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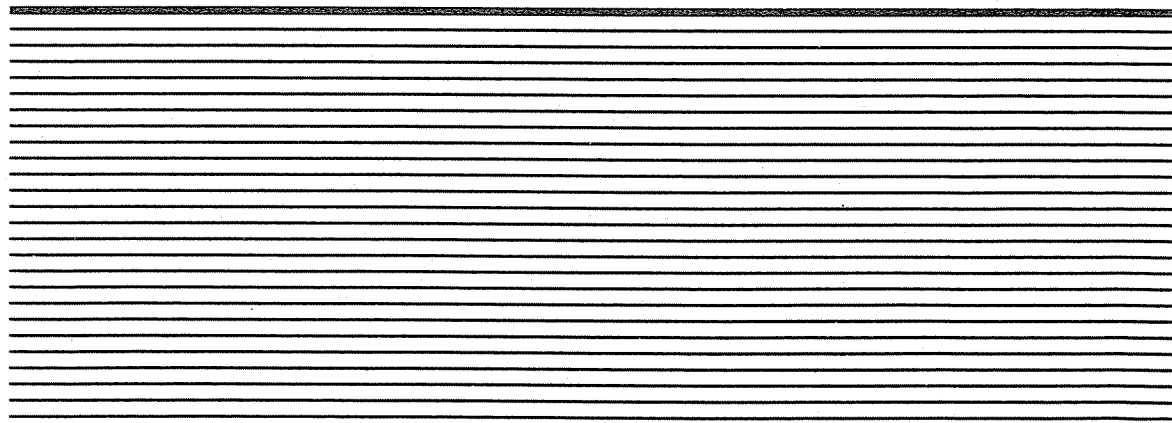
Preliminary Investigation Water Treatment Plant - Eastern Area

**City of Niagara Falls
Niagara Falls, New York**

May 1995



O'BRIEN & GERE
ENGINEERS, INC.



Draft Report

Preliminary Investigation Water Treatment Plant - Eastern Area

*City of Niagara Falls
Niagara Falls, New York*

May 1995

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1. Introduction

O'Brien & Gere Engineers, Inc. (O'Brien & Gere) was retained by the City of Niagara Falls to complete a Preliminary Investigation in the Eastern Area (the site) of the City of Niagara Falls Water Treatment Plant (WTP). This site is currently classified as Class 2a in the New York State Department of Environmental Conservation (NYSDEC) Registry of In-Active Hazardous Waste Sites (site code #932080A). This classification signifies that sufficient data does not exist to allow the NYSDEC to evaluate whether or not the site poses a threat to human health and the environment.

The site, which encompasses approximately 11 acres, is located within the City of Niagara Falls Corporate Limits immediately south of Buffalo Avenue between 55th and 56th Streets (See Figure 1). The Robert Moses Parkway is located to the south between the site and the Niagara River. Immediately east of the site is the de-listed Buffalo Avenue site, the location of the new City of Niagara Falls WTP currently under construction (see Figure 2). A One-Acre Parcel from the Buffalo Avenue site was not de-listed as elevated lead concentrations and chlorinated benzene compounds were detected in subsurface soils and ground water. This parcel was included in this investigation. West of the site is the current City of Niagara Falls WTP. Additional investigations and remediation of the western portion of the WTP is covered under the Occidental "S" Area Requisite Remedial Technology (RRT) Stipulation.

1.1. Site description and history

The topography of the site is generally flat with surface elevations ranging from 568 to 578 ft above mean sea level. Presently, the majority of the site is a vacant field. Two small structures, a pump house and a sludge thickener tank, are present. A small portion of the site is also used for storage of various construction materials utilized by the City (ie. extra water and sewer lines piping, valves, fire

hydrants, gravel backfill, and other related material). Access to the site is limited to authorized personnel only.

The site is a former wetland area that was filled between the 1930's through the 1950's. The fill was placed in this area to reclaim land to facilitate construction in the area. Miscellaneous waste, such as construction debris and incinerator refuse, were reportedly used for this purpose (NYSDEC, 1994). The construction debris and incinerator waste consisted of glass, brick, wood, fragments, ash, and cinders (O'Brien & Gere, 1991a).

The site was previously used for storage of materials. Roll-off boxes, storage boxes and barrels are evident in a 1970 aerial photograph (see Appendix A). The aerial photograph indicates that these activities were limited to the central portion of the site (O'Brien & Gere, 1991a).

1.2. Previous investigations

A ground water investigation of the Eastern Area was completed in 1983 by Clayton Environmental Consultants, Inc. (CEC). The objective of the investigation was to evaluate if ground water at the site had been affected. The analytical results indicated that elevated concentrations of inorganics were detected in several monitoring wells. Additionally, low levels of phthalates (a common plasticizer) were detected in surface and subsurface soil samples analyzed. CEC recommended that further investigations be completed to distinguish the source of these compounds (CEC, 1983).

The unconsolidated deposits identified at the site from the ground surface downward are lacustrine clay; miscellaneous fill; river alluvium; and glacial till (CEC, 1983). Beneath the glacial till, bedrock was encountered. Although the ground water flow direction was not evaluated as part of the ground water investigation, information from the Buffalo Avenue Site Investigation indicated that the ground water flow direction is to the south, towards the Niagara River (O'Brien & Gere, 1991a). Additional information pertaining to the site geology and hydrogeology are discussed in Section 2.3.

As part of the Buffalo Avenue Site Investigation completed by O'Brien & Gere in 1991, one monitoring well and three soil borings were completed in the Eastern Area. The ground water analyses indicate that several inorganics were detected above New York State Class GA standards. Additionally, chlorinated benzene compounds and polynuclear aromatic hydrocarbons (PAHs) were detected in the subsurface soil (O'Brien & Gere, 1991a).

The One-Acre Parcel was identified during the 1991 Site Investigation completed at the Buffalo Avenue Site (O'Brien & Gere, 1991a). The Buffalo Avenue site was de-listed from the NYSDEC Inactive Hazardous Waste Site List, with the exception of this One-Acre Parcel. Data from subsurface soil samples collected from soil borings and in ground water identified chlorobenzene compounds. In addition, elevated concentrations of lead were detected in the subsurface soil.

1.3. Report organization

This Preliminary Investigation Report is divided into four sections. The contents of each section of this report are summarized below.

- Section 1 includes the introduction, site description, previous investigations, and the report organization.
- Section 2, Eastern Area, describes background data, site geology and hydrogeology, and the field methods utilized in this investigation. This section also discusses the results of the ground water and surface soil analyses.
- Section 3, One-Acre Parcel, describes the background information and the field methods utilized in the One-Acre Parcel. This section also presents the results of the soil sampling completed in the soil boring SB-33 area and the subsurface soil sampling completed in the MW-7S area.
- Section 4 presents a summary of the results

2. Eastern area investigation

2.1. Background information

As previously mentioned, CEC was retained by the City of Niagara Falls in 1983 to complete a ground water investigation in the Eastern Area. As part of the investigation, twelve subsurface soil samples and six surface soils were collected and analyzed. Low levels of phthalates (a common plasticizer) were detected in surface and subsurface soil samples collected at the site.

Twelve monitoring wells designated as B-1 through B-12 were also installed as part of this study (Figure 2). Ground water samples were collected from each well on two occasions. Information noted during well installation indicated that fill material with strong odors was detected along the southern portion of the site. The majority of the wells were screened below the fill material atop bedrock. Low levels of inorganics were detected in several wells. The report recommended that further investigations be completed at the site.

As part of the Buffalo Avenue Site Investigation completed by O'Brien & Gere in 1991, three soil borings designated as SB-38, SB-39, and SB-40 were also completed in the Eastern Area (see Figure 2). The data indicated the presence of chlorinated benzene compounds which are indicative of "S" Area related compounds. The highest concentrations were detected at soil boring SB-40 located in the southern portion of the property. Specifically, hexachlorobenzene at 19,000 $\mu\text{g/Kg}$ and 1,2,4-trichlorobenzene at 3,500 $\mu\text{g/Kg}$ were detected. Concentrations of PAHs were detected at SB-40 as well as soil borings SB-38 and SB-39. The concentrations of total PAHs ranged from 34 $\mu\text{g/Kg}$ at SB-40 to 5,390 $\mu\text{g/Kg}$ at SB-38.

Shallow monitoring well MW-16S was installed in Eastern Area as part of the Buffalo Avenue Site Investigation (see Figure 2). The well was installed within the fill material. The analytical results from MW-16S indicate that soluble (filtered) iron, magnesium, manganese, and sodium were present at concentrations above New York State Class GA standards. In addition, low levels of pesticides including beta-BHC and alpha-BHC were detected. No volatile organic compounds (VOCs) or semivolatile compounds (SVOCs) were detected.

To further evaluate the shallow ground water chemistry in the Eastern Area, six additional ground water monitoring wells were installed at the site as part of this investigation. In addition, six surface soil samples were collected and analyzed to evaluate surface soil chemistry.

2.2. Field methods

The field methods utilized during this investigation were completed in accordance with the protocols presented in the New Water Treatment Plant Site Suitability Assessment Work Plan and the New Water Treatment Site Acquisition Investigation Work Plan (O'Brien & Gere, 1991 b,c). These work plans were approved by the NYSDEC in 1991. The laboratory analyses completed as part of this investigation contained sufficient documentation and Quality Assurance/Quality Control samples to allow for validation of these data. However, the data was not validated as part of this program.

2.2.1. Ground water monitoring well installation

Six shallow ground water monitoring wells were installed in February 1994 to further evaluate the geology, hydrogeology, and ground water chemistry at the site. The wells, designated as OBG-1 through OBG-6, were installed at the locations shown on Figure 3. The rationale for locating each well is as follows:

- Monitoring well OBG-1 was located in the northern end of the site to evaluate upgradient conditions at the site.
- Monitoring well OBG-2 was located on the northwest side of the site where the 1970 historical aerial photograph indicated

- roll-off boxes and storage containers were placed. Currently, miscellaneous construction equipment is located in this area.
- Monitoring well OBG-3 was installed near the northeast portion of the site where the 1970 historical aerial photograph indicated roll-off boxes and storage containers in this area.
 - Monitoring well OBG-4 was installed in the southwest portion of the site near the sedimentation basin.
 - Monitoring well OBG-5 was installed near the southeast portion of the site where odors were noted in fill material during the previous investigation completed by CEC.
 - Monitoring well OBG-6 was installed adjacent to the southern property boundary where odors were noted in the fill material during the previous investigation completed by CEC.

Monitoring wells were installed using a truck mounted drill rig and 4 1/4 inch inside diameter (I.D) hollow stem augers. Split spoon soil samples were collected continuously in accordance with ASTM method D-1586-84.

The soil samples were described in detail by the on-site O'Brien & Gere hydrogeologist. The soil description included moisture content, color, density, and grain size distribution. Each soil sample was screened in the field using a photoionization detector (PID). A portion of each soil sample was placed in a glass jar and covered with aluminum foil. Each sample was allowed to equilibrate at a temperature of 70°F. A PID with a 10.2 eV lamp was then used to monitor the headspace of each sample. Soil descriptions and PID readings are contained in Appendix B.

The six wells were installed to screen the first encountered ground water, which generally occurred in the fill. The wells were constructed using 2-inch I.D. flush joint, 0.010-inch slotted PVC well screen attached to an appropriate length of PVC riser pipe. A washed graded silica sand was placed around the well screen and extended a minimum of 2 ft above the screened interval. A bentonite pellet seal with a minimum thickness of 2 ft was placed on top of the sand pack. A portland cement/bentonite grout was installed from the bentonite seal to the ground surface. The wells were secured with a locking steel protective casing. Following completion, each monitoring well was surveyed for location and

elevation by a licensed surveyor. Well construction specifications for each monitoring well are presented in Table 1 and illustrated on the soil boring logs presented in Appendix B.

Upon completion, the newly installed monitoring wells were developed to remove fine grained materials that may have settled around the well screen during installation and to enhance the well's hydraulic connection with the surrounding aquifer. The wells were developed using a stainless steel bailer for a period of two hours or until the pH and specific conductance stabilized. The turbidity of the water removed was greater than 50 nephelometric turbidity units (NTUs).

Drilling equipment was decontaminated prior to initiating activities, between each well location, and at the completion of the field program. Decontamination fluids, drill cuttings and purge water generated during installation, sampling, and development were placed in labeled New York State Department of Transportation (NYSDOT) approved 55-gallon drums, and were temporarily stored at a designated location at the WTP. Samples of the drums of were collected for characterization. Laboratory results are presented in Appendix C. The water will be discharged to the City of Niagara Falls Waste Water Treatment Plant (WWTP) in accordance with applicable regulations. The drill cuttings will be placed in the near-by "S" Area landfill.

2.2.2. Ground water sampling

Ground water samples were collected from each newly installed monitoring well on one occasion. The sampling was completed between February 14 and 17, 1995.

Prior to sampling ground water elevations were obtained from each well using an electronic water elevation probe. This data was used to calculate the amount of water to be purged in order to obtain representative samples. Prior to sampling each well, three well volumes were removed using a decontaminated stainless steel bailer attached to dedicated polypropylene rope. Following the removal of each well volume pH, specific conductance and temperature were recorded. Specific details of the ground water sampling effort are found on the ground water sampling field logs contained in Appendix D.

Samples collected for VOC analyses were collected first. Ground water samples for soluble inorganic analyses were filtered in the field using a 0.45 micron filter prior to preservation. Samples requiring pH adjustment were checked in the field using pH paper. Samples were immediately transferred to coolers packed with ice. Proper chain of custody documentation was maintained.

Ground water samples were submitted to O'Brien & Gere Laboratories, Inc. for analyses according to NYSDEC Analytical Services Protocol (ASP) with Superfund deliverables. The following analyses were completed:

- VOCs via NYSDEC ASP method 91-1
- SVOCs via NYSDEC ASP method 91-2
- PCB/Pesticides via NYSDEC ASP method 91-3.
- Target Analyte List (TAL) Inorganics [total (unfiltered) and soluble (filtered) via ASP methodologies.
- Total Cyanide via SW846 method 9010.

The SVOC analyses also quantified four "S" Area indicator parameters: 1,3,5-trichlorobenzene, 1,2,3-trichlorobenzene, 1,2,4,5-tetrachlorobenzene and 1,2,3,4-tetrachlorobenzene. Samples could not be analyzed for 1,2,3,5-trichlorobenzene as requested by the NYSDEC. This compound coeluted and could not be distinguished from other compounds. Analytical results are presented in Tables 2 through 5.

Quality Assurance/Quality Control (QA\QC) samples were collected. These samples included a field duplicate, equipment blank, matrix spike and matrix spike duplicate. A laboratory trip blank was also included in each cooler that contained samples for VOC analyses.

The bailer was decontaminated between each location using analconox wash, methanol rinse and a final distilled water rinse. Purge water and decontamination fluids generated during sampling were contained and disposed as described in Section 2.2.1.

2.2.3. Surface soil sampling

Six surface soil samples, designated as SS-1 through SS-6, were collected from the Eastern Area site at the locations shown on

Figure 3. The sampling program was completed to evaluate whether the surface soil has been affected by previous activities at the site.

Surface soil sampling locations were chosen based on a review of previous sample analytical data, the 1970 aerial photograph, and field observations noted during this investigation:

- Surface soil sample SS-1 is located on the south eastern side of the site. Fill, such as brick, cinders, and wood were noted near this location during site reconnaissance.
- Surface soil sample SS-2 is located on the south western portion of the site.
- Surface soil samples SS-3 and SS-4 are located in the southern portion of the site of the site. Field screening data obtained during the installation of monitoring wells OBG-5 and OBG-6 indicated PID readings above background in this area.
- Surface soil samples SS-5 and SS-6 are located near the eastern boundary of the site directly west of the One-Acre Parcel. These locations were selected to evaluate if constituents identified at SB-33 and MW-7S, located in the One-Acre Parcel, were present in the surface soil in this part of the Eastern Area.

Surface soil samples were collected by driving a split-spoon sampler from 0 to 2 ft below grade. Surface soil descriptions are included on Table 6. Each split spoon was cleaned using an alconox wash, methanol rinse and a final distilled water rinse. Samples were immediately transferred to coolers packed with ice. Proper chain of custody documentation was maintained.

The samples were submitted to O'Brien & Gere Laboratories, Inc. for following analyses:

- SVOCs via NYSDEC ASP method 91-2.
- PCB/Pesticides via NYSDEC ASP method 91-3.
- Target Analyte List (TAL) Inorganics via ASP methodologies.
- Cyanide via SW846 method 9010.

Quality Assurance/Quality Control (QA\QC) samples were collected. These samples included a field duplicate, equipment blank, matrix spike and matrix spike duplicate.

Analytical results are presented in Tables 7 through 9.

