using reported concentrations were calculated using reported concentrations and one half the matix detection limit value.

(2) Class C standards as promulgated in 6 NYCRR 703.

(3) Class C standards for selected metals is based on the hardness of the water. For purposes of making these calculations, a hardness of 250 ppm was assumed.

Chromium = exp(0.819 [ln (ppm hardness)] + 1.561)
Copper = exp(0.8545 [ln (ppm hardness)] - 1.465)
Lead = exp(1.266 [ln (ppm hardness)] - 4.661)
Nickel = exp(0.76 [ln (ppm hardness)] + 1.06)
Zinc = exp(0.85 [ln (ppm hardness)] + 0.50)
Hardness estimated at 250 ppm due to calceriferous nature of stream bed.

(4) AWQC = USEPA Ambient Water Quality Criteria for Human Health; water and fish ingestion.

(5) Chromium is assumed to be trivalent chromium.

(6) Silver Class C standard is for ionic silver.

Table 19
Chem-Trol
Remedial Investigation
Summary of Health Based Surface Water Sediments ARARs/SCGs

Parameter	Downstream Occurance MAX	Downstream Occurance MIN	Downstream Occurance 95% Conf. Limit	Upstream Occurance MAX	Upstream Occurance MIN	Upstream Occurance 95% Conf. Limit	ARAR/SCG NYSDEC TAGM #4046	ARAR/SCG USEPA HEAST	ARAR/SCG Superfund PCB Cleanup	ARAR/SCG USEPA Sediment Criteria
VOLATILE ORG. COMPOUNDS (ug/kg)										
Methylene Chloride	13	9	24				100	93000		
Acetone	530	11	105				200	6000000		
Carbon Disulifide	6	3	10	5	5	7	2700	8000000		
2-Butanone	47	47	17				300	4000000		
SEMI-VOL. ORG. COMPOUNDS (ug/kg)										
Dibenzofuran	56	28	373	150	150	506	6200			
Diethylphthalate	130	130	330				7100	60000000		
Hexachlorobenzene	300	300	385				410	410		
Di-n-Butylphthalate	58	29	261				8100	8000000		
Butylbenzylphthalate	370	370	355				50000	20000000		
Bis (2-ethylhexyl) Phthalate	880	100	634	1300	60	1360	50000	50000		
Di-n-octylphthalate	150	120	378				50000	2000000		
PAHs (ug/kg)										
2-Methylnaphthalene				53	48	524	36400			
Naphthalene	47	47	366	33	33	530	13000	300000		
Acenaphthylene				73	73	524	41000	300000		
Acenaphthene	30	30	399	230	230	498	50000	5000000		1400
Fluorene	96	51	374	600	150	624	50000	3000000		
Phenanthrene	1000	26	562	4700	34	4916	50000			1200
Anthracene	170	57	327	900	98	941	50000	2000000		
Carbazole	170	36	345	150	120	265	50000	8300		
Fluoranthene	1900	45	1104	4500	63	5007	50000	3000000		10200
Pyrene	2000	40	1086	3500	74	4110	50000	2000000		
Benzo (a) Anthracene	910	49	472	1800	150	1934	224 or MDL	220		
Chrysene	1200	66	670	2100	53	2403	400			
Benzo (b) Fluoranthene	2300	32	913	2700	58	3171	1100	220		
Benzo (k) Fluoranthene	1100	31	557	1200	48	1438	1100	220		
Benzo (a) Pyrene	1100	70	584	1400	38	1598	61 or MDL	61		
Indeno (1,2,3-cd) Pyrene	980	56	529	1100	22	1443	3200			
Dibenz (a,h) Anthracene	340	340	388	500	370	543	14 or MDL	14		
Benzo(g,h,i) Perylene	540	73	387	670	93	769	50000			
PESTICIDES (ug/kg)										
alpha-BHC	8.4	1.6	5			-	110	110		
delta-BHC	31	5.6	16	3.8	1.1	4	300			
Heptachlor	0.74	0.24	3	1.2	0.48	3	100	160		
Aldrin	0.4	0.4	4				41	41		
Heptaclor Epoxide				0.45	0.45	3	20	770		
Endosulfan I	1.9	1.9	4	1.3	1.3	3	900	4000		
Dieldrin	2	0.73	6	0.52	0.52	5	44	44		90
4,4'-DDE	9.7	0.45	6	0.49	0.49	5	2100	2100		
Endrin	78	0.62	16				100	200000		40
Endosulfan II	1.2	1.2	7	0.56	0.56	5	900	4000		
4,4'-DDD	13	0.93	7	0.38	0.38	5	2900	2900		
4,4'-DDT	5.6	0.55	5	7	1.6	8	2100	2100		
Methoxychlor	3.5	2.9	33	2.2	2.2	27	10000	80000		
Endrin Ketone	3.7	1.7	6	2.5	1	5				
alpha-Chlordane	5.4	1.6	4	0.43	0.23	3	540	540		
gamma-Chlordane	2	2	4				540	540		

Table 19
Chem-Trol
Remedial Investigation
Summary of Health Based Surface Water Sediments ARARs/SCGs

Parameter	Downstream Occurance			Upstream Occurance			ARAR/SCG			
	MAX	MIN	95% Conf. Limit	MAX	MIN	95% Conf. Limit	NYSDEC TAGM #4046	USEPA HEAST	Superfund PCB Cleanup	USEPA Sediment Criteria
PCBs (ug/kg)										
Aroclor-1242	2800	450	1282							
Aroclor-1248	940	110	239	140	140	147				
Aroclor-1254	74	74	74	27	27	50				
Aroclor-1260	72	72	73	87	87	94				
Total PCBs (8)							1000	1000	190	
METALS (mg/kg)										
Aluminum	14700	8110	12971	13700	7340	15534	16653			
Arsenic	12.9	1.6	9	18.8	4.9	20	8.1 (7.5)	80		
Barium	185	52.5	107	86.1	71.6	115	68.6 (300)	4000		
Beryllium	0.85	0.85	1				(0.16)	0.16		
Cadmium	1.8	0.11	1	1.7	0.17	2	0.77 (1)	80		
Calcium	34400	24400	28965				72865			
Chromium	46.9	19.4	38	25.7	16.1	28	25.8 (10)	8000		
Cobalt	17.1	10.1	16	15.1	12.5	16	14.6 (30)			
Copper	62.7	24	46	28.5	20	37	55.1 (25)	40		
Iron	41600	19400	34860	24600	14500	29608	1337 (2000)			
Lead	317	18.1	166	205	34	215	96.8	250		
Magnesium	7260	5420	4095				7938			
Manganese	1430	252	1036	1050	574	1232	902	20000		
Nickel	55.7	30.2	51	46.9	30.8	48	49.8 (13)	2000		
Selenium				1.3	1.3	1	(2)			
Silver				0.14	0.14	0.2	0.06	200		
Sodium	606	606	557				381			
Vanadium	42.2	13.8	29	53.9	12.2	57	35 (150)	600		
Zinc	353	74.1	290	355	73.3	388	188 (20)	20000		
LEACHABLE INORGANICS (ug/g)										
Leachable Chloride	289	46	246	512	129	618				
Leachable Sulfate	6480	358	3270	10200	400	10663				

Notes:

(1) Site Occurance includes maximum and minimum detected values of the respective test parameters. The 95% confidence limit values were calculated using reported concetrations and one half the method detection limit for parameters not detected. Duplicate and spilt samples were averaged prior to performing the calculation.

(2) TAGM 4046 = "Division of Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objective Levels," prepared by NYSDEC, January 24, 1994. For organic compounds, values are based on a TOC of 1 %. For metals, a site background (the 95% confidence limit of test results from three background soil samples) is provided with TAGM # 4046 concentrations presented in parenthesis.

(3) USEPA HEAST = Health Effects Assessment Summary Table.

(4) HEAST values for endsulfan and chlordane were used for endosulfan I and II and alpha and gamma chlordane respectively.

(5) The HEAST value for chromium assumes trivalent chromium.

(6) Superfund PCB Cleanup values based on Guidance on Remedial Actions for Superfund Sites with PCB contaminatiuon.

(7) USEPA Sediment Criteria values based on a TOC of 1 %.

(8) Criteria for PCBs provided for total PCBs.

Table 20
Chem-Trol
Remedial Investigation
Summary of Groundwater Health-based ARARs and SCGs
Overburden

Parameter	Downgradient Occurance MAX	Downgradient Occurance MIN	Downgradient Occurance 95% CONF. VALUE	Upgradient Occurance MW-7S 8/12/93	Upgradient Occurance Q	ARARs/SCGs NYSDEC Class GA (ug/l)	USEPA MCLs (ug/l)	USEPA MCLGs (ug/l)	USEPA Health Advisories Child/one-day (ug/l)	USEPA Health Advisories Child/long term (ug/l)	USEPA Health Advisories Adult Lifetime (ug/l)
VOLATILE ORG. COMPOUNDS (ug/l)											
Chloroethane	200	22	100			5					
Acetone	93	93	50			50					
Carbon Disulfide	2	2	6			50					
1,1-Dichloroethene	1	1	6			5	7	7	2000	1000	7
1,1-Dichloroethane	68	20	45			5					
1,2-Dichloroethene(Total)	7	1	6			5	70	70	20000	2000	100
Chloroform	260	260	112			7	100		4000	100	
2-Butanone	15	7	11			50					
1,1,1-Trichloroethane	19	1	12			5	200	200	100000	40000	200
Trichloroethene	470	2	203			5	5	0			
Toluene	120	1	53			5	1000	1000	20000	2000	1000
Chlorotoluene	130000	130000	130000(5)			5					
SEMI-VOL. ORG. COMPOUNDS (ug/l)											
2-Methylphenol	18	4	10			50					
4-Chloro-3-Methylphenol	270	270	117			5					
Dibenzofuran	3	3	6			50					
Diethylphthalate	6	6	6			50					5000
Bis (2-ethylhexyl) Phthalate	1	1	6			50					
PAHs (ug/l)											
2-Methylnaphthalene	2	0.8	6			50					
Naphthalene	10	1	7			50			500	400	20
Acenaphthene	3	0.4	6			50					
Phenanthrene	2	2	6			50					
Fluorene	4	0.7	6			50					
Carbazole	5	0.9	6			50					
Fluoranthene	3	2	6			50					
Pyrene	2	1	6			50					
METALS (ug/l)											
Aluminum	7520	135	5823	366	N*J	100					
Arsenic	10	5	9			25	50				
Barium	172	36.5	156	34	B	1000	2000	2000			2000
Cadmium	0.5	0.2	0.3			10	5	5	40	5	5
Calcium	713000	14700	472932	88400	N*J						
Chromium	11.4	11.4	8	21	*	50	100	100	1000	200	100
Copper	31.9	31.9	18			200		1300			
Iron	16300	1480	12383	1070	N*J	500 (2)					
Lead	20	2	11	3	*J	25		0			
Magnesium	135000	21900	85071	15700	NJ	35000					
Manganese	2190	104	1399	199	NJ	500 (2)		200			
Nickel	33.6	33.3	29				100	100	1000	500	100
Potassium	15400	1980	9694	4020	B						
Sodium	175000	18000	124832	31700	NJ	20000					
INORGANICS (mg/l)											
Chloride	132000	24000	105751	30000	*	250000					
Sulfate	1550000	9700	846500	74000.00		250000					

Notes:

(1) Site Occurance includes maximum and minimum detected values of the respective test parameters. The 95% confidence limit values were calculated using reported concentrations were calculated using reported concentrations and one half the matix detection limit value. Elevated matrix detection limit values for VOCs in sample MW-3S were ommitted from the calculation.

(2) NYSDEC Class GA criteria developed for waters with a best usage as a potable water supply.

(3) USEPA MCLs and MCLGs developed for public water supply systems.

(4) USEPA Health Advisories developed to be protective of adverse non-carcinogenic health effects associated with exposure of a child for one day and longer term (approximately 7 years or 10% of lifetime) and lifetime exposure for adults.

(5) Chlorotoluene (a.k.a chloromethylbenzene) value presented is TIC concentration, identified in MW-3S only..

Table 21
Chem-Trol
Remedial Investigation
Summary of Groundwater Health-based ARARs and SCGs
Shallow Bedrock

Parameter	Downgradient Occurrence MAX	MIN	95% CONF. VALUE	Upgradient Occurence MW-7R 8/12/93	Q	MW-11R 8/13/93	Q	ARARs/SCGs NYSDEC Class GA (ug/l)	USEPA MCLs (ug/l)	USEPA MCLGs (ug/l)	USEPA Health Advisories Child/one-day (ug/l)	kid/long ter (ug/l)	Adult Lifetime (ug/l)
VOLATILE ORG. COMPOUNDS (ug/l)													
Vinyl chloride	3	1	21					2	2	0	3000	10	
Chloroethane	52	22	38					5					
Methylene Chloride	26	0.8	24					5	5	0	10000		
Carbon Disulfide	26	26	24					50					
1,1-Dichloroethene	270	2	129					5	7	7	2000	1000	7
1,1-Dichloroethane	860	2	374					5					
1,2-Dichloroethene(Total)	26	3	19					5	70	70	20000	2000	100
Chloroform	130	2	56					7	100		4000	100	
1,1,1-Trichloroethane	2800	1	1117					5	200	200	100000	40000	200
Trichloroethene	1500	1	601					5	5	0			
1,1,2-Trichloroethane	2	0.9	21					5	5	3	600	400	3
Benzene	2	2	21					0.7	5	0	200		
Tetrachloroethene	4	0.5	21					5	5	0	2000	1000	
Toluene	7	0.9	21					5	1000	1000	20000	2000	1000
Xylene (Total)	4	0.6	21					5	10000	10000	40000	40000	10000
Chlorotoluene	4200	620	2365					5			2000	2000	100
SEMI-VOL. ORG. COMPOUNDS (ug/l)													
2-Methylphenol	0.4	0.4	5					50					
4-Methylphenol	0.4	0.4	5					50					
2,4-Dimethylphenol	0.2	0.2	5					50					
4-Chloro-3-Methylphenol	14	3	7					5					
Diethylphthalate	1	0.2	5					50					5000
Bis (2-ethylhexyl) Phthalate	0.6	0.6	5					50					
PAHs (ug/l)													
2-Methylnaphthalene	0.5	0.5	6					50					
Naphthalene	4	1	5					50			500	400	20
Carbazole	0.4	0.4	6					50					
METALS (ug/l)													
Aluminum	9520	89.8	6139	5460	N*J	3540	N*J	100					
Barium	652	76.5	451	54.8	B	104	B	1000	2000	2000			2000
Cadmium	0.2	0.2	0.2	0.2	BJ	0.3	B	10	5	5	40	5	5
Calcium	235000	108000	220746	120000	BN*	142000	BN*J						
Chromium	13.7	13.7	10	39.7	*J			50	100	100	1000	200	100
Copper	5.4	5.4	4					200		1300			
Iron	11700	1250	7699	7180	N*J	4600	N*J	500 (2)					
Lead	3	2	3	12.2	S*J	10	*J	25		0			
Magnesium	38500	19500	39530	18800	NJ	37900	NJ	35000					
Manganese	1160	19.7	802	215	NJ	67.9	NJ	500 (2)		200			
Potassium	6640	3060	6007	4240	B	6030							
Sodium	67800	13300	74103	23800	NJ	54000	NJ	20000					
Zinc	89.1	22.2	59					300			6000	3000	2000
INORGANICS (ug/l)													
Chloride	145000	21000	138030	251000		93000		250000					
Sulfate	132000	82000	123330	154000		82000		250000					

Notes:

(1) Site Occurance includes maximum and minimum detected values of the respective test parameters. The 95% confidance limit values were calculated using reported concentrations were calculated using reported concentrations and one half the matix detection limit value. Elevated matrix detection limit values for VOCs in sample MW-1R were ommitted from the calculation.

(2) NYSDEC Class GA criteria developed for waters with a best usage as a potable water supply.

(3) USEPA MCLs and MCLGs developed for public water supply systems.

(4) USEPA Health Advisories developed to be protective of adverse non-carcinogenic health effects associated with exposure of a child for one day and longer term (approximately 7 years or 10% of lifetime) and lifetime exposure for adults.

(5) Chlorotoluene includes TICs identified as chloromethylbenzene.

Table 22
Chem-Trol
Remedial Investigation
Summary of Environment Based Surface Water ARARs/SCGs

Parameter	Upsteam Occurance MAX	Upsteam Occurance MIN	Upsteam Occurance 95% Conf. Limit	Downstream Occurance MAX	Downstream Occurance MIN	Downstream Occurance 95% Conf. Limit	ARAR/SCG NYSDEC Class C Waters	ARAR/SCG AWQC Aquatic Acute	ARAR/SCG AWQC Aquatic Chronic
SEMI-VOL. ORG. COMPOUNDS (ug/l)									
2,4-Dimethylphenol				0.7	0.7	10			
Bis (2-ethylhexyl) phthalate	1	0.6	6				0.6		
PAHs (ug/l)									
Fluoranthene				0.6	0.6	10		3980	
PESTICIDES (ug/l)									
alpha-BHC	0.0056	0.0056	0.03						
beta-BHC	0.014	0.0099	0.03						
METALS (ug/l)									
Barium	494	494	220						
Calcium	68200	68200	47534						
Chromium	99	10	48	11.1	11.1	16	*440		
Cobalt	21.2	21.2	15				5		
Copper	55.3	55.3	25				*26	18	12
Iron	34300	126	14602	3730	131	6350	300	1000	
Lead	94.4	2	41	8	8	13	*10	8.2	3.2
Manganese	3850	3850	1635						
Nickel	126	126	62				*192	1400	100
Silver	0.3	0.3	0.1				0.1	0.92	0.12
Vanadium	24.2	24.2	16	49	49	79	14		
Zinc	384	384	168				*180	96	86
Cyanide	16.6	13.6	11				5.2	22	5.2
INORGANICS (mg/l)									
Chloride	137000	64000	132899	206000	115000	272906			
Sulfate	126000	61000	120171	105000	87000	118072			

Notes:

(1) Site Occurance includes maximum and minimum detected values of the respective test parameters. The 95% confidence limit values were calculated using reported concentrations were calculated using reported concentrations and one half the matix detection limit value.

(2) Class C standards as promulgated in 6 NYCRR 703.

(3) Class C standards for selected metals is based on the hardness of the water. For purposes of making these calculations, a hardness of 250 ppm was assumed.

Chromium = exp(0.819 [ln (ppm hardness)] + 1.561)

Copper = exp(0.8545 [ln (ppm hardness)] - 1.465)

Lead = exp(1.266 [ln (ppm hardness)] - 4.661)

Nickel = exp(0.76 [ln (ppm hardness)] + 1.06)

Zinc = exp(0.85 [ln (ppm hardness)] + 0.50)

Hardness estimated at 250 ppm due to calceriferous nature of stream bed.

(4) AWQC = USEPA Ambient Water Quality Criteria for aquatic organisms, Fresh Water Acute and Chronic Lowest Observed Effect.

(5) Chromium is assumed to be trivalent chromium.

(6) Silver Class C standard is for ionic silver.

Table 23
Chem-Trol
Remedial Investigation
Summary of Environment Based Surface Water Sediments ARARs/SCGs

Parameter	Downstream Occurance MAX	Downstream Occurance MIN	Downstream Occurance 95% Conf. Limit	Upstream Occurance MAX	Upstream Occurance MIN	Upstream Occurance 95% Conf. Limit	ARAR/SCG NYSDEC Sediment Criteria Aquatic Toxicity	NYSDEC Sediment Criteria Human Health Residue	NYSDEC Sediment Criteria Wildlife Residue	NOAA Memo SOMA52	USEPA Sediment Criteria
VOLATILE ORG. COMPOUNDS (ug/kg)											
Methylene Chloride	13	9	24								
Acetone	530	11	105								
Carbon Disulifide	6	3	10	5	5	7					
2-Butanone	47	47	17								
SEMI-VOL. ORG. COMPOUNDS (ug/kg)											
Dibenzofuran	56	28	373	150	150	506					
Diethylphthalate	130	130	330								
Hexachlorobenzene	300	300	385				<75680	1.5	120		
Di-n-Butylphthalate	58	29	261								
Butylbenzylphthalate	370	370	355								
Bis (2-ethylhexyl) Phthalate	880	100	634	1300	60	1360	1197				
Di-n-octylphthalate	150	120	378								
PAHs (ug/kg)											
2-Methylnaphthalene				53	48	524				65	
Naphthalene	47	47	366	33	33	530				340	
Acenaphthylene				73	73	524					
Acenaphthene	30	30	399	230	230	498	7300			150	1400
Fluorene	96	51	374	600	150	624				35	
Phenanthrene	1000	26	562	4700	34	4916	1390			225	1200
Anthracene	170	57	327	900	98	941				85	
Carbazole	170	36	345	150	120	265					
Fluoranthene	1900	45	1104	4500	63	5007				600	10200
Pyrene	2000	40	1086	3500	74	4110				350	
Benzo (a) Anthracene	910	49	472	1800	150	1934		13		230	
Chrysene	1200	66	670	2100	53	2403		13		400	
Benzo (b) Fluoranthene	2300	32	913	2700	58	3171		13			
Benzo (k) Fluoranthene	1100	31	557	1200	48	1438		13			
Benzo (a) Pyrene	1100	70	584	1400	38	1598		13		400	
Indeno (1,2,3-cd) Pyrene	980	56	529	1100	22	1443		13			
Dibenz (a,h) Anthracene	340	340	388	500	370	543				60	
Benzo(g,h,i) Perylene	540	73	387	670	93	769					
PESTICIDES (ug/kg)											
alpha-BHC	8.4	1.6	5								
delta-BHC	31	5.6	16	3.8	1.1	4					
Heptachlor	0.74	0.24	3	1.2	0.48	3	0.3	1.1	1		
Aldrin	0.4	0.4	4				84	1	7.7		
Heptaclor Epoxide				0.45	0.45	3	0.3	1.1	1		
Endosulfan I	1.9	1.9	4	1.3	1.3	3	0.3				
Dieldrin	2	0.73	6	0.52	0.52	5	195	1.3		0.02	90
4,4'-DDE	9.7	0.45	6	0.49	0.49	5	<500	0.1	10	2	
Endrin	78	0.62	16				10.4	0.532	8	0.02	40
Endosulfan II	1.2	1.2	7	0.56	0.56	5	0.3				
4,4'-DDD	13	0.93	7	0.38	0.38	5	<500	0.1	10	2	
4,4'-DDT	5.6	0.55	5	7	1.6	8	<500	0.1	10	1	
Methoxychlor	3.5	2.9	33	2.2	2.2	27	6				
Endrin Ketone	3.7	1.7	6	2.5	1	5					
alpha-Chlordane	5.4	1.6	4	0.43	0.23	3	0.02	0.01	0.06	0.5	
gamma-Chlordane	2	2	4				0.02	0.01	0.06	0.5	
PCBs (ug/kg)											
Aroclor-1242	2800	450	1282								
Aroclor-1248	940	110	239	140	140	147					
Aroclor-1254	74	74	74	27	27	50					
Aroclor-1260	72	72	73	87	87	94					
Total PCBs (8)							<2760	0.08	195	50	

Table 23
Chem-Trol
Remedial Investigation
Summary of Environment Based Surface Water Sediments ARARs/SCGs

Parameter	Downstream Occurance			Upstream Occurance			NYSDEC Sediment Criteria			NOAA	USEPA
	MAX	MIN	95% Conf. Limit	MAX	MIN	95% Conf. Limit	Background (1)	Metals Criteria	Limit of Tolerance	Memo SOMA52	Sediment Criteria
METALS (mg/kg)											
Aluminum	14700	8110	12971	13700	7340	15534	16653.0				
Arsenic	12.9	1.6	9	18.8	4.9	20	8.1 (12)	5 (4-5.5)	33	33	
Barium	185	52.5	107	86.1	71.6	115	68.6				
Beryllium	0.85	0.85	1								
Cadmium	1.8	0.11	1	1.7	0.17	2	0.8(2.5)	0.8 (0.6-1.0)	10	5	
Calcium	34400	24400	28965				72865				
Chromium	46.9	19.4	38	25.7	16.1	28	25.8 (75)	26 (22-31)	111	80	
Cobalt	17.1	10.1	16	15.1	12.5	16	15.0				
Copper	62.7	24	46	28.5	20	37	55.1 (65)	19 (15-25)	114	70	
Iron	41600	19400	34860	24600	14500	29608	31337 (59000)	4000 (20000-30000	40000		
Lead	317	18.1	166	205	34	215	96.8 (55)	27(23-31)	250	35	
Magnesium	7260	5420	4095				7937.7				
Manganese	1430	252	1036	1050	574	1232	902.2 (1200)	428 (400-457)	1100		
Nickel	55.7	30.2	51	46.9	30.8	48	49.8 (75)	22 (15-31)	90	30	
Selenium				1.3	1.3	1					
Silver				0.14	0.14	0.2	0.1			1	
Sodium	606	606	557				381.2				
Vanadium	42.2	13.8	29	53.9	12.2	57	35.0				
Zinc	353	74.1	290	355	73.3	388	187.5 (145)	85 (65-110)	800	120	
LEACHABLE INORGANICS (ug/g)											
Leachable Chloride	289	46	246	512	129	618					
Leachable Sulfate	6480	358	3270	10200	400	10663					

Notes:
(1) Site Occurance includes maximum and minimum detected values of the respective test parameters. The 95% confidence limit values were calculated using reported concetrations and one half the method detection limit for parameters not detected. Dupliacte and spilt samples were averaged prior to performing the calculation.
(2) NYSDEC Cleanup Criteria for Toxicity as published in "Cleanup Criteria for Aquatic Sediments," December 1989.
(3) Assumed organic carbon content of 1% for organic compounds.
(4) For metals, background includes both 95% confidence limit of background soils and published background in NYSDEC guidance in parenthesis.
(5) Metals criteria include "no-effect" and "lowest effect" levels in parenthesis.
(5) Limit of tolerance would be detrimental to majority of species.
(6) National Oceanic and Atmospheric Administation Technical Memorandum No. SOMA52, "The Potential for Biological Effcets of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program", dated 1990.
(7) USEPA Sediment Criteria in USEPA Interim Sediement Quality Criteria based on equilibrium partitioning approach.
(8) PCB criteria provided for total PCBs.

Table 24
Chem-Trol
Remedial Investigation
Summary of Soil Cleanup Objectives

Parameter	Site Occurence			ARAR/SCG			CONTRACT REQUIRED DETECTION LIMIT (CRQL)	CLEANUP OBJECTIVES
	MAX	MIN	95% Conf. Limit	TAGM #4046	Superfund PCB Cleanup	USEPA HEAST		
VOLATILE ORG. COMPOUNDS (ug/kg)								
Methylene Chloride	8900	2	1142	100		93000	5	100
Chloroform	34000	0.4	3549	300		110000	5	300
Tetrachloroethene	35000	1	3999	1400		14000	5	1400
1,1,1-Trichloroethane	8800	4	1387	800		7000000	5	800
Trichloroethene	8700	2	1370	700		64000	5	700
Total Xylenes	18000	1	2492	1200		200000000	5	1200
SEMI-VOL. ORG. COMPOUNDS (ug/kg)								
Phenol	120000	51	14896	30 or MDL		50000000	330	330
2-Methylphenol	14000	14000	1910	100 or MDL			330	330
4-Methylphenol	52000	65	6565	900			330	900
Hexachlorobenzene	21000	76	3055	410		410	330	410
PAHs (ug/kg)								
Benzo (a) Anthracene	2900	40	574	224 or MDL		220	330	330
Chrysene	2700	66	686	400			330	400
Benzo (b) Fluoranthene	4300	86	866	1100		220	330	330
Benzo (k) Fluoranthene	1400	140	421	1100		220	330	330
Benzo (a) Pyrene	3000	230	624	61 or MDL		61	330	330
Dibenz(a,h)anthracene	77	37	248	14 or MDL		14	330	330
PESTICIDES (ug/kg)								
delta-BHC	46000	29	5888	300			8	300
gamma-BHC	2600	1.5	338	60		5400	8	60
PCBs (ug/kg)								
Aroclor 1242	1100000	700	138828					
Aroclor-1248	13000	66	1767					
Aroclor-1254	700000	30	85091					
Aroclor-1260	2500	56	605					
Total PCBs				10000	10000	1000	160	1000
METALS (mg/kg)								
Aluminum	29100	4570	16594	16653			20	16653
Arsenic	13.6	3.5	10	8.1 (7.5)		80	1	8.1
Beryllium	5.5	0.3	2	(0.16)		0.16	0.5	0.5
Cadmium	14.2	0.19	5	0.77 (1)		80	0.5	1
Calcium	261000	2860	102958	72864			500	72864
Chromium	125	8.7	56	25.8 (10)		8000	1	25.8
Copper	1390	7.3	368	55.1 (25)			2.5	55.1
Iron	96700	7010	47794	31337 (2000)			10	31337
Magnesium	54600	2670	18978	7938			500	7938
Manganese	2940	277	6090	902		20000	1.5	902
Silver	2.6	1.4	1	0.12		200	1	1
Sodium	1300	15.1	388	381			500	381

Notes: 1. See Tables 16 for information on ARAR/SGCs.
2. CRQL based on contract required quantitation limits presented in RI work plan.

Table 25
Chem-Trol
Remedial Investigation
Summary of Floodplain Sediments Cleanup Objectives

Parameter	Site Conditions			Health-based ARARs/SCGs			Contract Required Detection Limit (CRQL)	Cleanup Objective
	MAX	MIN	95% Conf. Limit	NYSDEC TAGM #4046	USEPA SUPERFUND PCB CLEANUP	USEPA HEAST		
Semi-Volatile Org. Compounds (ug/kg)								
Phenol	65	65	256	30 or MDL		50000000	330	330
2,4-Dinitrophenol	1800	1800	1015	200 or MDL		200000	1600	1600
Hexachlorobenzene	1600	85	692	410		410	330	410
PAHs (ug/kg)								
Benzo (a) Anthracene	2800	44	17333	224 or MDL		220	330	330
Chrysene	2900	62	1798	400			330	400
Benzo (b) Fluoranthene	2300	61	1438	1100		220	330	330
Benzo (k) Fluoranthene	2300	59	1439	1100		220	330	330
Benzo (a) Pyrene	2900	48	1791	61		61	330	330
Dibenz (a,h) Anthracene	1200	1200	804	14 or MDL		14	330	330
Pesticides (ug/kg) (6)								
delta-BHC	6000	6000	1794	300			8	300
Heptaclor Epoxide	350	1.9	112	20		770	8	20
Endrin	19000	2.3	5670	100		200000	16	100
PCBs (ug/kg) (6)								
Aroclor-1248	1900	300	1238					
Aroclor-1254	1900	180	1134					
Aroclor-1260	310	310	322					
Total PCBs				10000	10000	1000	160	1000
Metals (mg/kg)								
Beryllium	0.88	0.6	0.80	(0.16)		0.16	0.5	0.5
Cadmium	7	0.26	6	0.77 (1)		80	0.5	0.77
Chromium	34.1	16	31	25.8 (10)		8000	1	25.8
Copper	78.3	23.9	64	55.1(25)			2.5	55.1
Sodium	123	51.2	477	381			500	500

Notes: 1. See Tables 17 for information on ARAR/SCGs.
2. CRQL based oncontract required quantitation limits presented in RI work plan.

Table 26
Chem-Trol
Remedial Investigation
Summary of Surface Water Cleanup Objectives

Parameter	Downstream Occurance MAX	Downstream Occurance MIN	Downstream Occurance 95% Conf. Limit	Upstream Occurance MAX	Upstream Occurance MIN	Upstream Occurance 95% Conf. Limit	ARAR/SCG NYSDEC Class C Waters	ARAR/SCG USEPA AWQC Health	ARAR/SCG AWQC Aquatic Acute	ARAR/SCG AWQC Aquatic Chronic	Contract Required Detection Limit (CRQL)	Cleanup Objective
SEMI-VOL. ORG. COMPOUNDS (ug/l)												
Bis (2-ethylhexyl) phthalate	1	0.6	6				0.6				10	10
METALS (ug/l)												
Cobalt	21.2	21.2	15				5				50	50
Copper	66.3	66.3	25				*26	1000	18	12	25	25
Iron	34300	126	14602	3730	131	6360	300	30	1000		100	3730
Lead	94.4	2	41	8	8	13	*10	50	8.2	3.2	5	8
Manganese	3860	3860	1635					50			15	50
Nickel	126	126	62				*192	13.4	1400	100	40	40
Vanadium	24.2	24.2	16	49	49	79	14				50	50
Zinc	384	384	168				*180	5000	96	86	20	86
Cyanide	16.6	13.6	11				5.2	200	22	5.2	10	10

Notes:
(1) See Tables 18 and 22 for information on ARARS/SCGs
(2) CRQL based on contract required detection limit in RI Work Plan.

Table 27
Clean-Trol
Remedial Investigation
Summary of Surface Water Sediments Cleanup Objectives

Parameter	Downstream Occurance MAX	Downstream Occurance MIN	Downstream Occurance 95% Conf. Limit	Upstream Occurance MAX	Upstream Occurance MIN	Upstream Occurance 95% Conf. Limit	ARAR/SCG NYSDEC TAGM #4046	ARAR/SCG USEPA HEAST	ARAR/SCG Superfund PCB Cleanup	NYSDEC Sediment Criteria Aquatic Toxicity	NYSDEC Sediment Criteria Human Health Residue	NYSDEC Sediment Criteria Wildlife Residue	NOAA Memo SOMA52	Contract Required Detection Limit (CROL)	Cleanup Objective
PCBs (ug/kg)															
Aroclor-1242	2800	450	1282											80	
Aroclor-1248	940	110	239	140	140	147								80	
Aroclor-1254	74	74	74	27	27	50								160	
Aroclor-1260	72	72	73	87	87	94								160	
Total PCBs (8)							1000	1000	190	< 2760	0.08	195	50		80

Notes:
(1) See Tables 19 and 23 for information on ARARS/SCGs
(2) CROL based on contract required detection limit in RI Work Plan.

Table 28
Chem-Trol
Remedial Investigation
Summary of Groundwater Cleanup Objectives

OVERBURDEN

Parameter	Downgradient Occurance MAX	Downgradient Occurance MIN	Downgradient Occurance 95% CONF. VALUE	Upgradient Occurance MW-7S 8/12/93	Upgradient Occurance Q	ARARs/SCGs NYSDEC Class GA (ug/l)	ARARs/SCGs USEPA MCLs (ug/l)	ARARs/SCGs USEPA MCLGs (ug/l)	ARARs/SCGs USEPA Health Advisories Child/one-day (ug/l)	ARARs/SCGs USEPA Health Advisories Child/long term (ug/l)	ARARs/SCGs USEPA Health Advisories Adult Lifetime (ug/l)	Contract Required Detection Limit (CRQL)	Cleanup Objective
VOLATILE ORG. COMPOUNDS (ug/l)													
Chloroethane	200	22	100			5						10	10
Acetone	93	93	50			50						10	10
1,1-Dichloroethane	68	20	45			5						5	5
1,2-Dichloroethene(Total)	7	1	6			5	70	70	20000	2000	100	5	5
Chloroform	260	260	112			7	100		4000	100		5	7
1,1,1-Trichloroethane	19	1	12			5	200	200	100000	40000	200	5	5
Trichloroethene	470	2	203			5	5	0				5	5
Toluene	120	1	53			5	1000	1000	20000	2000	1000	5	5
Chlorotoluene	130000	1	130000			5							
SEMI-VOL. ORG. COMPOUNDS (ug/l)													
4-Chloro-3-Methylphenol	270	270	117			5						10	10
METALS (ug/l)													
Aluminum	7520	135	5823	366	N*J	100						200	366
Iron	16300	1070	12383	1070	N*J	500 (2)						100	1070
Magnesium	135000	15700	85071	15700	NJ	35000						5000	15700
Manganese	2190	104	1399	199	NJ	500 (2)		200				15	200
Sodium	175000	18000	124832	31700	NJ	20000						5000	31700
INORGANICS (mg/l)													
Sulfate	1550000	9700	845500	74000		250000							250000

Notes: 1. See Tables 20 for information on ARAR/SCGs.
2. CRQL based on contract required quantitation limits presented in RI work plan.

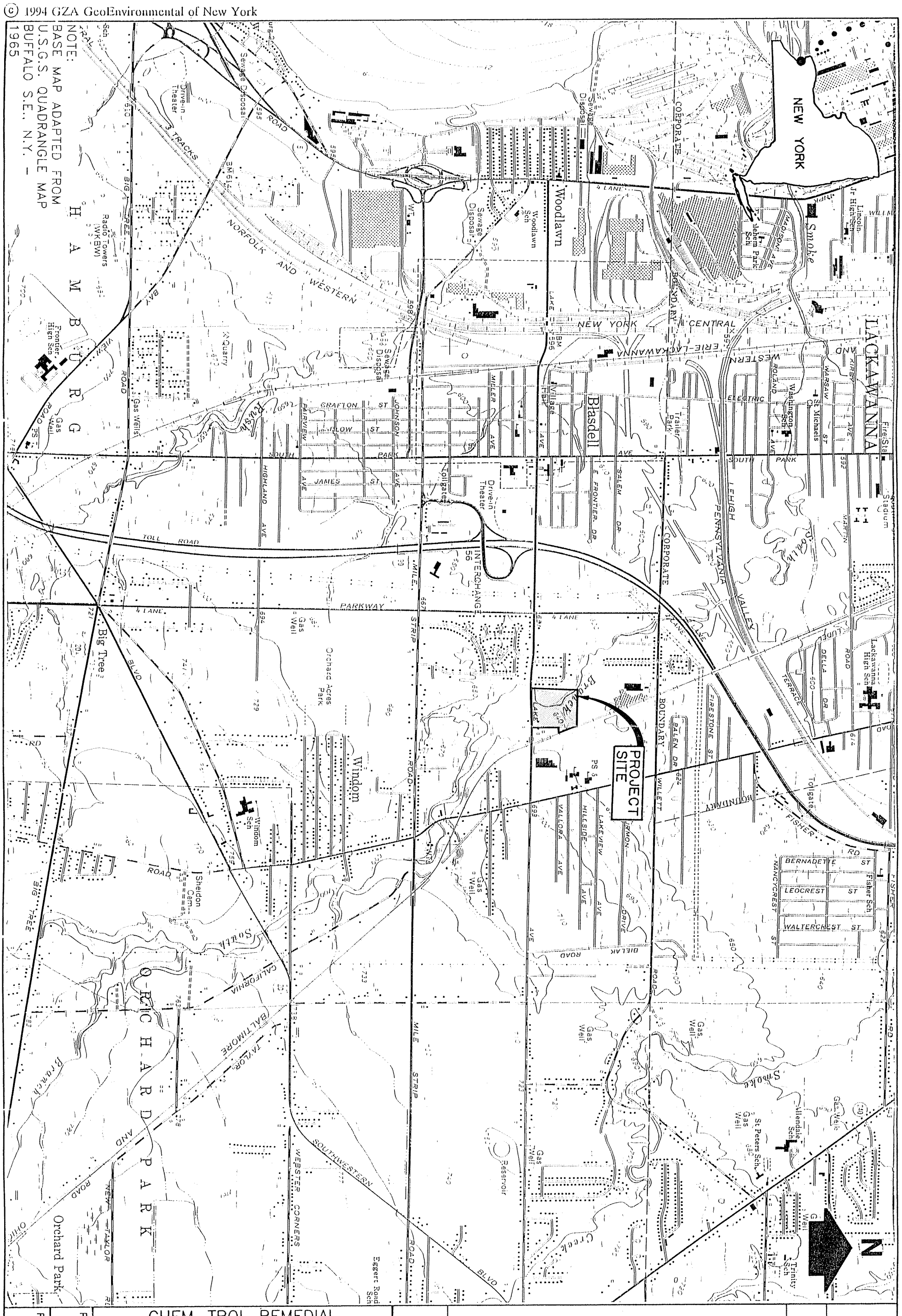
Table 29
Chem-Trol
Remedial Investigation
Summary of Groundwater Cleanup Objectives

SHALLOW BEDROCK

Parameter	Downgradient Occurance MAX	Downgradient Occurance MIN	Downgradient Occurance 95% CONF. VALUE	Upgradient Occurance MW-7R 8/12/93	Upgradient Occurance MW-7R Q	Upgradient Occurance MW-11R 8/13/93	Upgradient Occurance MW-11R Q	ARARs/SCGs NYSDEC Class GA (ug/l)	ARARs/SCGs USEPA MCLs (ug/l)	ARARs/SCGs USEPA MCLGs (ug/l)	ARARs/SCGs USEPA Health Advisories Child/one day (ug/l)	ARARs/SCGs USEPA Health Advisories Child/long term (ug/l)	ARARs/SCGs USEPA Health Advisories Adult Lifetime (ug/l)	Contract Required Detection Limit (CRQL)	Cleanup Objective
VOLATILE ORG. COMPOUNDS (ug/l)															
Vinyl chloride	3	1	21					2	2	0	3000	10		10	10
Chloroethane	52	22	38					5						10	10
Methylene Chloride	20	0.8	24					5	5	0	10000			5	5
1,1-Dichloroethene	270	2	129					5	7	7	2000	1000	7	5	5
1,1-Dichloroethane	880	2	374					5						5	5
1,2-Dichloroethene(Total)	26	3	19					5	70	70	20000	2000	100	5	5
Chloroform	130	2	56					7	100		4000	100		5	5
1,1,1-Trichloroethane	2800	1	1117					5	200	200	100000	40000	200	5	5
Trichloroethene	1500	1	601					5	5	0				5	5
Benzene	2	2	21					0.7	5	0	200			5	5
Toluene	7	0.9	21					5	1000	1000	20000	2000	1000	5	5
Chlorotoluene	4200	3	2365					5			2000	2000	100		
SEMI-VOL. ORG. COMPOUNDS (ug/l)															
4-Chloro-3-Methylphenol	14	3	7					5						10	10
METALS (ug/l)															
Aluminum	9520	89.8	6138	5460	N*J	3540	N*J	100						200	5460
Iron	11700	1250	7699	7180	N*J	4600	N*J	500 (2)						100	7180
Magnesium	38500	16800	39530	16800	NJ	37900	NJ	35000						5000	37900
Manganese	1160	19.7	802	215	NJ	67.9	NJ	500 (2)		200				15	67.9
Sodium	678000	13300	74103	23800	NJ	54000	NJ	20000						5000	23800

Notes: 1. See Tables 21 for information on ARAR/SCGs.
2. CRQL based on contract required quantitation limits presented in RI work plan.

NOTE:
BASE MAP ADAPTED FROM
U.S.G.S. QUADRANGLE MAP
BUFFALO S.E., N.Y. -
1965



REV. No.	DESCRIPTION	BY	DATE

CHEM-TROL REMEDIAL
INVESTIGATION/FEASIBILITY STUDY
HAMBURG, NEW YORK

LOCUS PLAN

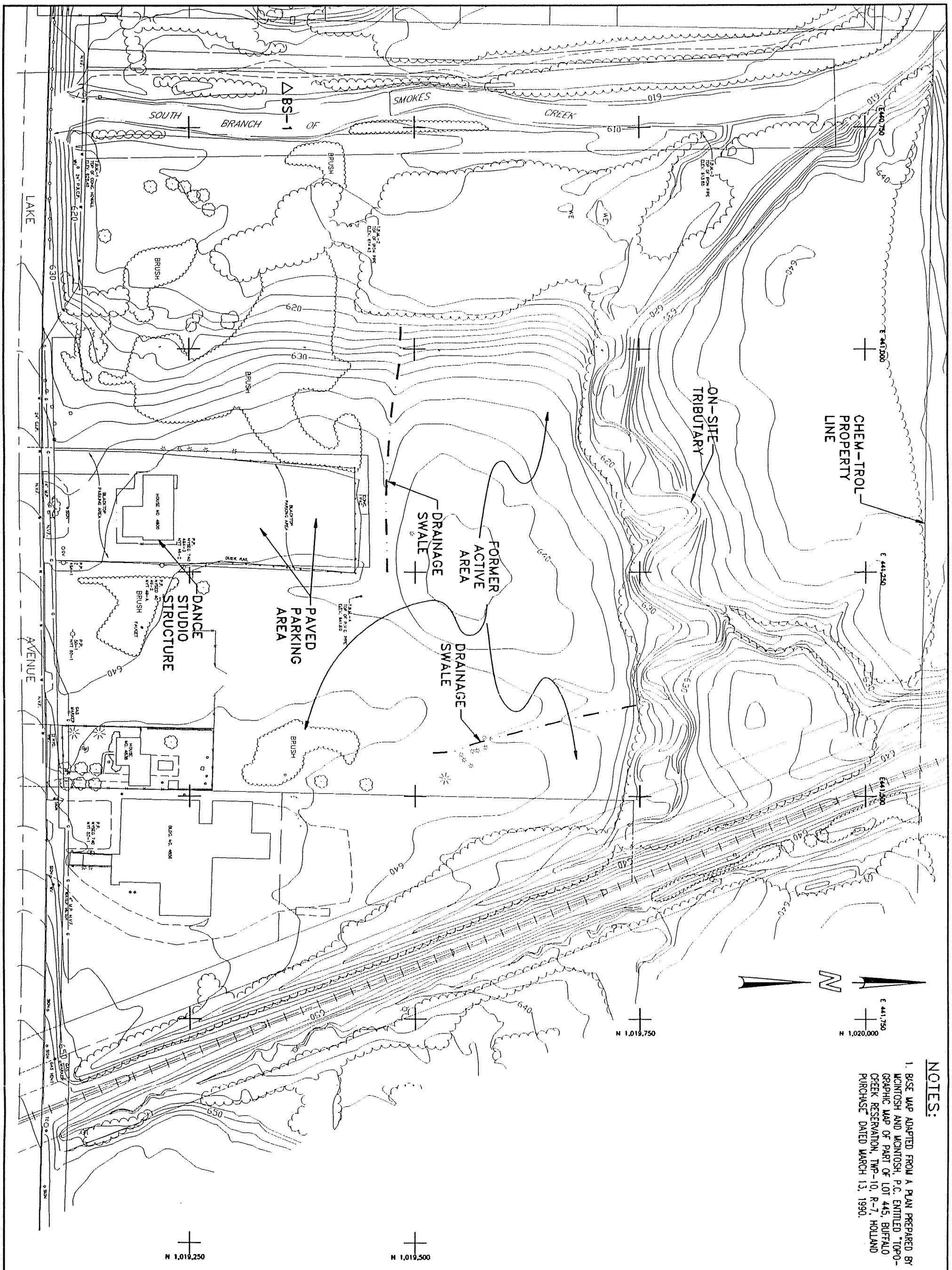
SCALE IN FEET
0 1000 2000 4000

DRAWN BY: DEW
DATE: SEPTEMBER 1994

GZA GeoEnvironmental of New York

PROJECT No. 5945

FIGURE No. 1



NOTES:

1. BASE MAP ADAPTED FROM A PLAN PREPARED BY MCINTOSH AND MCINTOSH, P.C. ENTITLED "TOPOGRAPHIC MAP OF PART OF LOT 445, BUFFALO CREEK RESERVATION, TWP-10, R-7, HOLLAND PURCHASE" DATED MARCH 13, 1990.

REV No.	DESCRIPTION	BY	DATE

CHEM-TROL REMEDIAL INVESTIGATION/FEASABILITY STUDY
HAMBURG, NEW YORK

SITE TOPOGRAPHY AND SITE FEATURES

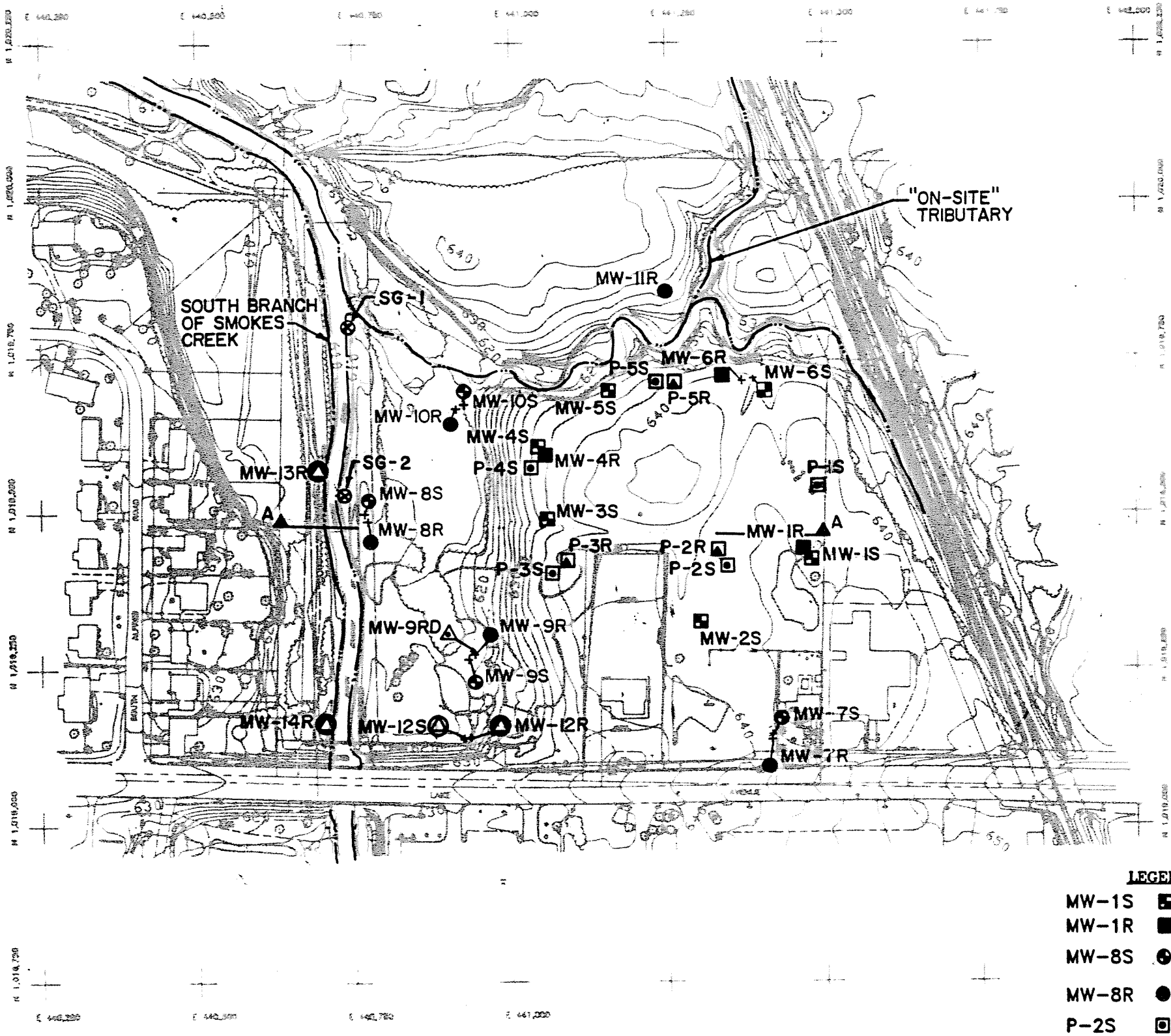
SCALE IN FEET
0 50 100 200

DRAWN BY: DEW
DATE: SEPTEMBER 1994

GZA GeoEnvironmental of New York

PROJECT No. 5945

FIGURE No. 2



NOTES:

1. BASE MAP ADAPTED FROM A PLAN PREPARED BY MCINTOSH AND MCINTOSH, P.C. ENTITLED "TOPOGRAPHIC MAP OF PART OF LOT 445, BUFFALO CREEK RESERVATION, TWP-10, R-7, HOLLAND PURCHASE" DATED MARCH 13, 1990.
2. MONITORING WELL AND PIEZOMETER LOCATIONS WERE MEASURED BY MCINTOSH AND MCINTOSH RELATIVE TO THE COORDINATE SYSTEM SHOWN, USING OPTICAL SURVEY METHODS AND PLOTTED ON THIS FIGURE BY GZA. LOCATIONS SHOULD BE CONSIDERED ACCURATE TO THE DEGREE IMPLIED BY THE METHOD USED.

LEGEND:

MW-1S	OVERBURDEN MONITORING WELL INSTALLED JULY 1990
MW-1R	BEDROCK MONITORING WELL INSTALLED JULY 1990
MW-8S	OVERBURDEN (OR TOP OF ROCK INTERFACE) MONITORING WELL INSTALLED OCTOBER - NOVEMBER 1992
MW-8R	BEDROCK MONITORING WELL INSTALLED OCTOBER - NOVEMBER 1992
P-2S	OVERBURDEN PIEZOMETER INSTALLED MARCH - APRIL 1990
P-2R	BEDROCK PIEZOMETER INSTALLED MARCH 1990
SG-1	STORM GAUGE INSTALLED DECEMBER 1993
MW-12S	OVERBURDEN MONITORING WELL INSTALLED MAY 1994
MW-12R	BEDROCK MONITORING WELL INSTALLED MAY 1994
MW-9RD	DEEP BEDROCK MONITORING WELL INSTALLED MAY 1994

REV No.	DESCRIPTION	BY	DATE

SCALE IN FEET: 0, 100, 200, 400

DRAWN BY: DEW

DATE: SEPTEMBER 1994

GZA GeoEnvironmental of New York

CHEM-TROL REMEDIAL INVESTIGATION/FEASIBILITY STUDY
HAMBURG, NEW YORK

MONITORING WELL AND PIEZOMETER LOCATION MAP

PROJECT No. 5945

FIGURE No. 3

NOTES:

1. BASE MAP ADAPTED FROM A PLAN PREPARED BY MCINTOSH AND MCINTOSH, P.C. ENTITLED "TOPOGRAPHIC MAP OF PART OF LOT 445, BUFFALO CREEK RESERVATION, TWP-10, R-7, HOLLAND PURCHASE" DATED MARCH 13, 1990.

LEGEND:

- SURFACE IMPOUNDMENT SOIL SAMPLE LOCATION
- DRUM SOIL SAMPLE LOCATION
- SELECTED PIEZOMETER/MONITORING WELL SOIL SAMPLE LOCATIONS (I.E. LOCATIONS WHERE SUBSURFACE SOIL SAMPLES WERE COLLECTED FOR ANALYTICAL TESTING)
- SURFACE SOIL SAMPLE LOCATION IDENTIFIED BY NYSDEC
- SUBSURFACE SOIL SAMPLE LOCATION ADJACENT TO TEST PIT L
- BACKGROUND SOIL SAMPLE LOCATION
- AUGER PROBE LOCATION WITH PCB FIELD SCREENING
- AUGER PROBE LOCATION WITH VOLITILE FIELD SCREENING
- AUGER PROBE LOCATION WITH PCB AND VOLITILE FIELD SCREENING
- TEST PIT LOCATION

BS-1 BS-2 BS-3 SS-1 SS-2 SD-1 SD-2 SSI-1 SSI-2 SSI-3 SSI-4 SPMW-1 SPMW-2 SPMW-4 A B C K L

E 440,750 E 441,000 E 441,250 E 441,500 E 441,750

N 1,020,000 N 1,019,750 N 1,019,500 N 1,019,250

N 700 N 600 N 500 N 400 N 300 N 200 N 100 0

W 600 LAKE W 500 W 400 W 300 W 200 W 100 AVENUE 0 E 100

BASELINE GRID

SCALE IN FEET 0 50 100 200

REV No.	DESCRIPTION	BY	DATE

DRAWN BY: DEW

DATE: SEPTEMBER 1994

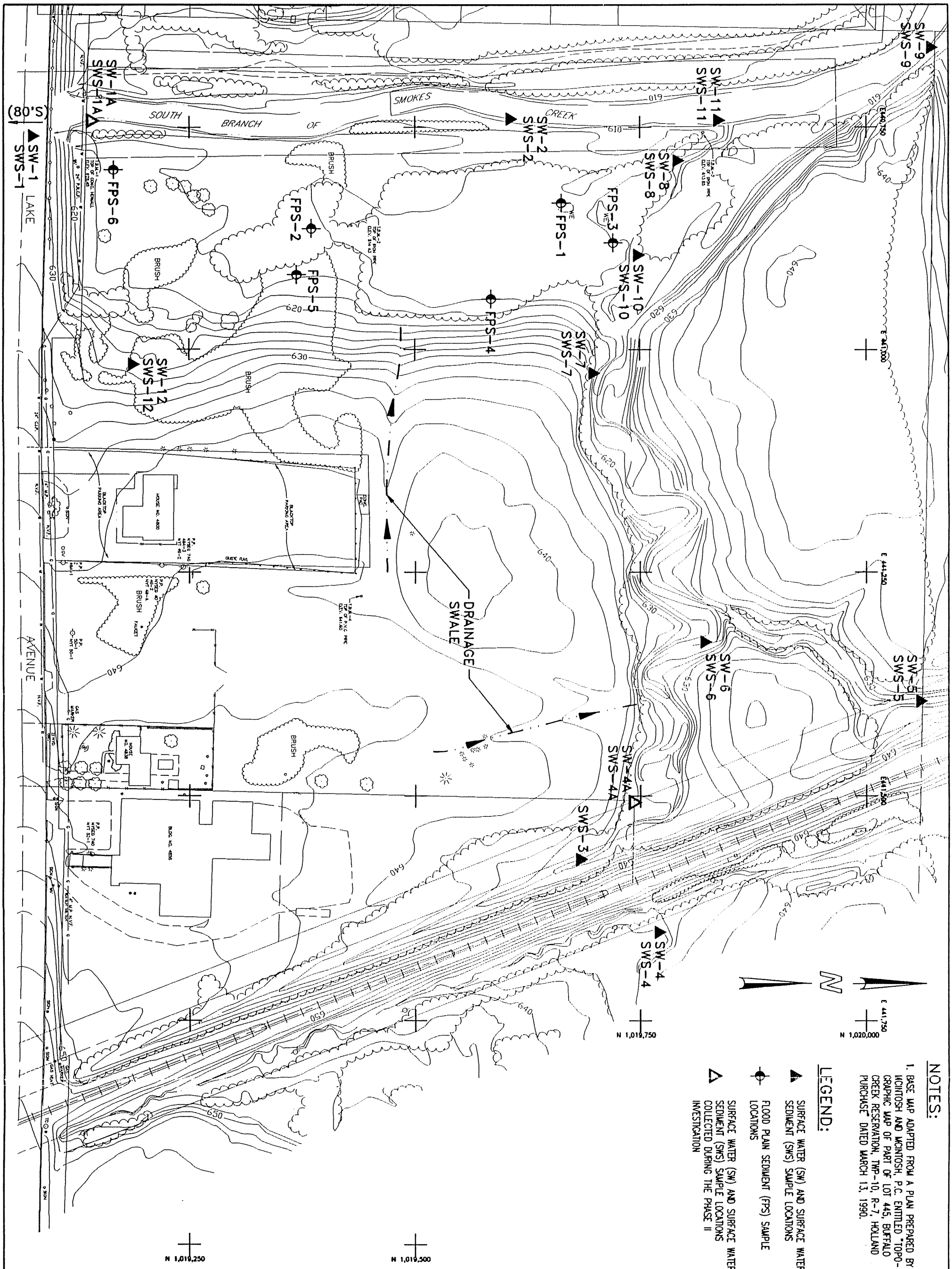
GZA GeoEnvironmental of New York

CHEM-TROL REMEDIAL INVESTIGATION/FEASABILITY STUDY
HAMBURG, NEW YORK

SOIL SAMPLE LOCATIONS

PROJECT No. 5945

FIGURE No. 5



NOTES:

1. BASE MAP ADAPTED FROM A PLAN PREPARED BY MCINTOSH AND MCINTOSH, P.C. ENTITLED "TOPOGRAPHIC MAP OF PART OF LOT 445, BUFFALO CREEK RESERVATION, TWP-10, R-7, HOLLAND PURCHASE" DATED MARCH 13, 1990.

LEGEND:

- SURFACE WATER (SW) AND SURFACE WATER SEDIMENT (SWS) SAMPLE LOCATIONS
- FLOOD PLAIN SEDIMENT (FPS) SAMPLE LOCATIONS
- SURFACE WATER (SW) AND SURFACE WATER SEDIMENT (SWS) SAMPLE LOCATIONS COLLECTED DURING THE PHASE II INVESTIGATION

FIGURE No. 4

PROJECT No. 5945

CHEM-TROL REMEDIAL INVESTIGATION/FEASABILITY STUDY
HAMBURG, NEW YORK

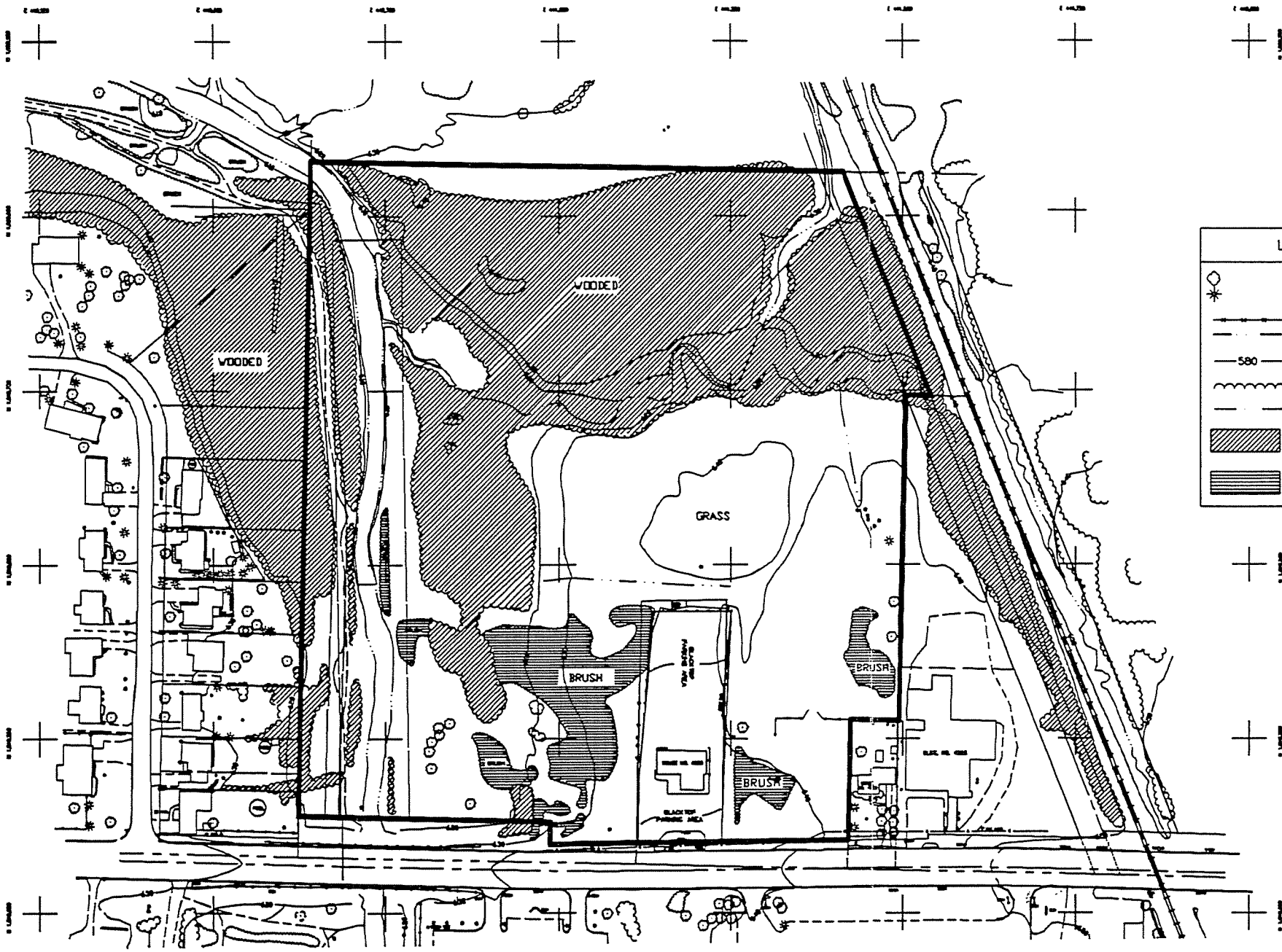
SEDIMENT AND SURFACE WATER SAMPLE LOCATIONS

REV No.	DESCRIPTION	BY	DATE

SCALE IN FEET
0 50 100 200

DRAWN BY: DEW
DATE: SEPTEMBER 1994

GZA GeoEnvironmental of New York



NOTES:

1. BASE MAP TAKEN FROM A MAP ENTITLED "TOPOGRAPHIC MAP OF PART OF LOT–445, BUFFALO CREEK RESERVATION, TWP. – 10, R–7, HOLLAND PURCHASE" DEVELOPED BY McINTOSH & McINTOSH, P.C., DATED MARCH 13, 1990.

2. THE BASE MAP WAS PRODUCED ENTIRELY BY PHOTOGRAMMETRIC METHODS FROM A 1" = 400' PHOTOGRAPHY TAKEN ON DECEMBER 9, 1989. THE USER OF THIS MAP IS CAUTIONED THAT CERTAIN AREAS OBSCURED BY SHADOWS AND HEAVY VEGETATION MAY REQUIRE FIELD VERIFICATION. THE OUTLINE OF ALL BUILDINGS IS THE ROOF LINE.

REV No.	DESCRIPTION	BY	DATE

DRAWN BY: DEW

DATE: SEPTEMBER 1994

SCALE IN FEET

0 100 200 400

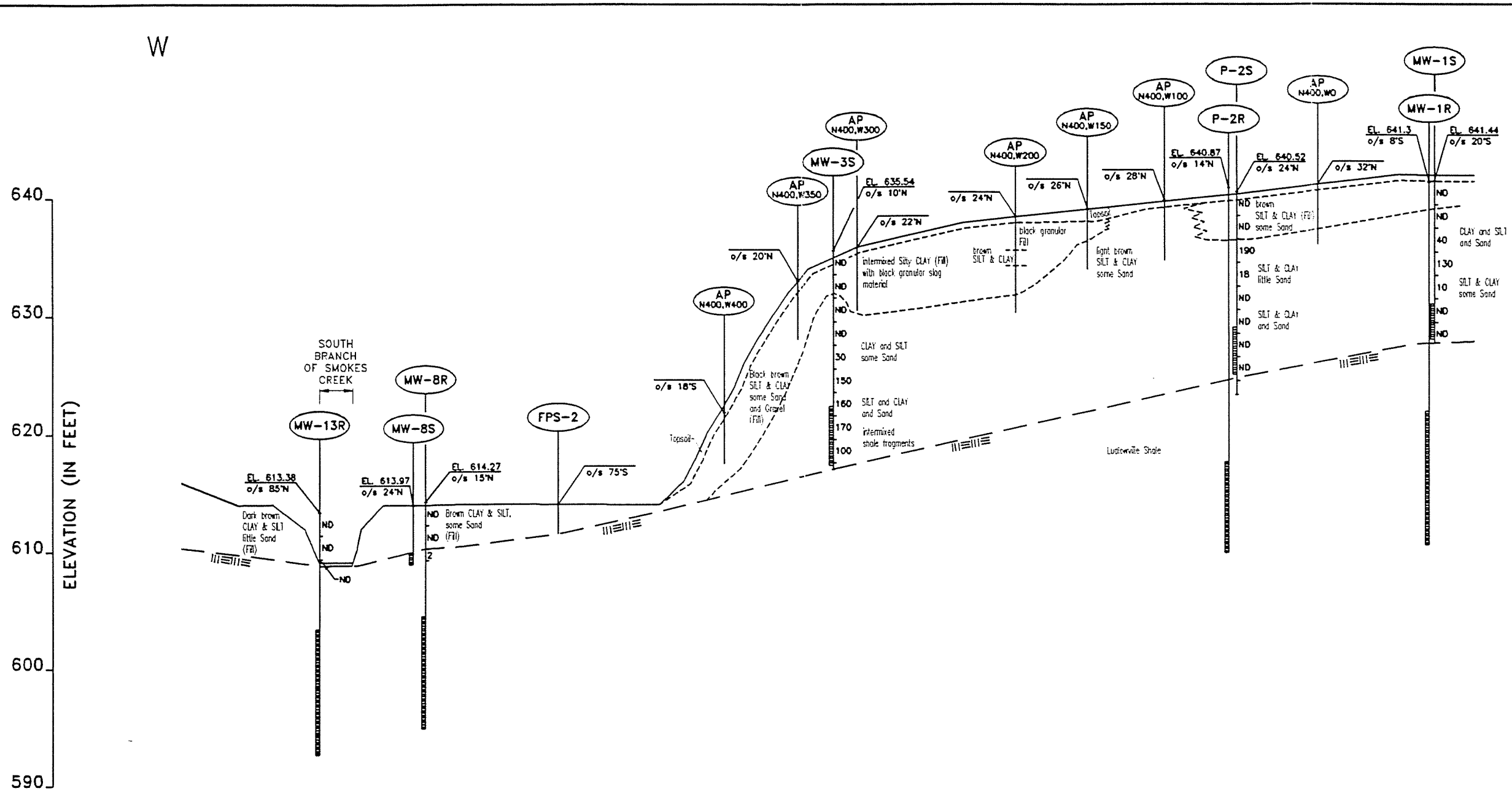
GZA GeoEnvironmental of New York

CHEM–TROL REMEDIAL INVESTIGATION/FEASABILITY STUDY
HAMBURG, NEW YORK

GROUND COVER MAP

PROJECT No. 5945

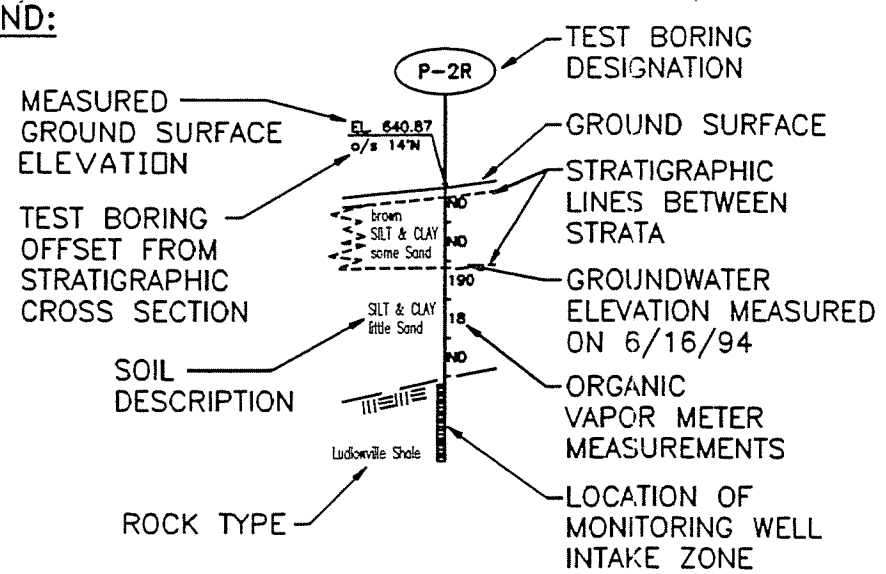
FIGURE No. 6



NOTES:

1. SEE FIGURE 2 FOR STRATIGRAPHIC CROSS SECTION LOCATION.
2. THE STRATIFICATION LINES ARE BASED UPON INTERPOLATION BETWEEN WIDELY-SPACED TEST BORINGS AND REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL AND ROCK TYPES. THE ACTUAL TRANSITIONS MAY VARY FROM THOSE SHOWN.
3. THE CROSS SECTIONS ARE INTENDED TO SHOW GENERAL GEOLOGICAL TRENDS TO ILLUSTRATE INTERPRETATIONS OF THE SUBSURFACE CONDITIONS. THE ACTUAL SUBSURFACE CONDITIONS MAY VARY FROM THOSE SHOWN.
4. FLUCTUATIONS IN GROUNDWATER LEVELS MAY OCCUR DUE TO VARIATIONS IN PRECIPITATION, BAROMETRIC PRESSURE AND OTHER FACTORS.
5. THE DEPTH OF BEDROCK WEST OF THE SOUTH BRANCH OF SMOKES CREEK WAS ASSESSED BY DRIVING PIPEING THROUGH OVERBURDEN TO REFUSAL. REFUSAL WAS ASSUMED TO BE TOP OF BEDROCK.