2.3. Site geology and hydrogeology

Information obtained from the previous investigation completed at the site by CEC, as well as information from the newly installed monitoring wells, were used to evaluate the site geology. The borings logs from the previous investigations and the newly installed wells are contained in Appendix B.

The unconsolidated deposits identified at the site in descending order from the ground surface are lacustrine clay; miscellaneous fill; river alluvium; and glacial till. Beneath the till, a dolostone bedrock is present (CEC, 1983).

The lacustrine clay consists of reddish brown and gray clay with silt lenses. This layer occurs near the ground surface at OBG-1 installed on the northern portion of the site and slopes sharply to the south. At monitoring wells OBG-3 and B-12, the clay layer was encountered at 10 and 30 ft below ground surface (bgs), respectively. This unit was not detected at B-1, located at the southern end of the site.

Miscellaneous fill, reportedly placed on-site between the 1930's to 1950's, was encountered from near the ground surface at each well with the exception of OBG-1. The miscellaneous fill is generally olive green, black, or gray in color and consists reworked sand and gravel with ash, burnt wood, glass, cinders, slag, and other materials. The thickness of the fill material increases to the south toward the Niagara River. The thickness of the fill varies from 7 ft at OBG-2, located in northern portion of the site, to at least 18 ft at OBG-6 located at the southern property boundary. The increasing thickness of fill material to the south is consistent with the findings of the Buffalo Avenue Site Investigation (O'Brien & Gere, 1991a).

Alluvium comprised of gray interbedded fine sand and silts was encountered beneath the fill in the southern portion of the site. The northern extent of alluvium is near OBG-4. At monitoring well OBG-4, the top of the alluvium was encountered at 12 ft bgs. The thickness of the alluvium at OBG-4 is at least 6 ft. However, the boring was terminated prior to reaching the base of this deposit. At monitoring well B-12, located approximately 150 ft south of OBG-4, the thickness of the alluvium is approximately 13 ft (17 to 30 ft bgs).

At monitoring well B-1, located near the southern property boundary, the thickness of the alluvium is approximately 20.5 ft (15 to 35.5 ft bgs). The data suggest that the thickness of alluvium increases to the south.

Information from the ground water investigation completed by CEC indicate that beneath the lacustrine clay or alluvium, a glacial till is present atop bedrock. The till is reportedly encountered at depths ranging from 32 ft bgs at B-12 to 35.5 ft bgs at B-1 (see Appendix B). The thickness of the till ranges from approximately 3 ft at monitoring wells B-1 and B-3 to 7 ft at monitoring well B-12. A detailed description of the glacial till was not presented in the ground water investigation completed by CEC in 1983. Information from the adjacent Buffalo Avenue Site indicates that the till consists of reddish-brown angular to rounded gravel in a cohesive silty clay matrix (O'Brien & Gere, 1991a). This till layer directly overlies bedrock.

The bedrock underlying the occurred at depths ranging from 32 ft bgs at B-3 to 39 ft bgs at B-12 (CEC, 1983). The bedrock is the Upper Silurian Lockport Group (Rickard and Fisher, 1970). This group is 150 to 200 ft thick and consists of the Guelph, Oak Orchard, Eramosa and Goat Island Dolostones and the Gasport Limestone. The bedrock unit beneath the site is the Oak Orchard Formation. Wells which fully penetrate the Oak Orchard at the nearby Occidental Chemical Companies "S" area indicate that this formation average 90 to 95 thick (Malcolm Pirnie, 1989). The upper portion of bedrock, as observed at the adjacent Buffalo Avenue Site, is highly fractured and contains both horizontal bedding planes and vertical fractures (O'Brien & Gere, 1991a).

Ground water elevation data were collected from each newly installed monitoring well on one occasion. The data indicate that ground water varies between 3.5 to 10 ft below the ground surface. A ground water flow map was prepared and is presented as Figure 4. The figure illustrates that ground water flow is to the south towards the Niagara River. In the northern portion of the site, the hydraulic gradient is approximately 0.013 ft/ft. The hydraulic gradient decreases in the southern portion of the site to less than 0.007 ft/ft.

2.4. Analytical results

2.4.1. Ground water

As previously mentioned, each newly installed monitoring well was analyzed for VOC, SVOCs plus four "S" Area indicator parameters, PCB/pesticides, and inorganics. The results from each analytical method are discussed separately. The ground water analytical data are summarized on Tables 2 through 5.

Volatile organic compounds

The ground water VOC data are presented in Table 2. Acetone was detected at low concentrations in each well with the exception of OBG-3. Acetone is generally considered a laboratory introduced contaminant and is therefore not considered to be present in the ground water and will not be discussed. The data indicate that total VOCs concentrations ranged from 20 to 134.7 $\mu\text{g/L}$ at monitoring wells OBG-2, OBG-4, OBG-5 and OBG-6 located along the western and southern portions of the site (see Figure 5). Total VOC concentrations ranged were 0.9 to 3.6 $\mu\text{g/L}$ at monitoring wells OBG-1, and OBG-3, located in the north portion of the site.

Chlorobenzene, an indicator of "S" area waste was detected at concentrations above NYS Class GA ground water standards at monitoring wells OBG-4, OBG-5 and OBG-6. The concentrations ranged from 21 $\mu\text{g/L}$ at OBG-6 to 130 $\mu\text{g/L}$ at OBG-4. The highest concentration of chlorobenzene, detected in a shallow monitoring well at the de-listed Buffalo Avenue Site, was 1.1 $\mu\text{g/L}$ at MW-2S (O'Brien & Gere, 1991a).

Benzene was detected at OBG-4 and OBG-5 at concentrations of 2 $\mu\text{g/L}$ which exceeds the NYS standard of 0.7 $\mu\text{g/L}$. Other VOCs detected in OBG-4, OBG-5 and OBG-6 at concentrations below standards include 1,1-dichloroethane, 1,2-dichloroethene, 2-butanone, 1,1,1-trichloroethane, trichloroethene, and tetrachloroethene. These compounds were not detected at the de-listed Buffalo Avenue Site (O'Brien & Gere, 1991a).

Monitoring wells OBG-1 and OBG-3, located in the northern portion of the site, contained low levels of VOCs. At upgradient well OBG-1, only chloroform was detected at a concentration of 0.9 µg/L which is below standards. At OBG-3, 2-butanone and 1,1,1-trichloroethane were detected at 3 and 0.6 µg/L, respectively. These concentrations are below standards.

The data from monitoring well OBG-2, located in the northwest portion of the site, contained petroleum related compounds. Specifically, toluene was detected at 5 µg/L, ethylbenzene at 1 µg/L, and xylene at 8 µg/L. The concentrations of toluene and xylene equal or exceed the standard of 5 µg/L. The compounds 2-butanone and 1,1,1-trichloroethane were detected at 5 and 1 µg/L, respectively, which are below standards. Chlorobenzene was not detected at OBG-2.

Semivolatile organic compounds

The ground water SVOC results are presented on Table 3. The data indicate that the primary SVOCs detected are "S" area indicator parameters and PAHs. The "S" area indicator parameters include: 1,3-dichlorobenzene, 1,4-dichlorobenzene, 1,2-dichlorobenzene, 1,2,4-trichlorobenzene, hexachlorobutadiene, hexachlorocyclopentadiene, 2,4,5-trichlorophenol, hexachlorobenzene, 1,3,5-trichlorobenzene, 1,2,3-trichlorobenzene, 1,2,4,5-tetrachlorobenzene and 1,2,3,4-tetrachlorobenzene.

The data indicate that the highest concentrations of "S" area indicator parameters are found in monitoring wells OBG-5 and OBG-6, located at the southern portion of the site. The total concentration of these compounds ranged between 55 and 73.9 µg/L (see Figure 5). Lower concentrations of "S" area indicator parameters are found in monitoring wells OBG-2, OBG-4 and OBG-3 with total concentrations ranging from 1 to 29 µg/L. No "S" area compounds were detected in the north and northeast portions of the site at OBG-1.

At monitoring well OBG-6, the following "S" area indicator parameters were detected above Class GA standards: 1,4-dichlorobenzene was detected at 46 µg/L, 1,2-dichlorobenzene at 9 µg/L, 1,2,4-trichlorobenzene at 7 µg/L. These compounds were not detected in the ground water at the de-listed Buffalo Avenue Site.

In addition, 1,3,5-trichlorobenzene, 1,2,3-trichlorobenzene, 1,2,4,5-tetrachlorobenzene, and 1,2,3,4-tetrachlorobenzene, which are "S"

area indicator parameters, were detected at concentrations ranging from 1 to 15 µg/L. It is not possible to compare these concentrations to the de-listed Buffalo Avenue site, as these compounds were not analyzed during that investigation.

Other SVOCs detected at OBG-6 include 4-methylphenol and naphthalene. Numerous PAHs were also detected at this location which include phenanthrene, fluoranthene, pyrene, 3,3'-dichlorobenzidine, benzo(a) anthracene, and chrysene. The concentrations ranged from 1 to 4 µg/L. Concentrations of PAH compounds at the de-listed Buffalo Avenue were similar, also ranging from 1 to 4 µg/L (O'Brien & Gere, 1991a).

At OBG-5, the only "S" area indicator parameters detected include 1,3-dichlorobenzene and 1,4-dichlorobenzene at 30 and 25 µg/L, respectively. These concentrations exceed standards. The compound 4-methylphenol was detected at 0.9 µg/L. No standard or guideline exists for this compound. No other SVOCs or PAHs were detected at this location.

At OBG-2, located along the northwest portion of the site, contained 29 µg/L of total "S" area indicator parameters. The compound 1,2,4-trichlorobenzene was detected at 7 µg/L, which slightly exceeds the ground water standard of 5 µg/L. Other compounds detected below standards include 1,3-dichlorobenzene, and 1,4-dichlorobenzene at concentrations of 4 and 1 µg/L, respectively. In addition, 1,2,4,5-tetrachlorobenzene and 1,2,3,4-tetrachlorobenzene were detected at 2 and 15 µg/L. No standards or guidelines exist for these compounds. Other SVOCs detected below guidelines include naphthalene at 2 µg/L and 2-methylnaphthalene at 0.8 µg/L.

No SVOCs were detected at OBG-1 located along the northern property boundary. At monitoring well OBG-3, located along the north east portion of the site, the only "S" area indicator parameter detected was 1,2,4,5-tetrachlorobenzene at a concentration of 1 µg/L. At OBG-4, located in the western portion of the site, 1,4-dichlorobenzene and 4-methylphenol were detected below standards at 1 and 4 µg/L.

Inorganics

Samples for inorganics were collected for both total (unfiltered) and soluble (filtered) analyses and presented on Table 4. Filtered

samples were collected from each well as the ground water exhibited turbidity values greater than 50 NTU's at each location. Ground water samples, which exhibit elevated NTU readings generally contain suspended sediment, which in turn contains inorganics. As required by the analytical procedures, ground water samples are preserved with nitric acid. In samples with sediment, the preservation causes significant concentrations of inorganics from the sediment to solubilize into the water. In our opinion, samples for inorganic analyses collected from monitoring wells with a high turbidity are not considered representative of those inorganics which migrate with the ground water system. Filtered samples, where the sediment is removed prior to preservation, are more likely to provide representative results for inorganics in solution.

The result of the total (unfiltered) analyses indicate concentrations of arsenic, barium, chromium, copper, iron, lead, magnesium, manganese, sodium, and zinc in various monitoring wells at concentrations above NYS Class GA standards (see Table 4). It is likely that these elevated concentrations are due to the elevated turbidity readings and sediment found in the samples.

The results of the soluble (filtered) analyses indicate only iron, magnesium, sodium and manganese were detected above Class GA standards (see Table 4). In general, with the exception of manganese, higher concentrations were detected in monitoring wells screened in the fill material than the upgradient well where no fill material was encountered. This suggests that some of the iron, magnesium and sodium is from the fill material.

PCB/Pesticides

The results of the PCB/Pesticide analyses are presented on Table 5. The data indicate that no PCBs were detected. Low levels of pesticides were detected in each ground water monitoring well total pesticide concentration ranging from 0.0131 to 0.34 $\mu\text{g/L}$ (see Table 5).

A total of 14 pesticides were detected which include: alpha-BHC, beta-BHC, delta-BHC, lindane, heptachlor, heptachlor epoxide, endosulfan I, dieldrin, 4,4'-DDE, 4,4'-DDT, methoxychlor, endrin ketone, endrin aldehyde, and A-chlordane. In general, the Class GA standard, if it exists, is non-detect. Therefore where Class GA standards exist, the detected compound is above the standard. Concentrations ranged from a minimum 0.001 $\mu\text{g/L}$ of Dieldrin at OBG-2 to 0.26 $\mu\text{g/L}$ of delta-BHC at OBG-6. These compounds

were not detected in the de-listed Buffalo Avenue site wells with the exception of delta-BHC and its related isomers. The maximum concentration of delta-BHC and its related isomers at the de-listed Buffalo Avenue Site was 0.12 µg/L at monitoring well MW-5D (O'Brien & Gere 1991a).

The data indicate that the highest concentrations of pesticides were detected in the southern and western portions of the site at monitoring wells OBG-2, OBG-4 and OBG-6. Specifically, beta-BHC and its related isomers including alpha-BHC and delta-BHC were detected at the highest concentrations. The total concentrations of these compounds at OBG-2, OBG-4 and OBG-6 ranged from 0.129 µg/L at OBG-2 to 0.34 µg/L at OBG-6. These compounds were not detected at the upgradient well OBG-1. At OBG-3, located along the eastern site boundary, the concentrations of beta-BHC and its related isomers were 0.0132 µg/L, which is approximately one order of magnitude less than detected in the southern portion of the site.

2.4.2. Surface soil

Surface soil samples were analyzed for SVOCs plus four "S" Area indicator parameters, PCB/pesticides and inorganics. Consistent with the ground water chemistry discussion, the results for each analytical method will be discussed separately. The surface soil analytical data are summarized on Tables 7 through 9.

Semivolatile organic compounds

SVOCs were detected in each surface soil sample. The highest concentrations are generally found at the southern end of the site. Background concentrations discussed herein were excerpted from a letter from the Niagara County Health Department (NCHD) to the NYSDEC (NCHD, 1987). This letter is included in Appendix D. The background information indicates that the most prevalent SVOCs detected in Niagara Falls surface soils are PAHs which include benzo(b)fluoranthene, phenanthrene, fluoranthene, pyrene, benzo(a)anthracene at concentrations up to 10,000 µg/Kg. Background concentrations of chlorobenzene compounds detected in Niagara Falls surface soils are generally 100 µg/Kg or less. Phthalate compounds are also typically found in Niagara Falls area soils.

The data summarized on Table 7 indicate that PAH compounds, which can be attributed to incomplete combustion, were detected in the six surface soil locations. PAH compounds detected include: phenanthrene, anthracene, carbazole, fluoranthene, pyrene, 3,3'-dichlorobenzidine, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, and benzo(a)pyrene, ideno(1,2,3-cd)pyrene, dibenz(a,h)anthracene, and benzo(g,h,i)perylene. The total concentrations of these compounds ranged from 248 to 7,336 $\mu\text{g/Kg}$ which are below the typical of background concentrations in the Niagara Falls area and similar to those detected at the de-listed Buffalo Avenue Site (O'Brien & Gere, 1991a).

Chlorinated benzene compounds including 1,4-dichlorobenzene, 1,2-dichlorobenzene, hexachlorobenzene, 1,2,4-trichlorobenzene, 1,2,3-trichlorobenzene, 1,2,4,5-tetrachlorobenzene, and 1,2,3,4-tetrachlorobenzene were detected in the surface soils. The only chlorinated benzene component detected in surface soils at the de-listed portion of the Buffalo Avenue site was hexachlorobenzene at a maximum concentration of 150 $\mu\text{g/Kg}$ in the central portion of the site (O'Brien & Gere, 1991a). The concentration of the majority of these compounds were generally less than the typical Niagara Falls background concentration of 100 $\mu\text{g/Kg}$ with the exception of hexachlorobenzene and 1,2,3,4-tetrachlorobenzene. The highest concentrations of these compounds were detected in the southern portion of the site with the exception of SS-4, where no chlorinated benzene compounds were detected. Hexachlorobenzene concentrations in the southern portion of the site ranged from 840 $\mu\text{g/Kg}$ at SS-2 to 2400 $\mu\text{g/Kg}$ at SS-1. In the northern portion of the site the concentration ranged from 28 to 380 $\mu\text{g/Kg}$. In the southern portion of the site, 1,2,3,4-tetrachlorobenzene ranged from 270 $\mu\text{g/Kg}$ at SS-2 to 3000 $\mu\text{g/Kg}$ at SS-3. In the northern portion of the site the concentrations ranged from 24 to 180 $\mu\text{g/Kg}$.