LEGEND:



DESCRIPTION	BY	DATE

DRAWN BY: DEW

DATE: SEPTEMBER 1994

GZA GeoEnvironmental of New York

REV No.

SCALE IN FEET

HORIZONTAL 0 40 80 160

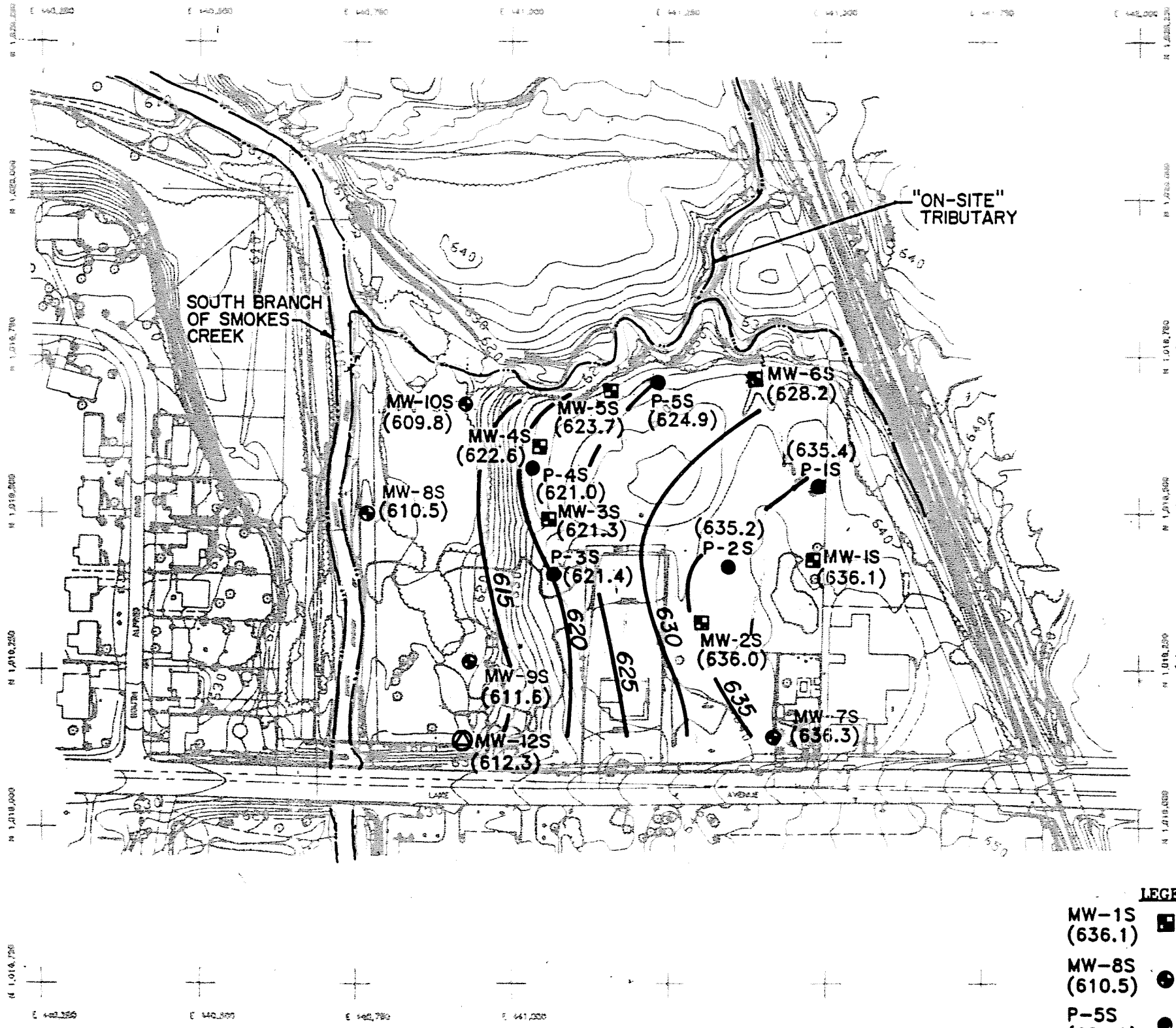
VERTICAL 0 5 10 20

CHEM-TROL REMEDIAL INVESTIGATION/FEASABILITY STUDY HAMBURG, NEW YORK

SECTION A-A

PROJECT No. 5945

FIGURE No. 7



NOTES:

1. BASE MAP ADAPTED FROM A PLAN PREPARED BY McINTOSH AND McINTOSH, P.C. ENTITLED "TOPOGRAPHIC MAP OF PART OF LOT 445, BUFFALO CREEK RESERVATION, TWP-10, R-7, HOLLAND PURCHASE" DATED MARCH 13, 1990.
2. MONITORING WELL AND PIEZOMETER LOCATIONS WERE MEASURED BY McINTOSH AND McINTOSH RELATIVE TO THE COORDINATE SYSTEM SHOWN, USING OPTICAL SURVEY METHODS AND PLOTTED ON THIS FIGURE BY GZA. LOCATIONS SHOULD BE CONSIDERED ACCURATE TO THE DEGREE IMPLIED BY THE METHOD USED.
3. GROUNDWATER CONTOURS WERE DEVELOPED BY INTERPOLATION USING WATER LEVEL MEASUREMENTS IN WIDELY SPACED PIEZOMETERS/WELLS, AND ARE SHOWN TO ILLUSTRATE GENERAL GROUNDWATER PATTERNS IN THE CONTEXT OF THIS REPORT. THE CONTOUR LINES ARE APPROXIMATE AND ACTUAL WATER LEVELS MAY VARY FROM THE LOCATIONS SHOWN.

LEGEND:

MW-1S (636.1)	OVERBURDEN MONITORING WELL INSTALLED JULY 1990 WITH WATER ELEVATION MEASURED ON JUNE 16, 1994
MW-8S (610.5)	OVERBURDEN (OR TOP OF ROCK INTERFACE) MONITORING WELL INSTALLED OCTOBER - NOVEMBER 1992 WITH WATER ELEVATION MEASURED ON JUNE 16, 1994
P-5S (624.9)	OVERBURDEN PIEZOMETER INSTALLED MARCH - APRIL 1990 WITH WATER ELEVATION MEASURED ON JUNE 16, 1994
MW-12S (612.3)	OVERBURDEN MONITORING WELL INSTALLED MAY 1994 WITH WATER ELEVATION MEASURED ON JUNE 16, 1994
620	OVERBURDEN GROUNDWATER CONTOUR

REV No.	DESCRIPTION	BY	DATE

SCALE IN FEET: 0, 100, 200, 400

DRAWN BY: DEW

DATE: SEPTEMBER 1994

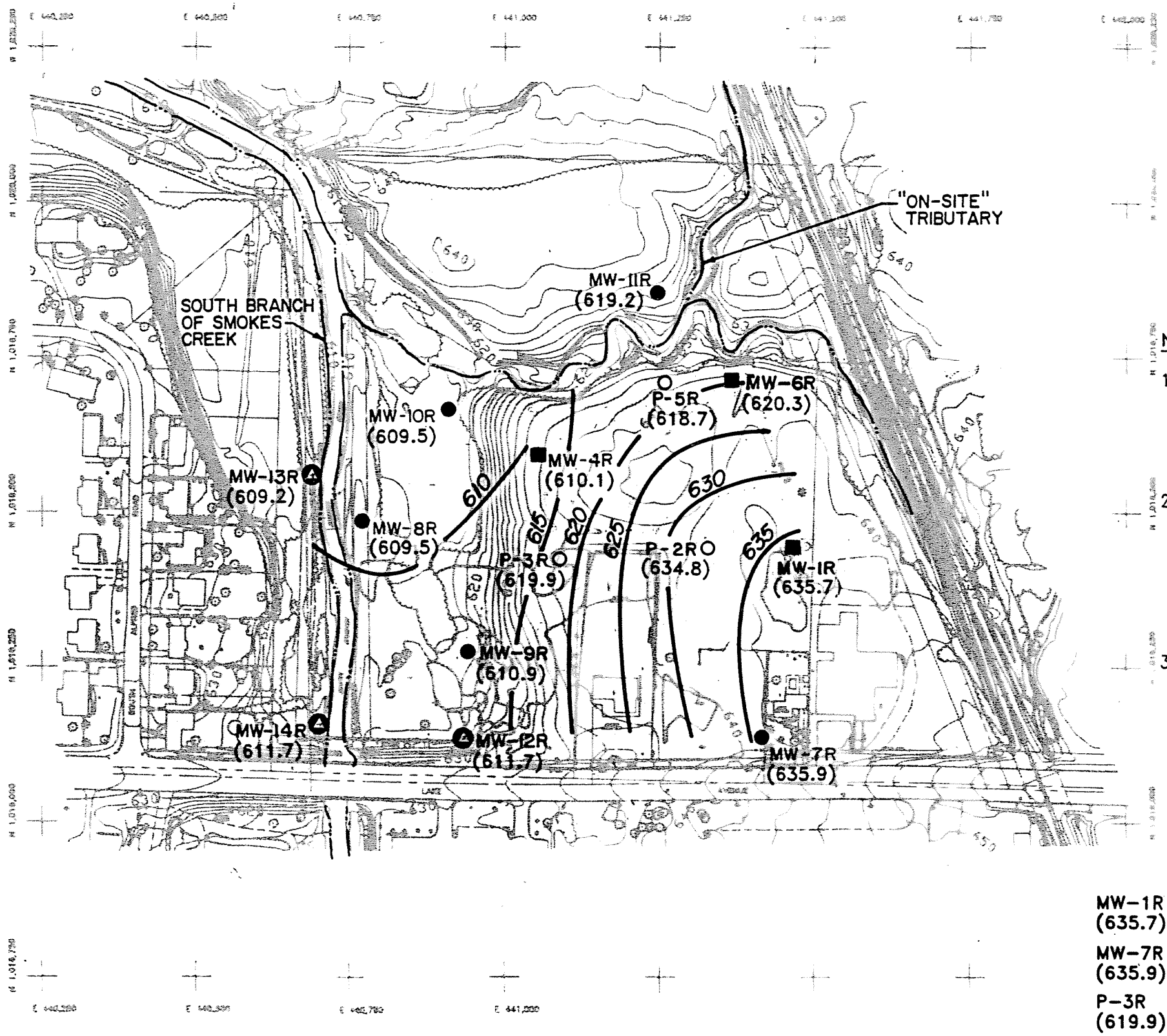
GZA GeoEnvironmental of New York

CHEM-TROL REMEDIAL INVESTIGATION/FEASIBILITY STUDY
HAMBURG, NEW YORK

OVERBURDEN GROUNDWATER CONTOUR MAP, JUNE 16, 1994

PROJECT No. 5945

FIGURE No. 8



NOTES:

1. BASE MAP ADAPTED FROM A PLAN PREPARED BY MCINTOSH AND MCINTOSH, P.C. ENTITLED "TOPOGRAPHIC MAP OF PART OF LOT 445, BUFFALO CREEK RESERVATION, TWP-10, R-7, HOLLAND PURCHASE" DATED MARCH 13, 1990.
2. MONITORING WELL AND PIEZOMETER LOCATIONS WERE MEASURED BY MCINTOSH AND MCINTOSH RELATIVE TO THE COORDINATE SYSTEM SHOWN, USING OPTICAL SURVEY METHODS AND PLOTTED ON THIS FIGURE BY GZA. LOCATIONS SHOULD BE CONSIDERED ACCURATE TO THE DEGREE IMPLIED BY THE METHOD USED.
3. GROUNDWATER CONTOURS WERE DEVELOPED BY INTERPOLATION USING WATER LEVEL MEASUREMENTS IN WIDELY SPACED PIEZOMETERS/WELLS, AND ARE SHOWN TO ILLUSTRATE GENERAL GROUNDWATER PATTERNS IN THE CONTEXT OF THIS REPORT. THE CONTOUR LINES ARE APPROXIMATE AND ACTUAL WATER LEVELS MAY VARY FROM THE LOCATIONS SHOWN.

LEGEND:

MW-1R (635.7)	■ BEDROCK MONITORING WELL INSTALLED JULY 1990 WITH WATER ELEVATION MEASURED ON JUNE 16, 1994
MW-7R (635.9)	● BEDROCK MONITORING WELL INSTALLED OCTOBER - NOVEMBER 1992 WITH WATER ELEVATION MEASURED ON JUNE 16, 1994
P-3R (619.9)	○ BEDROCK PIEZOMETER INSTALLED MARCH 1990 WITH WATER ELEVATION MEASURED ON JUNE 16, 1994
MW-12R (611.7)	▲ BEDROCK MONITORING WELL INSTALLED MAY 1994 WITH WATER ELEVATION MEASURED ON JUNE 16, 1994
620	BEDROCK GROUNDWATER CONTOUR

REV No.	DESCRIPTION	BY	DATE

SCALE IN FEET: 0, 100, 200, 400

DRAWN BY: DEW

DATE: SEPTEMBER 1994

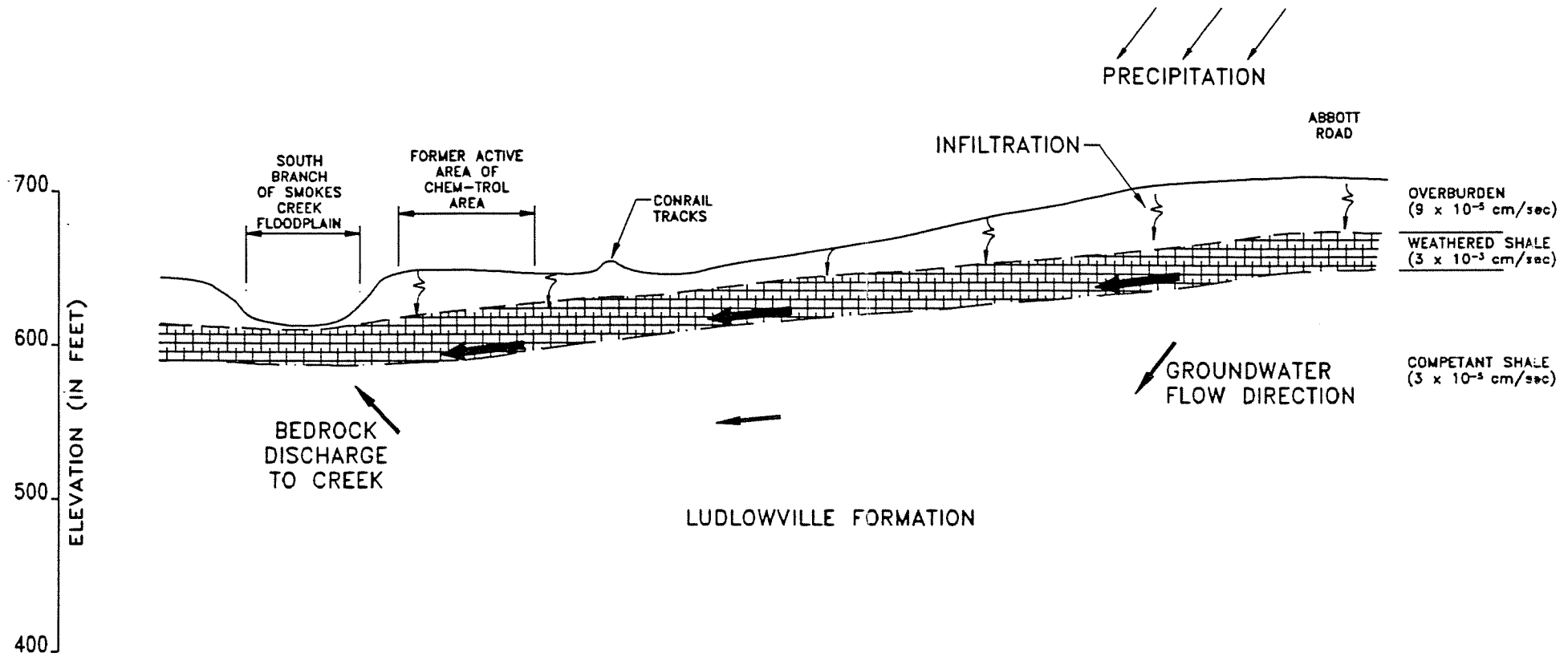
GZA GeoEnvironmental of New York

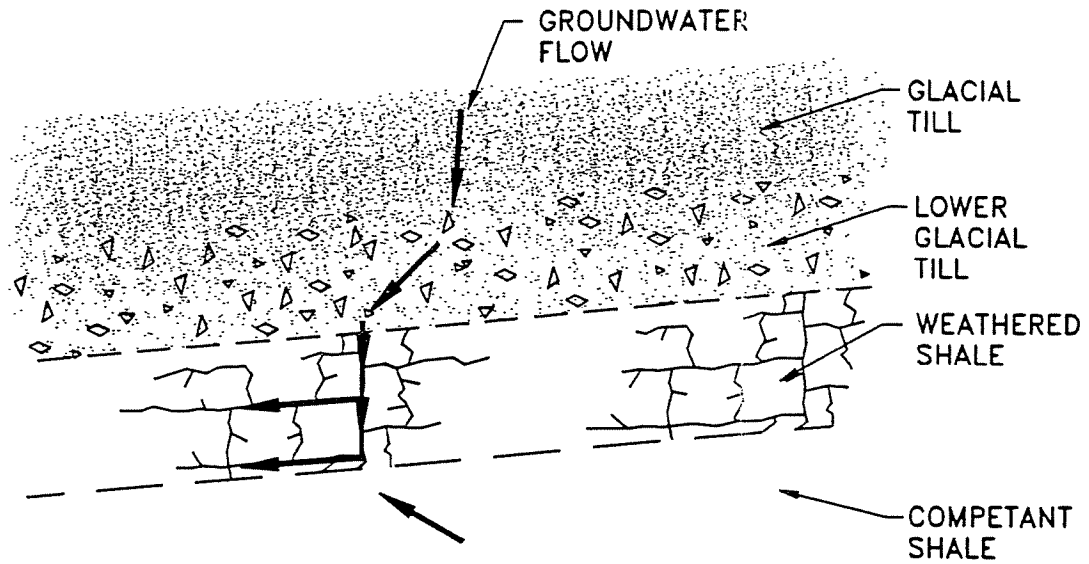
CHEM-TROL REMEDIAL INVESTIGATION/FEASIBILITY STUDY
HAMBURG, NEW YORK

BEDROCK GROUNDWATER CONTOUR MAP, JUNE 16, 1994

PROJECT No. 5945

FIGURE No. 9





DETAIL OF CONCEPTUAL GROUNDWATER FLOW

N.T.S.

NOTE:

1. HYDRAULIC CONDUCTIVITY BASED ON FIELD TESTING CONDUCTED BY GZA GEOENVIRONMENTAL OF NEW YORK. SEE APPENDIX E FOR INDIVIDUAL TEST RESULTS.
2. ACTUAL GROUNDWATER FLOW DIRECTIONS AT SPECIFIC LOCATIONS WITHIN THE BEDROCK MAY VARY DEPENDING ON PRECIPITATION AMOUNTS AND CLIMATOLOGICAL CONDITIONS.

REV No. | DESCRIPTION | BY | DATE

DRAWN BY: DEW

DATE: SEPTEMBER 1994

GZA GeoEnvironmental of New York

SCALE IN FEET

HORIZONTAL 0 250 500 1000

VERTICAL 0 50 100 200

CHEM-TROL REMEDIAL INVESTIGATION/FEASABILITY STUDY HAMBURG, NEW YORK

CONCEPTUAL GROUNDWATER FLOW MODEL

PROJECT No. 5945

FIGURE No. 10

APPENDIX A

APPENDIX A

LIMITATIONS

APPENDIX A

LIMITATIONS

1. This report has been prepared for the exclusive use of SCA Services, Inc. (SCA) for specific application to the Chem-Tool site in Hamburg, New York, in accordance with generally accepted professional practices for firms conducting remedial investigations in the same geographic area. No other warranty, expressed or implied, is made.

2. In preparing this report, GZA has relied on certain information provided by state and local officials and other parties referenced herein, and on information contained in the files of state and/or local agencies available to GZA at the time of site assessment. Although, there may have been some degree of overlap in the information provided by these various sources, GZA did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of the site assessment.

3. The conclusions and recommendations submitted in this report are based in part upon the data obtained from a limited number of soil, groundwater, surface water and sediment samples from widely-spaced explorations. The nature and extent of variations between these explorations may not become evident until further investigation. If variations or other latent conditions then appear evident, it will be necessary to reevaluate the recommendations of this report.

4. The generalized soil profile and hydrogeologic model described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretations of widely spaced explorations and samples collected; actual soil transitions are probably more gradual. For specific information, refer to the boring logs.

5. Water level readings have been made in the borings and/or piezometers and monitoring wells at times and under conditions stated on the exploration logs and water level summaries. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall and other factors different from those prevailing at the time measurements were made.

6. Quantitative testing was performed as part of the site assessment. Where such analyses have been conducted by an outside laboratory, GZA retained consultant to evaluate the validity of the data provided. As such, the reliability of test data presented herein is contingent upon the accuracy of the completed data validation.

7. Chemical analyses have been preformed for specific parameters during the course of this study, as detailed in the text. It must be noted that additional constituents not searched for during the current study may be present in soil, groundwater, surface water and sediments at the site.

8. The conclusions and recommendations contained in this report are based in part upon various types of chemical data. These data have been reviewed and interpretations made in the report are based on this data. It should be noted that variations in the types and concentrations of contaminants and variations in their flow paths may occur due to seasonal water table fluctuations, past disposal practices, the passage of time and other factors. Should additional chemical data become available in the future, these data should be reviewed by GZA, and the conclusions and recommendations presented herein modified accordingly.

9. In the event that the client obtains information on environmental or hazardous waste issues at the site not contained in this report, such information shall be brought to GZA's attention forthwith. GZA will evaluate such information and on the basis of this evaluation, may modify the conclusions stated in this report.

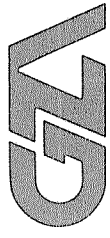
10. The test pit and test boring locations were measured by Mcintosh & Mcintosh and provided to GZA. GZA did not verify these data. Ground surface elevations were referenced to National Geodetic Vertical Datum (NGVD) - 1929. These data should be considered accurate to the degree implied by the method used.

11. It is recommended that this firm be retained to provide further engineering services during design ,implementation, and/or construction of any remedial measures, if necessary. This is to observe compliance with the concepts and recommendations contained herein and to allow design changes in the event that subsurface conditions differ from those anticipated.

12. The interpretations and conclusions presented in this report were based solely upon the services described herein, and not on scientific tasks or procedures beyond the scope of described services. The work described in this report was carried out in accordance with the agreed upon Terms & Conditions of Engagement.

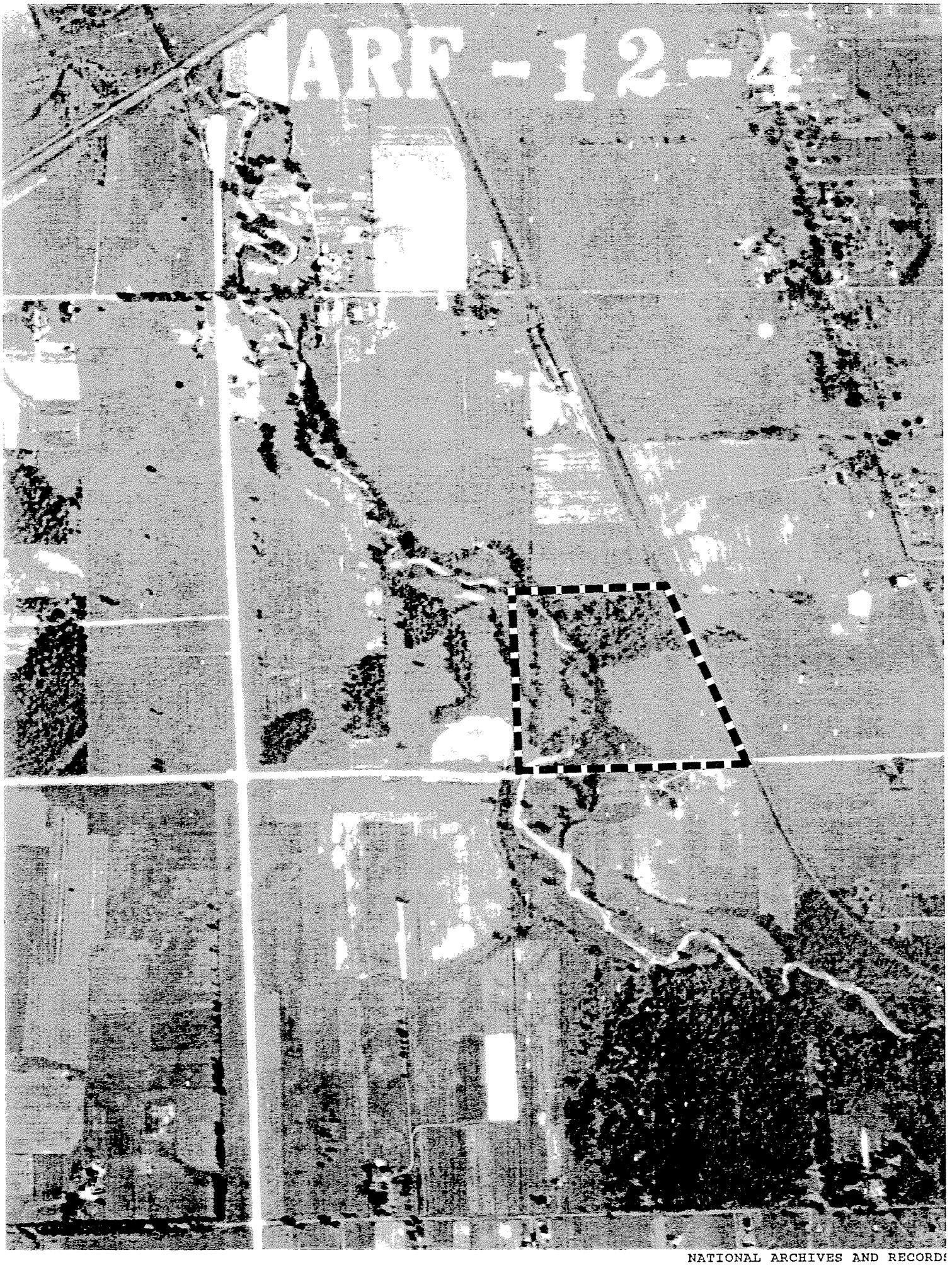
13. GZA's risk evaluation was performed in accordance with generally accepted practices of relevant regulatory agencies. The findings of the risk evaluation are dependent on numerous assumptions and uncertainties inherent in the risk assessment process. Sources of uncertainty may include the description of site conditions and the nature and extent of chemical distribution and the use of toxicity information. Consequently, the findings of the risk assessment are not an absolute characterization of actual risks, but rather serve to highlight potential sources of risk at the site. Although the range of uncertainties has into been quantified, the use of conservative assumptions and parameters throughout the assessment would be expected to err on the side of protection of human health and the environment.

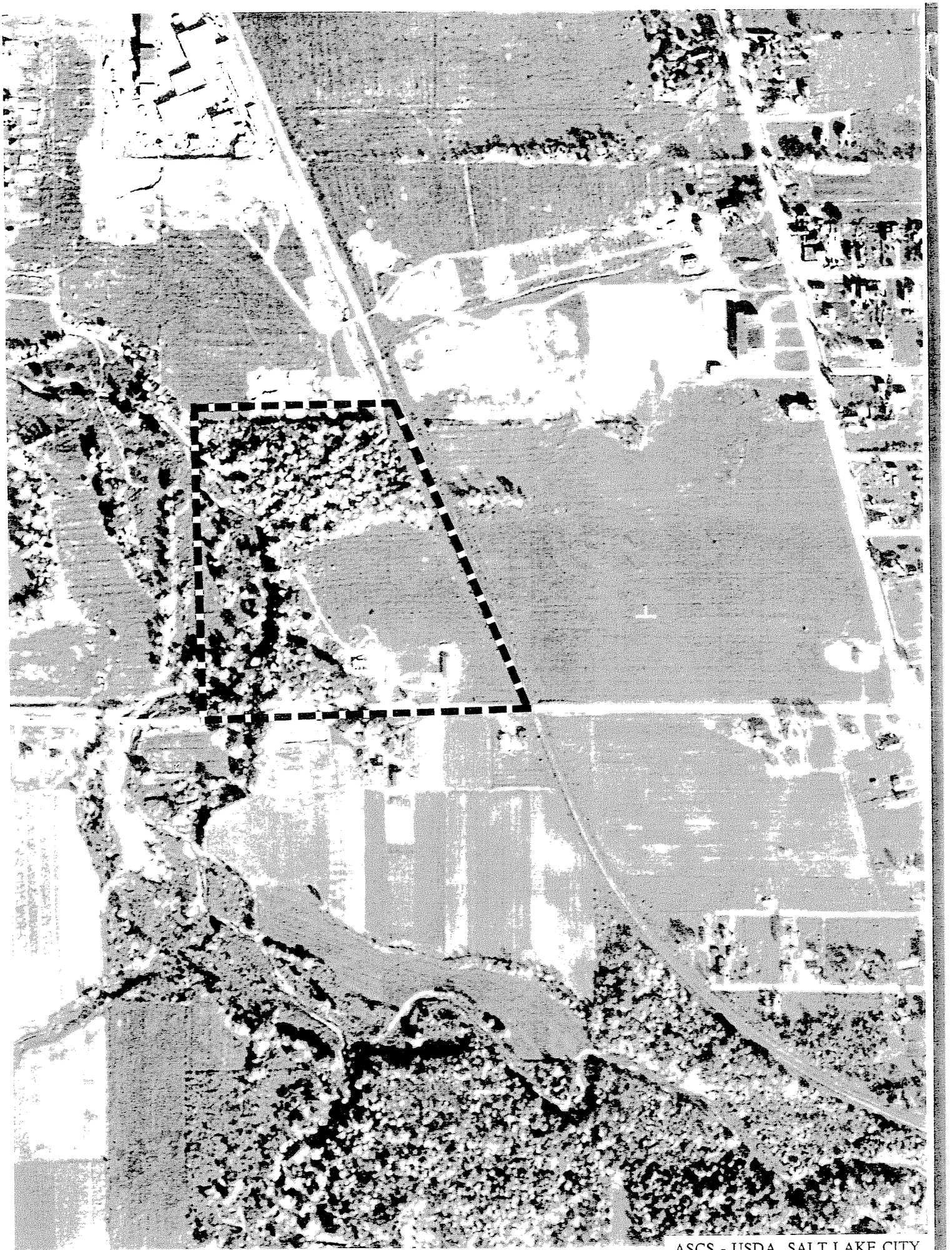
APPENDIX B



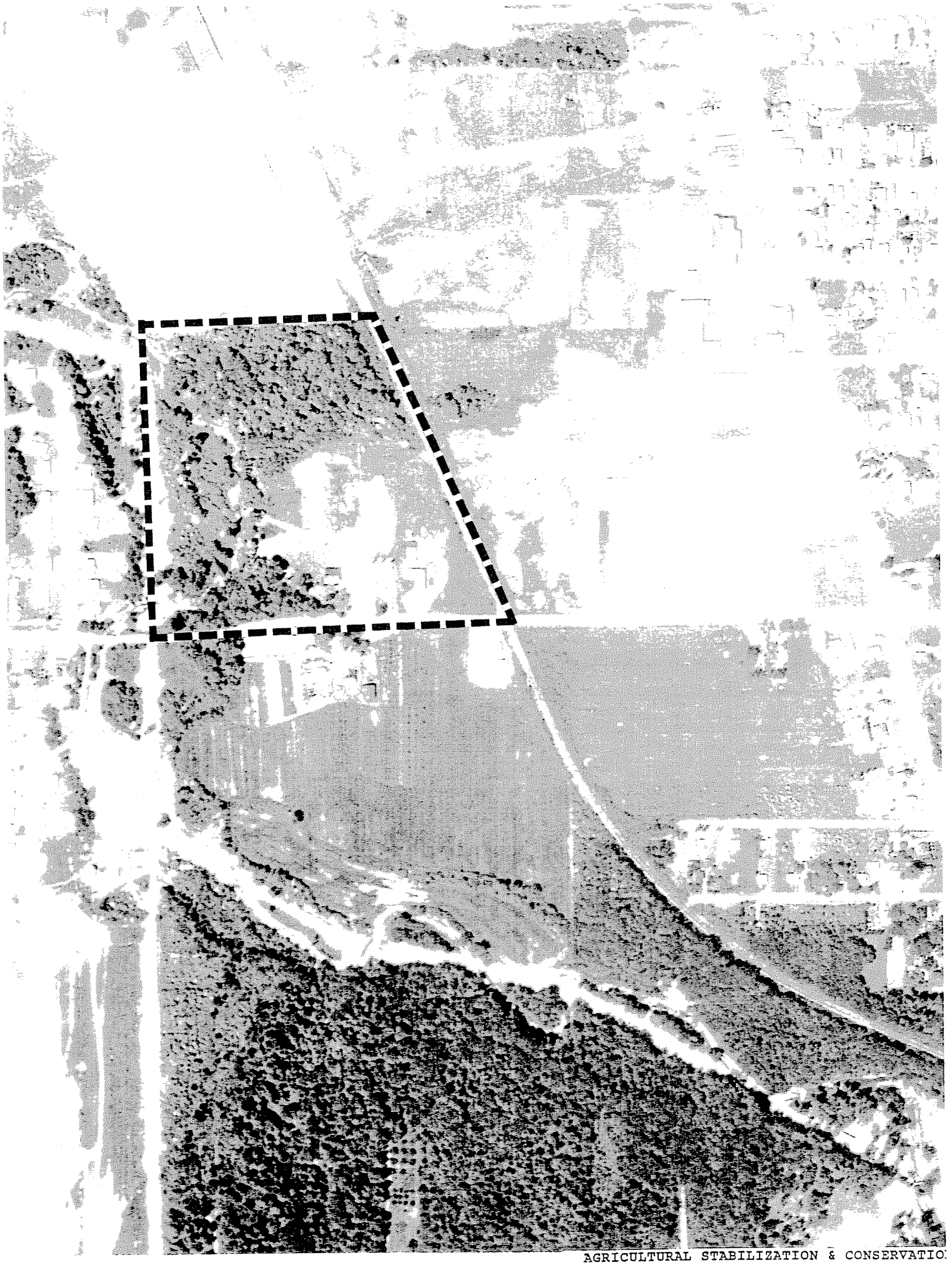
APPENDIX B

AERIAL PHOTOGRAPHS





ASCS - USDA, SALT LAKE CITY
UTAH, OCTOBER 14, 1951



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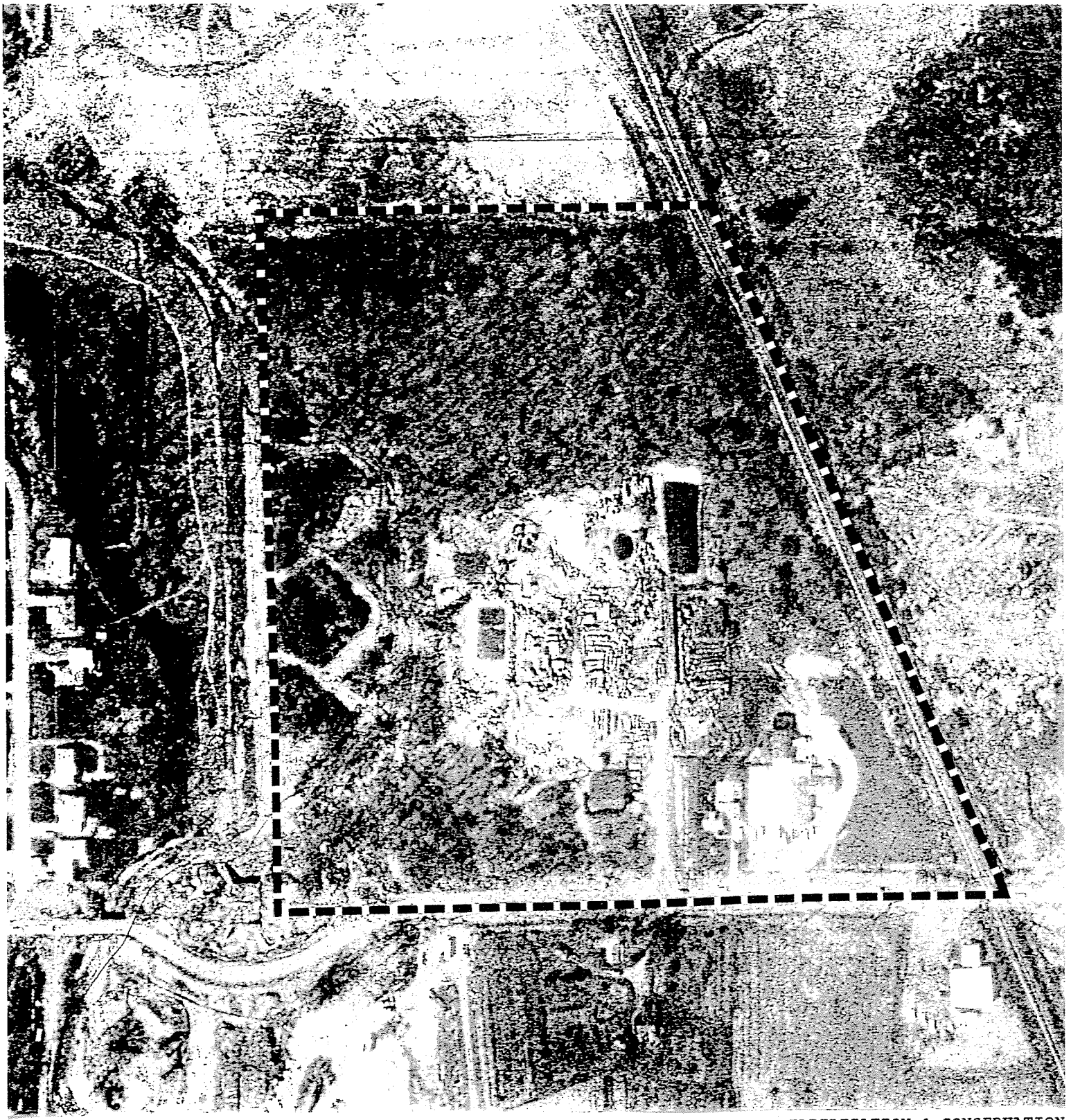

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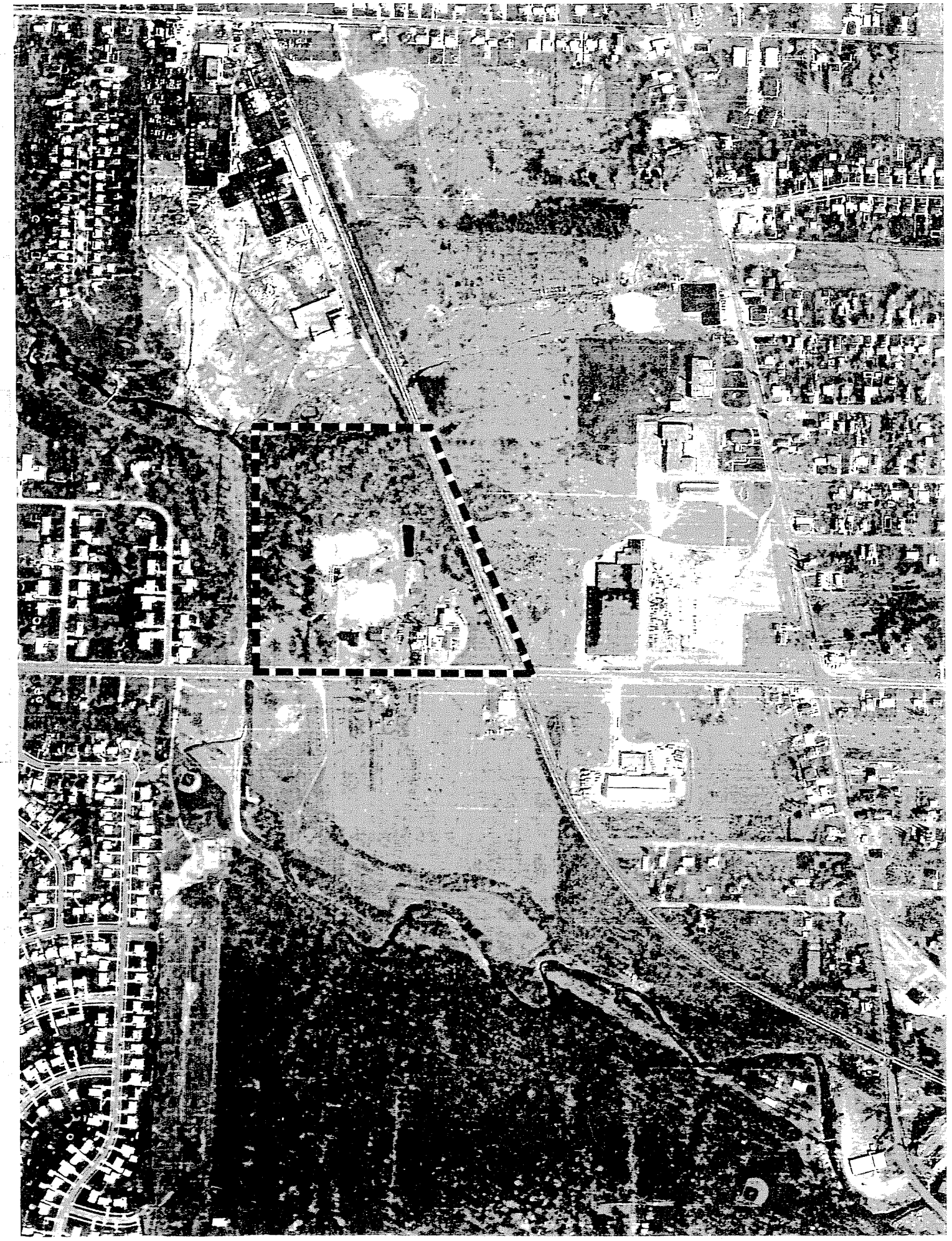
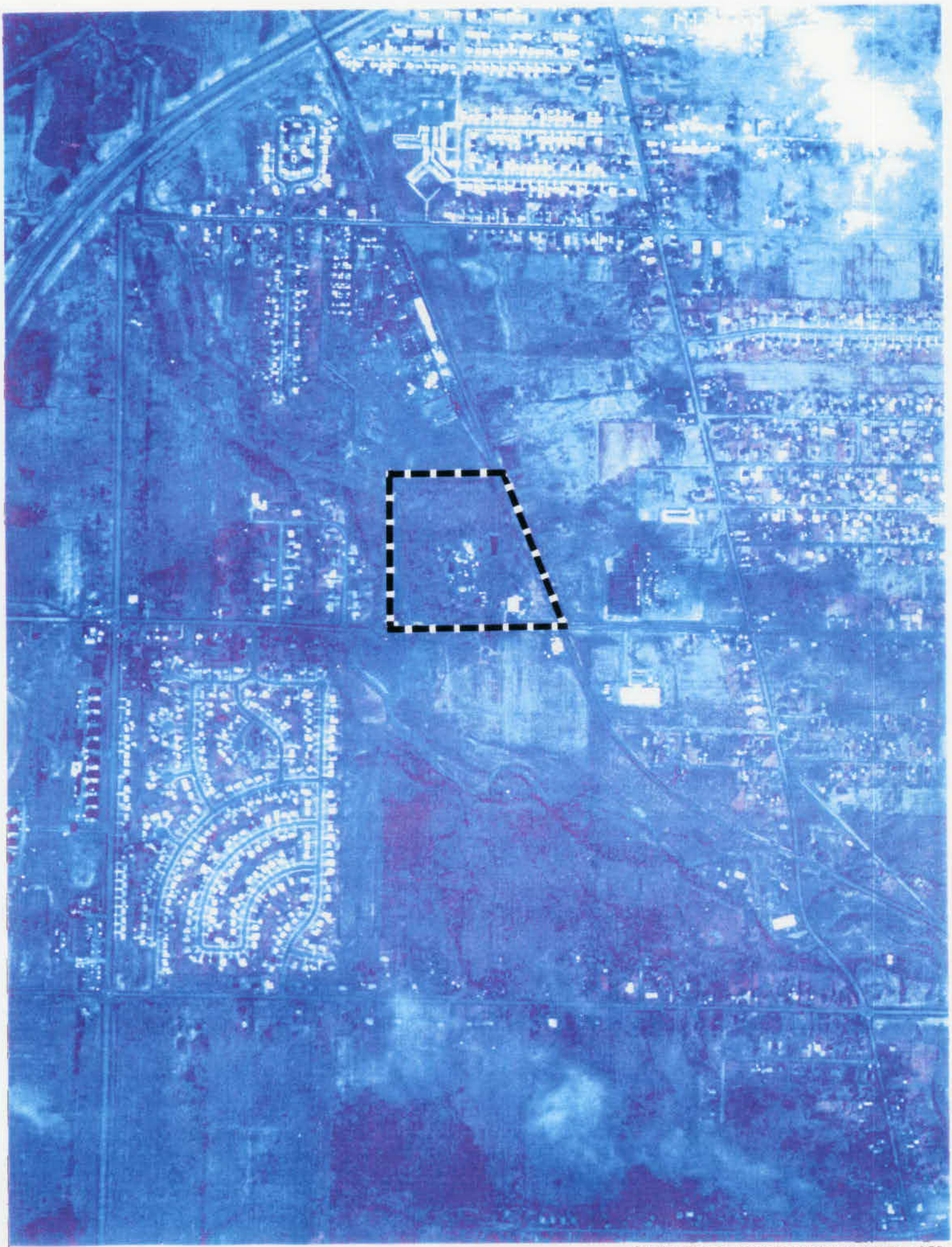
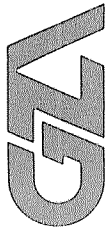


NOAA, NATIONAL OCEAN SURVEY, 1974



NASA HIGH ALTITUDE IMAGERY. 1972



APPENDIX C

BORING/TEST PIT LOGS

TEST PIT FIELD LOG

Project Description Chem-Trol
Project Location Hamburg, New York
GZA Representative S. Blair
Contractor Buffalo Drilling Co, Inc
Operator Terry Sally
Make Rupp Model 1400B

Test Pit No. K
Location N 585, W 132
File No. 5945
Date 11/20/92
Time Started 11:45
Time Completed 12:30
Weather Sunny, 40°F
Ground Elevation

DEPTH (feet)	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION	REMARK NO.
1			Dark brown, Silty CLAY, trace fine to coarse Sand, moist.	
2			Light brown SILT & CLAY and SAND, moist.	
	CT-K-1	2-2.5		
3			White plastic material and wood [FILL]	
4	CT-K-2	3.5-4	White gray, Clayey SILT, intermixed with brown CLAY and SILT, little Sand, moist with intermixed white-gray material (with chalky consistency) and wood branches	
5				
6				
7	CT-K-3	6.5-7	Black, Silty CLAY, trace Sand, moist ... piece of sheet metal ... piece of steel conduit ... 1/2 metal container lid ... grades wet ... water filling hole at 6.5 ft [FILL]	
8				
	CT-K-4	8.5-9	Gray, Clayey SILT, trace Sand, wet (possible natural material)	

REMARKS: BOTTOM OF HOLE AT 9 FT.

TEST PIT FIELD LOG

Project Description Chem-Trol
Project Location Hamburg, New York
GZA Representative S. Blair
Contractor Buffalo Drilling Co, Inc
Operator Terry Sally
Make Rupp Model 1400B

Test Pit No. C
Location N 430, W 126
File No. 5945
Date 11/20/92
Time Started 13:30
Time Completed 14:30
Weather Sunny, 40°F
Ground Elevation

DEPTH (feet)	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION	REMARK NO.
1			Dark brown, Silty CLAY, moist. [FILL]	1
2	CT-C-1	2-2.5	Several metal pipes with brown fine to medium SAND, intermixed and localized around pipes, wet.	
3	CT-C-2	3-4	Black granular slag, very hard, water perched on top of slag.[FILL]	
4			. . . pieces of wood . . . intermixed gray SILT & CLAY and CLAY and SAND, wet	
5			Gray-brown Clayey SILT, little Sand, Clayey SILT, little Sand, wet, (suspected natural material.	
6	CT-C-3	6-6.5		
7			BOTTOM OF HOLE 6.5 FT.	
8				

REMARKS:

1. Followed pipes 25 feet southwest.

GZA GEOENVIRONMENTAL OF NEW YORK

TEST PIT FIELD LOG

Project Description Chem-Trol
Project Location Hamburg, New York
GZA Representative S. Blair
Contractor Buffalo Drilling Co, Inc
Operator Terry Sally
Make Rupp Model 1400B

Test Pit No. L
Location N 568, W 185
File No. 5945
Date 11/20/92
Time Started 12:45
Time Completed 13:30
Weather Sunny, 40°F
Ground Elevation

DEPTH (feet)	SAMPLE NO.	SAMPLE DEPTH	DESCRIPTION	REMARK NO.
1			Dark brown Silty CLAY, some fine to medium Sand, little Gravel, moist.	
2				
3	CT-L-1	3-3.5	White-gray material (with chalky consistency) and occasionally inter-mixed Clayey SILT, little fine to medium Sand, moist. [FILL]	
4				
5			...grades; wet	
6	CT-L-2	6-6.5	Black stained gray-brown, clayey SILT, some fine to coarse Sand, wet. - chemical odor	1
7	CT-L-3	7-7.5	...grades; some fine to coarse Sand, wet - sheen observed on water at bottom of test pit	
8			...grades; occasional black staining.	

REMARKS: BOTTOM OF HOLE AT 9 FT.

1) Water began entering the test pit at 6 feet.

GZA GEOENVIRONMENTAL OF NEW YORK
364 NAGEL DRIVE, BUFFALO, NEW YORK
ENGINEERS AND SCIENTISTS

PROJECT

BORING No. ___ SHEET 1 OF ___
FILE No.
CHKD. BY

CONTRACTOR
DRILLER
GZA GEOENVIRONMENTAL REPRESENTATIVE

BORING LOCATION
GROUND SURFACE ELEVATION ___ DATUM
START DATE ___ END DATE

TYPE OF DRILL RIG
CASING SIZE AND TYPE
OVERBURDEN SAMPLING METHOD
ROCK DRILLING METHOD

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE: BLOWS / 6" (2)	NO. (3)	DEPTH (FT.) (4)	N-VALUE /ROD(%) (5)	RECOVERY (%) (6)	SAMPLE DESCRIPTION (7)	EQUIPMENT INSTALLATION LOG (8)	(9)	NOTES (10)
1									

(1) Numbers in this column are the depth in feet below ground surface..

(2) Numbers in this column report the number of blows required to drive a split spoon sampler (1-3/8 inch inside diameter) 6 inches with a 140 pound hammer free falling 30 inches.

WOH means that the static weight of the 140 pound hammer and the drilling rods attached to the split barrel sampler were sufficient to cause the sampler to advance 6 inches.

WOR means the static weight of the drilling rods attached to the split barrel sampler was sufficient to cause the sampler to advance 6 inches.

(3) The sample number and type are designated in this column.
e.g., S-1 (S = sample type, 1 = sample number)

S - Split Spoon Sample
U - Shelby Tube Sample
C - Rock Core Sample

(4) The numbers in this column designate the depth, in feet, from the ground surface of the sample identified in column 3.

(5) The Standard Penetration Test N-value, which is the sum of the blows recorded over the second and third 6 inch interval (column 2), is recorded in this column for soil samples. OB indicates an obstruction was encountered. R indicates that refusal was encountered. RQD, defined as the summation of all pieces of rock core greater than 4 inches in length divided by the length of the core run and expressed as a percentage, is reported for rock core samples in this column.

(6) The values shown are the length of the soil or rock core sample recovered divided by the distance that the sampler was advanced, expressed as a percentage.

(7) Description of soil samples include:

-- the relative density or consistency;
-- color;
-- a listing of the MAJOR and Minor soil components based on particle size distribution and plasticity;
-- moisture; and
-- other pertinent characteristics.

For example: Medium dense, brown, fine to medium SAND, trace Silt, damp, stratified.

Description of rock core samples include:

-- color, ROCK TYPE, hardness, weathering, texture, structure, discontinuity description, other features (FORMATION NAME, if known).

For example: Dark gray, DOLOMITE, moderately hard, slightly weathered, fine to medium grained, thinly bedded, very closely spaced horizontal fractures throughout (LOCKPORT DOLOMITE).

(8) Equipment installed within the borehole is graphically presented in this column. If no equipment was installed, this column is blank.

(9) The materials used to construct the equipment installed in the borehole are verbally described in this column. If no equipment was installed, this column is blank. Alternatively, field measurements may be included in this column.

(10) Pertinent observations made while advancing the test boring are identified in this column opposite the depth that the observation was made. The observation is explained at the bottom of the page under "Notes" next to the appropriate number.

DESCRIPTION OF SOIL SAMPLES

1. Density or Consistency: The density or consistency listed is determined from the Standard Penetration Test N-value according to the following table:

Density of Granular Soils	SPT N-Value	SPT N-Value	Consistency of Cohesive Soils
Very Loose	0-4	<2	Very Soft
Loose	4-10	2-4	Soft
Medium Dense	10-30	4-8	Medium
Dense	30-50	8-15	Stiff
Very Dense	>50	15-30	Very Stiff
		>30	Hard

2. Color: Visual

3. Soil Components

3.1 Description: The components of a soil sample are described by visually estimating the percentage of each component by weight of the total sample.

a. Major Component: The major soil component (>50 percent) is written with upper case letters for granular soil (e.g., SAND, GRAVEL) and a combination of upper and lower case letters for fine grained soil (e.g., Silty CLAY, Clayey SILT).

b. Minor Component: The minor soil components (≤50 percent) are written with the first letter of each soil type in upper case, and the remaining letters in lower case (e.g., Gravel, Silt). The minor components are identified and prefaced in the description based on the following percentages:

Description	Percentage
and	35-50
some	20-35
little	10-20
trace	0-10

c. Note: The actual percentage of gravel soils may differ from that measured when sampling with a standard split spoon sampler because of the relatively small sampler diameter. Also, it is not possible to identify the presence of boulders and cobbles using a standard split spoon sampler.

d. Fill: Fill is material placed by other than natural processes. It is described by its major component(s) and additional significant components are listed. The word "FILL" follows the sample description.

3.2 Definitions

a. Granular Soil: A granular soil sample is defined by the following particle sizes as referenced to a standard sieve.

Material		Standard Sieve Limit Upper	Lower
GRAVEL	- coarse (c)	3 inch	3/4 inch
	- fine (f)	3/4 inch	No. 4
SAND	- coarse (c)	No. 4	No. 10
	- medium (m)	No. 10	No. 40
	- fine (f)	No. 40	No. 200

b. Fine Grained Soil: A fine grained soil is defined as being finer than a No. 200 sieve and it is described by its plasticity as follows:

Material	Degree of Plasticity
SILT	Nonplastic
Clayey SILT	Slight
SILT & CLAY	Low
CLAY & SILT	Medium
Silty CLAY	High
CLAY	Very High

c. Organic Soil: An organic soil sample is classified by observation of the sample structure.

Material	Description
Topsoil	Surficial soils that support plant life and which contain organic matter.
Peat	Deposits of plant remains in which the original plant fibers may be visible.

4. Moisture Content

Damp - Moisture is not apparent, dusty.
Moist - No visible water.
Wet - Visible free water.

5. Other Pertinent Characteristics

Soil Structure: Produced by deposition of sediments.

Stratified	- Random soil deposits of varying components or color.
Varved	- Alternating soil deposits of varying thickness (i.e. clays or silts).
Stratum	- Soil deposit >12 inches thick.
Layer	- Soil deposit 3 inches to 12 inches thick.
Seam	- Soil deposit 1/8 inch to 3 inches thick.
Parting/lens	- Soil deposit <1/8 inch thick.

GZA GeoEnvironmental of New York

BORING LOG LEGEND

DESCRIPTION OF ROCK CORE SAMPLES

Description of rock core samples on the boring logs are based on visual observation of the samples. Rock core features are generally described with the following information.

1. Color - visual.

2. Rock Type: The geologic rock type is presented.

3. Rock Hardness - a measure of resistance to scratching or abrasion.

Very Hard	- Cannot be scratched with knife or sharp pick. Breaking of hand specimens requires several hard blows of geologist's pick.
Hard	- Can be scratched with knife or pick only with difficulty. Hard blow of hammer required to detach hand specimen.
Moderately Hard	- Can be scratched with knife or pick. Gouges or grooves to 1/4 inch deep can be excavated by hard blows of point of a geologist's pick. Hand specimens can be detached by moderate blow of hammer.
Medium Hard	- Can be grooved or gouged 1/16 inch deep by firm pressure on knife or pick point. Can be excavated in small chips to pieces about 1 inch maximum size by hard blows of the point of a geologist's pick.
Soft	- Can be gouged or grooved readily with knife or pick point. Can be excavated in chips to pieces several inches in size. Small thin pieces can be broken by finger pressure.
Very Soft	- Can be carved with knife. Can be excavated readily with point of pick. Pieces 1 inch or more in thickness can be broken with finger pressure. Can be scratched readily by fingernail.

Note: This is an engineering description and should not be confused with Moh's scale for minerals.

4. Weathering

Fresh	- Rock fresh, crystals bright, few joints may show slight staining. Rock rings under hammer if crystalline.
Very Slight	- Rock generally fresh, joints stained, some joints may show thin clay coatings, crystals in broken face show bright. Rock rings under hammer if crystalline.
Slight	- Rock generally fresh, joints stained, and discoloration extends into rock up to 1 inch. Joints may contain clay. In granitoid rocks some occasional feldspar crystals are dull and discolored. Crystalline rocks ring under hammer.
Moderate	- Significant portions of rock show discoloration and weathering effects. In granitoid rocks, most feldspars are dull and discolored; some show clayey. Rock has dull sound under hammer and shows significant loss of strength as compared with fresh rock.
Moderately Severe	- All rock except quartz discolored or stained. In granitoid rocks, all feldspars dull and discolored and majority show kaolinization. Rock shows severe loss of strength and can be excavated with geologist's pick. Rock goes "clunk" when struck.
Severe	- All rock except quartz discolored or stained. Rock "fabric" clear and evident, but reduced in strength to strong soil. In granitoid rocks, all feldspars kaolinized to some extent. Some fragments of strong rock usually left.
Very Severe	- All rock except quartz discolored or stained. Rock "fabric" discernible, but mass effectively reduced to "soil" with only fragments of strong rock remaining.

5. Texture: The description of the average or predominant mineralogic grain size diameter of igneous and metamorphic rocks and constituent grain size diameter of sedimentary rocks.

Aphanitic	- Too small to be seen with the unaided eye.
Fine-grained	- Visible with unaided eye to 1/16 inch diameter.
Medium-grained	- 1/16 inch to 1/4 inch diameter.
Coarse-grained	- >1/4 inch.

6. Structure and Discontinuity Description

6.1 Definitions

Bedding	- Composition and textural layering in sedimentary rocks; the term may be used with caution to describe layering in metamorphic and/or volcanic rocks (flow banding).
Foliation	- Any planar fabric homogeneously distributed throughout the rock mass at the scale of observation. Bedding is foliation (primary). Most foliation in rock is secondary.
Discontinuity	- A naturally occurring break in the rock. This general term includes joints, faults, shears and other fractures. Unless stated, the specific nature of the discontinuity is not defined herein.

Discontinuity, Bedding and Foliation Spacing

Spacing	Discontinuity	Bedding and Foliation
Less than 2 inches	Very close	Very thin
2 inches - 1 foot	Close	Thin
1 foot - 3 feet	Moderately Close	Medium
3 feet - 10 feet	Wide	Thick
More than 10 feet	Very wide	Very thick

7. Other Features

7.1 Fracture Surface Mineralization: Secondary mineralization (calcite, quartz, graphite, metals), clay development, rust weathering, solution or other indicators of alteration.

7.2 Slickensides: Polished rock surfaces, sometimes characterized by grooves or striations, resulting from movement along a fracture plane.

7.3 Cavities or Voids: Loss of rock due to selective weathering, dissolution or mechanical plucking.

8. Formation Name: The geologic name of the formation is presented.

GOLDBERG-ZOINO ASSOCIATES OF NEW YORK, P.C.
364 NAGEL DRIVE, BUFFALO, NEW YORK
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. P-1S
SHEET 1 OF 1
FILE No. R5866
CHKD. BY TRH/R.J.S

CONTRACTOR John Mathes and Associates, Inc.
DRILLER K. Moore
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019552.7872 441481.8143 (NYSPC)
GROUND SURFACE ELEVATION 640.66 DATUM NGVD
START DATE 3/28/90 END DATE 3/28/90

TYPE OF DRILL RIG CME-55 on John Deere Log Tractor
CASING SIZE AND TYPE 4-1/4 inch ID HSA
OVERBURDEN SAMPLING METHOD 2 inch OD by 24 inch Split Spoon Sampler (ASTM 1586)
ROCK DRILLING METHOD none

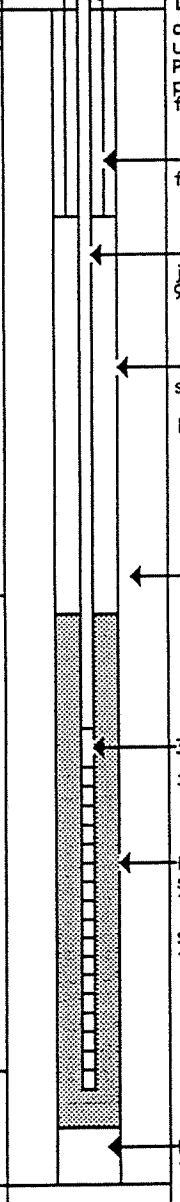
WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
3/28/90	15:45	13.7	14.0	15 min, from G.S.

See water level observation sheets for additional data

DEPTH	BLOWS / 6"	NO.	SAMPLE DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM (PPM)	SAMPLE DESCRIPTION
1	1						Medium, black, CLAY & SILT, little fine to coarse Sand, moist, with intermixed organics (roots) [TOP-SOIL]
	2	S-1	0-2	5	50	ND	
	3						Medium, gray-brown, SILT & CLAY, trace fine Sand, moist (CL)
2	4						
	5						
	6	S-2	2-4	12	65	ND	... grades; stiff
3	6						
	8						
4	3						
	4	S-3	4-6	8	70	ND	
5	4						
	6						
6	4						
	7	S-4	6-8	17	90	ND	... grades; very stiff, with lenses of fine to medium Sand about 1 inch apart
7	10						
	9						
8	3						Stiff, gray, CLAY & SILT, trace fine Sand, moist (CL)
	5	S-5	8-10	12	100	ND	
9	7						
	7						
10	3						
	3	S-6	8-10	6	0/50	ND	
11	3						... grades; little Gravel, trace fine to coarse Sand, wet with 1/4 to 1/2 inch thick seams of fine Sand and Silt about 1 inch apart
	4						
12	6						
	29	S7T	12-14	48	5	3	... grades, with frequently intermixed weathered rock fragments
13	19	S7B				2	
	19						
14	11						Gray, WEATHERED SHALE fragments, and Clayey SILT, moist
	29	S-8	14-15.3	---	80	ND	
15	50/0.3						Spilt spoon refusal at 15.3 ft.
							Bottom of Hole at 15.5 feet (auger refusal)
16							

EQUIPMENT INSTALLATION LOG



4 inch by 5 ft. locking steel protection casing with 1/4 inch vent hole at base.

3/4 inch vented PVC cap. 2.0 foot stick-up from top of 3/4 inch PVC riser (monitoring point) to ground surface.

Concrete surface seal from 0.0 to 3.0 ft.

3/4 inch ID PVC flush joint riser from 0.0 to 9.2 ft.

Bentonite pellets seal from 3 to 8 ft.

[1-3/4 - 5 gallon pails]

Nominal 8-1/2 inch diameter hole to 15.5 ft.

3/4 inch ID PVC flush joint screen (0.01 slot) from 9.2 to 14.2 ft.

Filter pack (No. 4 QROK silica sand) from 8 to 14.5 ft. [150 pounds]

Slots start 0.3 ft. from bottom of screen

PVC plug installed at bottom of screen

Bentonite pellet seal from 14.5 to 15.5 feet (1/4 - 5 gallon pail)

NOTES: 2, 1

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1) No recovery from sample S-6 using a 2 inch split spoon sampler. A second attempt was made, using a 3 inch split spoon sampler, in the same hole (S-6). 50% was then recovered. 2) OVM=peak organic vapor meter reading made in the headspace of the sample jar using a HNu model PI101 photo.detector.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA

GOLDBERG-ZOINO ASSOCIATES OF NEW YORK, P.C.
364 NAGEL DRIVE, BUFFALO, NEW YORK
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. P-2S
SHEET 1 OF 2
FILE No. R5866
CHKD. BY TRH/RJS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER K. Moore
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019439.0163 441330.5231 (NYSPC)
GROUND SURFACE ELEVATION 640.52 DATUM NGVD
START DATE 3/28/90 END DATE 3/29/90

TYPE OF DRILL RIG CME-55 on John Deere Log Tractor
CASING SIZE AND TYPE 4-1/4 inch ID HSA
OVERBURDEN SAMPLING METHOD 2 inch OD by 24 inch Split Spoon Sampler (ASTM 1586)
ROCK DRILLING METHOD none

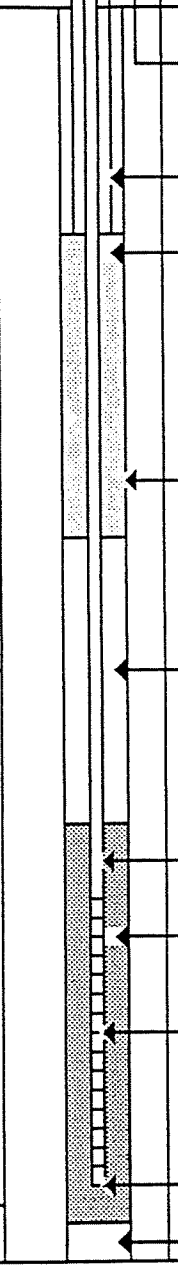
WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
3/29/90	9:00	none	17 ft.	15 min.

See water level observation sheets for additional data

DEPTH	BLOWS / 6"	NO.	SAMPLE DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM (PPM)	SAMPLE DESCRIPTION
1	1						Stiff, black, CLAY & SILT, some fine to coarse Sand, moist, intermixed organics (roots) [TOPSOIL]
	4	S-1	0-2	12	55	ND	
	8						Stiff, brown, SILT & CLAY and fine to coarse SAND, moist with intermixed wood and rock fragments [FILL]
2	7						
	4						
	5	S-2	2-4	10	60	ND	
3	5						Wire observed in open borehole when augers were removed at 3 and 3.5 ft.
	7						
4	2						Stiff, brown, SILT and CLAY, little fine to medium Sand, moist (CL)
	4	S-3	4-6	9	80	190	
5	5						
	10						
6							Interval from 6 to 7 ft. not sampled
7	5						
	5	S-4	6-8	12	85	18	
8	7						
	7						
9	3						Stiff, gray, SILT & CLAY, little fine Sand (CL)
	5	S-5	9-11	15	100	ND	
10	10						
	8						
11	1						... grade; very stiff, SILT & CLAY and fine to coarse SAND, little Gravel, moist (SC)
	4	S-6	11-13	18	80	ND	
12	7						
	7						
13	5						... grades; wet
	8	S-7	13-15	18	80	ND	
14	10						
	13						... grades; frequently intermixed weathered rock fragements
15	5						
	7	S-8	15-17	20	80	ND	
16	13						Gray, WEATHERED SHALE fragments, and Clayey SILT, moist

EQUIPMENT INSTALLATION LOG



NOTES: 1

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1) OVM = peak organic vapor meter reading made in the head space of the sample jar using a HNu model PI101 photoionization detector.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA

GOLDBERG-ZOINO ASSOCIATES OF NEW YORK, P.C.
364 NAGEL DRIVE, BUFFALO, NEW YORK
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. P-2S
SHEET 2 OF 2
FILE No. R5866
CHKD. BY TRH /RJS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM (PPM)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
17	16						Bottom of Hole at 17.0 ft.	← Bentonite pellets to 17.0 feet	
18									
19									
20									
21									
22									
23									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1) Peak organic vapor meter (Hnu Model PI 101) reading from the headspace of the soil sample jar.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. P-2R
SHEET 1 OF 2
FILE No. R5866
CHKD. BY TRH /R.JS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER K. Moore
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019448.7484 441328.2894 (NYSPC)
GROUND SURFACE ELEVATION 640.87 DATUM NGVD
START DATE 3/29/90 END DATE 3/30/90

TYPE OF DRILL RIG CME-55 on John Deere Log Tractor
CASING SIZE AND TYPE 6-1/4 inch ID HSA
OVERBURDEN SAMPLING METHOD 2 inch OD by 24 inch Split Spoon Sampler in accordance with ASTM D1586
ROCK DRILLING METHOD NX Size Core Barrel with air as drilling fluid

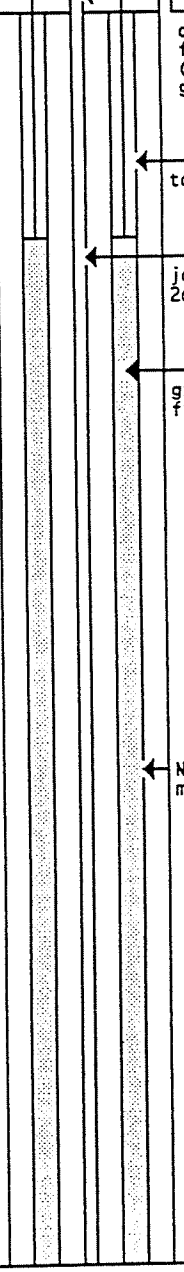
WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

See water level observation sheets.

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM)	SAMPLE DESCRIPTION
							No samples collected 0 to 17 feet. Refer to Boring Log No. P-2S for soil descriptions.

EQUIPMENT INSTALLATION LOG



6-inch by 5 ft. locking steel protective casing with 1/4 inch vent hole at base

3/4 inch PVC vented cap. 2.2 ft. stick-up from top of 4 inch PVC (monitoring point) to ground surface

Concrete surface seal to 3.0 feet

3/4 inch ID PVC flush joint riser from 0.0 to 26.0 ft.

Cement/bentonite grout from 3.0 to 23.3 ft.