Hexachlorobutadiene an "S" area indicator parameter was detected at surface soil SS-3. The concentration ranged from 440 to 690 $\mu\text{g/Kg}$ in a duplicate sample collected at this location.

Other SVOCs detected primarily in the southern portion of the site include naphthalene, 2-methylnaphthalene, 2,4,6-trichlorophenol, Acenaphthene, and Dibenzofurans. The concentrations ranged from 19 $\mu\text{g/Kg}$ of Dibenzofuran to 87 $\mu\text{g/Kg}$ of naphthalene.

Inorganics

Inorganic surface soil concentrations were compared to typical background concentrations of soils from New York State using references by Bowen, (1979), Shacklette and Boerngen (1984), Shacklette et al (1971), and Walsh et al (1977). These background values were used at the Buffalo Avenue Site (O'Brien & Gere, 1991a). The data indicate that concentrations are within the typical background range with few exceptions. Copper, lead, magnesium, and mercury were detected in each sample at concentrations above the typical background range (see Table 8). These elements were also compared to the highest concentrations previously detected at the de-listed Buffalo Avenue Site.

Copper concentrations ranged from 22 mg/Kg at SS-3 to 97 mg/Kg at SS-5. Four of the six samples contained copper above the maximum concentration of 28.7 mg/Kg detected at the de-listed Buffalo Avenue Site. Lead ranged from 14.5 mg/Kg at SS-4 to 161 mg/Kg at SS-5. Each sample was below the maximum concentration of 449 mg/Kg detected at the de-listed Buffalo Avenue Site. Magnesium was detected at concentrations ranging from 42,300 mg/Kg at SS-3 to 10,500 mg/Kg at SS-4. Each concentration was below the maximum concentration of 62,800 mg/Kg detected at the de-listed Buffalo Avenue Site. Mercury was detected at concentrations ranging from 0.54 mg/Kg at SS-3 to 4.7 mg/l at SS-5. These values were above the maximum concentration of 0.54 mg/Kg detected at the de-listed Buffalo Avenue Site.

In addition to the inorganics discussed above, nickel and selenium were detected above typical background concentrations in one or two samples. Nickel was detected at 30 mg/Kg at SS-5 which is above the typical concentration of 25 mg/Kg. However it was below the maximum concentration of 44.4 mg/Kg detected at the de-listed Buffalo Avenue Site. Selenium was detected at SS-4 and SS-5 at concentrations of 0.7 and 0.73 mg/Kg. These concentrations are above the typical concentration of 0.125 mg/Kg. Selenium could not be compared to the de-listed Buffalo Avenue site. Analytical data for selenium was considered unusable upon validation for each surface soil at the Buffalo Avenue Site (O'Brien & Gere, 1991a).

PCB/Pesticides

Background information from the NCHD indicate that background concentrations of beta-BHC and its related isomers in Niagara Falls surface soils are found at concentrations up to 1000 µg/Kg (see

Appendix A). Pesticides encountered at the de-listed Buffalo Avenue Site included chlordane at one location at a concentration of 200 $\mu\text{g/Kg}$, heptachlor epoxide at six locations at a maximum concentration of 5.9 $\mu\text{g/Kg}$ and gamma-BHC was detected at one location at a concentration of 4.2 $\mu\text{g/Kg}$ (O'Brien & Gere, 1991a).

The analytical data are presented on Table 9. The data indicate that no PCBs were detected.

The data indicate that beta-BHC and its related isomers (alpha-BHC and delta-BHC) were found at concentrations significantly below the background concentration of 1000 $\mu\text{g/Kg}$ with the exception of SS-2 where beta-BHC and its related isomers were detected slightly above the Niagara Falls area background concentration at 1080 $\mu\text{g/Kg}$.

Other pesticides detected at low concentrations in a single sample included 4,4'DDE, dieldrin, G-chlordane, endosulfan-1, heptachlor epoxide, and Lindane. The concentrations ranged from 0.22 $\mu\text{g/Kg}$ to 9.9 $\mu\text{g/Kg}$.

The data indicate that highest total concentrations of pesticides were detected in the southern portion of the site when compared to the northern portion of the site. The highest concentration in the southern portion of the site was 1095 $\mu\text{g/Kg}$ at SS-2 and the highest concentration in the northern portion of the site was 61.7 $\mu\text{g/Kg}$ at SS-5.

3. One-acre parcel

3.1. Background

The One-Acre Parcel was identified during the 1991 Site Investigation completed at the Buffalo Avenue Site (O'Brien & Gere, 1991a). The Buffalo Avenue site was de-listed from the NYSDEC Inactive Hazardous Waste Site List, with the exception of this One-Acre Parcel, which NYSDEC chose not to de-list for the following reasons.

- Elevated lead concentrations were detected in the subsurface soil at SB-33. At this location, the 4 to 7 ft bgs interval, contained 1510 mg/Kg of total lead. Leachability tests were completed on the soil samples using extraction procedure toxicity (EPTOX) and toxic characteristic leaching procedure (TCLP) methods. The EPTOX concentration was 39.1 mg/L and the TCLP Lead concentration was 0.66 mg/L. Based on the elevated EPTOX concentration, four additional subsurface soils samples were collected at 50 ft intervals away from SB-33 and a sample was collected adjacent to SB-33 in October 1991. The results indicated that the concentrations of lead in the subsurface soils ranged from 32 mg/Kg at SB-33B to 330 mg/Kg at SB-33D located to the west. Only the sample SB-33 (4 to 7 ft) exhibited characteristics of toxicity per EPTOX analyses. The sample did not exhibit characteristics of toxicity per TCLP criteria.
- Concentrations of chlorobenzene, 1,3-dichlorobenzene and 1,4-dichlorobenzene, which are considered "S" Area materials, were detected in the ground water at monitoring well MW-7S. The concentrations ranged between 6 and 7 µg/L. Data from soil boring SB-27 (5 to 13.5 bgs) located approximately

20 ft south of MW-7S also contained 1,3-dichlorobenzene, 1,4-dichlorobenzene and 1,2,4-trichlorobenzene at concentrations ranging from 730 µg/Kg to 2,300 µg/Kg.

3.2. Field methods

The field methods utilized during this investigation were completed in accordance with the protocols presented in the New Water Treatment Plant Site Suitability Assessment Work Plan and the New Water Treatment Site Acquisition Investigation Work Plan prepared by O'Brien & Gere in 1991. These work plans were approved by the NYSDEC.

The laboratory data completed as part of this investigation contained sufficient documentation and QA/QC samples to allow for validation of these data. However, the data was not validated as part of this program.

3.2.1. Surface soil

Six surface soil samples were collected at the One-Acre Parcel in the immediate vicinity of SB-33 to evaluate the concentration of lead in the surface soils.

Surface soil sampling locations were selected based on previous analytical results which indicated elevated levels of lead in the subsurface at SB-33 and to the west of SB-33. Soil samples were collected as previously described in Section 2.2.1. Samples designated SB-33F, SB-33G, SB-33I, SB-33J, and SB-33K were collected at approximately 25 foot intervals away from SB-33 to the south, southwest, northwest, north and east (see Figure 6). The sample SB-33H was collected 75 ft west of SB-33 to assess the western extent of elevated lead concentrations. Soil descriptions are presented on Table 6.

Surface soil samples SB-33F through SB-33K were collected from a depth of 0 to 2 feet. The samples were analyzed for total lead and leacheable lead according the toxicity characteristic leaching procedure (TCLP). The samples were submitted to O'Brien & Gere

Laboratory, Inc. for analyses. Samples were not analyzed for EPTOX lead as was originally proposed based on discussions with Mr. Glenn May, the on-site NYSDEC representative. Surface soil results collected as part of this investigation as well as subsurface results collected as part of the Buffalo Avenue Site Investigation are presented on Table 10 and illustrated on Figure 6.

3.2.2. Subsurface soil sampling

Five soil borings were completed at the One-Acre Parcel to evaluate the lateral extent of chlorinated benzene compounds previously identified at monitoring well MW-7S and soil boring SB-27. The soil borings designated as SB-7A through SB-7E are illustrated on Figure 7.

Soil boring locations were selected based on a review of analytical data in the vicinity of MW-7S and SB-27. The soil borings were completed using hollow stem auger drilling methods. Continuous split-spoon soil samples were collected from the ground surface to the base of the fill material, in accordance with ASTM method D-1586-84. Field screening included the use of a PID to monitor the headspace of each sample as described in Section 2.2.1. Samples for analyses were selected based on PID readings and visual inspection. Subsequent to completion, the boreholes were grouted to the ground surface. Soil descriptions and PID readings are found in Appendix B.

Subsurface soil samples were submitted to O'Brien & Gere Laboratories, Inc. for analyses according to NYSDEC ASP with Superfund deliverables. The following analyses were completed:

- VOCs via NYSDEC ASP method 91-1
- SVOCs via NYSDEC ASP method 91-2
- PCB/Pesticides via NYSDEC ASP method 91-3.
- Chromium and lead via ASP methodologies.

The SVOC analyses also quantified four "S" Area indicator parameters: 1,3,5-trichlorobenzene, 1,2,3-trichlorobenzene, 1,2,4,5-tetrachlorobenzene and 1,2,3,4-tetrachlorobenzene. Samples could not be analyzed for 1,2,3,5-trichlorobenzene as requested by the NYSDEC. This compound coeluted and could not be distinguished

from other compounds. Analytical results are presented in Tables 11 through 14.

Quality Assurance/Quality Control (QA\QC) samples were collected. These samples included a field duplicate, equipment blank, matrix spike and matrix spike duplicate. A laboratory trip blank was also included in each cooler that contained samples for VOC analyses.

Drilling equipment was decontaminated prior to initiating activities, between each well location, and at the completion of the field program. The split-spoon was decontaminated between each location using analconox wash, methanol rinse and a final distilled water rinse. Drill cuttings and decontamination fluids generated during sampling were contained and disposed as described in Section 2.2.1.

3.3. Analytical results

3.3.1. SB-33 area soils

Inorganics

The analytical results are presented on Table 10 and are illustrated on Figure 5. The results indicate that elevated lead concentrations in the surface soil are limited to a small area in the vicinity of the SB-33 area. The maximum concentration of total lead detected in the surface soil at the Buffalo Avenue site was 449 mg/Kg at location SS-5 (O'Brien & Gere, 1991a). The concentrations of lead detected in the subsurface soil at the SB-33 area were below the maximum concentration noted at Buffalo Avenue with the exception of SB-33J. At this location SB-33J, 527 mg/Kg of lead was detected. Total lead concentrations at other locations in the SB-33 ranged from 52.7 mg/Kg at SB-33F to 318 mg/Kg at SB-33I. In general, the highest total lead concentrations are found north and west of SB-33.

Samples were also analyzed for TCLP lead to evaluate the leaching potential of lead from the soils. A soil sample with a TCLP lead concentration greater than 5 mg/L exhibits the characteristics of

hazardous waste as set forth by 40 CFR Part 261. The data indicated that only the sample collected at SB-33G exceeded the 5 mg/L criteria. The remaining TCLP lead concentrations ranged from 0.5 mg/L at SB-33F and SB-33K to 2 mg/L at SB-33H.

As discussed in Section 3.1.1., previously collected data indicate that the subsurface soil are below the toxicity criteria set forth by 40 CFR with the exception of EPTOX lead concentrations at SB-33 (4 to 7 ft). The TCLP concentration at SB-33 (4 to 7 ft) and the TCLP and EPTOX concentrations SB-33E located adjacent to SB-33 were below criteria. The data suggest that the elevated EPTOX lead concentration detected at SB-33 (4 to 7 ft) is anomalous and may be related to inhomogeneities in the soils.

3.3.2. MW-7S subsurface samples

Volatile organic compounds

The VOC analyses are presented on Table 11. VOCs were detected in the subsurface soils in the vicinity of monitoring well MW-7S. Methylene chloride, acetone and 2-Butanone were detected in each sample. These compounds are usually associated with laboratory interferences and will not be discussed further.

At soil borings SB-7A and SB-7B located east and southeast of MW-7S the concentrations of VOCs ranged from non-detect to 9.7 $\mu\text{g/Kg}$.

The concentrations of VOCs increased slightly to south and west of MW-7S. At soil borings SB-7C, SB-7D and SB-7E located south and west of MW-7S the concentrations were slightly higher and ranged from 96 to 437 $\mu\text{g/Kg}$.

East of MW-7S, no VOCs were detected at soil boring SB-7A and at soil boring SB-7B low levels of VOCs were detected. These include 2 $\mu\text{g/Kg}$ of 1,1,1-trichloroethene, 4 $\mu\text{g/L}$ of toluene, 3 $\mu\text{g/Kg}$ of carbon disulfide, and 0.7 $\mu\text{g/Kg}$ of chloroform. Similar concentrations were detected at the de-listed Buffalo Avenue Site (O'Brien & Gere 1991a).

At soil boring, SB-7C located south of MW-7S, near SB-27, benzene, toluene, ethylbenzene, and xylene indicative of petroleum residue

were detected at concentrations ranging from 170 $\mu\text{g/Kg}$ to 18 $\mu\text{g/L}$. These concentrations are greater than those detected at the de-listed Buffalo Avenue Site. Chlorobenzene was also detected at this location at 6 $\mu\text{g/Kg}$.

To the west, at soil borings SB-7D and SB-7E, several chlorinated organic compounds were detected. The compounds detected include 1,1-dichloroethene, trichloroethene, and tetrachloroethene. The concentrations of the compounds ranged from 2 to 18 $\mu\text{g/Kg}$ which are greater than those detected at the de-listed Buffalo Avenue Site. Additionally, benzene, toluene, and xylene were detected at low levels ranging from 1 to 9 $\mu\text{g/Kg}$. Chlorobenzene, was detected at concentrations ranging from 5 to 160 $\mu\text{g/Kg}$.

The data indicate that the concentrations can vary significantly in a given sample. Chlorobenzene was detected at 12 $\mu\text{g/Kg}$ at SB-7E and at 160 $\mu\text{g/Kg}$ in a duplicate sample collected from the same boring. This variation is likely due to the heterogeneous nature of the soil and the distribution of compounds within the fill.

Semivolatile organic compounds

The results of the SVOC analyses are presented on Table 12. The data indicated that primarily "S" area indicator parameters and PAHs were detected.

The "S" area indicator parameters include: 1,3 -dichlorobenzene, 1,4-dichlorobenzene, 1,2-dichlorobenzene, 1,2,4-trichlorobenzene, hexachlorobutadiene, hexachlorocyclopentadiene, 2,4,5-trichlorophenol, hexachlorobenzene, 1,3,5-trichlorobenzene, 1,2,3-trichlorobenzene, 1,2,4,5-tetrachlorobenzene and 1,2,3,4-tetrachlorobenzene. "S" Area compounds were not detected at soil boring SB-7A, SB-7B and SB-7C which are located east and south of MW-7S. At soil boring SB-7D and SB-7E located southwest and west of MW-7S total "S" area compounds ranged between 3400 and 4280 $\mu\text{g/Kg}$. The highest total concentration of these compounds detected at the de-listed Buffalo Avenue site was 1,580 $\mu\text{g/Kg}$ at SB-22 (O'Brien & Gere, 1991).

PAHs which can be a by-product of combustion were detected in each sample. The following PAHs were detected at the site: anthracene, carbazole, fluoranthene, pyrene, 3,3'-dichlorobenzidine, benzo(a) anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, ideno (1,2,3-cd)pyrene, and Benzo(g,h,i)perylene.

The maximum concentration of PAHs detected at the de-listed Buffalo Avenue site was 132,600 $\mu\text{g/Kg}$ at SB-15 (O'Brien & Gere, 1991a).

Each sample in the MW-7S area was below the maximum concentration detected at the de-listed Buffalo Site with the exception of SB-7D where 1,019,000 $\mu\text{g/Kg}$ of PAHs were detected. This concentration of PAHs is inconsistent with previously collected data in the area. Therefore, the data indicates that the elevated concentration is likely attributed to the fill in the immediate area of soil boring SB-7D and is not likely representative of the area.

Inorganics

Chromium and lead were detected in each subsurface soil sample indicated on Table 13. Chromium was below the typical concentration of soil with the exception of SB-7D where 42.6 mg/Kg was detected. However, this concentration is below the maximum concentration detected at the de-listed Buffalo Avenue Site. Lead levels ranged from 19.9 mg/Kg at SB-7A to 292 mg/Kg at SB-7D. These concentrations are above typical concentration in soils, but below the maximum concentration detected at the Buffalo Avenue Site.

PCB/Pesticides

The result of the PCB/Pesticide analyses are presented on Table 13. The data indicate that no PCB compounds were detected at any of the subsurface sample locations.