[30 gallons water/ 376 pounds cement/ 12 pounds bentonite]

Nominal 11 inch diameter borehole to 18.3 feet

NOTES: 1

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, RANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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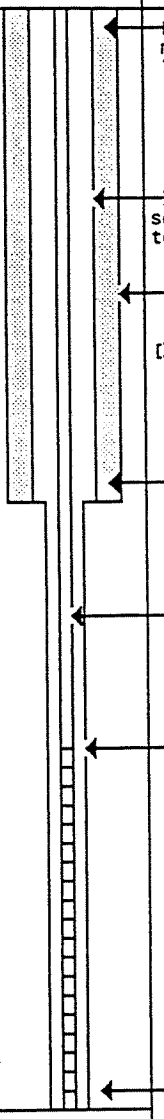
PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. P-2R
SHEET 2 OF 2
FILE No. R5866
CHKD. BY TRH/RJS

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM (PPM)	SAMPLE DESCRIPTION
17							
	19						
	22	S-1	17-18.8	58	60	ND	
18	36						Auger Refusal at 18.3 feet
	100/0.3						Gray shale, medium hard, moderately weathered, aphamitic very thin bedding (LUDLOWVILLE SHALE)
19							
20							
		C-1	18.3-23.3	50	70		... thin bedding
21							
22							
							... slightly weathered
23							
24							
25							Horizontal slightly open fracture at 25.2 feet
26							
27		C-2	23.3-31.0	85	90		
28							
29							
30							
							Horizontal slightly open fractures at 29.9 ft. and 30.5 ft.
31							Bottom of hole at 31.0 ft.
32							
33							
34							

EQUIPMENT INSTALLATION LOG



Nominal 11-inch diameter borehole to 18.3 feet

3 3/4 inch flush joint schedule 80 PVC casing to 23.3 ft.

Cement/benonite grout to 23.3 ft.

[30 gallons water/376 pounds cement/12 pounds bentonite]

Nominal 6-inch diameter borehole from 18.3 to 23.3 ft.

3/4 inch flush joint PVC riser pipe to 26.0 feet

3/4 inch PVC well screen (0.01 inch slot from 26.0 to 31.0 ft.

PVC plug in bottom of screen

Nominal 3 inch diameter borehole 23.3 to 31.0 feet

NOTES

1

2

3

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1) OVM = peak organic vapor meter reading made in the head space of the sample jar using a HNu model PI101 photoionization detector. 2) Rock reamed using 5-7/8 inch O.D. roller bit from 18.3 to 23.3 feet after C-1. 3) Water observed during coring at 30 ft.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL. 2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. P-3S
SHEET 1 OF 2
FILE No. R5866
CHKD. BY TRH/RJS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER K. Moore
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019412.2218 441068.4424 (NYSPC)
GROUND SURFACE ELEVATION 637.18 DATUM NGVD
START DATE 3/28/90 END DATE 3/28/90

TYPE OF DRILL RIG CME-55 on John Deere Log Tractor
CASING SIZE AND TYPE 4-1/4 inch ID HSA
OVERBURDEN SAMPLING METHOD 2 inch OD by 24 inch Split Spoon Sampler (ASTM 1586)
ROCK DRILLING METHOD none

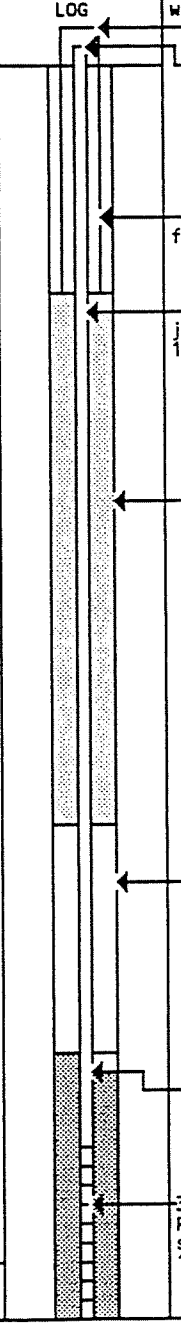
WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
4/1/90	11:15	19.3	19.5	after 10 min, from GS
"	11:50	16.5	PVC	after 45 min, from GS

See Water level observation sheets for add. data.

DEPTH	BLOWS / 6"	NO.	SAMPLE DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM (PPM)	SAMPLE DESCRIPTION
1	1						Medium, brown-black, SILT & CLAY and fine to coarse SAND, moist, with intermixed organics (wood fragments, roots) and occassionally intermixed fill (brick fragments). [TOPSOIL - FILL]
	1	S-1	0-2	7	55	ND	
	6						
2	10						
	10						Very stiff, brown-gray, CLAY & SILT, some fine to coarse Sand, moist, with intermixed seam/lens 1/16 to 1/4 inch thick of fine Sand and Silt. [CL]
3	10	S-2	2-4	20	60	ND	
	10						
4	13						
	3						
5	5	S-3	4-6	10	60	ND	... grades; Stiff, some fine Sand
	5						
6	7						... grades; with red-brown (iron staining) silt and fine Sand vertical and horizontal seam/lens about 1 to 4 inches apart
	3						
7	8	S-4	6-8	21	95	ND	
	13						
8	22						
	13						Hard, gray, Silty CLAY, little fine Sand, moist [CL]
9	15	S-5	8-10	33	100	ND	
	18						
10	22						
	3						... grades; stiff, wet
11	5	S-6	10-12	11	80	ND	
	6						
12	8						
	2						... grades; Medium; trace fine Sand
13	3	S-7	12-14	8	70	ND	
	5						
14	6						
	1						... grades, soft.
15	2	S-8	14-16	5	100	ND	
	2						
16	3						... grades; some fine Sand
	3						Very stiff, gray, SILT & CLAY and fine to coarse SAND, little Gravel

EQUIPMENT INSTALLATION LOG



4 inch by 5 ft. locking steel protection casing with 1/4 inch vent hole at base.

Vented PVC cap. 2.1 foot stick-up from the top of 3/4 PVC riser (monitoring point) to ground surface

Concrete surface seal from 0.0 to 3.0 ft.

3/4 inch ID PVC flush joint riser from 0.0 to 14.0 ft.

Cement/bentonite grout from 3.0 to 10.0 ft.

[21 gallons water/ 282 pounds cement/ 9 pounds bentonite]

Bentonite pellet seal from 10 to 13.0 ft.

[3/4 - 5 gallon pail]

Filter pack (No. 4 QROK Silica Sand) from 13.0 ft. to 19.0 ft.

[250 pounds]

3/4 inch ID flush joint PVC screen (0.01 inch slot) from 14.0 to 19.0 ft.

NOTES 1

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1) OVM = peak organic vapor meter reading made in the head space of the sample jar using a HNu model PI101 photoionization detector.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. P-3S
SHEET 2 OF 2
FILE No. R5866
CHKD. BY TRH/RJS

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM (PPM)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
17	8	S-9T	16-18	26	75	ND	Wet, with occassionally intermixed weathered shale fragments		
	18	S-9B				1			
18	13						Gray, WEATHERED SHALE, fragments, slightly moist		
19							Bottom of hole at 19.5 ft. (auger refusal)		
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									

Slots start 0.3 ft.. from bottom of screen

PVC plug installed at bottom of screen

Bentonite pellet seal from 19.0 to 19.5 ft.

(1/4 - 5 gallon pail)

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. P-3R
SHEET 1 OF 2
FILE No. R5866
CHKD. BY TRH/RJS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER K. Moore
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019418.4111 441079.5231 (NYSPC)
GROUND SURFACE ELEVATION 637.88 DATUM NGVD
START DATE 4/1/90 END DATE 4/2/90

TYPE OF DRILL RIG CME-55 on John Deere Log Tractor
CASING SIZE AND TYPE 6-1/4 inch ID HSA
OVERBURDEN SAMPLING METHOD 2 inch OD by 24 inch Split Spoon Sampler in accordance with ASTM D1586
ROCK DRILLING METHOD NX Size Rock Core with compressed air as drilling fluid

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
4/2/90	15:15	31.9	PVC	15 min, from G.S.

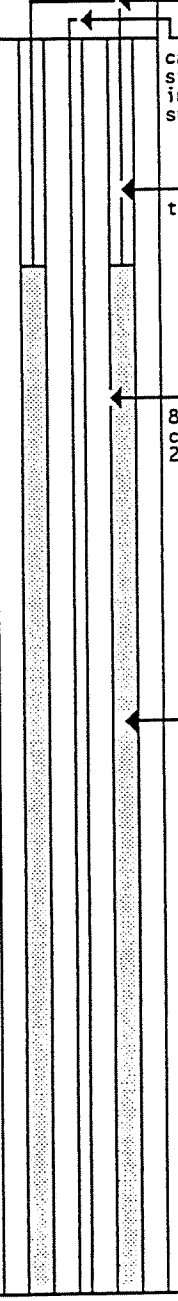
See water level observation sheets for additional data.

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM (PPM)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						

SAMPLE DESCRIPTION

No samples collected 0 to 18.0 ft. Refer to Boring Log No. P-3S for soil descriptions.

EQUIPMENT INSTALLATION LO



6-inch by 5 ft. locking steel protective casing with 1/4 inch vent hole at base

3/4 inch PVC vented cap. 2.0 ft. from stick-up from top of 4 inch casing to ground surface.

Concrete surface seal to 3.0 feet

3-3/4 inch I.D., sch 80, PVC, flush joint casing from 0.0 to 24.3 ft.

Cement/bentonite grout from 3 to 24.3 ft.

[63 gallons water/ 846 pound cement/ 27 pounds bentonite]

NOTES

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1) Some free standing water observed in borehole prior to coring at 19.3 ft. Muck in HSA prevented water level measurements.
2) Rock cuttings from C1 core run returned, by air, to the surface were dry to moist.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, RANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. P-3R
SHEET 2 OF 2
FILE No. R5866
CHKD. BY TRH/RJS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM3 (PPM)	SAMPLE DESCRIPTION	EQUIPMENT IN TALLATION LOG	NOTES
17									
18	50/ 0.0	S-1	18-18	---	0		Auger refusal at 19.3 ft.	Nominal 11 inch diameter hole to 19.3 feet	
19								Nominal 6 inch hole from 19.3 to 24.3 ft.	
20							Gray Shale, medium hard, moderately weathered, aphanitic thin bedding (LUDLOW VILLE SHALE) ...Slightly weathered		1
21		C-1	19.3-23.7	68	92	--			3
22									2
23							Horizontal slightly open fracture at 22.7 feet		
24								3-3/4 inch flush joint schedule 80 PVC casing to 24.3 feet	
25									
26								3/4 inch PVC flush joint riser pipe to 29.1 feet	
27									
28		C-2	23.7-34.1	84	82	--			
29							High angle closed fracture 28.5 to 29.0 feet		
30								3/4 inch PVC well screen, (0.01 inch slot) from 29.1 to 34.1 feet	
31									
32									
33							Horizontal slightly open fractuers at 32.5, 33.1 and 33.6 feet		
34								Nominal 3 inch diameter hole 24.3 to 34.1 feet	
35							Bottom of Hole at 34.1 feet	PVC plug in bottom of well screen	
36									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 3) Rock reamed using 5-7/8 inch O.D. roller bit from 19.2 to 24.3 after C-1.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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BORING No. P-3R

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PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. P-4S
SHEET 1 OF 1
FILE No. R5866
CHKD. BY TRH/RJS

CONTRACTOR John Mathes Associates, Inc.
DRILLER K. Moore
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019585.4858 441037.9318 (NYSPC)
GROUND SURFACE ELEVATION 634.42 DATUM NGVD
START DATE 4/3/90 END DATE 4/3/90

TYPE OF DRILL RIG CME-55 on John Deere Log Tractor (ATV)
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM 1586)
ROCK DRILLING METHOD None

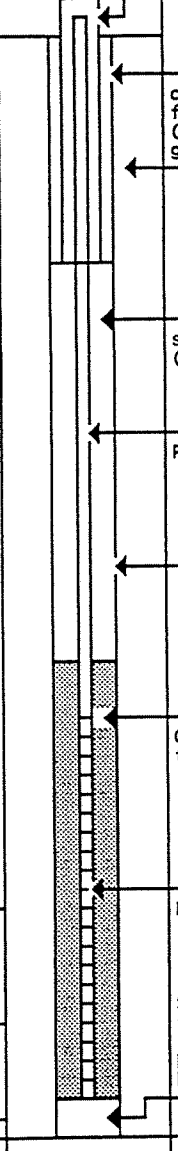
WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
4/3/90	10:00	13.0	--	At completion, from GS

See water level observation sheets for additional data.

DEPTH	BLOWS / 6"	NO.	SAMPLE DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM)	SAMPLE DESCRIPTION
1	3						Medium, black-brown, SILT & CLAY, fine to medium Sand, moist, with intermixed organics (root) [TOPSOIL]
	4	S-1	0-2	11	50	ND	
	7						
2	10						Stiff, red brown, Silty CLAY, trace fine to medium Sand, moist [FILL]
	5						
3	5	S-2	2-4	12	60	ND	Stiff, brown, SILT & CLAY, trace fine Sand, moist [CL]
	7						
4	9						
	3						
5	5	S-3	4-6	12	60	ND	
	7						
6	9						
	5						
7	6	S-4	6-8	17	100	ND	
	11						...grades; very stiff
8	15						
	5						
9	7	S-5	8-10	14	70	1	
	7						
10	15						
	3						
11	3	S-6T	10-12	10	70	200	...grades; stiff, wet
	7	S-6B				200	
12	6						Stiff, brown, fine to medium SAND, little Clayey Silt, wet [SC]
	4						
13	7	S-7T	12-14	18	80	150	Very stiff, gray, Silty CLAY and fine to coarse SAND, trace Gravel, wet, with intermixed weathered rock fragments [SC]
	11	S-7B				130	
14	12						
	28	S-8T	14-14.7	--	50	11	Gray, WEATHERED SHALE fragments and Clayey SILT, moist
15	50/ 0.2	S-8B				4	Bottom of Hole at 14.7 ft. (auger and split spoon refusal)
16							

EQUIPMENT INSTALLATION LOG



NOTES: 1

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1) OVM = peak organic vapor meter reading made in the head space of the sample jar using a HNu model PI101 photoionization detector.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
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PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. P-5S
SHEET 1 OF 1
FILE No. R5866
CHKD. BY TRH/RJS

CONTRACTOR John Mathes Associates, Inc.
DRILLER K. Moore
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019716.7097 441227.8670 (NYSPC)
GROUND SURFACE ELEVATION 635.38 DATUM NGVD
START DATE 3/30/90 END DATE 3/30/90

TYPE OF DRILL RIG CME-55 on John Deere Log Tractor (ATV)
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM 1586)
ROCK DRILLING METHOD None

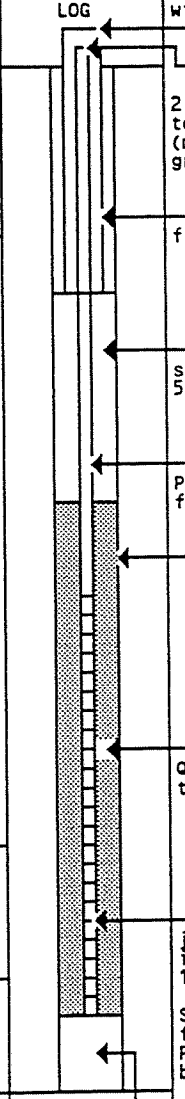
WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
3/30/90	16:30	none	13.5ft	30 min.
3/30/90	8:00	none	PVC	24hrs. after well pt

See water lvl. obser. sheets for additional data.

DEPTH	BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM)	SAMPLE DESCRIPTION
1	1						Very soft, black, SILT & CLAY, little fine to medium Sand, moist with intermixed organics (wood fragments, roots) [TOPSOIL]
	3	S-1	0-2	5	60	ND	
	2						Soft, red brown, Silty CLAY, trace fine Sand, moist. Wood fragments at 1.5 foot. [FILL]
2	4						
	5						
	7	S-2	2-4	15	60	ND	Stiff, light brown, SILT and fine SAND, moist (SM)
3	8						
	10						
4	3						...grades; gray-brown Clayey SILT and fine SAND
	6	S-3	4-6	15	80	ND	
5	9						
	12						
6	5						...grades; very stiff
	8	S-4	6-8	18	80	ND	
7	10						
	13						
8	6						
	7	S-5	8-10	19	60	ND	...grades; little fine to medium Sand, wet, with occasional 1/4 to 1/2 inch thick seams of fine Sand, some silt
9	12						
	13						
10	4						
	8	S-6	10-12	22	80	ND	Very stiff, gray, SILT & CLAY and fine to coarse SAND, little Gravel, moist, with occasionally intermixed weathered rock fragments. (SC)
11	14						
	23						
12	12						Gray, WEATHERED SHALE fragments, slightly moist.
	16	S-7	12-13.2	--	50	2	
13	50/ 0.2						
14							Bottom of Hole at 13.5 ft. (auger refusal)
15							
16							

EQUIPMENT INSTALLATION LOG



4 inch by 5 ft. locking steel protective casing with 1/4 inch vent hole at base
Vented PVC cap.
2.2 ft. stickup from top of 3/4 PVC riser (monitoring point) to ground surface.
Concrete surface seal from 0.0 to 3.0 ft.
Bentonite pellet seal from 3.0 to 5.9 ft.
[1 1/4 - 5 gallon pails]
3/4 inch flush joint PVC riser pipe to 6.9 ft.
Nominal 8-1/2 inch diameter hole
Filter pack (No. 4 QROK Silica Sand) 5.9 to 12.5 ft.
[200 pounds]
3/4 inch I.D. flush joint, PVC screen (0.01 inch slot) from 6.9 to 11.9 ft.
Slots begin 0.3 ft. from bottom of screen
PVC plug installed at bottom of screen.
Bentonite pellet seal from 12.5 to 13.5 ft.
[3/4 - 5 gallon pails]

NOTES
2
1

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1) No free water observed in the bottom of the HSA at completion of drilling. See water level data table. 2) OVM = peak organic vapor meter reading made in the head space of the sample jar using a HNu model PI101 photoionization detector.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA

GOLDBERG-ZOINO ASSOCIATES OF NEW YORK, P.C. 364 NAGEL DRIVE, BUFFALO, NEW YORK GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS	PROJECT Chem-Trol Site Phase II Investigation Hamburg, New York	BORING No. P-5R SHEET 1 OF 2 FILE No. R5866 CHKD. BY TRH/RJS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER K. Moore
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019717.2149 441245.3767 (NYSPC)
GROUND SURFACE ELEVATION 635.82 DATUM NGVD
START DATE 3/31/90 END DATE 4/2/90

TYPE OF DRILL RIG CME-55 or John Deere Log Splitter
CASING SIZE AND TYPE 6-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM 580)
ROCK DRILLING METHOD NX Size Core with compressed air as the drilling fluid

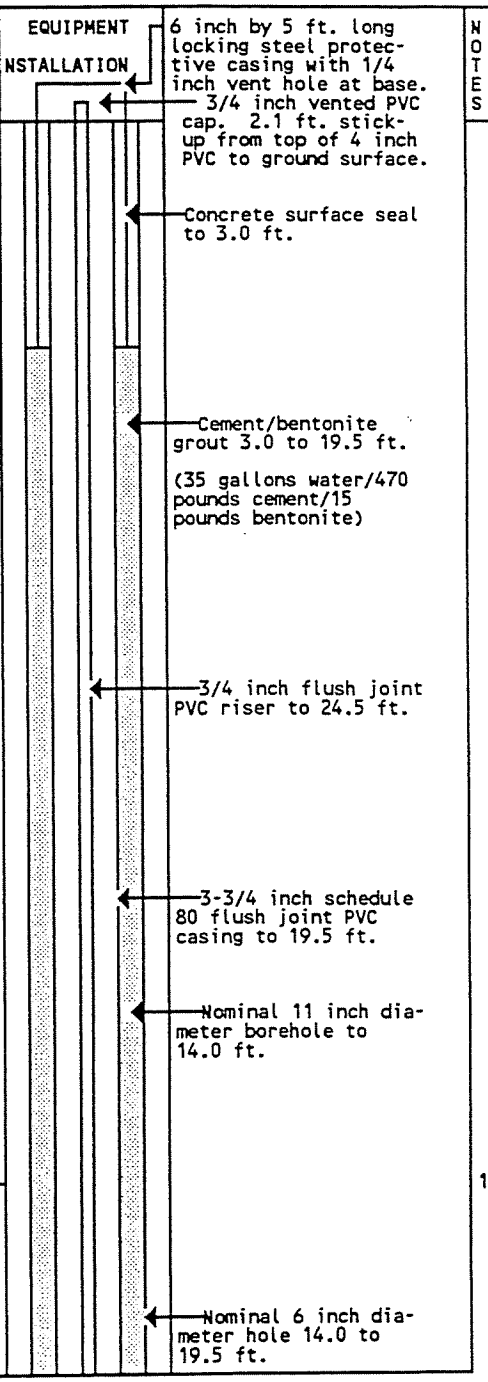
WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

See water level observation sheets.

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM)	SAMPLE DESCRIPTION
1							No samples collected 0 to 14.0 ft. Refer to boring log P-5S for soil descriptions.
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							Auger refusal at 14 ft.
							Gray shale, medium hard, moderately weathered, aphanitic, very thin bedding (LUDLOWVILLE SHALE)
15		C-1	14.0-19.5	47	65		...thin bedding
16							

EQUIPMENT INSTALLATION



NOTES: 1

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1) Rock reamed with 5-7/8 inch O.D. roller bit from 14.0 to 19.5 feet after C-1.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GOLDBERG-ZOINO ASSOCIATES OF NEW YORK, P.C.
364 NAGEL DRIVE, BUFFALO, NEW YORK
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. P-5R
SHEET 2 OF 2
FILE No. R5866
CHKD. BY TRH /R.JS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM4 (PPM)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
17		C-1	14.0-19.5	47	65		Gray shale, medium hard, moderately, weathered, amphanitic, thin bedding (LUDLOWVILLE SHALE)	3-3/4 inch schedule 80 flush joints PVC casing to 19.5 ft.	
18									
19								Nominal 6 inch diameter hole from 14 to 19.5 ft.	
20							Low angle closed fracture 20.0 to 20.1 ft.		
21									
22		C-2	19.5-29.5	90	93		High angle slightly open fracture 22.5 to 22.8 ft.		
23								3/4 inch PVC riser pipe to 24.5 ft.	
24							Horizontal slightly open fracture at 24.6 ft.		
25									
26									3
27								3/4 inch PVC well screen, (0.01 inch slot) from 24.5 to 29.5 ft.	
28								PVC plug in bottom of well screen	
29							Horizontal slightly open fractures at 28.3 and 28.7 ft.	Nominal 3 inch diameter core hole 19.5 to 29.5 ft.	
30							Bottom of hole at 29.5 ft.		
31									
32									
33									
34									
35									
36									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 3) Water observed during coring at 26.3 ft.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA

BORING No. P-5R

GOLDBERG-ZOINO ASSOCIATES OF NEW YORK, P.C.
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GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-1S
SHEET 1 OF 1
FILE No. R5866
CHKD. BY T. Heins/R JS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER R. Brungs
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019439.0472 441470.8991(NYSPC)
GROUND SURFACE ELEVATION 641.44 DATUM NGVB
START DATE 7/17/90 END DATE 7/17/90

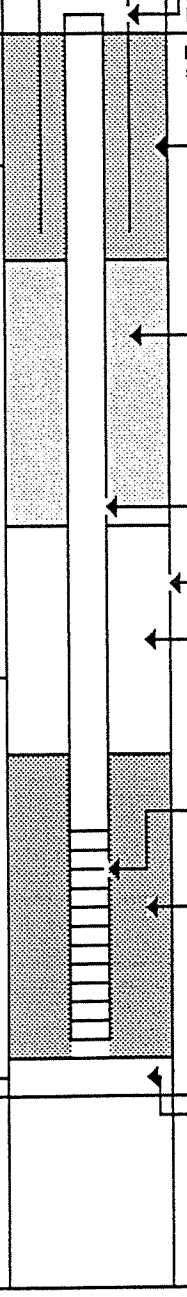
TYPE OF DRILL RIG Diedrich D-50
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM 1586)
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
7/17/90	1450	Dry	HSA 14'	5 min

DEPTH	BLOWS / 6"	NO.	SAMPLE DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM ppm	SAMPLE DESCRIPTION
1	2	S-1	0 - 2	12	5	ND	Stiff, black, SILT & CLAY, trace fine to medium Sand, moist, with intermixed organics (roots), rock fragments in tip of spoon (TOPSOIL - FILL)
	3						
	9						
2	11						
	4	S-2	2 - 4	14	45	ND	Stiff, brown, CLAY & SILT and fine SAND, moist, with lenses of fine Sand approximately 1/16 to 1/8 inch thick, 1/4 to 1 inch apart (CL)
3	7						
	7						
	8						
4	2	S-3	4 - 6	6	80	40	. . . grades; medium
	2						
5	4						
	4						
6	3	S-4	6 - 8	7	100	130	
	3						
7	4						
	4						
8	1	S-5	8 - 10	5	50	10	
	2						Medium, gray, SILT & CLAY, some fine Sand, moist (CL)
9	3						
	3						
10	2	S-6	10 - 12	6	75	ND	. . . grades; wet
	2						
11	4						
	4						
12	2	S-7	12 - 14	7	50	ND	
	2	T,B					
13	5						
	11						Gray, weathered rock fragments and Clayey Silt, moist
14							Bottom of Hole at 14.0 ft (augers advanced to 13.7 ft)
15							
16							

EQUIPMENT INSTALLATION LOG



NOTES
1
2

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:
1. OVM = peak organic vapor meter reading made in the head space of the sample jar using a HNu model PI101 photoionization detector.
2. Organic vapor reading of 10 ppm is from sample interval 8 to 8.5 ft. Gray silt and clay from 8.5 to 10' is not detected.

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA

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PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-1R
SHEET 1 OF 2
FILE No. R5866
CHKD. BY T. Heins/RJS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER R. Brungs
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019445.1916 441470.3205 (NYSPC)
GROUND SURFACE ELEVATION 641.32 DATUM NGVD
START DATE 7/17/90 END DATE 7/21/90

TYPE OF DRILL RIG Diedrich D-50
CASING SIZE AND TYPE 6-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM 1586)
ROCK DRILLING METHOD NX Size Rock Core using compressed air as the drilling fluid

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
7/17/90	1630	13.8	HSA 14	15 min
7/18/90	810	7.4	"	16 hrs
7/21/90	1430	19.6	Compl.	15 min

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM ppm	SAMPLE DESCRIPTION
1	2	S-1	0 - 2	18	50	ND	Very hard, black, SILT & CLAY, trace fine to medium Sand, moist with intermixed organics (roots) from 0.0 to 0.4 ft and intermixed black cinders from 0.4 to 0.6 ft (TOPSOIL - FILL)
	7						
	11						
2	9						
3							Advanced 6-1/4 inch I.D. HSA from 2.0 to 14.0 ft. No samples collected. See boring log MW-1S for soil description
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							Auger refusal at 14 ft
		C-1	14 - 18.7	50	100	--	Gray, SHALE, medium hard, moderately weathered, aphanitic, very thin bedding (LUDLOWVILLE SHALE)
15							
16							

EQUIPMENT INSTALLATION LOG

- 6inch by 5 ft locking steel protective casing with 1/4 vent hole at base
- Distance from ground surface to top of PVC riser = 1.2 ft
- Concrete surface seal from 0 to 3 ft (80 pounds ready mix concrete)
- Nominal 10 inch diameter hole to 14 ft
- 3-3/4 inch I.D. Sch 80 flush joint PVC casing from 0 to 19.4 ft
- Cement/bentonite grout from 3 to 19.4 ft (60 gallons water, 4 pounds bentonite, 376 pounds cement)
- Nominal 6 inch diameter hole from 14 to 19.4 ft

NOTES: 1, 2

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:
1. OVM = peak organic vapor meter reading made in the head space of the sample jar using a HNu model PI101 photoionization detector.
2. Rock reamed using 6 inch O.D. solid stem augers from 14 to 19.4 ft following NX core collection.

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-1R
SHEET 2 OF 2
FILE No. R5866
CHKD. BY T. Heins /RJS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM ppm	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
17							. . . slightly weathered		
18							Horizontal slightly open fracture at 17.7 ft Horizontal slightly open fracture at 18.4 ft		
19							. . . moderately weathered		
20		C-2	19.4-22	50	38	--			
21								Nominal 3 inch O.D. rock hole from 19.4 to 30.8 ft	3
22		C-3	22-25.7	--	24	--	Zone of weathered rock with frequent clay filled seams 22 to 24.8 ft		
23									
24									
25									
26		C-4	25.7-30.8	90	95		Horizontal slightly open fracture at 26 ft		
27									
28									
29									
30									
31							Bottom of Hole at 30.8 feet		

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 3. Water encountered during coring at 21.4 ft.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA

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PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-2S
SHEET 1 OF 2
FILE No. R5866
CHKD. BY T. Heins/R J S

CONTRACTOR John Mathes and Associates, Inc.
DRILLER R. Brungs
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019334.9741 441305.4093 (NYSPC)
GROUND SURFACE ELEVATION 640.78 DATUM NGVD
START DATE 7/20/90 END DATE 7/20/90

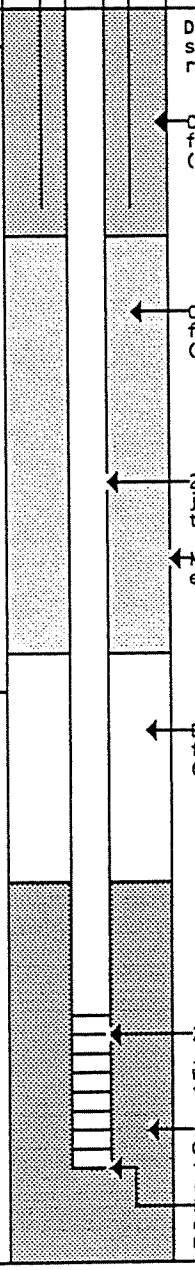
TYPE OF DRILL RIG Diedrich D-50
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM 1586)
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
7/20/90	1520	16.5'	16.7'	10 min

DEPTH	BLOWS / 6"	NO.	SAMPLE DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM ppm	SAMPLE DESCRIPTION
1	3	S-1	0 - 2	12	40	5	Stiff, black, SILT & CLAY, little fine to coarse Sand, moist, with intermixed organics (roots) from 0 to 0.2 ft (TOPSOIL-FILL)
	4						
	8						
2	10						Stiff, gray-brown, CLAY & SILT, some fine to medium Sand, moist (CL)
	10	S-2	2 - 4	13	60	12	
3	6						
	7						
4	5						
	2	S-3	4 - 6	6	100	ND	. . . grades; medium Clayey SILT and fine to medium SAND, with occasional lenses 1/16 to 1/8 inch thick fine Sand and Silt 1/4 to 4 inches apart
5	2						
	4						
6	5						
	3	S-4	6 - 8	7	90	3	
7	3						
	4						
8	6						
	3	S-5	8 - 10	7	80	ND	
9	3						
	4						Stiff, gray , Silty CLAY, trace fine Sand, wet (CL)
10	4						
	2	S-6	10 - 12	6	100	ND	
11	3						
	3						
12	4						
	1	S-7	12 - 14	3	100	ND	
13	1						
	2						. . . grades; some fine to coarse Sand
14	3						1/16 inch thick lens of fine to medium Sand at 13.6 ft
	5	S-8	14 - 16	22	20	ND	
15	9						
	13						. . . grades occasional intermixed weathered rock fragments
16	15						

EQUIPMENT INSTALLATION LOG



NOTES
1
2

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1. OVM = peak organic vapor meter reading made in the head space of the sample jar using a HNu model PI101 photoionization detector.
2. No samples collected from 16.0 to 16.7 ft. Drillers advanced augers past sample interval.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA

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GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-2S
SHEET 2 OF 2
FILE No. R5866
CHKD. BY T. Heins /R J S

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE RECOVERY (%)	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG		NOTES
17								← Bentonite pellet seal from 16.5 to 16.7 ft	
						Bottom of Hole at 16.7 ft (auger refusal)			
18									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-3S
SHEET 1 OF 2
FILE No. R5866
CHKD. BY T. Heins/RJS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER R. Brungs
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019497.0940 441058.4215 (NYSPC)
GROUND SURFACE ELEVATION 635.54 DATUM NGVD
START DATE 7/20/90 END DATE 7/20/90

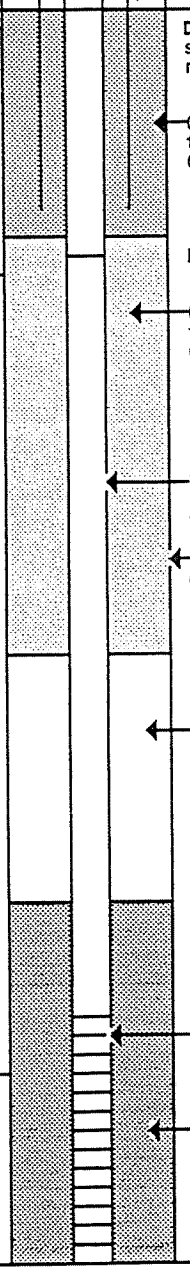
TYPE OF DRILL RIG Diedrich D-50
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM 1586)
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
7/20/90	1055	17.3	well	10 min

DEPTH	BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM ppm	SAMPLE DESCRIPTION
1	2	S-1	0 - 2	8	50	ND	Stiff, black, SILT & CLAY, little fine to medium Sand, moist, with intermixed organics (roots) from 0 to 0.2 ft(TOPSOIL)
	3						
	5						
2	7						Stiff, brown, Silty CLAY, some fine to medium Sand, moist (FILL)
	3	S-2	2 - 4	7	40	ND	. . . grades; occasional intermixed white-gray slag-like material
3	4						
	3						. . . grades; medium
	5						Stiff, gray-brown, CLAY & SILT little fine to medium Sand, moist (CL)
4	3	S-3	4 - 6	9	45	ND	
5	5						
	4						
	6						
6	4	S-4	6 - 8	10	60	ND	
7	4						
	6						
	10						
8	3	S-5	8 - 10	12	80	30	. . . grades; SILT & CLAY, some fine to medium Sand, moist, with 1/16 inch thick lenses of fine Sand and Silt 1/2 to 1 inch apart
9	5						
	7						
	10						
10	3	S-6	10 - 12	10	100	150	
11	3						
	7						
	9						
12	3	S-7	12 - 14	12	70	160	
13	5						
	7						
	6						
14	2	S-8	14 - 16	14	20	170	Stiff, gray, SILT & CLAY and fine to coarse SAND, little Gravel, wet (SC)
15	6						. . . grades; with occasional intermixed Shale fragments
	8						
	13						rock fragment in split spoon at 15.5 ft
16	12						

EQUIPMENT INSTALLATION LOG



NOTES

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1. OVM = peak organic vapor meter reading made in the head space of the sample jar using a HNu model PI101 photoionization detector.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA

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364 NAGEL DRIVE, BUFFALO, NEW YORK
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-3S
SHEET 2 OF 2
FILE No. R5866
CHKD. BY T. Heins/R J S

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM ppm	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
17	18	S-9	16-18	54	30	100	. . . grades; frequently intermixed Shale fragments		
	36						Gray, weathered SHALE fragments, and Clayey Silt, wet		
18	26						Gray, weathered SHALE fragments, moist	PVC end plug at bottom of screen (slot start 0.3 ft from tip)	
							Bottom of Hole at 18.5 ft (auger refusal)	Bentonite pellet seal from 18.2 to 18.5 ft	
19									
20									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-4S
SHEET 1 OF 1
FILE No. R5866
CHKD. BY T. Heins/RJS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER R. Brungs
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019608.8426 441051.1914 (NYSPC)
GROUND SURFACE ELEVATION 635.20 DATUM NGVD
START DATE 7/19/90 END DATE 7/19/90

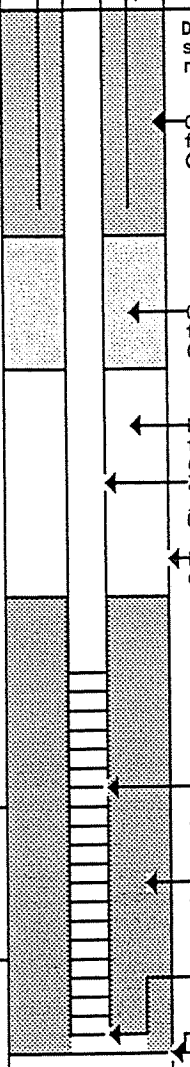
TYPE OF DRILL RIG Diedrich D-50
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM 1586)
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
7/19/90	1450	Dry	HSA 14	10 min

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM ppm	SAMPLE DESCRIPTION
1	3	S-1	0 - 2	16	30	ND	Stiff, black, SILT & CLAY, little fine to coarse Sand, moist, with intermixed organics (roots), from 0.0 to 0.2 ft (TOPSOIL-FILL)
	6						
	10						Gray slag type fragment at 1.0 ft
2	11						Stiff, brown, Silty CLAY, some fine to medium Sand, moist(FILL)
	4	S-2	2 - 4	14	40	ND	Stiff, gray-brown, CLAY & SILT and fine to coarse SAND, moist (CL)
3	6						
	8						
4	10						
	3	S-3	4 - 6	10	50	ND	
5	4						
	5						
6	6						
	3	S-4	6 - 8	15	50	ND	
7	6						
	9						
8	9						
	3	S-5	8 - 10	13	80	ND	
9	5						
	8						
10	10						
	2	S-6	10 - 12	7	80	ND	
11	3						Medium, gray, Silty CLAY, trace fine to medium Sand, moist (CL)
	4						
12	5						
	5	S-7	12 - 14	24	40	8	Very stiff, Clayey SILT, some fine to coarse Sand, wet, with intermixed weathered rock fragments (SC)
13	10						
	14						
	16						Frequent intermixed rock fragment
14							Bottom of Hole at 14.0 ft (auger refusal)
15							
16							

EQUIPMENT INSTALLATION LOG



NOTES
1
2

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:
1. OVM = peak organic vapor meter reading made in the head space of the sample jar using a HNu model PI101 photoionization detector.
2. Organic vapor reading of 8 ppm is from sample interval 12.5 to 14 ft.

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-4R
SHEET 1 OF 2
FILE No. R5866
CHKD. BY T. Heins/RJS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER R. Brungs
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019600.6753 441054.5250 (NYSPC)
GROUND SURFACE ELEVATION 635.54 DATUM NGVB
START DATE 7/19/90 END DATE 7/21/90

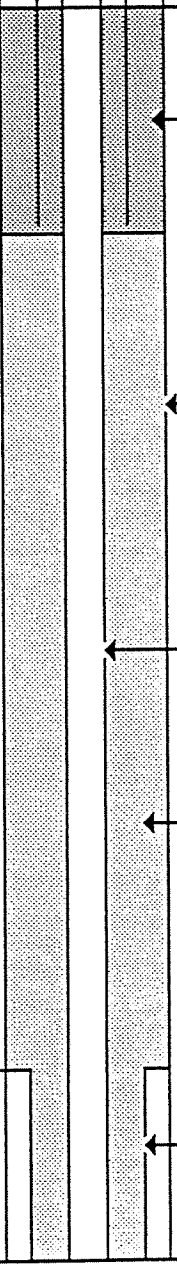
TYPE OF DRILL RIG Diedrich D-50
CASING SIZE AND TYPE 6-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM 1586)
ROCK DRILLING METHOD NX Size Rock Core with compressed air as drilling fluid

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
7/19/90	1550	Dry	HSA 14	2 hours
7/21/90	2000	29	Compl.	15 min

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM ppm	SAMPLE DESCRIPTION
1							Advanced HSA from 0 to 14 ft. No samples collected. See boring log MW-4S for soil description.
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							Auger refusal at 14 ft
		C-1	14 - 18.9	LT 20	40	--	Gray, SHALE, medium hard, moderately weathered, aphanitic, very thin bedding (LUDLOWVILLE SHALE)
15							
16							

EQUIPMENT INSTALLATION LOG



NOTES
2
1

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1. Rock reamed using 6 inch O.D. solid stem augers from 14 to 18.9 ft following rock coring.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-4R
SHEET 2 OF 2
FILE No. R5866
CHKD. BY T. Heins / R J S

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM ppm	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
17									
18									
19							. . . slightly weathered		
20		C-2	18.9-24.2	90	60	--			
21								Nominal 3 inch O.D. rock hole from 18.9 to 32.1 ft	
22									
23									
24									
25		C-3	24.2-28.1	90	100	--			
26									
27									
28									
29		C-4	28.1-32.1	90	95	--			
30							Horizontal slightly open fracture at approximately 29.5 ft		2
31							Horizontal slightly open fracture at approximately 31 ft		
32							Bottom of Hole at 32.1 feet		
33									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 2. Water encountered during coring at 29.5 ft.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA

BORING No. MW-1R

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PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-5S
SHEET 1 OF 1
FILE No. R5866
CHKD. BY T. Heins/RJS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER R. Brungs
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019697.1449 441160.5477 (NYSPC)
GROUND SURFACE ELEVATION 634.14 DATUM
START DATE 7/20/90 END DATE 7/20/90

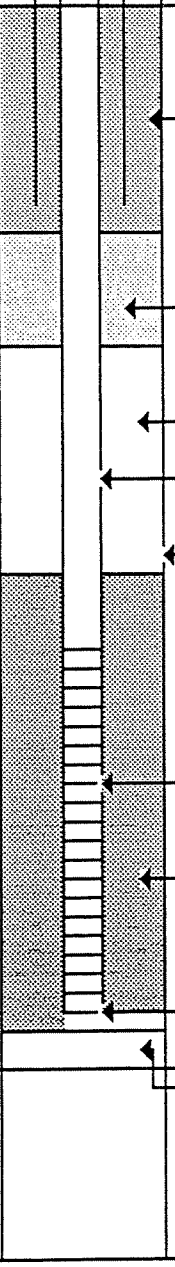
TYPE OF DRILL RIG Diedrich D-50
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM 1586)
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
7/20/90	830	Dry	HSA 14	5 min

DEPTH	BLOWS / 6"	NO.	SAMPLE DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM ppm	SAMPLE DESCRIPTION
1	2	S-1	0 - 2	10	50	ND	Stiff, black, SILT & CLAY, little fine to medium Sand, moist, with intermixed organics (roots) from 0 to 0.2 ft (TOPSOIL-FILL)
	4						
	6						
2	6						Stiff, brown, Silty CLAY, some fine to medium Sand, moist (FILL)
	4	S-2	2 - 4	6	40	ND	
3	3						
	3						
4	4						Stiff, gray-brown, CLAY & SILT, some fine to medium Sand, moist (CL)
	4	S-3	4 - 6	11	60	ND	
5	5						
	6						
6	8						
	4	S-4	6 - 8	13	60	ND	
7	5						. . . grades; Clayey SILT, little fine to medium Sand
	8						
8	8						
	2	S-5	8 - 10	8	70	ND	
9	4						
	4						
10	4						
	5	S-6	10 - 12	11	80	ND	. . . grades; CLAY & SILT and fine to medium Sand, with 1/16 to 1/4 lenses of wet fine to medium Sand and Silt 1 to 2 inches apart
11	5						
	6						
12	8						. . . grades; wet (SC)
	9	S-7	12 - 14	39	90	ND	
13	22	T,B					
	17						
	17						Gray, weathered Shale fragments, slightly moist
14							Bottom of Hole at 14.0 ft (auger refusal)
15							
16							

EQUIPMENT INSTALLATION LOG



4inch by 5 foot locking steel protective casing with 1/4 vent hole at base
Distance from ground surface to top of PVC riser = 2.1 ft
Concrete surface seal from 0 to 3 ft (80 pounds ready mix concrete)
Cement/bentonite grout from 3 to 4.6 ft (3.5 gallons water/ 47 pounds of cement/ 1 pounds bentonite powder)
Bentonite pellet seal from 4.6 to 7.6 ft (2 pails at 5 gal)
2 inch I.D. flush joint PVC riser from 0 to 8.6 ft
Nominal 8 inch diameter hole to 14 ft
2 inch I.D. flush joint No. 6 slot PVC well screen from 8.6 to 13.6 ft
Filter pack (No. 1 QROK) sand from 7.6 to 13.6 (1-1/2 bags at 100 pounds)
PVC end plug at bottom of screen (slot starts 0.3 ft from tip)
Bentonite pellet seal from 13.6 to 14 ft

NOTES: 1

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1. OVM = peak organic vapor meter reading made in the head space of the sample jar using a HNu model PI101 photoionization detector.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA

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PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-6S-A
SHEET 1 OF 1
FILE No. R5866
CHKD. BY T. Heins/R JS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER R. Brunges
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION Sta. 6+38 o/s 0 (site grid)
GROUND SURFACE ELEVATION ~637 DATUM NGVB
START DATE 7/18/90 END DATE 7/18/90

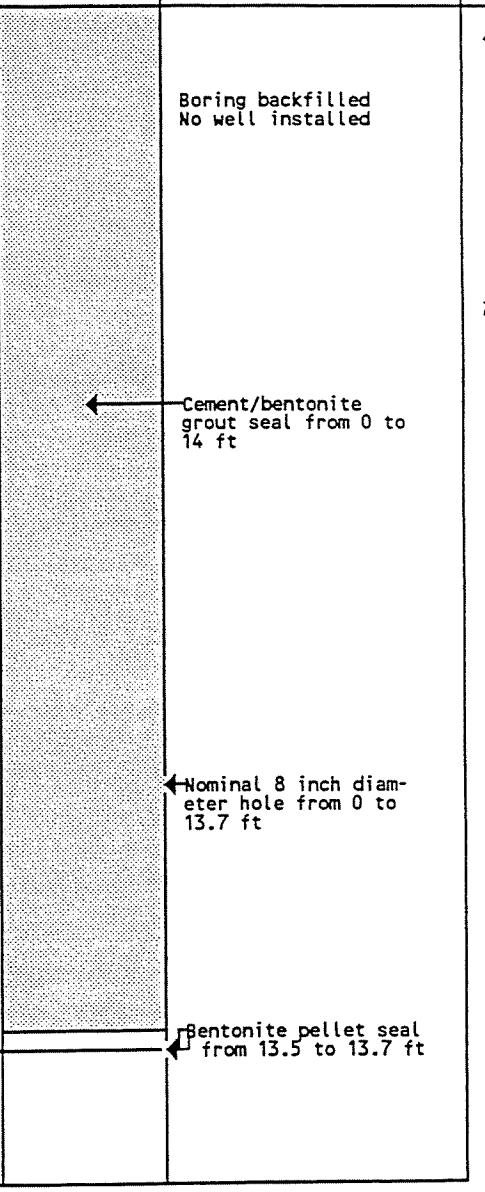
TYPE OF DRILL RIG Diedrich D-50
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM D1586)
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
7/18/90	1450	Dry	13.7'	5 min

DEPTH	BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM ppm	SAMPLE DESCRIPTION
1	2	S-1	0 - 2	10	40	ND	Stiff, black, SILT & CLAY, little fine to medium Sand, moist, with intermixed organics (roots) from 0.0 to 0.2 ft (TOPSOIL-FILL)
	6						
	4						Stiff, brown, Silty Clay, some fine to medium Sand, moist (FILL)
2	5						
	4	S-2	2 - 4	10	40	ND	Stiff, gray-brown, CLAY & SILT and fine to coarse SAND, moist (CL)
3	4						
	6						
	8						
4	3	S-3	4 - 6	9	40	ND	
	3						
5	6						
	10						
6	6	S-4	6 - 8	19	40	ND	. . . grades; very stiff
	9						
7	10						
	11						
8	4	S-5	8 - 10	12	50	ND	. . . grades; stiff, CLAY & SILT, some fine Sand
	6						
9	6						
	9						
10	3	S-6	10 - 12	19	20	ND	
	5						
11	14						Medium dense, gray, Clayey SILT and fine to coarse SAND, moist with intermixed Shale fragments
	18						
12	6	S-7	12 - 14	16	30	ND	. . . grades; wet at 11.8 ft (SC)
	6						
13	10						. . . grades; frequently intermixed rock fragments at 12.5 ft
	10						
14							Bottom of Hole at 13.7 ft
15							
16							

EQUIPMENT INSTALLATION LOG



NOTES

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:
1. OVM = peak organic vapor meter reading made in the head space of the sample jar using a HNu model PI101 photoionization detector.
2. Borehole grouted because driller weight from measuring tape was dropped down the hole and could not be retrieved.
3. See boring log MW-6S-C for well installation information.

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-6S-B
SHEET 1 OF 1
FILE No. R5866
CHKD. BY T. Heins / R J S

CONTRACTOR John Mathes and Associates, Inc.
DRILLER R. Brunges
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION Sta. 6+36 o/s 6R (site grid)
GROUND SURFACE ELEVATION ____ DATUM ____
START DATE 7/18/90 END DATE 7/18/90

TYPE OF DRILL RIG Diedrich D-50
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM D1586)
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
7/18/90		Dry		

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM ppm	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
1							HSA advanced from 0 to 6 ft. No samples collected.		Boring backfilled No well installed
2									
3									
4									
5								← Cement/bentonite grout backfilled from 0 to 6 ft	
6							Bottom of Hole at 6.0 feet (auger refusal)		
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

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BORING No. MW-6SB

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GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-6S-C
SHEET 1 OF 1
FILE No. R5866
CHKD. BY T. Heins/RJS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER R. Brungs
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019723.4153 441387.5286 (NYSPC)
GROUND SURFACE ELEVATION 637.00 DATUM NGVB
START DATE 7/18/90 END DATE 7/18/90

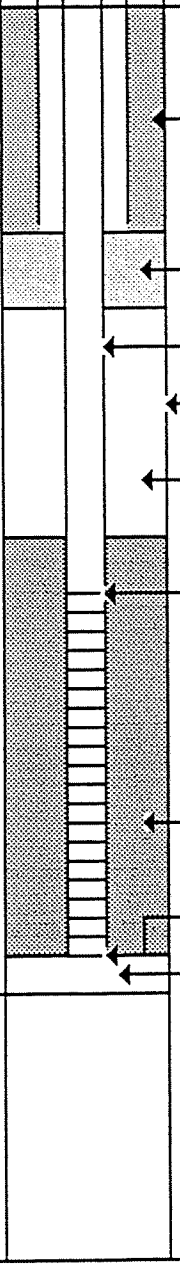
TYPE OF DRILL RIG Diedrich D-50
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM 1586)
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
7/18/90	1630	Dry	HSA 13	5 min

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM ppm	SAMPLE DESCRIPTION
1							HSA advanced from 0 to 13 ft. No samples collected. See boring log MW-6S-A for soil descriptions
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							Weathered rock fragments in auger spoil at 12.8 to 13 ft
13							Bottom of Hole at 13 ft (auger refusal)
14							
15							
16							

EQUIPMENT INSTALLATION LOG



4inch by 5 ft locking steel protective casing with 1/4 vent hole at base
Distance from ground surface to top of PVC riser = 1.6 ft
Concrete surface seal from 0 to 3 ft (80 pounds ready mix concrete)
Cement/bentonite grout seal from 3 to 4 ft
2 inch I.D. flush joint PVC riser from 0 to 7.7 ft
Nominal 8 inch diameter hole to 13 ft
Bentonite pellet seal from 4 to 7 ft (1 pail at 5 gal)
2 inch I.D. flush joint No. 6 slot PVC well screen from 7.7 to 12.7 ft
Filter pack (No. 1 QROK) sand from 7 to 12.7 ft (1-1/2 bags at 100 pounds)
PVC end plug at bottom of screen (slot starts 0.3 ft from tip)
Bentonite pellet seal from 12.7 to 13 ft (1/4 pail at 5 gal)

NOTES

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA

GOLDBERG-ZOINO ASSOCIATES OF NEW YORK, P.C.
364 NAGEL DRIVE, BUFFALO, NEW YORK
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-6RB
SHEET 1 OF 1
FILE No. R5866
CHKD. BY T. Heins 7RJS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER R. Brunges
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION Sta. 6+26 o/s 5R (site grid)
GROUND SURFACE ELEVATION _____ DATUM _____
START DATE 7/18/90 END DATE 7/18/90

TYPE OF DRILL RIG Diedrich D-50
CASING SIZE AND TYPE 6-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM D1586)
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
		Dry		

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM ppm	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG		NOTES
1							Advance 6-1/4 HSA to 2 feet No samples collected (see boring log MW-6DC)		← Hole backfilled with native material	
2							Bottom of Hole at 2 ft. (auger refusal)			
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA

GOLDBERG-ZOINO ASSOCIATES OF NEW YORK, P.C.
364 NAGEL DRIVE, BUFFALO, NEW YORK
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-6RA
SHEET 1 OF 1
FILE No. R5866
CHKD. BY T. Heins /RJS

CONTRACTOR John Mathes and Associates, Inc.
DRILLER R. Brunges
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION Sta. 6+25 o/s 11R (site grid)
GROUND SURFACE ELEVATION _____ DATUM _____
START DATE 7/18/90 END DATE 7/18/90

TYPE OF DRILL RIG Diedrich D-50
CASING SIZE AND TYPE 6-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM D1586)
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
		Dry		

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM ppm	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG		NOTES
1							6-1/4 HSA advanced to 2 feet No samples collected (see boring log MW-6DC)		← Hole backfilled with native material	
2							Bottom of Hole at 2 ft. (auger refusal)			
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA

GOLDBERG-ZOINO ASSOCIATES OF NEW YORK, P.C.
364 NAGEL DRIVE, BUFFALO, NEW YORK
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-6RC
SHEET 1 OF 2
FILE No. R5866
CHKD. BY T. Heins/R J S

CONTRACTOR John Mathes and Associates, Inc.
DRILLER R. Brungs
GZA REPRESENTATIVE G. Klawinski

BORING LOCATION 1019720.4441 441372.9671 (NYSPC)
GROUND SURFACE ELEVATION 637.24 DATUM NGVD
START DATE 7/18/90 END DATE 7/21/90

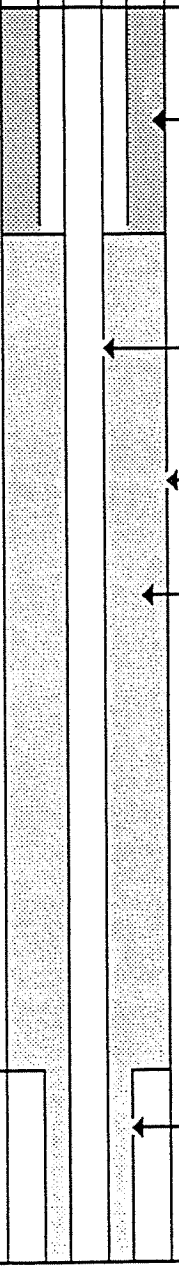
TYPE OF DRILL RIG
CASING SIZE AND TYPE 6-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch Split Spoon Sampler (ASTM 1586)
ROCK DRILLING METHOD NX Size Rock Core with compressed air as the drilling fluid

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS
7/18/90	1730	Dry	HSA 14	15 min
7/19/90	810	11.5	HSA 14	14 hrs
7/21/90	1638	~25	well	

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM ppm	SAMPLE DESCRIPTION
1							Advanced 6-1/4 HSA from 0 to 14 ft. No samples collected. See boring log MW-6SA for soil descriptions.
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							Auger refusal at 14 ft
		C-1	14-17.8	37	68		Gray, SHALE, medium hard, moderately weathered, aphanitic, very thin bedding
15							
16							. . . slightly weathered

EQUIPMENT INSTALLATION LOG



6 inch by 5 ft locking steel protective casing with 1/4 vent hole at base

NOTES

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1. Rock reamed using 6 inch O.D. solid stem augers from 14 to 18.8 ft following rock coring.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA

GOLDBERG-ZOINO ASSOCIATES OF NEW YORK, P.C.
364 NAGEL DRIVE, BUFFALO, NEW YORK
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Chem-Trol Site
Phase II Investigation
Hamburg, New York

BORING No. MW-6RC
SHEET 2 OF 2
FILE No. R5866
CHKD. BY T. Heins RJS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM ppm	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
17							Horizontal slightly open fracture at approximately 16.5 ft		
18									
19		C-2	18.8-23.9	90	80				
20									
21									
22							Horizontal slightly open fracture at approximately 21.6 ft		Nominal 3 inch diameter rock hole from 18.8 to 29 ft
23									
24									
25		C-3	23.9-29	90	100				
26									
27							Horizontal slightly open fracture at approximately 26.8 ft Horizontal slightly open fracture at approximately 27.6 ft		
28									
29							Bottom of Hole at 29.0 feet		
30									
31									
32									
33									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 2. No water observed coming from borehole during coring from 14 to 17.8 feet.
3. Water encountered during coring at 22.5 ft.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, NY	BORING No. MW-7S SHEET 1 OF 1 FILE No. 5945 CHKD. BY SHB

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER C. Nicometi
GZA GEOENVIRONMENTAL REPRESENTATIVE G. Klawinski

BORING LOCATION 1019144.243, E441409.311 (NYSPC)
GROUND SURFACE ELEVATION 640.37 DATUM NGVD
START DATE 10/20/92 END DATE 10/20/92

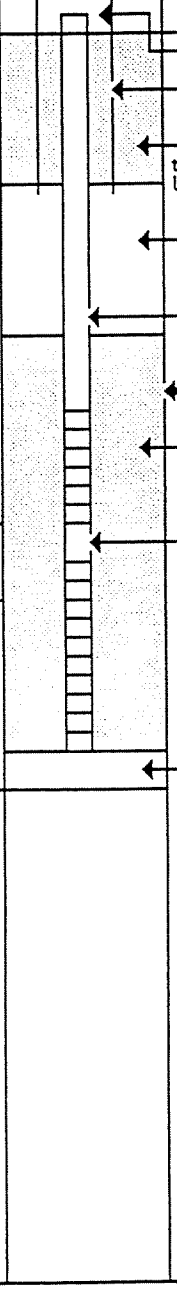
TYPE OF DRILL RIG Mobil B-34 (track mounted)
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch split spoon sampler (ASTM 1586)
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM	SAMPLE DESCRIPTION
1	2	S-1	0 - 2	8	75	ND	Stiff, Black-brown, CLAY & SILT, little fine to coarse Sand, moist, with intermixed organics (roots) from 0 to 0.4' (TOPSOIL)
	4						
	4						
2	9						Stiff, gray-brown, SILT & CLAY, some fine to medium Sand, moist (CL).
	3	S-2	2 - 4	12	85	ND	
3	6						
	6						. . . grades; with occasional lenses 1/16 to 1/8" thick fine Sand and Silt 1/2" to 4" apart.
	8						
4	2	S-3	4 - 6	4	100	ND	. . . grades; medium, wet.
	2						
5	2						. . . grades; little fine to medium Sand.
	3						
6	3	S-4	6 - 8	17	85	ND	
7	5						Very stiff, gray-brown, Clayey SILT and fine to coarse SAND, little Gravel, wet (SC).
	12						
	40						Hard, gray, SILT & CLAY and fine to coarse SAND, with occasional intermixed weathered rock fragment (CL).
8	33	S-5	8 - 10	45	10	0.6	
9	23						
	22						
	26						Rock fragment in bottom of split spoon (S-5).
10							Auger Refusal at 10.0 feet. Bottom of Hole at 10.0 feet.
11							
12							
13							
14							
15							
16							

EQUIPMENT INSTALLATION LOG



Stickup from GS to top protective casing 2.7'
Stickup from GS to top of inner PVC riser 2.5'.

NOTES

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:
1. No water in hole at time of well installation.
2. OVM = peak organic vapor meter readings made in the headspace of the sample jar using a HNu model PI101 photoionization detector.

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-7R SHEET 1 OF 2 FILE No. 5945 CHKD. BY SHB

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER C. Nicometi
GZA GEOENVIRONMENTAL REPRESENTATIVE G. Klawinski

BORING LOCATION N 1019138.521 E 441410.888 (NYSPC)
GROUND SURFACE ELEVATION 640.46 DATUM NGVD
START DATE 10/20/92 END DATE 11/6/92

TYPE OF DRILL RIG Mobile B-34 (track mount)
CASING SIZE AND TYPE 6-1/4 inch ID HSA
OVERBURDEN SAMPLING METHOD None
ROCK DRILLING METHOD NX size core with air as drilling fluid to 20.1' with water from 20.1 to '

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM PPM	SAMPLE DESCRIPTION
0							Advanced 6-1/4" ID HSA from ground surface to 10.3'. No samples collected. See boring log MW-7S for soil descriptions.
10							Top of bedrock at 10.3'.
11		C-1	10.3-14.7		40		Gray shale, soft to medium hard, slight to moderate weathering, aphanitic very thin to thin bedding (LUDLOWVILLE SHALE).
15		C-2	14.7-16.0		100		

EQUIPMENT INSTALLATION LOG

Stickup from GS to top protective casing 2.58'
Stickup from GS to top of PVC riser 1.9'

- Vented PVC cap
- 6" by 3.5' locking steel protective casing installed with 1/4" weep hole.
- Concrete surface seal to 0.5' (2 bags at 80 lbs ready mix concrete).
- Nominal 10" diameter hole to 13.5'.
- Cement/bentonite grout from 0.5' to 16' (6 bags of cement at 90 lbs and 1/8 bag of bentonite powder).
- 4-1/4" ID by 4-1/2" OD Sch 80, flush joint PVC casing to 16'.
- Nominal 6" diameter hole from 13.5 to 16'.

NOTES: 1

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1. Water was blown up from borehole (<5 gpm) during coring with air from 10.3' to 16.0'.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK
364 NAGEL DRIVE, BUFFALO, NEW YORK
ENGINEERS AND SCIENTISTS

PROJECT
Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York

BORING No. MW-7R
SHEET 2 OF 2
FILE No. 5945
CHKD. BY SHB

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM PPM	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
17		C-3	16-19.3	66	66				
18									
19								3" nominal diameter hole from 16.0 to 36.2'.	
20		C-4	19.3-21.5	86	86				
21									
22		C-5	21.5-26.3	84	94				
23							Horizontal fracture, slightly open to closed, fresh to slightly weathered at 23.1'.		
24									
25							Zone of fractured rock, slightly open to closed, fresh to slightly weathered from 24.4 to 24.9'.		
26									
27		C-6	26.3-31	98	98		Low angle fracture at 27.3'.		
28							Horizontal fracture, moderately weathered, slightly open to closed at 27.8 and 28.8'.		
29									
30									
31		C-7	31-36.2	98	98				
32									
33									
34									
35							Low angle fracture at 25.1'.		
36							Bottom of Hole at 36.2 feet.		

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-7RA SHEET 1 OF 1 FILE No. 5945 CHKD. BY SHB

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER K. Danser
GZA GEOENVIRONMENTAL REPRESENTATIVE D. DiFante

BORING LOCATION See MW-7R for approximate location.
GROUND SURFACE ELEVATION DATUM
START DATE 11/6/92 END DATE 11/6/92

TYPE OF DRILL RIG Diedrich D-55

CASING SIZE AND TYPE 4-1/4 inch ID HSA

OVERBURDEN SAMPLING METHOD None

ROCK DRILLING METHOD NX size core with water as drilling fluid

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM ppm	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG		NOTES
1							Advanced 4-1/4" HSA from ground surface to 10.5'. No samples collected. See boring log MW-7S for soil descriptions.		Cement/bentonite grout 0' to 15.6'.	
11		C-1	10.5-15.6	63	80		Gray shale, soft to medium hard, moderately weathered, aphanitic, thin bedding (LUDLOWVILLE SHALE). Zone of horizontal fractures, 1" to 3" apart slightly open to open, moderately to moderately severe weathering from 10.5 to 11.1'. High angle fracture moderate to moderately severe weathering at 11.5'.			
16							Bottom of Hole at 15.6 feet.			

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1. This test boring was advanced so that a packer pressure test could be done at the top of bedrock.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, NY	BORING No. MW-8S SHEET 1 OF 1 FILE No. 5945 CHKD. BY SHB

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER C. Nicometi
GZA GEOENVIRONMENTAL REPRESENTATIVE D. DiFante

BORING LOCATION N 1019498.482, E 440768.722 (NYSPC)
GROUND SURFACE ELEVATION 613.97 DATUM NGVD
START DATE 10/26/92 END DATE 10/26/92

TYPE OF DRILL RIG Mobil B-34 (track mounted)
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD None
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM PPM	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
1							Advanced 4-1/4 inch I.D. HSA from ground surface to 5.3'. No samples collected. See boring log MW-8R for sample descriptions.	Vented PVC cap 6" by 4' locking steel pro. casing with 1/4" weep hole. Concrete surface seal to 0.5'. (1/4 bags at 80 lbs ready mix concrete) Nominal 8" dia. hole Bentonite pellet seal from 0.5' to 3.5'. (1 pail at 5 gal) 2" I.D., PVC, flush joint Sch 40 riser pipe to 4.0'. No. 1 (silica-quartz) sand filter pack from 3.5' to 5.0' (1/4 bag at 100 lbs). 2" I.D., PVC, flush joint Sch 40, screened from 4.0' to 5.0'. Bentonite pellet seal from 5.0' to 5.3'.	Stickup from GS to top protective casing 3.3' Stickup from GS to top of riser 3.15'
2									
3									
4									
5									
6							Bottom of Hole at 5.3 feet.		
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-8R SHEET 1 OF 2 FILE No. 5945 CHKD. BY SHB

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER C. Nicometi
GZA GEOENVIRONMENTAL REPRESENTATIVE D. DiFante

BORING LOCATION N 1019490.124 E 440771.135 (NYSPC)
GROUND SURFACE ELEVATION 614.27 DATUM NGVD
START DATE 10/26/92 END DATE 10/27/93

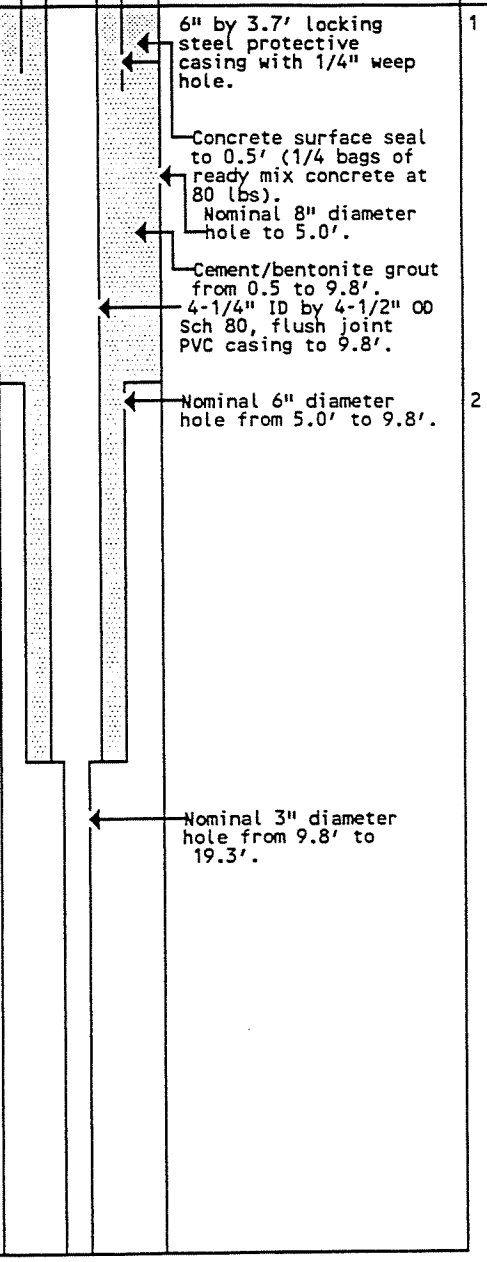
TYPE OF DRILL RIG Mobil B-34 (track mount)
CASING SIZE AND TYPE 4-1/4 inch ID HSA/6 inch flush joint
OVERBURDEN SAMPLING METHOD 2 inch OD by 24 inch split spoon sampler (ASTM 1526)
ROCK DRILLING METHOD NX size core with air as drilling fluid

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM	SAMPLE DESCRIPTION
1	1	S-1	0 - 2	6	75	ND	Medium, black-brown CLAY & SILT, some fine to medium Sand, trace organics (roots), damp(TOPSOIL).
	2						
	4						Medium, brown, CLAY & SILT, some fine to medium Sand, moist (CL).
2	7						
	4	S-2	2 - 4	11	50	ND	. . . grades, frequently intermixed weathered rock (shale) fragments.
3	5						
	6						
	8						
4	100/0.3	S-3	4 - 5	--	10	2	Gray, weathered shale fragments in split spoon, moist.
5		C-1	5 - 9.3	33	77		Gray shale, medium hard to soft, moderately to severely weathered, aphanitic, thin bedding (LUDLOWVILLE SHALE). Zone of weathered rock 5.0 to6.9' core barrel dropped slowly from 6.8 to 7.3'.
6							
7							Horizontal fractures, slightly open to closed, fresh to slightly weathered, spaced 1/2 to 6 inches apart from 6.9' to 14.5'.
8							
9							Advanced 5-7/8 roller bit from 9.3 to 9.8'. No samples taken.
10		C-2	9.8-14.5	12	83		
11							
12							
13							
14							
15		C-3	14.5-19.3	94	98		Horizontal, slightly open to closed, fresh to slightly weathered fractures at 15.1, 15.5 15.7, 15.8, 15.9, 16.1, 16.5, 17.0, 17.6, 18.7
16							

EQUIPMENT INSTALLATION LOG



NOTES
1
2

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:
1. OVM = peak organic vapor meter reading made in the headspace of the sample jar using a HNu model PI101 photoionization detector.
2. Auger refusal at 5.0 feet.

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-8R SHEET 2 OF 2 FILE No. 5945 CHKD. BY SHB

DEPTH	SAMPLE					SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG		NOTES
	BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	RECOVERY (%)				
17									
18									
19									
20						Bottom of Hole at 19.3 feet			
21									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, NY	BORING No. MW-9SA SHEET 1 OF 1 FILE No. 5945 CHKD. BY SHB

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER C. Nicometi
GZA GEOENVIRONMENTAL REPRESENTATIVE G. Klawinski

BORING LOCATION See MW-9SB for approximate location
GROUND SURFACE ELEVATION DATUM
START DATE 10/22/92 END DATE 10/22/93

TYPE OF DRILL RIG Mobil B-34 (track mounted)
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD 2 inch O.D. by 24 inch split spoon samples (ASTM 1586)
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
1	1	S-1	0 - 2	3	50	ND	Very loose, black, SILT and fine to coarse SAND, trace Gravel, wet with intermixed organics (roots) (suspected fill).		
	1								
	2						Soft, gray-black, SILT & CLAY, some fine to medium Sand, moist, with occasional intermixed organics (roots) (FILL).		Borehole backfilled with cement bentonite grout from 0 to 4'.
2	3								
	3	S-2	2 - 4	29	50	0.4	. . . grades; wet with intermixed rock (weathered shale) fragments.		
3	4						. . . grades; very stiff.		
	15						No organics.		
	52						Rock fragments in bottom spoon.		
4							Bottom of Hole at 4.2'.		
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1. OVM = peak organic vapor meter reading made in headspace of the sample jar using a HNu model PI101 photoionization detector.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, NY	BORING No. MW-9SB SHEET 1 OF 1 FILE No. 5945 CHKD. BY SHB

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER L. Schroeder
GZA GEOENVIRONMENTAL REPRESENTATIVE D. DiFante

BORING LOCATION N 1019265.672 E 440936.955
GROUND SURFACE ELEVATION 617.12 DATUM NGVD
START DATE 10/29/92 END DATE 10/29/92

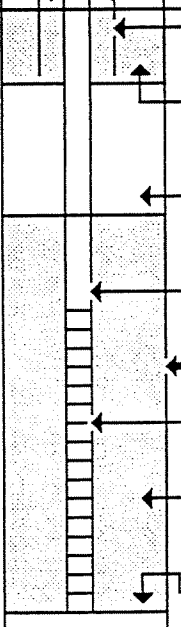
TYPE OF DRILL RIG Mobil B-34 (track mounted)
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD None
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM	SAMPLE DESCRIPTION
1							Advanced 4-1/4 inch I.D. HSA from ground surface to 8'. No samples were collected. See boring logs MW-9SA and MW-9R for soil description.
2							
3							
4							
5							
6							
7							
8							
9							Bottom of Hole at 8.3 feet
10							
11							
12							
13							
14							
15							
16							

EQUIPMENT INSTALLATION LOG



NOTES

Stickup from GS to top protective casing 3'.
Stickup from GS to top of PVC riser 2.8'.
Vented PVC cap.