Pesticides were detected in each subsurface sample collected during this investigation. The highest total pesticide concentration from the de-listed Buffalo Avenue site was 69 $\mu\text{g/kg}$ with individual compounds not exceeding 24 $\mu\text{g/kg}$. The data indicate that total pesticide concentrations ranged from 4.31 to 229 $\mu\text{g/Kg}$ at soil boring SB-7C, SB-7D, and SB-7E which are located south and west of monitoring well MW-7S. Lower concentrations of pesticides were detected at soil boring SB-7A and SB-7B which are located east and south east of monitoring well MW-7S. The total pesticide concentrations at these locations ranged from 0.19 to 0.532 $\mu\text{g/Kg}$.

At SB-7A the only pesticide detected was alpha-BHC at a concentration of 0.19 $\mu\text{g/Kg}$. At SB-7B the following pesticides were detected: alpha-BHC at 0.38 $\mu\text{g/Kg}$, heptachlor epoxide at 0.075

µg/Kg and dieldrin at 0.077 µg/Kg. These concentrations are significantly below the maximum concentration detected at the de-listed Buffalo Avenue site.

At SB-7C, located south of MW-7S, three pesticides were detected at concentrations less than 1.2 µg/Kg and 4,4-DDT was detected at 28 µg/Kg. At SB-7D, located southwest of MW-7, alpha-BHC and endosulfan were detected at 0.91 and 3.4 µg/Kg. These concentrations are similar to the maximum concentrations detected at the de-listed Buffalo Avenue Site.

The highest concentrations of pesticides were detected at SB-7E, located west of monitoring well MW-7S. Delta-BHC was detected at 110 µg/Kg, lindane at 20 µg/L, Dieldrin at 21 µg/Kg and 4,4'-DDE at 36 µg/Kg and 42 µg/Kg of 4,4'-DDE. These concentrations are greater than the concentrations detected at the de-listed Buffalo Avenue Site (O'Brien & Gere, 1991a). A duplicate sample at this location indicated concentrations 2 to 10 times lower for each individual parameter which indicates that the distribution of pesticides are very heterogenous in a given sample.

4. Summary

The following subsections summarize the results of the data collected in each area.

4.1. Eastern area summary

The data indicate that VOCs and SVOCs are the primary concern at the site in ground water. Surface soils were also found to contain elevated levels of SVOCs. Pesticides were also detected in the surface soil and ground water at low concentrations. The aerial distribution of these compounds in both media are similar in that the highest concentrations are observed in the southern portion of the site.

The data indicate that the highest concentrations of VOCs were detected in the monitoring wells OBG-2, OBG-4, OBG-5 and OBG-6 located at the southern and western portions of the site (see Figure X). The total VOC concentration at these locations ranged between 20 and 134.7 $\mu\text{g/L}$, with individual compounds above NYS Class GA standards. In the northern and northwest portion of the site the total VOC concentration ranged between 0.9 and 3.6 $\mu\text{g/L}$.

"S" area indicator parameters are found in the highest concentrations in monitoring wells OBG-5 and OBG-6, located at the southern portion of the site (see Figure 5). The total concentration of these compounds ranged between 55 and 73.9 $\mu\text{g/L}$. At OBG-2, 29 $\mu\text{g/L}$ of "S" area compounds were detected. At monitoring wells OBG-3 and OBG-4 the total concentration was 1 $\mu\text{g/L}$. No "S" area indicator parameters were detected at OBG-1.

In surface soils, the majority of the chlorinated benzene components were detected at concentrations less than the typical Niagara Falls background concentration of 100 $\mu\text{g/Kg}$ with the exception of

hexachlorobenzene and 1,2,3,4-tetrachlorobenzene. The highest concentrations of these compounds were detected in the southern portion of the site with the exception of SS#4, where no chlorinated benzene compounds were detected.

Pesticides also exhibited a similar aerial distribution of concentrations in both the ground water and surface soil as the "S" area parameters. That is higher concentrations were detected in the southern portion of the site when compared to the northern portion of the site. Specifically, beta-BHC and its related isomers including alpha-BHC and delta-BHC were detected at the highest concentrations at monitoring wells OBG-2, OBG-4 and OBG-6, located in the southern and western portions of the site. The total concentrations of these compounds in southern and western portions of the site ranged from 0.129 $\mu\text{g/L}$ at OBG-2 to 0.34 $\mu\text{g/L}$ at OBG-6. These compounds were not detected at the upgradient well OBG-1. At OBG-3, located along the western site boundary, the concentrations of beta-BHC and its related isomers were 0.0132 $\mu\text{g/L}$, which is approximately one order of magnitude less than detected in the southern portion of the site.

In surface soils, the highest concentrations of pesticides were detected in the southern portion of the site. At surface soil sample SS-2, located in the southern portion of the site, the total pesticide concentration detected was 1095 $\mu\text{g/Kg}$ and the highest total pesticide concentration in the northern portion of the site was 61.7 $\mu\text{g/Kg}$ at SS-5.

The results of the inorganic analyses in both the surface soil and ground water did not exhibit a definitive distribution pattern. The concentrations of the majority of these inorganics were below standards or less than the maximum concentration detected at the Buffalo Avenue site.

Given the data presented in this report, it appears that the north and northeast portions of the site contain compounds at similar concentrations to the de-listed Buffalo Avenue Site. The southern and western portions of the site contain compounds at concentrations above the de-listed Buffalo Avenue Site.

4.2. One-acre parcel

4.2.1. SB-33 area summary

In the area of soil boring SB-33, lead concentrations were noted in the soils. Previously completed laboratory analyses of the subsurface soils were completed for total lead, and leachable lead according to EPTOX and TCLP procedures. The results indicated that the EPTOX and TCLP concentrations are considerably lower in the subsurface soils than the toxicity concentration of 5 mg/L for lead as defined by 40 CFR Part 261 with the exception of one sample. At soil boring SB-33 (4 to 7 ft), EPTOX lead was detected at 39.1 mg/L. The TCLP concentration at this location was below criteria. This location was subsequently resampled, SB-33E (4 to 8 ft) and the EPTOX and TCLP values were below criteria. Based on these data, it is reasonable to assume that the EPTOX levels at SB-33 (4 to 7 ft) may be related to the inhomogeneities in the soils and is not representative of the majority of soils in the area.

Surface soil samples collected as part of this Preliminary Investigation were analyzed for TCLP lead to evaluate the leaching potential of lead from the soils. The data indicated that only the sample collected at SB-33G exceeded the 5 mg/L criteria. The remaining TCLP lead concentrations were below criteria. Based on the TCLP lead concentration, surface soils in an area of approximately 25 ft by 35 ft exceed the toxicity criteria set forth by 40 CFR part 261 (see Figure 5).

4.2.2. MW-7S area

The data indicate that elevated concentrations were detected at soil borings SB-7D and SB-7E and previously installed soil boring SB-27 located south and west of monitoring well MW-7S.

The concentration of total VOCs ranged from non-detect to 9.7 $\mu\text{g}/\text{Kg}$ at soil borings SB-7A and SB-7B, located east and southeast of MW-7S. At soil borings SB-7C, SB-7D SB-7E and previously installed soil boring SB-27, located south and west of MW-7S, the

concentrations were slightly higher and ranged from 18.9 to 437 $\mu\text{g}/\text{Kg}$.

The data indicate PAHs were detected in each subsurface soil sample. Each sample in the MW-7S area was below the maximum concentration detected at the de-listed Buffalo Site with the exception of SB-7D where 1,019,000 $\mu\text{g}/\text{Kg}$ of PAHs were detected. This concentration of PAHs is inconsistent with previously collected data in the area. Therefore, the data indicates that the elevated concentration is likely attributed to the fill in the immediate area of soil boring SB-7D and is not likely representative of the area.

No "S" area compounds were detected at soil borings SB-7A, SB-7B and SB-7C located east, southeast and east of MW-7S. Consistent with the distribution of VOCs and PAHs higher concentrations were detected at soil borings SB-7D and SB-7E located southwest and west of monitoring well MW-7S. The "S" area compounds ranged between 3,400 and 4,280 $\mu\text{g}/\text{Kg}$. At soil SB-27 the total "S" area compound concentration was 4,310 $\mu\text{g}/\text{Kg}$.

The data indicate that total pesticide concentrations ranged from 4.31 to 229 $\mu\text{g}/\text{Kg}$ at soil borings SB-7C, SB-7D, and SB-7E which are located south and west of monitoring well MW-7S. Lower concentrations of pesticides were detected at soil boring SB-7A and SB-7B which are located east and southeast of monitoring well MW-7S. The total pesticide concentrations at these locations ranged from 0.19 to 0.532 $\mu\text{g}/\text{Kg}$.

Preliminary Investigation

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Tables



O'BRIEN & GERE
ENGINEERS, INC.

Table 1
Preliminary Investigation
Water Treatment Plant - Eastern Area
Monitoring Well Specifications
Niagara Falls, New York

WELL NO.	GROUND	TOP OF PVC CASING	WELL	SCREEN	GROUND WATER ELEVATIONS (FT)
	ELEVATION (FT)	ELEVATION (FT)	DEPTH (FT)	INTERVAL (FT)	3/28/95
				Below Ground	
OBG-1	573.04	575.83	17.45	15 - 5	569.83
OBG-2	570.06	572.57	17.46	15 - 5	565.29
OBG-3	571.64	574.35	17.5	15 - 5	564.06
OBG-4	573.94	577.21	20.36	17 - 7	563.94
OBG-5	578.64	576.22	19.74	17 - 7	563.79
OBG-6	573.34	576.33	20.36	17 - 7	563.78

* - Elevation based on East Parkway Survey Baseline.

Table 2
Preliminary Investigation
Water Treatment Plant - Eastern Area
Ground Water - Volatile Organic Compounds
Niagara Falls, New York

Location: Date Collected:		OBG-1 2/15/95	OBG-2 2/14/95	OBG-3 2/14/95	OBG-3 BLD DUP 2/14/95	OBG-4 2/14/95	OBG-5 2/15/95	OBG-6 2/15/95
	NYS GA Standards							
Chloromethane	NE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromomethane	NE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Vinyl chloride	2	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroethane	NE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methylene chloride	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	NE	14	14	10 U	9 J	12	13	12
Carbon disulfide	NE	10 U	10 U	10 U	10 U	10 U	10 U	1 J
1,1-Dichloroethene	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	5	10 U	10 U	10 U	10 U	0.7 J	10 U	10 U
1,2-Dichloroethene (total)	5	10 U	10 U	10 U	10 U	2 J	0.6 J	1 J
Chloroform	100	0.9 J	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Butanone	NE	10 U	5 J	3 J	2 J	10 U	4 J	10 U
1,1,1-Trichloroethane	5	10 U	1 J	0.6 J	10 U	10 U	0.7 J	10 U
Carbon tetrachloride	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	50 #	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	NE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	5	10 U	10 U	10 U	10 U	10 U	10 U	0.6 J
Dibromochloromethane	50 #	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzene	0.7	10 U	10 U	10 U	10 U	2 J	2 J	10 U
trans-1,3-Dichloropropene	NE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromoform	50 #	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	NE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Hexanone	50 #	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	5	10 U	10 U	10 U	10 U	10 U	10 U	2 J
1,1,2,2-Tetrachloroethane	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Toluene	5	10 U	5 J	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	5	10 U	10 U	10 U	10 U	130	31	21
Ethylbenzene	5	10 U	1 J	10 U	10 U	10 U	10 U	10 U
Styrene	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Xylenes (total)	5	10 U	8 J	10 U	10 U	10 U	10 U	10 U
Total VOCs		0.9	20	3.6	2	134.7	38.3	25.6
Total TICs		ND	ND	ND	ND	ND	75 JN	46 JN

Notes: Concentration units in ug/kg (ppb).
J - Estimated value.
U - Not detected.
N - Spiked sample recovery not within control limits.
B - Analyte is found in the associated blank as well as in the sample.
ND - Not detected.
NA - Not analyzed.
- Guidance value.
TICs - Tentatively Identified Compounds

Table 2
Preliminary Investigation
Water Treatment Plant - Eastern Area
Ground Water - Volatile Organic Compounds
Niagara Falls, New York

Location:	EQUIPBLK	QCTRPBLK	MW-16S	
Date Collected:	2/15/95	2/14/95	9/91	
<u>NYS GA</u>				
	<u>Standards</u>			
Chloromethane	NE	10 U	10 U	ND
Bromomethane	NE	10 U	10 U	ND
Vinyl chloride	2	10 U	10 U	ND
Chloroethane	NE	10 U	10 U	ND
Methylene chloride	5	10 U	10 U	ND
Acetone	NE	9 J	9 J	NA
Carbon disulfide	NE	10 U	10 U	NA
1,1-Dichloroethene	5	10 U	10 U	ND
1,1-Dichloroethane	5	10 U	10 U	ND
1,2-Dichloroethene (total)	5	10 U	10 U	ND
Chloroform	100	10 U	10 U	ND
1,2-Dichloroethane	5	10 U	10 U	ND
2-Butanone	NE	10 U	10 U	NA
1,1,1-Trichloroethane	5	10 U	10 U	ND
Carbon tetrachloride	5	10 U	10 U	ND
Bromodichloromethane	50 #	10 U	10 U	ND
1,2-Dichloropropane	5	10 U	10 U	ND
cis-1,3-Dichloropropene	NE	10 U	10 U	ND
Trichloroethene	5	10 U	10 U	ND
Dibromochloromethane	50 #	10 U	10 U	ND
1,1,2-Trichloroethane	5	10 U	10 U	ND
Benzene	0.7	10 U	10 U	ND
trans-1,3-Dichloropropene	NE	10 U	10 U	ND
Bromoform	50 #	10 U	10 U	ND
4-Methyl-2-pentanone	NE	10 U	10 U	NA
2-Hexanone	50 #	10 U	10 U	NA
Tetrachloroethene	5	10 U	10 U	ND
1,1,2,2-Tetrachloroethane	5	10 U	10 U	ND
Toluene	5	10 U	10 U	ND
Chlorobenzene	5	10 U	10 U	ND
Ethylbenzene	5	10 U	10 U	ND
Styrene	5	10 U	10 U	NA
Xylenes (total)	5	10 U	10 U	ND
Total VOCs		ND	ND	ND
Total TICs		ND	60 JN	NA

Notes: Concentration units in ug/kg (ppb).

J - Estimated value.

U - Not detected.

N - Spiked sample recovery not within control limits.

B - Analyte is found in the associated blank as well as in the sample.

ND - Not detected.

NA - Not analyzed.

- Guidance value.