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-9R SHEET 1 OF 2 FILE No. 5945 CHKD. BY SHB

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER C. Nicometi
GZA GEOENVIRONMENTAL REPRESENTATIVE G. Klawinski

BORING LOCATION N 1019274.489 E 440939.495 (NYSPC)
GROUND SURFACE ELEVATION 616.98 DATUM NGVD
START DATE 10/22/92 END DATE 10/28/92

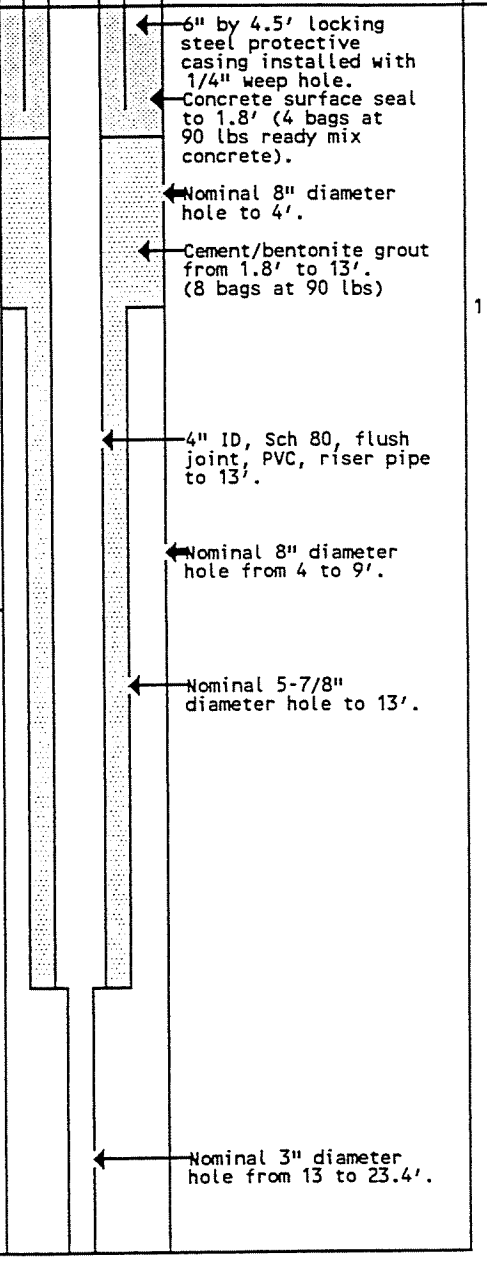
TYPE OF DRILL RIG Mobile B-34 (track mount)
CASING SIZE AND TYPE 6 inch flush joint casing
OVERBURDEN SAMPLING METHOD None
ROCK DRILLING METHOD NX size core with air as drilling fluid

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM	SAMPLE DESCRIPTION
1							Advance 6" flush joint casing to 4'. No samples collected. See boring log MW-9S for soil descriptions.
2							
3							
4		C-1	4 - 9	44	44		
5							Concrete (gray with intermixed gravel) from 4 to 5.5'.
6							Core barrel dropped from 5.5 to 6' Approximately 5 gpm water blowing up from hole at this zone.
7							Core barrel dropped from 7 to 8'.
8							Gray, SHALE, soft to medium hard moderately to severely weathered, aphanitic, very thin bedding (LUDLOWVILLE SHALE).
9		C-2	9 -12.3	46	86		
10							
11							Horizontal slightly open, slightly weathered fracture at 11.3'.
12							Horizontal slightly open, slightly weathered fracture at 12' Advanced 5-7/8 roller bit from 12.3 to 13'. No samples collected.
13							
14		C-3	12.8-17.5	81	91		
15							
16							Zone of horizontal fractures, slightly open to closed, fresh to slightly weathered from 16' to 16.5'.

EQUIPMENT INSTALLATION LOG



NOTES: 1

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1. Advanced 6" flush joint casing from 4 to 8' after C-1 was collected. Very difficult to spin casing from 4 to 5'.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-9R SHEET 2 OF 2 FILE No. 5945 CHKD. BY SHB

DEPTH	SAMPLE						SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG		NOTES
	BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM				
17										
		C-4	17.5-22.5	82	82					
18										
19										
20										
21										
22										
		C-5	22.5-23.4	89	89					
23							Bottom of Hole at 23.4 feet.			
24										
25										

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-9RD SHEET 1 OF 4 FILE No. 5945 CHKD. BY RJS

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER L. Schroeder
GZA GEOENVIRONMENTAL REPRESENTATIVE G. Klawinski

BORING LOCATION N 1019282.549 E 440942.546 (NYSPC)
GROUND SURFACE ELEVATION 616.70 DATUM NGVD
START DATE 5/10/94 END DATE 5/25/94

TYPE OF DRILL RIG CME-55 on ATV

CASING SIZE AND TYPE 4-1/4" ID HSA, 6" ID flush joint steel casing

OVERBURDEN SAMPLING METHOD 2" OD by 2" split spoon sampler (ASTM 1586)

ROCK DRILLING METHOD NX size core, 3-7/8" OD roller bit

WATER LEVEL DATA

DATE	TIME	WATER	CASING	STABILIZATION TIME
5/10/94	730am	2	9	14 hrs.

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM	SAMPLE DESCRIPTION
1	2	S-1	0 - 2	--	50	ND	Black-brown, SILT & CLAY, some fine to coarse Sand, wet, with intermixed organics (roots). [FILL]
	2	T,B					
	3						
2	7						Gray-brown, CLAY & SILT, little fine to coarse Sand, trace Gravel, moist with frequently intermixed organics (roots) and occasional intermixed slag type material. (1.5'-2.0')
	40	S-2	2 - 4	--	20	ND	
3	15						
	20						Gray, fine to coarse Sand and Gravel size slag material, wet.
	26						
4	100/0	S-3	4	--	0	--	
							Very difficult augering from 4' to 5' (suspected concrete).
5							Augers dropped from approximately 5' to 6' (possible void).
6	2	S-4	6 - 8	--	20	12	Gray-black, Silt and very weathered Shale, moist. [weathered shale]
	3						
7	4						
	40						Auger refusal at 8'.
8		C-1	8.1-17.9	70	88		Gray, SHALE, soft to medium hard, moderately to severely weathered, aphanitic, very thin bedding. [LUDLOWVILLE SHALE] Zone severely weathered shale fragments at 9' to 9.1'.
9							
10							
11							Core barrel dropped from 11.1 to 11.4'.
12							
13							Horizontal fracture, slightly open, moderately severely weathered at 12.4'.
14							
15							
16							Horizontal fracture, slightly open, moderately weathered at 16.1', 16.7' and 16.9'.

EQUIPMENT INSTALLATION LOG

Stickup from GS to top protective casing 2.6'
Stickup from GS to top of PVC riser 2.4'
Vented PVC cap.

- 6" by 4.5' locking steel protective casing.
- Concrete surface seal to 3'.
- Nominal 8" diameter hole to 8'.
- Cement/bentonite grout from 3' to 19'.
- 1-1/2" ID Sch 40 PVC flush joint riser to 48'.
- 4" ID, Sch 80, flush joint PVC casing to 38'.
- Nominal 5-7/8" diameter hole from 8 to 38'.

NOTES 1, 2

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:
1. OVM = Peak organic vapor meter readings made in the headspace of the sample jar using a HNu Model PI101 photoionization detector.
2. Water came up the hole during coring in this zone. The remaining run C-1 cored dry.

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-9RD SHEET 2 OF 4 FILE No. 5945 CHKD. BY RJS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM PPM	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
17									
18		C-2	17.9-19.7	50	100				3
19							Zone of several horizontal fractures, closed to slightly open, slightly to moderately weathered spaced 0.1 to 0.4 apart from 19.2 to 23'.		
20		C-3	19.7-26.0	22	80				
21									
22									
23									
24								Bentonite seal from 19 to 43'.	4
25									5
26		C-4	26.0-28.5	40	100		High angle closed fracture from 25.5 to 26.8'.		
27									
28									
29		C-5	28.5-33.3	92	96				
30							High angle fracture with secondary (calcite) mineralization, closed from 29.6 to 37.5'.		
31									
32									
33									
34		C-6	33.3-37.6	90	98				
35									
36									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:
3. Water came up hole during coring from top C-2 to 37.6 ft.
4. Water shot up out of MW-9R during coring from 24 to 26'.
5. Chemical odor noticed during coring from 23 to 24'.

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

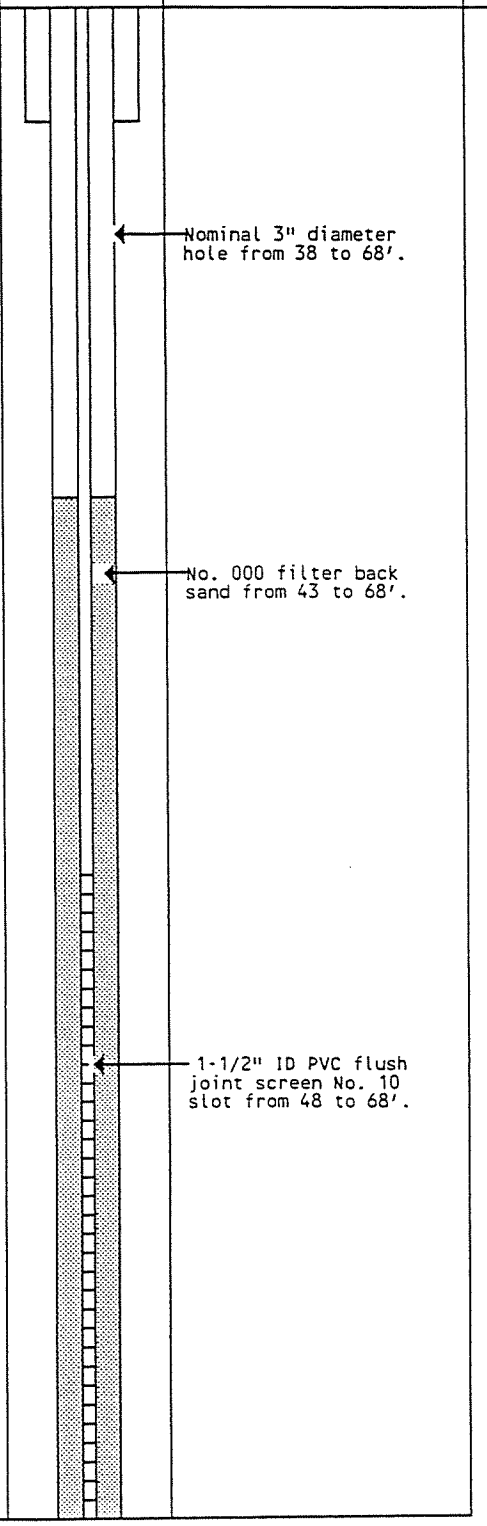
GZA GEOENVIRONMENTAL OF NEW YORK
364 NAGEL DRIVE, BUFFALO, NEW YORK
ENGINEERS AND SCIENTISTS

PROJECT
Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York

BORING No. MW-9RD
SHEET 3 OF 4
FILE No. 5945
CHKD. BY RJS

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM	SAMPLE DESCRIPTION
37							
38		C-7	37.6-43.2	25	53		Horizontal fractures, closed to slightly open, fresh to moderately weathered, spaced 0.1 to 0.5' apart from 38 to 45'.
39							
40							
41							
42							
43		C-8	43.2-48.7	30	90		
44							
45							
46							
47							
48							
49		C-9	48.7-53.4	60	100		
50							
51							
52							
53							
54		C-10	53.4-58.0	50	100		
55							
56							

EQUIPMENT INSTALLATION LOG



NOTES

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-9RD SHEET 4 OF 4 FILE No. 5945 CHKD. BY RJS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM PPM	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
57									
58		C-11	58 -63.5	35	87				
59							Horizontal fractures, closed to slightly open, fresh to moderately weathered, spaced 0.1 to 0.5' apart from 55' to 68'.		
60									
61									
62									
63									
64		C-12	63.5- 68	50	85				
65									
66									
67									
68							Bottom of Hole at 68 feet.		
69									
70									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, NY	BORING No. MW-10S SHEET 1 OF 1 FILE No. 5945 CHKD. BY SHB

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER C. Nicometi
GZA GEOENVIRONMENTAL REPRESENTATIVE D. DiFante

BORING LOCATION N 1019674.604 E 440922.406 (NYSPC)
GROUND SURFACE ELEVATION 612.39 DATUM NGVD
START DATE 10/28/92 END DATE 10/28/92

TYPE OF DRILL RIG Mobil B-34 (track mounted)
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA
OVERBURDEN SAMPLING METHOD None
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM PPM	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
1							Advanced 4-1/4 inch I.D. HSA from ground surface to 5.0'. No samples were collected. See boring log MW-10R for soil description.	Stickup from GS to top protective casing 3.1' Stickup from GS to top of riser 2.9' Vented PVC cap 4" by 4' locking steel pro. cas. installed with 1/4" weep hole. Concrete surface seal to 0.3'. Nominal 8" diameter hole. Bentonite pellet seal from 0.3' to 2.5'. (1 pail at 5 gal) 2" I.D., PVC, flush joint Sch 40 riser pipe to 3.3'. No. 1 (silica-quartz) sand filter pack from 2.5' to 4.8' (1 bag at 100 lbs). 2" I.D., PVC, flush joint Sch 40, screened from 3.3' to 4.8'. Bentonite pellet seal from 4.8' to 5.0'.	
2									
3									
4									
5							Bottom of Hole at 5.0 feet		
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-10R SHEET 1 OF 2 FILE No. 5945 CHKD. BY

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER L. Schroeder
GZA GEOENVIRONMENTAL REPRESENTATIVE D. DiFante

BORING LOCATION N 1019667.989 E 440916.435 (NYSPC)
GROUND SURFACE ELEVATION 612.37 DATUM NGVD
START DATE 10/27/92 END DATE 10/28/92

TYPE OF DRILL RIG Mobil B-34 (track mount)

CASING SIZE AND TYPE 4-1/4 inch HSA/6 inch flush joint

OVERBURDEN SAMPLING METHOD 2 inch OD by 24 inch split spoon sampler (ASTM 1586)

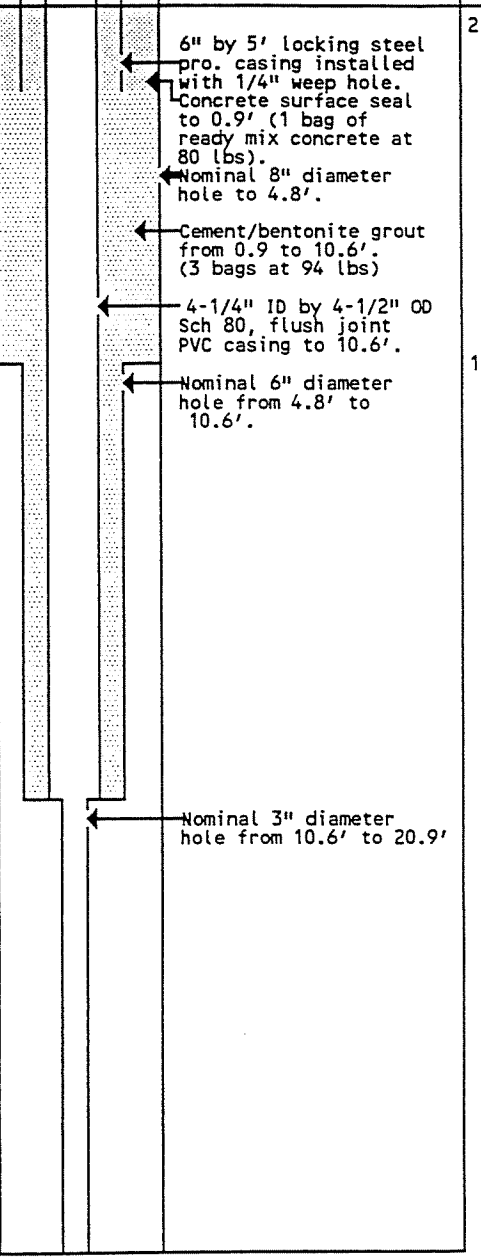
ROCK DRILLING METHOD NX size core with air as drilling fluid

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM	SAMPLE DESCRIPTION
1	1	S-1	0 - 2	3	50	0.4	Soft, brown, SILT & CLAY, some fine Sand, trace organics (roots) damp (TOPSOIL).
	1						
	2						
2	3						
	4	S-2	2 - 4	--	55	1.2	. . . grades to; and medium to coarse Sand, some fine Gravel, wet.
3	2						
	56						Gray weathered shale fragments in split spoon, moist, with some gray Silt intermixed.
	89						
4	32	S-3	4 - 4.8	--	50	1.2	
	100/.2						
5		C-1	4.8-10.6	28	81		Gray SHALE, medium hard to soft, moderately to severely weathered, aphanitic, thin bedding (LUDLOW-VILLE SHALE). High angle, closed, fresh fracture from 5.2 to 5.9'. Horizontal fractures, slightly open to closed, fresh to slightly weathered, spaced 6 to 1/4" apart from 4.8 to 7.8'.
6							
7							
8							Core barrel dropped 7.8' to 8.3'.
9							
10							Horizontal fracture, slightly open to open, slightly to severely weathered at 10.0, 10.1, 10.2'.
11		C-2	10.6-13	83	83		Horizontal fracture, slightly open to closed, fresh to slightly weathered at 11.5'.
12							
13							
		C-3	13 -16.2	71	91		
14							
15							
16							High angle, closed, fresh fracture from 15.5 to 15.9'.

EQUIPMENT INSTALLATION LOG



NOTES

2

1

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1. Water was blowing up from casing during coring at C-1 with air.
2. OVM = peak organic vapor meter reading made in the headspace of the sample jar using a HNu model PI101 photoionization detector.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-10R SHEET 2 OF 2 FILE No. 5945 CHKD. BY SHB

DEPTH	SAMPLE						SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
	BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM			
17		C-4	16.2-20.9	96	96		Horizontal fracture, slightly open to closed, fresh to slightly weathered at 20.9'.		
18									
19									
20									
21							Bottom of Hole at 20.9 feet.		
22									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-11RA SHEET 1 OF 1 FILE No. 5945 CHKD. BY SHB

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER L. Shrander
GZA GEOENVIRONMENTAL REPRESENTATIVE D. DiFante

BORING LOCATION See MW-11RC for approximate location
GROUND SURFACE ELEVATION DATUM
START DATE 11/2/92 END DATE 11/2/93

TYPE OF DRILL RIG Mobil B-34 (track mount)

CASING SIZE AND TYPE 4-1/4 inch HSA

OVERBURDEN SAMPLING METHOD 2 inch OD by 24 inch split spoon sampler (ASTM 1576)

ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE						SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG		NOTES
	BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM				
1	1	S-1	0 - 2	12	75	ND	Very soft, dark brown, CLAY & SILT, some fine to medium Sand, trace organics,wet (TOPSOIL)(CL).		Hole grouted to surface 11/2/93	
	5									
	7						Stiff, brown, SILT & CLAY, some fine to medium Sand, damp(CL-ML).			
2	9									
	12	S-2	2 - 2.9		95	ND	Very stiff, gray, Silty CLAY, some fine to medium Sand, moist (SC).			
3	100/4						. . . grades to frequently inter-mixed rock fragments.			
							Split spoon sampler refusal. Bottom of Boring at 2.9 feet.			
4							Moved 20 feet west to new boring location due to auger refusal.			
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-11RB SHEET 1 OF 2 FILE No. 5945 CHKD. BY SHB

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER L. Schroeder
GZA GEOENVIRONMENTAL REPRESENTATIVE D. DiFante

BORING LOCATION About 30' west of MW-11RC
GROUND SURFACE ELEVATION DATUM
START DATE 11/2/92 END DATE 11/3/93

TYPE OF DRILL RIG Mobile B-34 (track mount)
CASING SIZE AND TYPE 4-1/4 inch HSA/6 inch flush joint
OVERBURDEN SAMPLING METHOD 2 inch OD by 24 inch split spoon sampler (ASTM 1526)
ROCK DRILLING METHOD NX size core with air as drilling fluid

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM PPM	SAMPLE DESCRIPTION
1							Advanced 4-1/4" HSA from ground surface to 4.0'. No samples were collected. See boring log MW-11RA for soil descriptions.
2							
3							
4	21	S-3	4 - 6	48	75	ND	Very stiff, gray, Silty CLAY, some fine Sand, frequently intermixed rock fragments (SC).
5	19						
	29					ND	
	20						
6	27	S-4	6 - 8	102	50	ND	. . . grades to hard.
7	48						
	54						Fractured gray shale fragments 7.2 to 7.5'.
	44					ND	
8	52	S-5	8 - 8.6	52	50	1	Hard, brown, CLAY & SILT, frequently intermixed shale fragments.
	100/1						
9		C-1	8.6-13.2	0	0		
10							
11							
12							
13							Gray, SHALE, soft to medium hard, moderate to severely weathered, aphanitic, very thin bedding. (LUDLOWVILLE SHALE)
14		C-2	13.2-14.6	64	79		Horizontal, slightly open to open severely weathered fracture at 14.1'.
15		C-3	14.6-18.1	24	54		Horizontal, slightly open to open moderately severe to severely weathered fracture at 15.5'.
16							

EQUIPMENT INSTALLATION LOG

PVC casing removed on 11/11/92 due to the casing being loose in the borehole. Borehole was filled to surface with cement grout.

Nominal 8" diameter hole to 8.6'

Cement/bentonite grout to 14.5'

Nominal 6" diameter hole from 8.6 to 14.5'

Nominal 3" diameter hole from 14.5 to 23.6'

NOTES: 1

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK
364 NAGEL DRIVE, BUFFALO, NEW YORK
ENGINEERS AND SCIENTISTS

PROJECT
Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York

BORING No. MW-11RB
SHEET 2 OF 2
FILE No. 5945
CHKD. BY SHB

DEPTH	SAMPLE BLOWS / 6"	SAMPLE NO.	SAMPLE DEPTH (FT.)	SAMPLE N-VALUE /RQD(%)	SAMPLE REC (%)	SAMPLE OVM PPM	SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
17							Zone of severely weathered fractured rock from 17.5 to 17.6' Horizontal, slightly open to open, severely weathered fracture at 17.8'.	Grout to surface on 11/11/92.	
18									
		C-4	18.1-23.6	96	96				
19									
20									
21									
22									
23									
24							Bottom of Hole at 23.6 feet.		
25									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-11RC SHEET 1 OF 2 FILE No. 5945 CHKD. BY SHB

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER L. Schroeder
GZA GEOENVIRONMENTAL REPRESENTATIVE D. DiFante

BORING LOCATION N 1019855.059 E 441250.557
GROUND SURFACE ELEVATION 632.62 DATUM NGVD
START DATE 11/3/92 END DATE 11/4/92

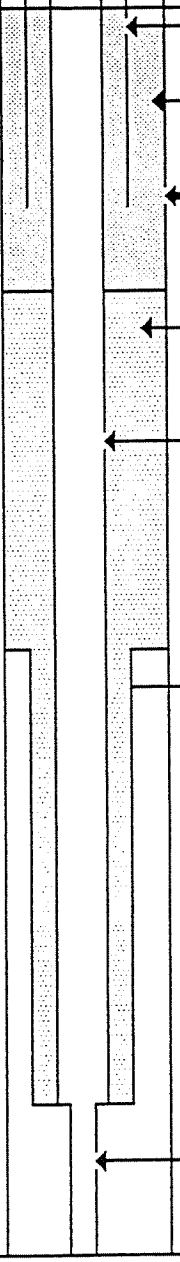
TYPE OF DRILL RIG Mobile B-34 (track mount)
CASING SIZE AND TYPE 4-1/4 inch I.D. HSA/6 inch flush joint
OVERBURDEN SAMPLING METHOD None
ROCK DRILLING METHOD 3 inch roller bit with air as drilling fluid

WATER LEVEL DATA

DATE	TIME	WATER	CASING	REMARKS

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM	SAMPLE DESCRIPTION
1							Advanced 4-1/4" HSA to 8.5'. No samples were collected. Removed HSA, and advanced 6" flush joint casing to 9.5'.
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							Advanced 3" roller bit from 14.5' to 24.5'. No rock core samples were collected. See boring log MW-11RB.
16							

EQUIPMENT INSTALLATION LOG



NOTES 1

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: Core sample was attempted from 5.5 to 13.0 feet. There was no recovery of a sample.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-11RC SHEET 2 OF 2 FILE No. 5945 CHKD. BY SHB

DEPTH	SAMPLE						SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG		NOTES
	BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM				
17										
18										
19										
20										
21										
22										
23										
24										
25							Bottom of Hole at 24.5 feet			
26										

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-12S SHEET 1 OF 1 FILE No. 5945 CHKD. BY RJS

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER L. Schroeder
GZA GEOENVIRONMENTAL REPRESENTATIVE G. Klawinski

BORING LOCATION N 1019147.459 E 440927.023 (NYSPC)
GROUND SURFACE ELEVATION 618.97 DATUM NGVD
START DATE 5/23/94 END DATE 5/23/94

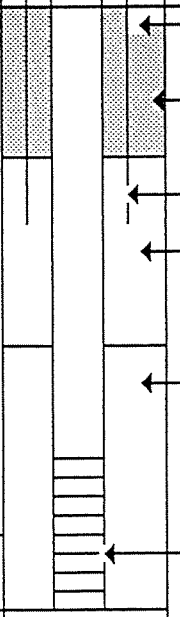
TYPE OF DRILL RIG CME-55 on ATV
CASING SIZE AND TYPE 4-1/4" ID HSA, 6" ID flush joint steel casing
OVERBURDEN SAMPLING METHOD 2" OD by 24" split spoon sampler (ASTM 1586)
ROCK DRILLING METHOD None

WATER LEVEL DATA

DATE	TIME	WATER	CASING	STABILIZATION TIME
5/23/94	1200p	6.7	7.9	15 min

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM	SAMPLE DESCRIPTION
1	15	S-1	0 - 2	7	50	ND	Gray-brown, SILT & CLAY, little fine to coarse Sand, trace Gravel moist, with intermixed organics (roots) to 1.5'. [FILL]
	3						
	4						
2	4						
	4	S-2	2 - 4	10	50	ND	
3	5						
	5						
4	7						
	7	S-3	4 - 6	11	50	ND	Gray-black, Clayey SILT, some fine to coarse Sand, trace Gravel, wet, with intermixed slag type fragments. [FILL]
5	6						
	5						
6	8						
	7	S-4	6 - 6.9	--	80	ND	
7	50/.4	T,B				ND	Gray-black very weathered shale [weathered SHALE] Advanced augers through weathered rock from 6.9 to 7.9'. Auger refusal at 7.9'.
8							Bottom of Hole at 7.9 feet.
9							
10							
11							
12							
13							
14							
15							
16							

EQUIPMENT INSTALLATION LOG



NOTES

Stickup from GS to top protective casing 2.4'
Stickup from GS to top of PVC riser 2.2'
Vented PVC cap.

4" by 5' locking steel protective casing.

Concrete surface seal to 2 ft.

Nominal 8" diameter hole to 7.9'.

Bentonite pellet seal from 2 to 4.5'.

No. 000 filter pack sand from 4.5 to 7.9'.

2" ID flush joint PVC well screen No. 10 slot from 5.9 to 6.9'.
Bottom cap

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1. OVM = peak organic vapor meter readings made in the headspace of the sample jar using a HNu model PI-101 photoionization detector.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-12R SHEET 1 OF 2 FILE No. 5945 CHKD. BY RJS

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER L. Schroeder
GZA GEOENVIRONMENTAL REPRESENTATIVE G. Klawinski/W. Lemke

BORING LOCATION N 1019148.158 E 440935.523 (NYSPC)
GROUND SURFACE ELEVATION 619.83 DATUM NGVD
START DATE 5/13/94 END DATE 5/16/94

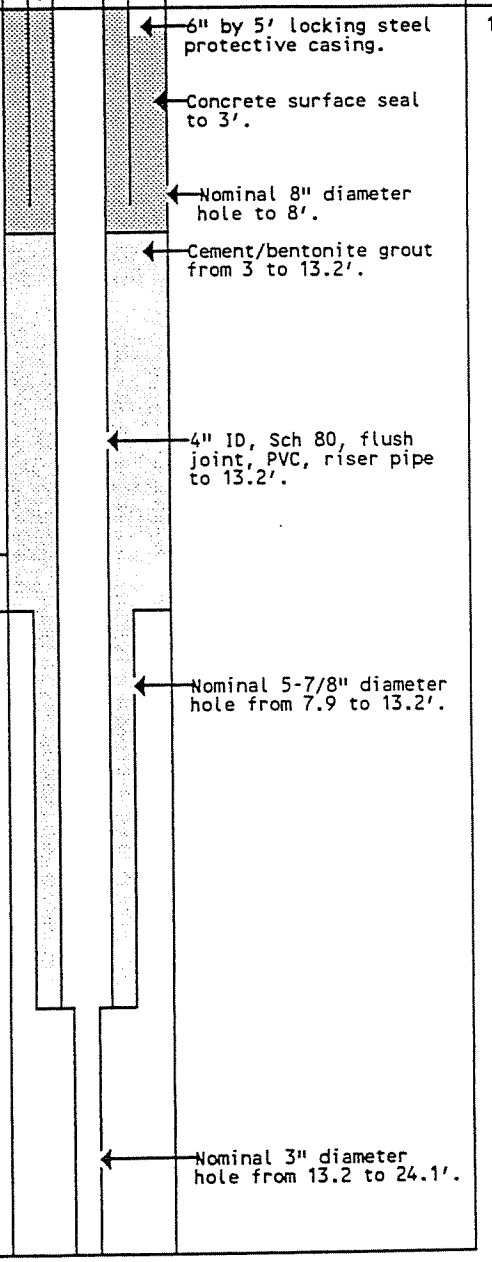
TYPE OF DRILL RIG CME-55 on ATV
CASING SIZE AND TYPE 4-1/4" ID HSA, 6" ID flush joint steel casing
OVERBURDEN SAMPLING METHOD 2" OD by 24" split spoon sampler (ASTM 1586)
ROCK DRILLING METHOD NX size core, 5-7/8" OD roller bit

WATER LEVEL DATA

DATE	TIME	WATER	CASING	STABILIZATION TIME
5/13/94	1230p	7.9'	9	1 hr

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM	SAMPLE DESCRIPTION
1	3	S-1	0 - 2	--	50	ND	Gray-brown, SILT & CLAY, little fine to coarse Sand, trace Gravel moist, with intermixed organics (roots) from 0 to 1.5'. [FILL]
	2						
	3						
2	4						
	8	S-2	2 - 4	--	20	ND	
3	7						
	8						
	11						
4	2	S-3	4 - 6	--	50	ND	
	3	T,B					Gray-black, Clayey SILT, some fine to coarse Sand, trace Gravel, wet, with intermixed slag type fragment at 5.8'. [FILL]
5	4						
	64						
6	5	S-4	6 - 7.8	--	20	ND	
	5						
7	16						
	100/.3						Gray-black silt and very weathered shale [weathered SHALE]
8		C-1	8 -13.2	11	58		Auger refusal at 8'.
9							Gray, SHALE, soft to medium hard, moderately to severely weathered, aphanitic, very thin bedding. [LUDLOWVILLE SHALE]
10							
11							Zone of severely weathered rock with horizontal fractures closed to open, slightly to severely weathered from 8 to 13.4'.
12							
13							
14		C-2	13.2-19.1	81	90		
15							Horizontal fracture, slightly open, moderately weathered at 14.4'.
16							

EQUIPMENT INSTALLATION LOG



NOTES: 1

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES: 1. OVM = Peak organic vapor meter readings made in the headspace of the sample jar using a HNu Model PI-101 photoionization detector.

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-12R SHEET 2 OF 2 FILE No. 5945 CHKD. BY RJS

DEPTH	SAMPLE						SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
	BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM			
17									
18									
19		C-3	19.1-24.1	98	100				
20									
21									
22							Horizontal fracture, slightly open, moderately weathered at 21.1 and 23'.		
23									
24									
25							Bottom of Hole at 24.1 feet.		
26									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-13R SHEET 1 OF 2 FILE No. 5945 CHKD. BY RJS

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER L. Schroeder
GZA GEOENVIRONMENTAL REPRESENTATIVE G. Klawinski/W. Lemke

BORING LOCATION N 1019564.179 E 440697.822 (NYSPC)
GROUND SURFACE ELEVATION 613.39 DATUM NGVD
START DATE 5/19/94 END DATE 5/20/94

TYPE OF DRILL RIG CME-55 on ATV
CASING SIZE AND TYPE 4-1/4" ID HSA, 6" ID flush joint steel casing
OVERBURDEN SAMPLING METHOD 2" OD by 24" split spoon sampler (ASTM 1586)
ROCK DRILLING METHOD NX size core, 5-7/8" OD roller bit

WATER LEVEL DATA

DATE	TIME	WATER	CASING	STABILIZATION TIME
5/19/94	1315	Dry	4.0	15 min
5/19/94	1430	4.0	5.2	15 min

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM	SAMPLE DESCRIPTION
1	2	S-1	0 - 2	--	20	ND	Dark brown, CLAY & SILT, little fine to coarse Sand, moist with intermixed organics (roots) to 1'.
	3						
	5						
2	9						
	4	S-2	2 - 4	--	35	ND	. . . grades; brown, Silty CLAY, trace fine to medium Sand with intermixed shale fragments at 4'. [FILL]
3	4	T,B					
	8						
	10						Gray-black, very weathered Shale fragments.
4	100/.2	S-3	4 - 4.2	--	100	ND	Auger refusal at 4.2 ft.
5		C-1	5 - 10	45	90		Gray, SHALE, soft to moderately hard, moderately weathered, aphanitic, very thin bedding [LUDLOWVILLE FORMATION].
6							
							Moderately to severely weathered from 4.2 to 9'.
7							
8							
9							
10		C-2	10 - 15	90	100		
11							Zone of horizontal fractures, slightly open, moderately to severely weathered from 10.4 to 10.8'.
12							
13							
14							
15		C-3	15 -20.7	95	85		Horizontal fracture, slightly open, moderate to severely weathered at 14.6'.
16							

EQUIPMENT INSTALLATION LOG

Stickup from GS to top protective casing 2.5'
Stickup from GS to top of PVC riser 1.7'
Vented PVC cap.

6" steel protective casing to 3'.

Concrete surface seal to 3'.

Nominal 8" diameter hole to 4.2'.

Cement/bentonite grout from 3' to 10'.

4" ID, Sch 80, flush joint, PVC, riser pipe to 10'.