TICs - Tentatively Identified Compounds

Table 3
Preliminary Investigation
Water Treatment Plant - Eastern Area
Ground Water - Semivolatile Organic Compounds
Niagara Falls, New York

Location: Date Collected:		OBG-1 2/15/95	OBG-1 RE 2/15/95	OBG-2 2/14/95	OBG-3 2/14/95	OBG-3 BLD DUP 2/14/95	OBG-4 2/14/95
	<u>NYS GA Standards</u>						
Phenol	1	10 U	10 U	10 U	11 U	11 U	10 U
bis(2-Chloroethyl)ether	1	10 U	10 U	10 U	11 U	11 U	10 U
2-Chlorophenol	NE	10 U	10 U	10 U	11 U	11 U	10 U
1,3-Dichlorobenzene(*)	5	10 U	10 U	4 J	11 U	11 U	10 U
1,4-Dichlorobenzene(*)	4.7	10 U	10 U	1 J	11 U	11 U	1 J
1,2-Dichlorobenzene(*)	4.7	10 U	10 U	10 U	11 U	11 U	10 U
2-Methylphenol	NE	10 U	10 U	10 U	11 U	11 U	10 U
2,2'-Oxybis(1-Chloropropane)	NE	10 U	10 U	10 U	11 U	11 U	10 U
4-Methylphenol	NE	10 U	10 U	10 U	11 U	11 U	4 J
N-Nitroso-di-n-propylamine	NE	10 U	10 U	10 U	11 U	11 U	10 U
Hexachloroethane	NE	10 U	10 U	10 U	11 U	11 U	10 U
Nitrobenzene	5	10 U	10 U	10 U	11 U	11 U	10 U
Isophorone	50 #	10 U	10 U	10 U	11 U	11 U	10 U
2-Nitrophenol	NE	10 U	10 U	10 U	11 U	11 U	10 U
2,4-Dichlorophenol	1	10 U	10 U	10 U	11 U	11 U	10 U
bis(2-Chloroethoxy)methane	NE	10 U	10 U	10 U	11 U	11 U	10 U
2,4-Dichlorophenol	NE	10 U	10 U	10 U	11 U	11 U	10 U
1,2,4-Trichlorobenzene(*)	5	10 U	10 U	7 J	11 U	11 U	10 U
Naphthalene	10 #	10 U	10 U	2 J	11 U	11 U	10 U
4-Chloroaniline	NE	10 U	10 U	10 U	11 U	11 U	10 U
Hexachlorobutadiene(*)	5	10 U	10 U	10 U	11 U	11 U	10 U
4-Chloro-3-methylphenol	NE	10 U	10 U	10 U	11 U	11 U	10 U
2-Methylnaphthalene	NE	10 U	10 U	0.8 J	11 U	11 U	10 U
Hexachlorocyclopentadiene(*)	5	10 U	10 U	10 U	11 U	11 U	10 U
2,4,6-Trichlorophenol	NE	10 U	10 U	10 U	11 U	11 U	10 U
2,4,5-Trichlorophenol(*)	NE	26 U	26 U	25 U	27 U	28 U	25 U
2-Chloronaphthalene	5	10 U	10 U	10 U	11 U	11 U	10 U
2-Nitroaniline	NE	26 U	26 U	25 U	27 U	28 U	25 U
Dimethylphthalate	50 #	10 U	10 U	10 U	11 U	11 U	10 U
Acenaphthylene	NE	10 U	10 U	10 U	11 U	11 U	10 U
2,6-Dinitrotoluene	5	10 U	10 U	10 U	11 U	11 U	10 U
3-Nitroaniline	NE	26 U	26 U	25 U	27 U	28 U	25 U
Acenaphthene	20 #	10 U	10 U	10 U	11 U	11 U	10 U
2,4-Dinitrophenol	NE	26 U	26 U	25 U	27 U	28 U	25 U
4-Nitrophenol	NE	26 U	26 U	25 U	27 U	28 U	25 U
Dibenzofuran	NE	10 U	10 U	10 U	11 U	11 U	10 U
2,4-Dinitrotoluene	NE	10 U	10 U	10 U	11 U	11 U	10 U
Diethylphthalate	50 #	10 U	10 U	10 U	11 U	11 U	10 U
4-Chlorophenyl-phenylether	NE	10 U	10 U	10 U	11 U	11 U	10 U
Fluorene	50 #	10 U	10 U	10 U	11 U	11 U	10 U
4-Nitroaniline	NE	26 U	26 U	25 U	27 U	28 U	25 U
4,6-Dinitro-2-methylphenol	NE	26 U	26 U	25 U	27 U	28 U	25 U
N-Nitrosodiphenylamine	50 #	10 U	10 U	10 U	11 U	11 U	10 U
4-Bromophenyl-phenylether	NE	10 U	10 U	10 U	11 U	11 U	10 U
Hexachlorobenzene(*)	0.35	10 U	10 U	10 U	11 U	11 U	10 U
Pentachlorophenol	1	26 U	26 U	25 U	27 U	28 U	25 U
Phenanthrene	50 #	10 U	10 U	10 U	11 U	11 U	10 U
Anthracene	50 #	10 U	10 U	10 U	11 U	11 U	10 U
Carbazole	NE	10 U	10 U	10 U	11 U	11 U	10 U
Di-n-butylphthalate	NE	10 U	10 U	10 U	11 U	11 U	10 U
Fluoranthene	50 #	10 U	10 U	10 U	11 U	11 U	10 U
Pyrene	50 #	10 U	10 U	10 U	11 U	11 U	10 U
Butylbenzylphthalate	50 #	10 U	10 U	10 U	11 U	11 U	10 U
3,3'-Dichlorobenzidine	NE	10 U	10 U	10 U	11 U	11 U	10 U
Benzo(a)anthracene	0.002 #	10 U	10 U	10 U	11 U	11 U	10 U
Chrysene	0.002 #	10 U	10 U	10 U	11 U	11 U	10 U
bis(2-Ethylhexyl)phthalate	50	10 U	10 U	13 B	4 BJ	4 BJ	2 BJ
Di-n-octylphthalate	0.5	10 U	10 U	10 U	11 U	11 U	10 U
Benzo(b)fluoranthene	0.002 #	10 U	10 U	10 U	11 U	11 U	10 U

Table 3
Preliminary Investigation
Water Treatment Plant - Eastern Area
Ground Water - Semivolatile Organic Compounds
Niagara Falls, New York

Location: Date Collected:		OBG-1 2/15/95	OBG-1 RE 2/15/95	OBG-2 2/14/95	OBG-3 2/14/95	OBG-3 BLD DUP 2/14/95	OBG-4 2/14/95
	NYS GA Standards						
Benzo(k)fluoranthene	NE	10 U	10 U	10 U	11 U	11 U	10 U
Benzo(a)pyrene	NE	10 U	10 U	10 U	11 U	11 U	10 U
Indeno(1,2,3-cd)pyrene	0.002 #	10 U	10 U	10 U	11 U	11 U	10 U
Dibenz(a,h)anthracene	NE	10 U	10 U	10 U	11 U	11 U	10 U
Benzo(g,h,i)perylene	NE	10 U	10 U	10 U	11 U	11 U	10 U
1,3,5-Trichlorobenzene(*)		10 U	10 U	10 U	11 U	11 U	10 U
1,2,3-Trichlorobenzene(*)		10 U	10 U	10 U	11 U	11 U	10 U
1,2,4,5-Tetrachlorobenzene(*)		10 U	10 U	2 J	1 J	1 J	10 U
1,2,3,4-Tetrachlorobenzene(*)		10 U	10 U	15	11 U	11 U	10 U
Total "S" Area Indicator Parameter		ND	ND	29	1	1	1
Total TICs		44 JN	78 JN	830 JN	171 JN	60 JN	207 JN
Total TICs in Blanks		20 BJN	38 BJN	50 BJN	30 BJN	30 BJN	20 BJN

Notes: Concentration units in ug/L (ppb).
J - Estimated value.
U - Not detected.
N - Spiked sample recovery not within control limits.
B - Analyte is found in the associated blank as well as in the sample.
ND - Not detected.
NE - Not established.
RE - The sample was reanalyzed due to a surrogate failure or blank failure, yielding the same results as the first analysis.
TICs - Tentatively Identified Compounds.
(*) - "S" Area Indicator Parameters
- NYS Guidance Value

Table 3
Preliminary Investigation
Water Treatment Plant - Eastern Area
Ground Water - Semivolatile Organic Compounds
Niagara Falls, New York

Location: Date Collected:		OBG-5 2/15/95	OBG-6 2/15/95	EQUIPBLK 2/15/95	MW-16S 9/91
	NYS GA Standards				
Phenol	1	11 U	11 U	13 U	ND
bis(2-Chloroethyl)ether	1	11 U	11 U	13 U	ND
2-Chlorophenol	NE	11 U	11 U	13 U	ND
1,3-Dichlorobenzene(*)	5	30	11 U	13 U	ND
1,4-Dichlorobenzene(*)	4.7	25	46	13 U	ND
1,2-Dichlorobenzene(*)	4.7	11 U	9 J	13 U	ND
2-Methylphenol	NE	11 U	11 U	13 U	ND
2,2'-Oxybis(1-Chloropropane)	NE	11 U	11 U	13 U	ND
4-Methylphenol	NE	0.9 J	5 J	13 U	ND
N-Nitroso-di-n-propylamine	NE	11 U	11 U	13 U	ND
Hexachloroethane	NE	11 U	11 U	13 U	ND
Nitrobenzene	5	11 U	11 U	13 U	ND
Isophorone	50 #	11 U	11 U	13 U	ND
2-Nitrophenol	NE	11 U	11 U	13 U	ND
2,4-Dichlorophenol	1	11 U	11 U	13 U	ND
bis(2-Chloroethoxy)methane	NE	11 U	11 U	13 U	ND
2,4-Dichlorophenol	NE	11 U	11 U	13 U	ND
1,2,4-Trichlorobenzene(*)	5	11 U	7 J	13 U	ND
Naphthalene	10 #	11 U	1 J	13 U	ND
4-Chloroaniline	NE	11 U	11 U	13 U	ND
Hexachlorobutadiene(*)	5	11 U	11 U	13 U	ND
4-Chloro-3-methylphenol	NE	11 U	11 U	13 U	ND
2-Methylnaphthalene	NE	11 U	11 U	13 U	ND
Hexachlorocyclopentadiene(*)	5	11 U	11 U	13 U	ND
2,4,6-Trichlorophenol	NE	11 U	11 U	13 U	ND
2,4,5-Trichlorophenol(*)	NE	27 U	27 U	32 U	ND
2-Chloronaphthalene	5	11 U	11 U	13 U	ND
2-Nitroaniline	NE	27 U	27 U	32 U	ND
Dimethylphthalate	50 #	11 U	11 U	13 U	ND
Acenaphthylene	NE	11 U	11 U	13 U	ND
2,6-Dinitrotoluene	5	11 U	11 U	13 U	ND
3-Nitroaniline	NE	27 U	27 U	32 U	ND
Acenaphthene	20 #	11 U	11 U	13 U	ND
2,4-Dinitrophenol	NE	27 U	27 U	32 U	ND
4-Nitrophenol	NE	27 U	27 U	32 U	ND
Dibenzofuran	NE	11 U	11 U	13 U	ND
2,4-Dinitrotoluene	NE	11 U	11 U	13 U	ND
Diethylphthalate	50 #	11 U	11 U	13 U	ND
4-Chlorophenyl-phenylether	NE	11 U	11 U	13 U	ND
Fluorene	50 #	11 U	11 U	13 U	ND
4-Nitroaniline	NE	27 U	27 U	32 U	ND
4,6-Dinitro-2-methylphenol	NE	27 U	27 U	32 U	ND
N-Nitrosodiphenylamine	50 #	11 U	11 U	13 U	ND
4-Bromophenyl-phenylether	NE	11 U	11 U	13 U	ND
Hexachlorobenzene(*)	0.35	11 U	11 U	13 U	ND
Pentachlorophenol	1	27 U	27 U	32 U	ND
Phenanthrene	50 #	11 U	2 J	13 U	ND
Anthracene	50 #	11 U	11 U	13 U	ND
Carbazole	NE	11 U	11 U	13 U	ND
Di-n-butylphthalate	NE	11 U	11 U	13 U	ND
Fluoranthene	50 #	11 U	3 J	13 U	ND
Pyrene	50 #	11 U	4 J	13 U	ND
Butylbenzylphthalate	50 #	11 U	11 U	13 U	ND
3,3'-Dichlorobenzidine	NE	11 U	1 J	13 U	ND
Benzo(a)anthracene	0.002 #	11 U	2 J	13 U	ND
Chrysene	0.002 #	11 U	2 J	13 U	ND
bis(2-Ethylhexyl)phthalate	50	2 BJ	6 BJ	4 BJ	ND
Di-n-octylphthalate	0.5	11 U	11 U	13 U	ND
Benzo(b)fluoranthene	0.002 #	11 U	11 U	13 U	ND

Table 3
Preliminary Investigation
Water Treatment Plant - Eastern Area
Ground Water - Semivolatile Organic Compounds
Niagara Falls, New York

Location: Date Collected:		OBG-5 2/15/95	OBG-6 2/15/95	EQUIPBLK 2/15/95	MW-16S 9/91
	NYS GA				
	<u>Standards</u>				
Benzo(k)fluoranthene	NE	11 U	11 U	13 U	ND
Benzo(a)pyrene	NE	11 U	11 U	13 U	ND
Indeno(1,2,3-cd)pyrene	0.002 #	11 U	11 U	13 U	ND
Dibenz(a,h)anthracene	NE	11 U	11 U	13 U	ND
Benzo(g,h,i)perylene	NE	11 U	11 U	13 U	ND
1,3,5-Trichlorobenzene(*)		11 U	1 J	13 U	ND
1,2,3-Trichlorobenzene(*)		11 U	1 J	13 U	ND
1,2,4,5-Tetrachlorobenzene(*)		11 U	3 J	13 U	ND
1,2,3,4-Tetrachlorobenzene(*)		11 U	15	13 U	ND
Total "S" Area Indicator Parameter		55	73.9	ND	ND
Total TICs		847 JN	870 JN	60 J	ND
Total TICs in Blanks		40 BJN	50 BJN	70 BJN	ND

Notes: Concentration units in ug/kg (ppb).
J - Estimated value.
U - Not detected.
N - Spiked sample recovery not within control limits.
B - Analyte is found in the associated blank as well as in the sample.
ND - Not detected.
NE - Not established.
RE - The sample was reanalyzed due to a surrogate failure or blank failure, yielding the same results as the first analysis.
TICs - Tentatively Identified Compounds.
(*) - "S" Area Indicator Parameters
- NYS Guidance Value

Table 4
Preliminary Investigation
Water Treatment Plant - Eastern Area
Ground Water - Inorganics
Niagara Falls, New York

		Location:	OBG-1	OBG-2	OBG-2	OBG-3	OBG-3	OBG-3	OBG-3
		Date Collected:	2/17/95	2/14/95	2/14/95	2/14/95	2/14/95	2/14/95	BLD DUP
			Filtered	Unfiltered	Filtered	Unfiltered	Unfiltered	Filtered	Unfiltered
	NYS Class GA Standards	NYS Drinking Water Standards							
Aluminum	NE	NE	43.5 BP	35900 P	35.6 BP	1170 P	30 UP	3000 P	
Antimony	300 #	NE	6.4 BP	3.1 BP	6.2 BP	2.6 BP	3.2 BP	3.1 BP	
Arsenic	25	50	2.3 BP	9.5 BP	2 UP	2 UP	2 UP	2 UP	
Barium	1000	1000	94.6 BP	295 P	39.5 BP	64 BP	51.5 BP	79.3 BP	
Beryllium	300	NE	0.27 BP	2.1 BP	0.31 BP	0.32 BP	0.29 BP	0.44 BP	
Cadmium	10	10	0.5 UP	0.94 BP	0.5 UP	0.78 BP	0.69 BP	1.1 BP	
Calcium	NE	NE	54600 P	269000 EP	197000 P	327000 EP	336000 P	341000 EP	
Chromium	50	50	4.1 BP	52.6 EP	4.1 BP	6.7 BEP	4.6 BP	10.8 EP	
Cobalt	NE	NE	1.1 BP	28.7 P	4.2 BP	4.8 BP	3.6 BP	6.3 BP	
Copper	200	1000	6 BP	53.4 P	7.5 BP	3.2 BP	1 UP	6.4 BP	
Iron	300	300	8.9 BEP	54500 EP	27.1 BEP	6380 EP	5510 EP	9130 EP	
Lead	25	50	2 UP	34.5 EP	2 UP	6.1 EP	2 UP	11.6 EP	
Magnesium	35 #	NE	36900 EP	82200 EP	96200 EP	63800 EP	56400 EP	64500 EP	
Manganese	300	300	80.4 EP	1280 EP	313 EP	437 EP	415 EP	500 EP	
Mercury	2	2	0.2 UCV	1.2 CV	0.2 UCV	0.2 UCV	0.2 UCV	0.2 UCV	
Nickel	NE	NE	2.3 BP	57.6 EP	5.6 BP	7.5 BEP	3.3 BP	10 BEP	
Potassium	NE	NE	4060 BEP	20400 EP	9260 EP	13800 EP	14100 EP	14800 EP	
Selenium	10	10	3 UP	3 UP	3 UP	3 UP	3 UP	3 UP	
Silver	50	50	1 UP	1 UP	1 UP	1 UP	1 UP	1 UP	
Sodium	20000	NE	19600 P	49700 EP	53100 P	45600 EP	42100 P	45900 EP	
Thallium	400 #	NE	3 UP	3 UP	4.1 BP	3 UP	3.6 BP	3 UP	
Vanadium	NE	NE	1 UP	64.9 EP	1 UP	2.4 BEP	1 UP	5.4 BEP	
Zinc	300	5000	1.7 BP	157 EP	5.4 BP	56 EP	32.6 P	101 EP	
Cyanide	100	NE	NR	10 UC	NR	10 UC	NR	10 UC	

NOTES:

Concentration units in ug/kg (ppb).

J - Estimated value.

U - The analyte was analyzed for but not detected.

N - Spiked sample recovery not within control limits.

B - The reported value is greater than or equal to the Instrument Detection Limit (IDL) but less than the Contract Required Detection Limit (CRDL).

P - Analyzed by ICP techniques.

E - The report value is estimated due to the presence of interference.

N - Spiked sample recovery not within control limits.

C - Analyzed by Manual Spectrophotometric techniques.

CV - Manual Cold Vapor AA.

NR - Not requested.

* - Duplicate analysis not within control limits.

- Guidance value.

Table 4
Preliminary Investigation
Water Treatment Plant - Eastern Area
Ground Water - Inorganics
Niagara Falls, New York

		OBG-3		OBG-4		OBG-4		OBG-5		OBG-5		OBG-6	
		Location: BLD DUP		OBG-4		OBG-4		OBG-5		OBG-5		OBG-6	
		Date Collected: 2/14/95		2/14/95		2/14/95		2/15/95		2/15/95		2/15/95	
		Filtered		Unfiltered		Filtered		Unfiltered		Filtered		Unfiltered	
NYS Class	NYS Drinking												
GA	Water												
Standards	Standards												
Aluminum	NE	NE	41.3 BP	28100 P	42.3 BP	40100 P	31.7 BP	59500 P					
Antimony	300 #	NE	5.5 BP	4.4 BP	3.1 BP	4.1 BP	4.6 BP	1.6 P					
Arsenic	25	50	2 UP	29 P	2 UP	61.8 P	2 UP	215 P					
Barium	1000	1000	50.7 BP	296 P	72.7 BP	888 P	143 BP	4780 P					
Beryllium	300	NE	0.43 BP	1.8 BP	0.4 BP	3.3 BP	0.35 BP	4.6 BP					
Cadmium	10	10	0.63 BP	7.3 P	0.5 UP	4.4 BP	0.5 UP	36.6 P					
Calcium	NE	NE	320000 P	272000 EP	243000 P	322000 EP	246000 P	324000 EP					
Chromium	50	50	8.2 BP	56.7 EP	3.4 BP	128 EP	4 BP	275 EP					
Cobalt	NE	NE	3.1 BP	29 BP	2.6 BP	51.7 P	2.7 BP	91.1 P					
Copper	200	1000	2.9 BP	103 P	1 UP	234 P	1 BP	2250 P					
Iron	300	300	5120 EP	63200 EP	4360 EP	150000 EP	18400 EP	480000 EP					
Lead	25	50	2 UP	138 EP	2 UP	935 EP	2 UP	5470 EP					
Magnesium	35 #	NE	55500 EP	55900 EP	42700 EP	59200 EP	37700 EP	77100 EP					
Manganese	300	300	394 EP	996 EP	336 EP	1570 EP	464 EP	2770 EP					
Mercury	2	2	0.2 UCV	2.1 CV	0.2 UCV	1.6 CV	0.2 UCV	27.6 CV					
Nickel	NE	NE	5.9 BP	63.1 EP	1.5 BP	107 EP	2 BP	272 EP					
Potassium	NE	NE	14000 EP	62500 EP	53400 EP	23100 EP	15600 EP	38100 EP					
Selenium	10	10	3 UP	3 UP	3 UP	3 UP	3 UP	8.7 P					
Silver	50	50	1 UP	1 UP	1 UP	1 UP	1 UP	7.4 BP					
Sodium	20000	NE	41300 P	627000 EP	528000 P	67400 EP	65100 P	119000 EP					
Thallium	400 #	NE	3.8 BP	3 UP	3 UP	3 UP	3 UP	3 UP					
Vanadium	NE	NE	1 UP	55.4 EP	1 UP	99 EP	1 UP	134 EP					
Zinc	300	5000	33.8 P	1090 EP	2 BP	1810 EP	1.2 BP	12100 EP					
Cyanide	100	NE	NR	10 UC	NR	10 UC	NR	10 UC					

NOTES:

Concentration units in ug/kg (ppb).

J - Estimated value.

U - The analyte was analyzed for but not detected.

N - Spiked sample recovery not within control limits.

B - The reported value is greater than or equal to the Instrument Detection Limit (IDL) but less than the Contract Required Detection Limit (CRDL).

P - Analyzed by ICP techniques.

E - The report value is estimated due to the presence of interference.

N - Spiked sample recovery not within control limits.

C - Analyzed by Manual Apectrophotometric techniques.

CV - Manual Cold Vapor AA.

NR - Not requested.

* - Duplicate analysis not within control limits.

- Guidance value.

Table 4
Preliminary Investigation
Water Treatment Plant - Eastern Area
Ground Water - Inorganics
Niagara Falls, New York

		Location:	OBG-6	EQUIPBLK	EQUIPBLK	MW-16S	MW-16S
		Date Collected:	2/15/95	2/15/95	2/15/95	9/91	9/91
			Filtered	Unfiltered	Filtered	Unfiltered	Filtered
	NYS Class GA Standards	NYS Drinking Water Standards					
Aluminum	NE	NE	38.6 BP	30 UP	30 UP	NA	NA
Antimony	300 #	NE	4.2 BP	1.6 BP	1 UP	NA	NA
Arsenic	25	50	2.6 BP	2 UP	2 UP	NA	NA
Barium	1000	1000	257 P	1 UP	1 UP	NA	NA
Beryllium	300	NE	0.24 BP	0.1 UP	0.11 BP	NA	NA
Cadmium	10	10	0.5 UP	0.5 UP	0.5 UP	NA	NA
Calcium	NE	NE	148000 P	30.5 BEP	24.4 BP	ND	ND
Chromium	50	50	4.1 BP	7 BEP	1 UP	NA	NA
Cobalt	NE	NE	2.4 BP	1 UP	1 UP	NA	NA
Copper	200	1000	1.4 BP	1 UP	1 UP	NA	NA
Iron	300	300	8570 EP	189 EP	23.4 BEP	NA	ND
Lead	25	50	2 UP	2 UEP	2 UP	0.64 J	NA
Magnesium	35 #	NE	42400 EP	10 UEP	10 UEP	NA	NA
Manganese	300	300	173 EP	2.3 BEP	1 UEP	0.702	0.298 J
Mercury	2	2	0.2 UCV	0.2 UCV	0.2 UCV	0.0076	ND
Nickel	NE	NE	1.6 BP	4.2 BEP	1 UP	NA	NA
Potassium	NE	NE	26900 EP	100 UEP	100 UEP	NA	NA
Selenium	10	10	3 UP	3 UP	3 UP	NA	NA
Silver	50	50	1 UP	1 UP	1 UP	NA	NA
Sodium	20000	NE	1110000 P	43.8 BEP	86.5 BP	NA	NA
Thallium	400 #	NE	3 UP	3.5 BP	3.5 BP	NA	NA
Vanadium	NE	NE	1 UP	1 UEP	1 UP	NA	NA
Zinc	300	5000	1 UP	1 UEP	1 UP	NA	NA
Cyanide	100	NE	NR	10 UC	NR	NA	NA

NOTES:

Concentration units in ug/kg (ppb).

J - Estimated value.

U - The analyte was analyzed for but not detected.

N - Spiked sample recovery not within control limits.

B - The reported value is greater than or equal to the Instrument Detection Limit (IDL) but less than the Contract Required Detection Limit (CRDL).

P - Analyzed by ICP techniques.

E - The report value is estimated due to the presence of interference.

N - Spiked sample recovery not within control limits.

C - Analyzed by Manual Spectrophotometric techniques.

CV - Manual Cold Vapor AA.

NR - Not requested.

* - Duplicate analysis not within control limits.

- Guidance value.

Table 5
Preliminary Investigation
Water Treatment Plant - Eastern Area
Ground Water - PCB/Pesticides
Niagara Falls, New York

Location:		OBG-1	OBG-2	OBG-3	OBG-3	OBG-4	OBG-5
Date Collected:		2/17/95	2/14/95	2/14/95	BLD DUP 2/14/95	2/14/95	2/15/95
	NYS GA						
	Standards						
alpha-BHC	NE	0.053 U	0.029 JP	0.056 U	0.057 U	0.084	0.062 P
beta-BHC	NE	0.053 U	0.1	0.0084 J	0.057 U	0.17	0.055 U
delta-BHC	NE	0.053 U	0.051 U	0.0048 JP	0.0056 JP	0.054 U	0.023 JP
Lindane		0.053 U	0.0063 J	0.056 U	0.057 U	0.0052 JP	0.055 U
Heptachlor	ND	0.015 BJP	0.0016 JP	0.056 U	0.057 U	0.054 U	0.055 U
Aldrin	ND	0.053 U	0.051 U	0.056 U	0.057 U	0.054 U	0.055 U
Heptachlor epoxide	ND	0.053 U	0.005 JP	0.056 U	0.057 U	0.054 U	0.055 U
Endosulfan I	NE	0.053 U	0.051 U	0.0018 JP	0.0043 JP	0.054 U	0.055 U
Dieldrin	ND	0.11 U	0.001 JP	0.11 U	0.11 U	0.11 U	0.11 U
4,4'-DDE	ND	0.0037 JP	0.1 U	0.11 U	0.11 U	0.11 U	0.11 U
Endrin	ND	0.11 U	0.1 U	0.11 U	0.11 U	0.11 U	0.11 U
Endosulfan II	NE	0.056 BJ	0.1 UB	0.0072 BJP	0.0034 BJP	0.11 UB	0.11 UB
4,4'-DDD	ND	0.11 U	0.1 U	0.11 U	0.11 U	0.11 U	0.11 U
Endosulfan sulfate	NE	0.11 U	0.1 U	0.11 U	0.11 U	0.11 U	0.11 U
4,4'-DDT	ND	0.018 JP	0.1 UB	0.11 UB	0.11 UB	0.11 UB	0.11 UB
Methoxychlor	35.0	0.53 U	0.51 U	0.56 U	0.57 U	0.54 U	0.55 U
Endrin ketone	NE	0.028 JP	0.1 U	0.11 U	0.0032 JP	0.11 U	0.11 U
Endrin aldehyde	NE	0.11 U	0.0045 JP	0.11 U	0.11 U	0.031 JP	0.11 U
A-Chlordane	0.1	0.053 U	0.051 U	0.056 U	0.057 U	0.054 U	0.055 U
G-Chlordane	0.1	0.053 U	0.051 U	0.056 U	0.057 U	5.4 U	0.055 U
Toxaphene	ND	5.3 U	5.1 U	5.6 U	5.7 U	1.1 U	5.5 U
PCB-1016	0.1	1.1 U	1 U	1.1 U	1.1 U	2.2 U	1.1 U
PCB-1221	0.1	2.1 U	2 U	2.2 U	2.3 U	1.1 U	2.2 U
PCB-1232	0.1	1.1 U	1 U	1.1 U	1.1 U	1.1 U	1.1 U
PCB-1242	0.1	1.1 U	1 U	1.1 U	1.1 U	1.1 U	1.1 U
PCB-1248	0.1	1.1 U	1 U	1.1 U	1.1 U	1.1 U	1.1 U
PCB-1254	0.1	1.1 U	1 U	1.1 U	1.1 U	1.1 U	1.1 U
PCB-1260	0.1	1.1 U	1 U	1.1 U	1.1 U	1.1 U	1.1 U
Total Pesticides		0.0497	0.1658	0.015	0.0131	0.29	0.085

Notes: Concentration units in ug/L (ppb).

J - Estimated value.

U - Not detected.

N - Spiked sample recovery not within control limits.

B - Analyte is found in the associated blank as well as in the sample.

P - Analyzed by ICP techniques.

ND - Not detected.

NE - Not established.

DL - Dilution.

Table 5
Preliminary Investigation
Water Treatment Plant - Eastern Area
Ground Water - PCB/Pesticides
Niagara Falls, New York

Location:		OBG-6		OBG-6 DL		EQUIPBLK		MW-16S
Date Collected:		2/15/95		2/15/95		2/15/95		9/91
	NYS GA							
	Standards							
alpha-BHC	NE	0.08	P	0.035	JP	0.063	U	0.008
beta-BHC	NE	0.061	U	0.61	U	0.063	U	0.011
delta-BHC	NE	0.26	P	0.61	U	0.063	U	ND
Lindane		0.061	U	0.61	U	0.063	U	ND
Heptachlor	ND	0.061	U	0.61	U	0.063	U	ND
Aldrin	ND	0.061	U	0.61	U	0.063	U	ND
Heptachlor epoxide	ND	0.061	U	0.61	U	0.063	U	ND
Endosulfan I	NE	0.061	U	0.61	UB	0.0053	JP	ND
Dieldrin	ND	0.12	U	1.2	U	0.13	U	ND
4,4'-DDE	ND	0.12	U	1.2	U	0.13	U	ND
Endrin	ND	0.12	U	1.2	U	0.13	U	ND
Endosulfan II	NE	0.12	UB	1.2	UB	0.0058	BJP	ND
4,4'-DDD	ND	0.12	U	1.2	U	0.13	U	ND
Endosulfan sulfate	NE	0.12	U	1.2	U	0.13	U	ND
4,4'-DDT	ND	0.12	UB	1.2	UB	0.0018	BJP	ND
Methoxychlor	35.0	0.61	U	0.18	JP	0.63	U	ND
Endrin ketone	NE	0.12	U	1.2	U	0.13	U	ND
Endrin aldehyde	NE	0.12	U	1.2	U	0.13	U	NA
A-Chlordane	0.1	0.061	U	0.61	U	0.063	U	ND
G-Chlordane	0.1	0.061	U	0.61	U	0.063	U	NA
Toxaphene	ND	6.1	U	61	U	6.3	U	NA
PCB-1016	0.1	1.2	U	12	U	1.3	U	NA
PCB-1221	0.1	2.4	U	24	U	2.5	U	NA
PCB-1232	0.1	1.2	U	12	U	1.3	U	NA
PCB-1242	0.1	1.2	U	12	U	1.3	U	NA
PCB-1248	0.1	1.2	U	12	U	1.3	U	NA
PCB-1254	0.1	1.2	U	12	U	1.3	U	NA
PCB-1260	0.1	1.2	U	12	U	1.3	U	NA
Total Pesticides		0.34		0.25		0.0053		0.019

Notes: Concentration units in ug/L (ppb).

J - Estimated value.

U - Not detected.

N - Spiked sample recovery not within control limits.

B - Analyte is found in the associated blank as well as in the sample.

P - Analyzed by ICP techniques.

ND - Not detected.

NE - Not established.

DL - Dilution.

Table 6
Preliminary Investigation
Water Treatment Plant - Eastern Area/One Acre Parcel
Surface Soil Descriptions
Niagara Falls, New York

Sample #	Blow Counts/ 6 Inches	Description
<u>One Acre Parcel</u>		
SB-33G	9-13-14-24	Damp, med. brown, med. dense SILT, some very fine sand, little clay, little fine to med. angular gravel.
SB-33F	8-8-9-8	Damp, dark brown, med. dense SILT, some very fine sand, little fine angular gravel.
SB-33H	7-16-9-6	Dry, brown to gray, med. dense SILT, some very fine sand, some fine to med. angular gravel, little fine to coarse sand.
SB-33I	3-18-26-20	Dry to damp, brown to black, dense SILT, some fine sand, little fine to coarse angular gravel, trace cinders, trace clay.
SB-33J	3-5-9-10	Dry, brown to black, med. dense SILT, some very fine sand, little fine to coarse angular gravel, trace white ash, trace cinders, trace orange brick.
SB-33K	3-6-17-17	Dry to damp, gray to brown, med. dense SILT some fine to coarse gravel, little fine to med. sand trace clay.
<u>Eastern Area</u>		
SS-1	9-7-7-7	Dry to damp, med. to dark brown, med dense SILT, some very fine sand, little clay, trace fine to med. angular gravel, trace organics (plant roots), trace cinders.
SS-2	8-5-5-5	Dry to dark, med. brown, med. dense SILT, some very fine sand, little clay trace white ash, trace fine to med. angular gravel, trace plant roots (organics).
SS-3	20-17-8-9	Dry to damp, med. brown, med. dense SILT, some very fine to fine sand, little clay, trace white ash, trace cinders, trace fine angular gravel.
SS-4	24-12-9-8	Dry to damp, med. brown, med. dense SILT, some very fine to fine sand, little clay, trace fine angular gravel.
SS-5	19-36-12-6	Dry to damp, med. to dark brown, dense SILT and fine SAND, some fine to coarse gravel, little clay, trace white ash, trace orange brick fragments.
SS-6	6-5-4-8	Dry to damp, gray to brown, loose SILT, some very fine to fine sand, little clay, little fine to med. angular gravel, little cinders.