Nominal 5-7/8" diameter hole from 4.2 to 10'.

Nominal 3" hole from 10 to

NOTES 1 2

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:
1. OVM = Peak organic vapor meter readings made in the headspace of the sample jar using a HNu Model PI-101 photoionization detector.
2. Air bubbles were observed coming from fractures in south branch of Smokes Creek creek bed when coring from 6.5' to 7.5'.

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-13R SHEET 2 OF 2 FILE No. 5945 CHKD. BY RJS

DEPTH	SAMPLE						SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
	BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM			
17							Horizontal fracture, slightly open, moderately severely weathered at 18.9'.		
18									
19									
20									
21							Bottom of Hole at 20.7 feet.		
22									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
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GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-14R SHEET 1 OF 2 FILE No. 5945 CHKD. BY RJS

CONTRACTOR Buffalo Drilling Company, Inc.
DRILLER L. Scroeder
GZA GEOENVIRONMENTAL REPRESENTATIVE G. Klawinski

BORING LOCATION N 1019165.458 E 440699.077 (NYSPC)
GROUND SURFACE ELEVATION 616.63 DATUM NGVD
START DATE 5/20/94 END DATE 5/23/94

TYPE OF DRILL RIG CME-55 on ATV
CASING SIZE AND TYPE 4-1/4" ID HSA, 6" ID flush joint steel casing
OVERBURDEN SAMPLING METHOD 2" OD by 24" split spoon sampler (ASTM 1586)
ROCK DRILLING METHOD NX size core, 5-7/8" OD roller bit

WATER LEVEL DATA

DATE	TIME	WATER	CASING	STABILIZATION TIME
5/23/94	3:00p	6 ft	7 ft	30 min

DEPTH	SAMPLE BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM	SAMPLE DESCRIPTION
1	5	S-1	0 - 2	--	50	ND	Black-brown, fine to coarse SAND, little Silt, trace Gravel, moist with intermixed black-gray cinder/slag type fragments. [FILL]
	11						
	18						
2	18						
	9	S-2	2 - 4	--	50	ND	Gray-brown, SILT & CLAY, little fine to coarse Sand, trace Gravel moist. [FILL]
3	9						
	9						
	11						
4	7	S-3	4 - 5.4	--	20	ND	
	10						
5	100/0.4						
							Gray-black Silt and weathered Shale, damp [weathered SHALE].
6	100/.1	S-4	6 - 6.1	--	80	ND	
							Auger refusal at 7 feet.
7		C-1	7 - 12	--	0		
8							
9							
10							
11							
12		C-2	12 -16.4	85	100		Gray, SHALE, soft to moderately hard, moderately weathered, aphanitic, very thin bedding [LUDLOWVILLE FORMATION]
13							
14							
15							
16							

EQUIPMENT INSTALLATION LOG

Stickup from GS to top protective casing 2.5'
Stickup from GS to top of PVC riser 1.9'
Vented PVC cap.

- 6" by 5' steel protective casing.
- Concrete surface seal to 3'.
- Nominal 8" diameter hole to 7'.
- Cement/bentonite grout from 3' to 12'.
- 4" ID, Sch 80, flush joint, PVC, riser to 12'.
- Nominal 5-7/8" diameter hole from 7' to 12'.
- Nominal 3" diameter hole from 12' to 26.3'.

NOTES: 1, 2

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:
1. OVM = Peak organic vapor meter readings made in the headspace of the sample jar using a HNU Model PI-101 photoionization detector.
2. No recovery from C-1, likely due to a significant weathering. Rock cuttings from this zone were weathered and damp.

GENERAL NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

GZA GEOENVIRONMENTAL OF NEW YORK 364 NAGEL DRIVE, BUFFALO, NEW YORK ENGINEERS AND SCIENTISTS	PROJECT Chem-Trol Site, Remedial Investigation/Feasibility Study, Hamburg, New York	BORING No. MW-14R SHEET 2 OF 2 FILE No. 5945 CHKD. BY RJS

DEPTH	SAMPLE						SAMPLE DESCRIPTION	EQUIPMENT INSTALLATION LOG	NOTES
	BLOWS / 6"	NO.	DEPTH (FT.)	N-VALUE /RQD(%)	REC (%)	OVM PPM			
17		C-3	16.4-21.1	98	95		Horizontal fracture, slightly open to open, moderate to severely weathered at 18.7'.		
18									
19									
20									
21		C-4	21.1-26.3	98	95		Horizontal fracture, slightly open, moderately weathered at 21.7 and 23'.		
22									
23									
24									
25									
26									
27							Bottom of Hole at 26.3 feet.		
28									

LEGEND
S - Split Spoon Soil Sample
U - Undisturbed Soil Sample
C - Rock Core Sample

NOTES:

GENERAL NOTES: 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

APPENDIX D

SUMMARY OF FIELD MEASUREMENTS

Summary of Field Measurements
Chem-Trol Site
Hamburg, New York

Monitoring Well:	MW-1S	
Date Installed:	7/17/90	
Ground Surf. Elev.	641.44	ft
Monit. Point Elev.	643.04	ft
Riser Diam.	2	"
Depth of Borehole	13.4	ft
(from top of riser)	15	ft

Activity	Date	Time	Depth of Water From Monit. Point (ft)	Ground-water Elevation NGVD	Total Volume Purged (gal)	pH (Standard Units)	Specific Cond. (uMhos/cm)	Temp (C)	Turbidity (NTU)	Sample Number
Initial Water Level	7/25/90	913	9.7	633.4						
Purge Well	7/25/90	1242			1.0 dry	6.9	1200	23.5	20	
		1256			1.5 dry	6.9	1200	17.5	10	
		1329			1.6 dry	6.9	1000	12.5	<100	
	7/27/90	1430			2.6 dry	6.9	1000	12.5	<100	
	8/4/90	1030			3.6 dry	6.9	1000	15.0	5	
Sample Well	8/7/90	1516	10.6	632.5	4.6 dry	6.8	800	15.0	5	
Purge Well	8/10/93	1315	11.4	631.6	1	8.1	400	13.0	>100	OVM = ND
Sample Well	8/11/93	1500				8.0	500	12.0	38	CT-08113-1S
Initial Water Level	6/1/94	0800	7.1	635.9						
Purge Well	6/1/94				1.5 dry					
Sample Well	6/1/94	1000				7.1	1000	12.0	40	MW-1S

Summary of Field Measurements
Chem-Trol Site
Hamburg, New York

Monitoring Well:	MW-1R	
Date Installed:	7/21/90	
Ground Surf. Elev.	641.32	ft
Monit. Point Elev.	642.50	ft
Riser Diam.	3.75	"
Depth of Borehole	29.82	ft
(from top of riser)	31	ft

Activity	Date	Time	Depth of Water From Monit. Point (ft)	Ground-water Elevation NGVD	Total Volume Purged (gal)	pH (Standard Units)	Specific Cond. (uMhos/cm)	Temp (C)	Turbidity (NTU)	Sample Number
Initial Water Level	7/25/90	915	8.8	633.7						
Purge Well	7/25/90	1313			15	6.9	1000	15.0	100	
		1317			30	6.9	1000	13.5	25	
		1320			45	6.9	1000	13.5	13	
	7/27/90	1325			60	6.9	1000	13.5	13	
	8/4/90	1030			61	7.0	1000	14.0	5	
Initial Water Level	8/7/90	1517	9.3	633.2						
Purge Well	8/8/90	1315	9.4	633.1	25					
Sample Well		1345			86	7.1	800	15.0	17	CT-08080-1R
Initial Water Level	8/12/93	1100	10.0	632.5	15	7.0	1000	12.0	20	OVM = ND
Sample Well		1150			35	7.0	1000	11.0	15	CT-08123-1R
Initial Water Level	6/1/94	0805	6.7	635.8						
Purge Well	6/1/94				25					
Sample Well	6/1/94	1030				7.0	1000	12.0	20	MW-1R

Summary of Field Measurements
Chem–Trol Site
Hamburg, New York

Monitoring Well:	MW–2S
Date Installed:	7/20/90
Ground Surf. Elev.	640.78 ft
Monit. Point Elev.	642.68 ft
Riser Diam.	2 "
Depth of Borehole	15.5 ft
(from top of riser)	17.4 ft

Activity	Date	Time	Depth of Water From Monit. Point (ft)	Ground–water Elevation NGVD	Total Volume Purged (gal)	pH (Standard Units)	Specific Cond. (uMhos/cm)	Temp (C)	Turbidity (NTU)	Sample Number
Initial Water Level	7/25/90	1007	8.8	633.8						
Purge Well	7/25/90	1413			2	7.3	700	14.5	>100	
		1415			3	7.0	700	12.5	>100	
					4	7.0	700	12.5	95	
		1430			5 dry	7.0	700	12.5	>100	
	7/27/90	1500			7 dry	7.0	700	12.5	>100	
	8/4/90	1050	9.3	633.4	9 dry	7.0	700	15.0	15	
Initial Water Level	8/7/90	1545	9.3	633.4						
Purge Well	8/8/90	1130	9.3	633.4	12 dry	6.8	750	15.0	17	
		1140				7.1	750	16.0	25	
Sample Well		1215				7.2	700	15.0	>100	CT–08080–2S
Initial Water Level	8/10/93	1450	10.1	632.6	3					
					4	8.3	320	13.0	39	OVM=ND
					5	8.3	330	12.0	99	
Sample Well					5.7	8.3	320	12.0	48	CT–08103–2S

Summary of Field Measurements
Chem–Trol Site
Hamburg, New York

Monitoring Well:	MW–3S
Date Installed:	7/20/90
Ground Surf. Elev.	635.54 ft
Monit. Point Elev.	637.64 ft
Riser Diam.	2 "
Depth of Borehole	18.2 ft
(from top of riser)	20.3 ft

Activity	Date	Time	Depth of Water From Monit. Point (ft)	Ground–water Elevation NGVD	Total Volume Purged (gal)	pH (Standard Units)	Specific Cond. (uMhos/cm)	Temp (C)	Turbidity (NTU)	Sample Number
Initial Water Level	7/25/90	951	17.0	620.6						
Purge Well	7/26/90	1530			1.5 dry	7.3	1300	25.0	>100	
					3.0 dry	7.3	1300	25.0	>100	
					4.1	6.8	1200	14.0	95	
Initial Water Level	8/8/90	1400	17.1	620.5						OVM=ND
Sample Well	8/9/90	1443			1.8	7.0	1000	23.0	17	CT–08090–3S
Initial Water Level	8/19/93	830	17.4	620.2						
Purge Well					2	7.3	900	20.0	>100	
					4	7.2	900	20.0	>100	
					6	7.0	900	17.0	60	
Sample Well		930				7.0	900	17.0	38	CT–08193–3S

Summary of Field Measurements
Chem–Trol Site
Hamburg, New York

Monitoring Well:	MW–4S
Date Installed:	7/19/90
Ground Surf. Elev.	635.20 ft
Monit. Point Elev.	637.18 ft
Riser Diam.	2 "
Depth of Borehole	13.62 ft
(from top of riser)	15.6 ft

Activity	Date	Time	Depth of Water From Monit. Point (ft)	Ground–water Elevation NGVD	Total Volume Purged (gal)	pH (Standard Units)	Specific Cond. (uMhos/cm)	Temp (C)	Turbidity (NTU)	Sample Number
Initial Water Level	7/25/90	936	DRY							
	8/4/90	1515	DRY							
	8/7/90	1502	DRY							
	10/23/93	1341	15.3	621.9						
	8/5/93	1400	15.7 DRY							
	8/23/93	1550	DRY							NOT SAMPLED

Summary of Field Measurements
Chem–Trol Site
Hamburg, New York

Monitoring Well: MW–4R
Date Installed: 7/21/90
Ground Surf. Elev. 635.54 ft
Monit. Point Elev. 637.02 ft
Riser Diam. 3.75 "
Depth of Borehole 32.12 ft
(from top of riser) 33.6 ft

Activity	Date	Time	Depth of Water From Monit. Point (ft)	Ground–water Elevation NGVD	Total Volume Purged (gal)	pH (Standard Units)	Specific Cond. (uMhos/cm)	Temp (C)	Turbidity (NTU)	Sample Number
Initial Water Level	7/25/90	938	27.8	609.2						
Purge Well	7/30/90	1630			5	7.9	500	20.0	>100	
					10	7.9	500	18.0	>100	
					15	7.9	400	18.0	>100	
Initial Water Level	8/4/90	1255	28.2	608.9	15.5	8.1	300	18.0	25	
Purge Well					30	7.4	1000	18.0	>100	
					35	7.4	1000	18.0	>100	
					40	6.9	1000	19.0	90	
					50	6.9	1000	19.0	80	
					60	6.9	1000	19.0	90	
			29.3	607.8	70	7.0	1000	19.0	40	
					80	7.0	1000	19.0	33	
					90	7.0	1000	19.0	30	
Initial Water Level	8/8/90	1700	28.2	608.8						
Purge Well	8/9/90	1315				7.2	950	17.0	38	
Sample Well		1405				7.1	900	14.0	>100	CT–08090–4R
Initial Water Level	8/5/93	1350	28.0	609.0						
Purge Well	8/16/93				3	7.2	1000	15.0	>100	
					6	7.2	1000	12.0	>100	
					9	7.2	1000	12.0	50	
					12	7.2	1000	12.0	25	
Sample Well		1130				7.2	1000	12.0	20	CT–08163–4R

Summary of Field Measurements
Chem–Trol Site
Hamburg, New York

Monitoring Well:	MW–5S
Date Installed:	7/20/90
Ground Surf. Elev.	634.14 ft
Monit. Point Elev.	636.28 ft
Riser Diam.	2 "
Depth of Borehole	13.56 ft
(from top of riser)	15.7 ft

Activity	Date	Time	Depth of Water From Monit. Point (ft)	Ground–water Elevation NGVD	Total Volume Purged	pH (Standard Units)	Specific Cond. (uMhos/cm)	Temp (C)	Turbidity (NTU)	Sample Number
Initial Water Level	7/25/90	932	15.6	620.7						
Purge Well		1347			100(ml) dry					
	7/27/90	1630			100(ml) dry					
	7/30/90	1309			700(ml) dry	7.0	2400	15.0	80	
	8/1/90	1625	14.8	621.5	1200(ml) dry	7.0	2400	14.0	10	
	8/2/90	850	14.9	621.4	1400(ml) dry	7.0	2400	14.0	10	
	8/4/90	1240	14.8	621.5	1600(ml) dry	7.0	2400	14.0	10	
Initial Water Level	8/7/90	1448	14.7	621.6						OVM=ND
Sample Well		1645			800(ml)	6.8	2300	17.0	10	CT–08070–5S
Initial Water Level	8/10/93	1230	14.1	622.2						
Purge Well					1/3(GAL) dry	7.6	500	16.0	32	OVM=ND
Sample Well	8/11/93	1320				7.7	530	16.0	5	CT–08113–5S
										CT–08133–5S
										CT–08193–5S

Summary of Field Measurements
Chem–Trol Site
Hamburg, New York

Monitoring Well: MW–6S
Date Installed: 7/18/90
Ground Surf. Elev. 637.00 ft
Monit. Point Elev. 638.54 ft
Riser Diam. 2 "
Depth of Borehole 12.66 ft
(from top of riser) 14.2 ft

Activity	Date	Time	Depth of Water From Monit. Point (ft)	Ground–water Elevation NGVD	Total Volume Purged	pH (Standard Units)	Specific Cond. (uMhos/cm)	Temp (C)	Turbidity (NTU)	Sample Number
Initial Water Level	7/25/90	925	13.6	624.9						
Purge Well					500(ml) dry	7.0	2600	14.5	50	
	7/26/90	1410			750(ml) dry	7.0	3000	22.0	>100	
	7/27/90	1615			1000(ml) dry	7.0	3000	22.0	>100	
	7/30/90	1305			1500(ml) dry	7.0	2500	15.0	90	
	8/1/90	1630	13.5	625.0	2000(ml) dry	6.9	2500	14.0	85	
	8/2/90	830	13.5	625.0	2500(ml) dry	6.9	2500	15.0	45	
	8/4/90	1110	13.6	624.9	3000(ml) dry	6.9	2500	16.0	90	
		1110	13.6	624.9	3500(ml) dry	6.9	2500	16.0	45	
		1640	13.6	624.9	4000(ml) dry	6.9	2500	16.0	45	
Initial Water Level	8/7/90	1411	13.5	625.0						
Purge Well		1434			4500(ml) dry	6.8	2300	15.0	69	OVM=ND
Sample Well		1630								CT–08070–6S
Initial Water Level	8/10/93	1250	12.2	626.3						
Purge Well		1310			0.5(GAL) dry	7.4	1150	13.0	30	OVM=ND
Sample Well		1330				7.3	1200	13.0	7	CT–08113–6S
										CT–08133–6S

Summary of Field Measurements
Chem-Trol Site
Hamburg, New York

Monitoring Well:	MW-6R
Date Installed:	7/21/90
Ground Surf. Elev.	637.24 ft
Monit. Point Elev.	638.64 ft
Riser Diam.	3.75 "
Depth of Borehole	29 ft
(from top of riser)	30.4 ft

Activity	Date	Time	Depth of Water From Monit. Poin (ft)	Ground-water Elevation NGVD	Total Volume Purged (GAL)	pH (Standard Units)	Specific Cond. (uMhos/cm)	Temp (C)	Turbidity (NTU)	Sample Number
Purge Well	7/26/90	1443			13	6.9	1100	21.0	30	
		1514			20	6.9	1000	21.0	>100	
	8/4/90	1120	18.3	620.3	21	7.2	800	16.0	15	
					50	7.0	950	19.0	>100	
		1630			60	7.1	850	14.0	>100	
		1640			70	7.2	850	16.0	75	
					80	7.2	850	16.0	60	
					90	7.2	850	16.0	40	
					100	7.2	850	16.0	35	
					110	7.2	850	16.0	35	
Initial Water Level	8/8/90	1420	18.2	620.4						OVM=ND
Purge Well		1430	18.4	620.2	125					
		1500			135	7.2	800	15.0	>100	
Sample Well	8/9/90	1100				7.1	780	16.0	33	
		1125				7.2	780	15.0	>100	CT-08090-6r
Initial Water Level	8/5/93	1445	19.3	619.4						
Purge Well	8/16/93				5	7.2	900	12.0	>100	
					10	7.1	900	12.0	60	
					15	7.1	850	14.0	20	
Sample Well	8/16/93	1000			20	7.1	800	12.0	20	CT-08163-6r

Summary of Field Measurements
Chem–Trol Site
Hamburg, New York

Monitoring Well:	MW–7S
Date Installed:	10/20/92
Ground Surf. Elev.	640.37 ft
Monit. Point Elev.	642.85 ft
Riser Diam.	2"
Depth of Borehole	10 ft
(from top of riser)	12.48 ft

Activity	Date	Time	Depth of Water From Monit. Poin (ft)	Ground–water Elevation NGVD	Total Volume Purged (gal)	pH (Standard Units)	Specific Cond. (uMhos/cm)	Temp (C)	Turbidity (NTU)	Sample Number
Initial Water Level	12/4/92	1055	4.7	638.2		7.3	816	10.6		
Purge Well	12/4/92	1108			1	7.5	693	15.4	18	
		1116			1.8	7.7	698	15.4	16	
		1125			2.7	7.7	690	15.4	17	
		1139			3.5	8.0	688	15.4	13	
		1150			4.3	8.0	694	15.4	5	
		1210			5	7.9	695	15.4	3	
Initial Water Level	8/12/93		8.9	634.0						
Purge Well					3	7.8	700	13.0	15	
					4	7.8	720	12.0	15	
					5	7.8	720	12.0	10	OVM=ND
Sample Well	8/12/93	1430	8.9	634.0		7.9	740	12.0	10	CT–08123–7S
										CT–08163–7S

Summary of Field Measurements
Chem–Trol Site
Hamburg, New York

Monitoring Well:	MW–7R
Date Installed:	10/21/92
Ground Surf. Elev.	640.46 ft
Monit. Point Elev.	642.28 ft
Riser Diam.	4.25"
Depth of Borehole (from top of riser)	36.2 ft 38.02 ft

Activity	Date	Time	Depth of Water From Monit. Point (ft)	Ground–water Elevation NGVD	Total Volume Purged (gal)	pH (Standard Units)	Specific Cond. (uMhos/cm)	Temp (C)	Turbidity (NTU)	Sample Number
Initial Water Level	12/4/92	1152	4.7	637.6		7.7	1339	17.4	3.7	
Purge Well	12/4/92	1210			17	7.5	1509	21.3	1.9	
		1220			34	7.4	1506	21.2	1.6	
		1229			51	7.4	1532	22.1	1.5	
		1236			68	7.4	1512	22.4	1.3	
		1256			128	7.5	1520	22.0	1.1	
Initial Water Level	8/5/93	1620	8.6	633.7						
Purge Well	8/12/93	1530	8.6	633.7	15	7.8	1400	18.0	20	
					30	7.4	1200	17.0	15	
					45	7.4	1240	18.0	15	
					60	7.5	1240	18.0	15	OVM=ND
Sample Well	8/12/93	1600	8.6	633.7		7.4	1200	18.0	10	CT–08123–7R

Summary of Field Measurements
Chem–Trol Site
Hamburg, New York

Monitoring Well: MW–8S
Date Installed: 10/26/92
Ground Surf. Elev. 613.97 ft
Monit. Point Elev. 617.28 ft
Riser Diam. 2"
Depth of Borehole 5.3 ft
(from top of riser) 8.61 ft

Activity	Date	Time	Depth of Water From Monit. Point (ft)	Ground–water Elevation NGVD	Total Volume Purged (gal)	pH (Standard Units)	Specific Cond. (uMhos/cm)	Temp (C)	Turbidity (NTU)	Sample Number
Initial Water Level	10/27/92	920	6.5	610.8						
Purge Well	12/8/92	1438	7.4	609.9		7.4	600		>100	
		1612			0.2dry	7.6	390		44	
	12/10/92	920	7.5	609.8	0.1dry	7.8	400		>100	
		1100			0.13dry	7.5	430		>100	
Sample Well	8/23/93	1500	7.9	609.4	dry					Well Not Sampled

Summary of Field Measurements
Chem-Trol Site
Hamburg, New York

Monitoring Well:	MW-8r	
Date Installed:	10/27/92	
Ground Surf. Elev.	614.27	ft
Monit. Point Elev.	617.38	ft
Riser Diam.	4.25"	
Depth of Borehole	19.3	ft
(from top of riser)	22.41	ft

Activity	Date	Time	Depth of Water (ft)	Ground-water Elevation MSL	Total Volume Purged (gal)	pH (Standard Units)	Specific Cond. (uMhos/cm)	Temp (C)	Turbidity (NTU)	Sample Number
Initial Water Level	10/27/92	915	8.4	609.0						
Purge Well	12/7/92	1344	10.3	607.1		7.7	1100	21.0	>100	
		1352			8	7.5	930	21.1	78	
		1359			16	7.5	970	21.9	44	
		1410			24	7.5	990	22.4	20	
		1414			32	7.4	1100	22.4	22	
		1420			40	7.5	1100	22.5	22	
		1425			48	7.3	1100	22.5	23	
		1450			118	7.4	1000	22.8	11	
Initial Water Level	8/5/93	1241	8.7	608.7						
Purge Well	8/16/93				10	7.1	1000	14.0	60	
					20	7.2	1200	14.0	40	
Sample Well		1245	8.7	608.7	30	7.4	1100	14.0	40	CT-08163-8r
Initial Water Level	6/1/94	1040	7.9	609.5						
Purge Well	6/1/94				25					
Sample Well	6/1/94	1100	8.2	609.2		7.5	1200	14.0	40	MW-8R

Summary of Field Measurements
Chem–Trol Site
Hamburg, New York

Monitoring Well:	MW–9S
Date Installed:	10/29/92
Ground Surf. Elev.	617.12 ft
Monit. Point Elev.	619.91 ft
Riser Diam.	2"
Depth of Borehole	8.3 ft
(from top of riser)	11.09 ft

Activity	Date	Time	Depth of Water From Monit.Point (ft)	Ground–water Elevation NGVD	Total Volume Purged (gal)	pH (Standard Units)	Specific Cond. (uMhos/cm)	Temp (C)	Turbidity (NTU)	Sample Number
Initial Water Level	10/30/92	1420	7.7	612.2	3	7.7	700	28	>100	
Purge Well	10/30/92	1532			4	8.4	700	28	>100	
		1614			5	7.8	900	22	>100	
		1616			6	7.8	900	22	>100	
		1619			7	7.8	900	22	>100	
		1623			8	7.8	900	22	>100	
		1625			9	7.8	900	22	>100	
		1630			10	7.8	900	22	>100	
		1636			11	7.8	900	22	>100	
		1641			12	7.7	900	22	>100	
		1644			13	7.7	900	23	95	
		1647			14	7.7	900	22	90	
Initial Water Level	8/11/93	1050	9.5	610.4						
Purge Well		1050			2(quarts)dry	7.8	690	17	15	OVM=ND
Sample Well	8/11/93	1100	9.5	610.4		7.8	690	17	15	CT–08113–9S

Summary of Field Measurements
Chem-Trol Site
Hamburg, New York

Monitoring Well:	MW-9R	
Date Installed:	10/28/92	(extended 5/25/94)
Ground Surf. Elev.	616.98	ft
Monit. Point Elev.	619.17	ft
Riser Diam.	4.25"	
Depth of Borehole	28.4	ft
(from top of riser)	30.59	ft

Activity	Date	Time	Depth of Water From Monit. Point (ft)	Ground-water Elevation NGVD	Total Volume Purged (gal)	pH (Standard Units)	Specific Cond. (uMhos/cm)	Temp (C)	Turbidity (NTU)	Sample Number
Initial Water Level	10/28/92	1139	8.6	610.6						
Purge Well	10/30/92	1148	8.7	610.5	17.5	7.2	850	28	>100	
		1614			24	7.5	990	26	>100	
		1616			32	7.4	1100	26	>100	
		1619			40	7.4	1100	25	58	
		1623			48	7.4	1100	25	39	
		1625			56	7.4	1100	25	17	
		1630			63	7.5	1100	25	20	
Initial Water Level	8/13/93	1340	9.6							
Purge Well					7	7.8	1000	15	25	
					14	7.8	990	15	40	
					21	7.8	980	15	30	OVM = ND
Sample Well	8/13/93	1440	9.6	609.6		7.8	980	13	20	CT-08133-9R
Initial Water Level	6/1/94	1200	8.4	610.8						
Purge Well	6/1/94				30					
Sample Well	6/1/94	1430	8.4	610.8		7.6	1100	14	20	MW-9R

Summary of Field Measurements
Chem-Trol Site
Hamburg, New York

Monitoring Well:	MW-9RD	
Date Installed:	5/25/94	
Ground Surf. Elev.	616.70	ft
Monit. Point Elev.	619.13	ft
Riser Diam.	1.5"	
Depth of Borehole	68	ft
(from top of riser)	70.4	ft

Activity	Date	Time	Depth of Water From Monit. Point (ft)	Ground-water Elevation NGVD	Total Volume Purged (gal)	pH (Standard Units)	Specific Cond. (uMhos/cm)	Temp (C)	Turbidity (NTU)	Sample Number
Initial Water Level	5/31/94	1000	6.5	612.6						
Purge Well	5/31/94	1040			6	6.1	2000	15	>100	
					8	6.2	2100	15		
					10	6.3	2100	15		
					12	6.3	2100	15		
					14	6.3	2100	15		
					16	6.3	2100	15		
					18	6.3	2100	15	>100	
Initial Water Level	6/1/94	1300	5.6	613.5						
	6/1/94				5	6.3	2100	15		
					10	6.4	2100	15		
					15	6.4	2100	15		
Sample Well	6/1/94	1415				6.4	2100	15	>100	MW-9RD

Summary of Field Measurements
Chem–Trol Site
Hamburg, New York

Monitoring Well: MW–10S
Date Installed: 10/28/92
Ground Surf. Elev. 612.39 ft
Monit. Point Elev. 615.15 ft
Riser Diam. 2"
Depth of Borehole 5 ft
(from top of riser) 7.76 ft

Activity	Date	Time	Depth of Water From Monit. Point (ft)	Ground–water Elevation NGVD	Total Volume Purged (gal)	pH (Standard Units)	Specific Cond. (uMhos/cm)	Temp (C)	Turbidity (NTU)	Sample Number
Initial Water Level	10/28/92	1115	4.7	610.4						
Purge Well	12/08/92	1400	3.5	611.6		7.8	940		>100	
		1410			0.7	7.7	870		>100	
		1418			1.4	7.7	890		>100	
		1433			2.1	7.4	1100		>100	
		1519			2.8	7.7	1000		>100	
		1539			3.5	7.5	880		43	
		1557			4.2	7.5	890		23	
		1624			4.9	7.5	880		18	
		1648			5.6	7.4	880		10	
Initial Water Level	8/10/93	1540	6.4	608.8						
Purge Well					1(qt)dry	8.2	780	19	60	
Sample Well	8/11/93	1530				8.0	800	19		CT–08113–10S
										CT–08133–10S
										CT–08163–10S
										CT–08233–10S

Summary of Field Measurements
Chem–Trol Site
Hamburg, New York

Monitoring Well:	MW–10R
Date Installed:	10/28/92
Ground Surf. Elev.	612.37 ft
Monit. Point Elev.	615.47 ft
Riser Diam.	4.25"
Depth of Borehole	20.9 ft
(from top of riser)	24 ft

Activity	Date	Time	Depth of Water From Monit. Point (ft)	Ground–water Elevation NGVD	Total Volume Purged (gal)	pH (Standard Units)	Specific Cond. (uMhos/cm)	Temp (C)	Turbidity (NTU)	Sample Number
Initial Water Level	10/28/92	1110	6.1	609.4						
Purge Well	12/08/92	1206	9.7	605.8		7.1	960	10	>100	
		1229			30	6.2	1200	10	>100	
		1406			60	7.6	1000	10	>100	
		1420			70	7.6	920	10	>100	
		1431			80	7.5	850	10	>100	
		1456			90	7.4	680	10	19	
		1510			101	7.7	780	10	39	
		1529			110	7.4	600	10	6.1	
		1540			120	7.4	700	10	12	
		1602			130	7.4	665	10	21	
Initial Water Level	8/13/93	1030	6.9	608.6						
Purge Well					7	8.4	680	15	47	
					14	8.3	690	13	>100	OVM=ND
Sample Well		1130			21	8.3	690	13	40	CT–08133–10R

Summary of Field Measurements
Chem–Trol Site
Hamburg, New York

Monitoring Well: MW–11R
Date Installed: 11/3/93
Ground Surf. Elev. 632.62 ft
Monit. Point Elev. 634.73 ft
Riser Diam. 4.25"
Depth of Borehole 24.5 ft
(from top of riser) 26.61 ft

Activity	Date	Time	Depth of Water From Monit. Point (ft)	Ground–water Elevation NGVD	Total Volume Purged (gal)	pH (Standard Units)	Specific Cond. (uMhos/cm)	Temp (C)	Turbidity (NTU)	Sample Number
Initial Water Level	12/8/92	1045	16.8	617.9		7.9	860	5	>100	
Purge Well	12/8/92	1045	16.8	617.9		7.9	860	5	>100	
		1050			5	8.6	630	12	>100	
		1056			10	8.5	1150	15	>100	
		1100			15	8.8	810	12	>100	
		1104			20	8.3	880	11	>100	
		1106			25	8.2	880	11	>100	
		1108			30	7.9	850	11	>100	
		1111			35	7.9	830	12	34	
		1113			40	8.0	830	12	23	
		1119			50	7.9	830	12	25	
		1121			55	7.9	830	11	17	
Initial Water Level	8/13/93	1230	16.3	618.5						
Purge Well					3	8.3	740	20	>100	
					6	8.3	700	17	>100	
					9	8.4	690	13	60	OVM=ND
Sample Well						8.4	690	13	38	CT–08133–11R

Summary of Field Measurements
Chem-Trol Site
Hamburg, New York

Monitoring Well:	MW-12S	
Date Installed:	5/23/94	
Ground Surf. Elev.	618.97	ft
Monit. Point Elev.	621.17	ft
Riser Diam.	2"	
Depth of Borehole	7.9	ft
(from top of riser)	10.1	ft

Activity	Date	Time	Depth of Water From Monit. Point (ft)	Ground-water Elevation NGVD	Total Volume Purged (gal)	pH (Standard Units)	Specific Cond. (uMhos/cm)	Temp (C)	Turbidity (NTU)	Sample Number
Purge Well	5/26/94	1000			2 dry					
Purge Well	5/30/94	1200			2 dry					
Initial Water Level	5/31/94	1000	8.9	612.3						
Purge Well	5/31/94				1	6.8	1300	`8	80	
					2 dry	6.8	1300	18	80	
Sample Well	5/31/94	1600	9.2	612.0		6.8	1300	18	20	MW-12S

Summary of Field Measurements
Chem-Trol Site
Hamburg, New York

Monitoring Well:	MW-12R	
Date Installed:	5/16/94	
Ground Surf. Elev.	619.83	ft
Monit. Point Elev.	621.59	ft
Riser Diam.	4"	
Depth of Borehole	24.1	ft
(from top of riser)	25.8	ft

Activity	Date	Time	Depth of Water From Monit. Point (ft)	Ground-water Elevation NGVD	Total Volume Purged (gal)	pH (Standard Units)	Specific Cond. (uMhos/cm)	Temp (C)	Turbidity (NTU)	Sample Number
Purge Well	5/27/94	0930			5	6.8	1500	15	>100	
					10	6.8	1600	14		
					15	6.8	1800	13		
					20 dry	6.8	1600	13	>100	
Initial Water Level	5/31/94	0830	7.1	612.7						
Purge Well	5/31/94				20 dry					
Sample Well	5/31/94	1530				6.8	1600	14	50	MW-12R

Summary of Field Measurements
Chem-Trol Site
Hamburg, New York

Monitoring Well:	MW-13R	
Date Installed:	5/20/94	
Ground Surf. Elev.	613.39	ft
Monit. Point Elev.	615.14	ft
Riser Diam.	4"	
Depth of Borehole	20.7	ft
(from top of riser)	22.4	ft

Activity	Date	Time	Depth of Water From Monit. Point (ft)	Ground-water Elevation NGVD	Total Volume Purged (gal)	pH (Standard Units)	Specific Cond. (uMhos/cm)	Temp (C)	Turbidity (NTU)	Sample Number
Purge Well	5/27/94	1100			5	7.2	2300	14	>100	
					10	7.4	2000	14		
					15	6.8	1500	14		
					20	6.8	1200	14		
					25	6.8	1200	14		
					30	7.0	1200	14	10	
Initial Water Level	5/31/94	0840	3.4	611.7						
Purge Well	5/31/94				30					
Sample Well	5/31/94	1430	3.4	611.7		7.2	1200	14	10	MW-13R

Summary of Field Measurements
Chem-Trol Site
Hamburg, New York

Monitoring Well:	MW-14R	
Date Installed:	5/23/94	
Ground Surf. Elev.	616.63	ft
Monit. Point Elev.	618.55	ft
Riser Diam.	4"	
Depth of Borehole	26.3	ft
(from top of riser)	28.2	ft

Activity	Date	Time	Depth of Water From Monit. Point (ft)	Ground-water Elevation NGVD	Total Volume Purged (gal)	pH (Standard Units)	Specific Cond. (uMhos/cm)	Temp (C)	Turbidity (NTU)	Sample Number
Purge Well	5/27/94	1300			5	7.0	2400	14	>100	
					10	6.8	2000	14		
					15	6.8	2000	14		
					20 dry	6.9	2000	14	35	
Initial Water Level	5/31/94	0845	7.2	611.3						
Purge Well	5/31/94				15					
Sample Well	5/31/94	1445	7.2	611.3		6.8	2000	14	20	MW-14R

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