Table 7
Preliminary Investigation
Water Treatment Plant - Eastern Area
Surface Soil - Semivolatile Organic Compounds
Niagara Falls, New York

	Location:	SS-1	SS-2	SS-3	SS-3	SS-3
	Date Collected:	2/10/95	2/10/95	2/10/95	BLD DUP	BLD DUP RE
					2/10/95	2/10/95
	Max. Conc. from Buffalo Ave. Site					
Phenol	230J	460 U	400 U	380 U	380 U	380 U
bis(2-Chloroethyl)ether	ND	460 U	400 U	380 U	380 U	380 U
2-Chlorophenol	ND	460 U	400 U	380 U	380 U	380 U
1,3-Dichlorobenzene(*)	ND	460 U	400 U	380 U	380 U	380 U
1,4-Dichlorobenzene(*)	ND	65 J	84 J	380 U	380 U	380 U
1,2-Dichlorobenzene(*)	ND	460 U	27 J	380 U	380 U	380 U
2-Methylphenol	ND	460 U	400 U	380 U	380 U	380 U
2,2'-Oxybis(1-Chloropropane)	ND	460 U	400 U	380 U	380 U	380 U
4-Methylphenol	ND	460 U	400 U	380 U	380 U	380 U
N-Nitroso-di-n-propylamine	ND	460 U	400 U	380 U	380 U	380 U
Hexachloroethane	ND	460 U	400 U	380 U	380 U	380 U
Nitrobenzene	ND	460 U	400 U	380 U	380 U	380 U
Isophorone	ND	460 U	400 U	380 U	380 U	380 U
2-Nitrophenol	ND	460 U	400 U	380 U	380 U	380 U
2,4-Dichlorophenol	ND	460 U	400 U	380 U	380 U	380 U
bis(2-Chloroethoxy)methane	ND	460 U	400 U	380 U	380 U	380 U
2,4-Dichlorophenol	ND	460 U	400 U	380 U	380 U	380 U
1,2,4-Trichlorobenzene(*)	ND	180 J	73 J	380 U	380 U	46 J
Naphthalene	31J	87 J	42 J	380 U	380 U	380 U
4-Chloroaniline	ND	460 U	400 U	380 U	380 U	380 U
Hexachlorobutadiene(*)	ND	460 U	400 U	440	690	490
4-Chloro-3-methylphenol	ND	460 U	400 U	380 U	380 U	380 U
2-Methylnaphthalene	41J	86 J	64 J	380 U	380 U	380 U
Hexachlorocyclopentadiene(*)	ND	460 U	400 U	380 U	380 U	380 U
2,4,6-Trichlorophenol	ND	86 J	400 U	380 U	380 U	380 U
2,4,5-Trichlorophenol(*)	ND	1100 U	1000 U	960 U	950 U	960 U
2-Chloronaphthalene	ND	460 U	400 U	380 U	380 U	380 U
2-Nitroaniline	ND	1100 U	1000 U	960 U	950 U	960 U
Dimethylphthalate	ND	460 U	400 U	380 U	380 U	380 U
Acenaphthylene	93J	460 U	400 U	380 U	380 U	380 U
2,6-Dinitrotoluene	ND	460 U	400 U	380 U	380 U	380 U
3-Nitroaniline	ND	1100 U	1000 U	960 U	950 U	960 U
Acenaphthene	ND	40 J	20 J	380 U	380 U	380 U
2,4-Dinitrophenol	ND	1100 U	1000 U	960 U	950 U	950 U
4-Nitrophenol	ND	1100 U	1000 U	960 U	950 U	950 U
Dibenzofuran	83J	49 J	19 J	360 U	380 U	380 U
2,4-Dinitrotoluene	ND	460 U	400 U	380 U	380 U	380 U
Diethylphthalate	ND	460 U	400 U	380 U	380 U	380 U
4-Chlorophenyl-phenylether	ND	460 U	400 U	380 U	380 U	380 U
Fluorene	38J	460 U	400 U	380 U	380 U	380 U
4-Nitroaniline	ND	1100 U	1000 U	960 U	950 U	960 U
4,6-Dinitro-2-methylphenol	ND	1100 U	1000 U	960 U	950 U	960 U
N-Nitrosodiphenylamine	ND	460 U	400 U	380 U	380 U	380 U
4-Bromophenyl-phenylether	ND	460 U	400 U	380 U	380 U	380 U
Hexachlorobenzene(*)	260J	2400	840	1000	1400	1200
Pentachlorophenol(**)	ND	1100 U	1000 U	960 U	950 U	960 U
Phenanthrene(**)	520J	660	260 J	60 J	50 J	45 J
Anthracene(**)	86J	140 J	69 J	380 U	380 U	380 U
Carbazole(**)	ND	76 J	63 J	380 U	380 U	380 U
Di-n-butylphthalate(**)	ND	460 U	400 U	34 J	59 J	55 J
Fluoranthene(**)	850	1100	540	110 J	220 J	160 J
Pyrene(**)	870J	930	440	110 J	450	380 J
Butylbenzylphthalate(**)	2900	460 U	400 U	380 U	380 U	380 U
3,3'-Dichlorobenzidine(**)	ND	470	210 J	78 J	260 J	130 J
Benzo(a)anthracene(**)	430J	590	310 J	67 J	260 J	180 J
Chrysene(**)	420J	640	400 J	79 J	290 J	210 J
bis(2-Ethylhexyl)phthalate(**)	1200J	460 U	400 U	380 U	170 BJ	120 BJ
Di-n-octylphthalate(**)	ND	460 U	400 U	380 U	380 U	380 U

Table 7
Preliminary Investigation
Water Treatment Plant - Eastern Area
Surface Soil - Semivolatile Organic Compounds
Niagara Falls, New York

	Location: Date Collected:	SS-1	SS-2	SS-3	SS-3 BLD DUP	SS-3 BLD DUP RE
		2/10/95	2/10/95	2/10/95	2/10/95	2/10/95
	Max. Conc. from Buffalo Ave. Site					
Benzo(b)fluoranthene(**)	530J	540	300 J	380 U	380 U	280 J
Benzo(k)fluoranthene(**)	360J	850	290 J	380 U	380 U	230 J
Benzo(a)pyrene(**)	740J	610	240 J	380 U	380 U	230 J
Indeno(1,2,3-cd)pyrene(**)	400J	360 J	130 J	380 U	380 U	380 U
Dibenz(a,h)anthracene(**)	120J	460 U	400 U	380 U	380 U	380 U
Benzo(g,h,i)perylene(**)	330J	370 J	120 J	380 U	380 U	380 U
1,3,5-Trichlorobenzene(*)		460 U	400 U	380 U	380 U	380 U
1,2,3-Trichlorobenzene(*)		27 J	400 U	380 U	380 U	26 J
1,2,4,5-Tetrachlorobenzene 1)(*)		140 J	60 J	49 J	300 J	310
1,2,3,4-Tetrachlorobenzene(*)		1000	270	550	3000	2200
Total "S" Area Indicator Parameter		3812	1354	2479	5390	4246
Total PAH Concentrations		7336	3372	538	1559	1900
Total TICs		12800 JN	2800 JN	5200 BJN	3800 JN	9400 JN
Total TICs in Blanks		40000 BJN	30000 BJN	30000 BJN	40000 BJN	30000 BJN

Notes: Concentration units in ug/kg (ppb).

J - Estimated value.

U - Not detected.

N - Spiked sample recovery not within control limits.

B - Analyte is found in the associated blank as well as in the sample.

ND - Not detected.

RE - The sample was reanalyzed due to a surrogate failer,
yielding the same results as the first analysis.

DL - Dilution.

TICs - Tentatively Identified Compounds.

Max Concentration Detected at Buffalo Avenue Site
(O'Brien & Gere, 1991a)

(*) - "S" Area Indicator Parameters.

(**) - Polynuclear Aromatic Hydrocarbons.

Table 7
Preliminary Investigation
Water Treatment Plant - Eastern Area
Surface Soil - Semivolatile Organic Compounds
Niagara Falls, New York

	Location:	SS-4	SS-5	SS-5 RE	SS-6	SS-6 RE
	Date Collected:	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95
	Max. Conc. from Buffalo Ave. Site					
Phenol	230J	390 U	410 U	410 U	400 U	400 U
bis(2-Chloroethyl)ether	ND	390 U	410 U	410 U	400 U	400 U
2-Chlorophenol	ND	390 U	410 U	410 U	400 U	400 U
1,3-Dichlorobenzene(*)	ND	390 U	410 U	410 U	400 U	400 U
1,4-Dichlorobenzene(*)	ND	390 U	410 U	410 U	400 U	400 U
1,2-Dichlorobenzene(*)	ND	390 U	410 U	410 U	400 U	400 U
2-Methylphenol	ND	390 U	410 U	410 U	400 U	400 U
2,2'-Oxybis(1-Chloropropane)	ND	390 U	410 U	410 U	400 U	400 U
4-Methylphenol	ND	390 U	410 U	410 U	400 U	400 U
N-Nitroso-di-n-propylamine	ND	390 U	410 U	410 U	400 U	400 U
Hexachloroethane	ND	390 U	410 U	410 U	400 U	400 U
Nitrobenzene	ND	390 U	410 U	410 U	400 U	400 U
Isophorone	ND	390 U	410 U	410 U	400 U	400 U
2-Nitrophenol	ND	390 U	410 U	410 U	400 U	400 U
2,4-Dichlorophenol	ND	390 U	410 U	410 U	400 U	400 U
bis(2-Chloroethoxy)methane	ND	390 U	410 U	410 U	400 U	400 U
2,4-Dichlorophenol	ND	390 U	410 U	410 U	400 U	400 U
1,2,4-Trichlorobenzene(*)	ND	390 U	410 U	410 U	400 U	400 U
Naphthalene	31J	54 J	45 J	40 J	400 U	400 U
4-Chloroaniline	ND	390 U	410 U	410 U	400 U	400 U
Hexachlorobutadiene(*)	ND	390 U	410 U	410 U	400 U	400 U
4-Chloro-3-methylphenol	ND	390 U	410 U	410 U	400 U	400 U
2-Methylnaphthalene	41J	45 J	44 J	37 J	400 U	400 U
Hexachlorocyclopentadiene(*)	ND	390 U	410 U	410 U	400 U	400 U
2,4,6-Trichlorophenol	ND	390 U	410 U	410 U	400 U	400 U
2,4,5-Trichlorophenol(*)	ND	970 U	1000 U	1000 U	1000 U	1000 U
2-Chloronaphthalene	ND	390 U	410 U	410 U	400 U	400 U
2-Nitroaniline	ND	970 U	1000 U	1000 U	1000 U	1000 U
Dimethylphthalate	ND	390 U	410 U	410 U	400 U	400 U
Acenaphthylene	93J	390 U	410 U	410 U	400 U	400 U
2,6-Dinitrotoluene	ND	390 U	410 U	410 U	400 U	400 U
3-Nitroaniline	ND	970 U	1000 U	1000 U	1000 U	1000 U
Acenaphthene	NQ	390 U	43 J	40 J	400 U	400 U
2,4-Dinitrophenol	ND	970 U	1000 U	1000 U	1000 U	1000 U
4-Nitrophenol	ND	970 U	1000 U	1000 U	1000 U	1000 U
Dibenzofuran	83J	390 U	410 U	410 U	400 U	400 U
2,4-Dinitrotoluene	ND	390 U	410 U	410 U	400 U	400 U
Diethylphthalate	ND	390 U	410 U	410 U	400 U	400 U
4-Chlorophenyl-phenylether	ND	390 U	410 U	410 U	400 U	400 U
Fluorene	38J	390 U	410 U	410 U	400 U	400 U
4-Nitroaniline	ND	970 U	1000 U	1000 U	1000 U	1000 U
4,6-Dinitro-2-methylphenol	ND	970 U	1000 U	1000 U	1000 U	1000 U
N-Nitrosodiphenylamine	ND	390 U	410 U	410 U	400 U	400 U
4-Bromophenyl-phenylether	ND	390 U	410 U	410 U	400 U	400 U
Hexachlorobenzene(*)	260J	390 U	380 J	280 J	400 U	28 J
Pentachlorophenol(**)	ND	970 U	1000 U	1000 U	1000 U	1000 U
Phenanthrene(**)	520J	51 J	460	330 J	240 J	190 J
Anthracene(**)	86J	390 U	130 J	82 J	48 J	36 J
Carbazole(**)	ND	390 U	53 J	35 J	400 U	400 U
Di-n-butylphthalate(**)	ND	26 J	410 U	410 U	47 J	40 J
Fluoranthene(**)	850	58 J	750	440	320 J	220 J
Pyrene(**)	870J	42 J	900	760	360 J	340 J
Butylbenzylphthalate(**)	2900	390 U	410 U	410 U	400 U	400 U
3,3'-Dichlorobenzidine(**)	ND	390 U	310 J	170 J	120 J	72 J
Benzo(a)anthracene(**)	430J	30 J	450	320 J	180 J	130 J
Chrysene(**)	420J	41 J	480	340 J	190 J	150 J
bis(2-Ethylhexyl)phthalate(**)	1200J	78 BJ	410 U	120 BJ	150 BJ	400 U
Di-n-octylphthalate(**)	ND	390 U	410 U	410 U	400 U	400 U

Table 7
Preliminary Investigation
Water Treatment Plant - Eastern Area
Surface Soil - Semivolatile Organic Compounds
Niagara Falls, New York

	Location:	SS-4	SS-5	SS-5 RE	SS-6	SS-6 RE
	Date Collected:	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95
	Max. Conc. from Buffalo Ave. Site					
Benzo(b)fluoranthene(**)	530J	390 U	410 U	330 J	400 U	400 U
Benzo(k)fluoranthene(**)	360J	390 U	410 U	300 J	400 U	400 U
Benzo(a)pyrene(**)	740J	390 U	410 U	290 J	400 U	400 U
Indeno(1,2,3-cd)pyrene(**)	400J	390 U	410 U	410 U	400 U	400 U
Dibenz(a,h)anthracene(**)	120J	390 U	410 U	410 U	400 U	400 U
Benzo(g,h,i)perylene(**)	330J	390 U	410 U	410 U	400 U	400 U
1,3,5-Trichlorobenzene(*)		390 U	410 U	410 U	400 U	400 U
1,2,3-Trichlorobenzene(*)		390 U	410 U	410 U	400 U	400 U
1,2,4,5-Tetrachlorobenzene 1)(*)		390 U	33 J	39 J	400 U	400 U
1,2,3,4-Tetrachlorobenzene(*)		390 U	160 J	180 J	24 J	29 J
Total "S" Area Indicator Parameter		ND	573	499	24	
Total PAH Concentrations		248	3533	3397	1505	1178
Total TICs		200 J	400 J	800 JN	0	800 JN
Total TICs in Blanks		30000 BJN	40000 BJN	30000 BJN	30000 BJN	20000 BJN

Notes: Concentration units in ug/kg (ppb).

J - Estimated value.

U - Not detected.

N - Spiked sample recovery not within control limits.

B - Analyte is found in the associated blank as well as in the sample.

ND - Not detected.

RE - The sample was reanalyzed due to a surrogate failer,
yielding the same results as the first analysis.

DL - Dilution.

TICs - Tentatively Identified Compounds.

Max Concentration Detected at Buffalo Avenue Site
(O'Brien & Gere, 1991a)

(*) - "S" Area Indicator Parameters.

(**) - Polynuclear Aromatic Hydrocarbons.

Table 8
Preliminary Investigation
Water Treatment Plant - Eastern Area
Surface Soil - PCB/Pesticides
Niagara Falls, New York

	Location:	SS-1	SS-1 DL	SS-2 DL	SS-2 DL	SS-3	SS-3
	Date Collected:	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95	BLD DUP
	Max Conc. from						
	Buffalo Ave. Site						
alpha-BHC	ND	15	15 J	390 EP	410 J	1.9 U	3 P
beta-BHC	ND	52 EP	88 P	540 E	670	10 P	20 P
delta-BHC	ND	2.3 U	27 P	15 JP	610 U	1.9 U	1.9 U
Lindane	ND	2.3 U	23 UB	28 BP	31 BJ	1.9 U	1.9 U
Heptachlor	ND	4 BP	23 UB	20 UB	610 UB	1.9 UB	2.4 BP
Aldrin	ND	2.3 U	23 U	20 U	610 U	1.9 U	1.9 U
Heptachlor epoxide	59.0	2.3 U	23 U	20 U	610 U	1.9 U	1.9 U
Endosulfan I	ND	2.3 U	23 U	20 U	610 U	2.7 P	1.2 JP
Dieldrin	ND	9.9	14 BJ	41 U	1200 U	3.8 U	3.8 U
4,4'-DDE	ND	14 P	22 BJP	17 BJP	1200 UB	2.7 JP	6.4 P
Endrin	ND	4.6 U	46 UB	41 U	1200 U	3.8 U	3.8 U
Endosulfan II	ND	4.6 UB	46 UB	41 UB	1200 UB	3.8 UB	3.8 UB
4,4'-DDD	ND	4.6 U	46 UP	41 UB	1200 UB	3.8 U	3.8 U
Endosulfan sulfate	ND	30 BP	55 BP	16 BJP	27 BJP	8 BP	8.7 BP
4,4'-DDT	ND	4.6 UB	330 BP	75 BP	98 BJ	32 BP	51 BP
Methoxychlor	ND	23 UB	230 U	200 U	6100 U	19 UB	19 UB
Endrin ketone	ND	4.6 UB	46 UB	41 UB	1200 UB	3.8 UB	3.8 UB
Endrin aldehyde	ND	4.6 U	46 UB	41 UB	1200 UB	3.8 U	3.8 U
A-Chlordane	ND	2.3 UB	23 UB	20 UB	610 UB	0.74 BJP	1.9 UB
G-Chlordane	ND	2.3 U	3.9 JP	20 U	610 U	1.3 JP	2.4 P
Toxaphene	ND	230 U	2300 U	2000 U	61000 U	190 U	190 U
PCB-1016	ND	46 U	460 U	410 U	12000 U	38 U	38 U
PCB-1221	ND	91 U	910 U	810 U	24000 U	77 U	79 U
PCB-1232	ND	46 U	460 U	410 U	12000 U	38 U	38 U
PCB-1242	ND	46 U	460 U	410 U	12000 U	38 U	38 U
PCB-1248	ND	46 U	460 U	410 U	12000 U	38 U	38 U
PCB-1254	ND	46 U	460 U	410 U	12000 U	38 U	38 U
PCB-1260	ND	46 U	460 U	410 U	12000 U	38 U	38 U

Notes: Concentration units in ug/kg (ppb).

J - Estimated value.

U - Not detected.

N - Spiked sample recovery not within control limits.

B - Analyte is found in the associated blank as well as in the sample.

P - Analyzed by ICP techniques.

E - The flag identifies compounds whose concentrations exceed the calibration range of the GC/MS instrument for that specific analysis.

DL - Dilution.

ND - Not detected.

Maximum Concentration Detected at the De-listed Buffalo Avenue Site (O'Brien & Gere, 1991a).

Table 8
Preliminary Investigation
Water Treatment Plant - Eastern Area
Surface Soil - PCB/Pesticides
Niagara Falls, New York

	Location:	SS-4	SS-5	SS-5 DL	SS-6
	Date Collected:	2/10/95	2/10/95	2/10/95	2/10/95
	Max Conc. from Buffalo Ave. Site				
alpha-BHC	ND	0.69 J	2 U	20 U	0.36 JP
beta-BHC	ND	0.72 J	34 EP	56 P	3.8
delta-BHC	ND	1.9 U	2 U	5.7 JP	2 U
Lindane	ND	1.9 U	2 U	20 UB	0.22 JP
Heptachlor	ND	0.17 BJP	2 UB	20 UB	0.3 BJP
Aldrin	ND	1.9 U	2 U	20 U	2 U
Heptachlor epoxide	59.0	1.9 U	0.62 JP	20 U	1.6 J
Endosulfan I	ND	1.9 U	2 U	20 U	2 U
Dieldrin	ND	3.9 U	4.1 U	41 U	0.21 JP
4,4'-DDE	ND	3.9 U	4.1 U	3.8 BJP	4 U
Endrin	ND	3.9 U	4.1 U	41 U	4 U
Endosulfan II	ND	3.9 UB	4.1 UB	2.8 BJP	4 UB
4,4'-DDD	ND	3.9 U	4.1 U	41 UB	0.12 JP
Endosulfan sulfate	ND	3.9 UB	1.8 BJP	41 UB	0.97 BJP
4,4'-DDT	ND	3.9 UB	2.3 BJP	12 BJP	1.3 BJP
Methoxychlor	ND	19 UB	20 UB	200 U	1.6 BJP
Endrin ketone	ND	3.9 UB	4.1 UB	41 UB	4 UB
Endrin aldehyde	ND	3.9 U	4.1 U	41 UB	4 U
A-Chlordane	ND	1.9 UB	0.42 BJP	20 UB	0.67 BJP
G-Chlordane	ND	1.9 U	2 U	20 U	2 U
Toxaphene	ND	190 U	200 U	2000 U	200 U
PCB-1016	ND	39 U	41 U	410 U	40 U
PCB-1221	ND	78 U	81 U	810 U	80 U
PCB-1232	ND	39 U	41 U	410 U	40 U
PCB-1242	ND	39 U	41 U	410 U	40 U
PCB-1248	ND	39 U	41 U	410 U	40 U
PCB-1254	ND	39 U	41 U	410 U	40 U
PCB-1260	ND	39 U	41 U	410 U	40 U

Notes: Concentration units in ug/kg (ppb).

J - Estimated value.

U - Not detected.

N - Spiked sample recovery not within control limits.

B - Analyte is found in the associated blank as well as in the sample.

P - Analyzed by ICP techniques.

E - The flag identifies compounds whose concentrations exceed the calibration range of the GC/MS instrument for that specific analysis.

DL - Dilution.

ND - Not detected.

Maximum Concentration Detected at the De-listed Buffalo Avenue Site (O'Brien & Gere, 1991a).

Table 9
Preliminary Investigation
Water Treatment Plant - Eastern Area
Surface Soil - Inorganics
Niagara Falls, New York

	Location: SS-1		SS-2		SS-3		SS-3 BLD DUP		SS-4	
	Date Collected: 2/10/95		2/10/95		2/10/95		2/10/95		2/10/95	
	Max Conc. From Buffalo Ave. Site	Typical Range								
Aluminum	19200	1000-25000	5410	P	11300	P	6600	P	5550	P
Antimony	ND	—	1.8	BNP	0.45	BNP	1.1	BNP	1	BNP
Arsenic	8.2	3 - 12	6.1	P	4.3	P	3.4	P	2	BP
Barium	156	15 - 600	194	P	133	P	103	P	62.5	P
Beryllium	ND	0 - 1.75	0.59	BP	0.67	BP	0.46	BP	0.36	BP
Cadmium	ND	0.01 - 2.0	0.14	UP	0.31	BP	0.12	UP	0.18	BP
Calcium	143000	130 - 35000	31100	P	56900	P	73000	P	94500	P
Chromium	87.9	1.5 - 40	25.1	EP	18.6	EP	16.3	EP	10.3	EP
Cobalt	15.7	2.5 - 60	4.5	BP	10	BP	6.5	BP	5.8	BP
Copper	28.7	<1 - 15	40.9	P	31.5	P	30.5	P	22	P
Iron	37200	17500 - 25000	12500	P	20600	P	14200	P	11000	P
Lead	449	1 - 12.5	60.1	P*	37	P*	54.7	P*	38.5	P*
Magnesium	62800	2500 - 6000	11600	P*	19700	P*	31100	P*	42300	P*
Manganese	ND	50 - 5000	385	P	504	P	387	P	466	P
Mercury	0.54	0.042 - 0.066	1.8	NCV*	0.84	NCV*	0.54	NCV*	4.1	NCV*
Nickel	44.4	0.5 - 25	12.9	P	24.4	P	16.3	P	13.6	P
Potassium	7100	8500 - 43000	1360	BEP	2990	EP	1990	EP	1730	EP
Selenium	ND	<0.1 - 0.125	0.82	UP	0.73	UP	0.69	UP	0.69	UP
Silver	ND		0.27	UP	0.24	UP	0.23	UP	0.23	UP
Sodium	ND	6000 - 8000	2820	EP	419	BEP	443	BEP	519	BEP
Thallium	ND	—	0.82	UP	0.73	UP	0.69	UP	0.69	UP
Vanadium	30.7	25 - 60	10.7	BP	22.3	P	15.3	P	11.6	P
Zinc	470	37 - 60	113	P	149	P	130	P	127	P
Cyanide	ND	—	0.68	UC	1.4	C	0.58	UC	0.57	UC
% Total Solids			73.1		82.4		86.7		87.4	

Notes:

Concentration units in ug/kg (ppb).

J - Estimated value.

U - The analyte was analyzed for but not detected.

N - Spiked sample recovery not within control limits.

B - The reported value is greater than or equal to the Instrument Detection Limit (IDL) but less than the Contract Required Detection Limit (CRDL).

P - Analyzed by ICP techniques.

E - The report value is estimated due to the presence of interference.

N - Spiked sample recovery not within control limits.

C - Analyzed by Manual Apectrophotometric techniques.

CV - Manual Cold Vapor AA.

ND - Not detected.

* - Duplicate analysis not within control limits.

-Maximum Concentration Detected in De-listed Portion of Buffalo Avenue Site.

-Typical Range from New York State (Bowen, 1979, Shacklette and Boergen, 1984, Shacklette et al 1971 and Walsh 1978).

Table 9
Preliminary Investigation
Water Treatment Plant - Eastern Area
Surface Soil - Inorganics
Niagara Falls, New York

	Location: SS-5		SS-6	
	Date Collected: 2/10/95		2/10/95	
	Max Conc. From Buffalo Ave. Site	Typical Range		
Aluminum	19200	1000-25000	12600 P	8250 P
Antimony	ND	—	2.4 BNP	1.5 BNP
Arsenic	8.2	3 - 12	5.7 P	4.3 P
Barium	156	15 - 600	175 P	90.3 P
Beryllium	ND	0 - 1.75	0.74 BP	0.51 BP
Cadmium	ND	0.01 - 2.0	0.23 BP	0.41 BP
Calcium	143000	130 - 35000	57800 P	59800 P
Chromium	87.9	1.5 - 40	32 EP	21.7 EP
Cobalt	15.7	2.5 - 60	10.5 BP	7.1 BP
Copper	28.7	<1 - 15	97.1 P	30.5 P
Iron	37200	17500 - 25000	24600 P	16000 P
Lead	449	1 - 12.5	161 P*	68.3 P*
Magnesium	62800	2500 - 6000	17000 P*	25500 P*
Manganese	ND	50 - 5000	464 P	592 P
Mercury	0.54	0.042 - 0.066	4.7 NCV*	2.6 NCV*
Nickel	44.4	0.5 - 25	30 P	17.2 P
Potassium	7100	8500 - 43000	3440 EP	1940 EP
Selenium	ND	<0.1 - 0.125	0.73 P	0.72 UP
Silver	ND		0.24 UP	0.24 UP
Sodium	ND	6000 - 8000	587 BEP	334 BEP
Thallium	ND	—	0.73 UP	0.72 UP
Vanadium	30.7	25 - 60	26.6 P	18.5 P
Zinc	470	37 - 60	264 P	208 P
Cyanide	ND	—	0.61 UC	0.62 C
% Total Solids			81.8	83.2

Notes:

Concentration units in ug/kg (ppb).

J - Estimated value.

U - The analyte was analyzed for but not detected.

N - Spiked sample recovery not within control limits.

B - The reported value is greater than or equal
to the Instrument Detection Limit (IDL)
but less than the Contract Required
Detection Limit (CRDL).

P - Analyzed by ICP techniques.

E - The report value is estimated due to the
presence of interference.

N - Spiked sample recovery not within control
limits.

C - Analyzed by Manual Apectrophotometric
techniques.

CV - Manual Cold Vapor AA.

ND - Not detected.

* - Duplicate analysis not within control
limits.

-Maximum Concentration Detected in De-listed
Portion of Buffalo Avenue Site.

-Typical Range from New York State (Bowen,
1979, Shacklette and Boergen, 1984,
Shacklette et al 1971 and Walsh 1978).

Table 10
Preliminary Investigation
Water Treatment Plant - Eastern Area
One Acre Parcel - Surface and Subsurface Soil - Lead Concentrations
Niagara Falls, New York

Subsurface Soils							
Location:	SB-33	SB-33	SB-33A	SB-33B	SB-33C	SB-33D	SB-33E
Date Collected:	5/15/91	5/15/91	10/14/91	10/14/91	10/14/91	10/14/91	10/14/91
Depth:	2-4'	4-7'	4-7'	4-8'	6-10'	4-8'	4-8'
Lead (mg/Kg)	121 J	1510	41	32	36	330	320
TCLP Lead (mg/L)	0.018	0.66	0.5 U	0.5 U	0.5 U	1.6	0.5 U
EPTOX Lead (mg/L)	0.16	39.1	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Surface Soils							
Location:	SB-33F	SB-33G	SB-33H	SB-33I	SB-33I BLD DUP	SB-33J	SB-33K
Date Collected:	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95
Depth:	0-2'	0-2'	0-2'	0-2'	0-2'	0-2'	0-2'
Lead (mg/Kg)	52.7	151	294	302	318	527	115
TCLP Lead (mg/L)	0.5	21	2	0.5 U	0.8	0.7	0.5 U
EPTOX Lead (mg/L)	NA	NA	NA	NA	NA	NA	NA

Note: U - Not detected.
NA - Not Analyzed.

Table 11
Preliminary Investigation
Water Treatment Plant - Eastern Area
One-Acre Parcel - Subsurface Soil - Volatile Organic Compounds
Niagara Falls, New York

	Location:	SB-7A	SB-7B	SB-7C	SB-7D	SB-7E	SB-7E BLD DUP	QCTRPBLK
	Date Collected:	2/9/95	2/9/95	2/10/95	2/10/95	2/10/95	2/10/95	---
	Depth:	10-12'	10-12'	8-10'	8-10'	8-10'	8-10'	---
	Max Conc. from Buffalo Ave. Site							
Chloromethane	ND	12 U	13 U	13 U	12 U	13 U	15 U	10 U
Bromomethane	ND	12 U	13 U	13 U	12 U	13 U	15 U	10 U
Vinyl chloride	ND	12 U	13 U	13 U	12 U	13 U	15 U	10 U
Chloroethane	25	12 U	13 U	13 U	12 U	13 U	15 U	10 U
Methylene chloride	25	2 BJ	5 BJ	3 J	2 BJ	3 J	4 J	10 U
Acetone	ND	19	36	58	34	39	150	10 U
Carbon disulfide	2	12 U	3 J	4 J	7 J	2 J	38	10 U
1,1-Dichloroethene	ND	12 U	13 U	13 U	12 U	13 U	15 U	10 U
1,1-Dichloroethane	ND	12 U	13 U	13 U	12 U	13 U	15 U	10 U
1,2-Dichloroethene (total)	4	12 U	13 U	13 U	12 U	2 J	2 J	10 U
Chloroform	2	12 U	0.7 J	13 U	1 J	45	8 J	10 U
1,2-Dichloroethane	ND	12 U	13 U	13 U	12 U	13 U	15 U	10 U
2-Butanone	34	4 BJ	0.8 BJ	11 BJ	9 BJ	8 BJ	28	10 U
1,1,1-Trichloroethane	ND	12 U	2 J	13 U	1 J	13 U	15 U	10 U
Carbon tetrachloride	ND	12 U	13 U	13 U	12 U	13 U	15 U	10 U
1,1-Dichloroethane	ND	12 U	13 U	13 U	12 U	13 U	15 U	10 U
1,2-Dichloropropane	ND	12 U	13 U	13 U	12 U	13 U	15 U	10 U
cis-1,3-Dichloropropene	ND	12 U	13 U	13 U	12 U	13 U	15 U	10 U
1,1-Dichloroethene	10	12 U	13 U	13 U	12 U	10 J	2 J	10 U
Bromochloromethane	ND	12 U	13 U	13 U	12 U	13 U	15 U	10 U
1,1,2-Trichloroethane	ND	12 U	13 U	13 U	12 U	13 U	15 U	10 U
Benzene	1	12 U	13 U	74	0.9 J	13 U	1 J	10 U
trans-1,3-Dichloropropene	ND	12 U	13 U	2 J	12 U	13 U	15 U	10 U
Chloroform	ND	12 U	13 U	13 U	12 U	13 U	15 U	10 U
Methyl-2-pentanone	ND	12 U	13 U	13 U	12 U	13 U	15 U	10 U
2-Hexanone	ND	12 U	13 U	13 U	12 U	13 U	15 U	10 U
Tetrachloroethene	3	12 U	13 U	13 U	12 U	18	6 J	10 U
1,2,2-Tetrachloroethane	2	12 U	13 U	13 U	12 U	13 U	15 U	10 U
Toluene	7	12 U	4 J	140	2 J	3 J	6 J	10 U
Chlorobenzene	8	12 U	13 U	6 J	5 J	12 J	160	10 U
Ethylbenzene	0.3	12 U	13 U	18	12 U	13 U	15 U	10 U
Xyrene	ND	12 U	13 U	23	12 U	13 U	15 U	10 U
Arenes (total)	5	12 U	13 U	170	2 J	6 J	9 J	10 U
Total VOCs		ND	9.7	437	18.9	96	260	
Total TICs		ND	ND	150 JN	60 JN	ND	1010 JN	60 JN

Notes: Concentration units in ug/kg (ppb).

J - Estimated value.

U - Not detected.

N - Spiked sample recovery not within control limits.

B - Analyte is found in the associated blank as well as in the sample.

ND - Not detected.

Maximum Concentration Detected at De-listed Buffalo Avenue Site (O'Brien & Gere, 1991a).

Table 12
Preliminary Investigation
Water Treatment Plant - Eastern Area
One-Acre Parcel - Subsurface Soil Semivolatile Organic Compounds
Niagara Falls, New York

	Location:	SB-7A	SB-7A RE	SB-7B	SB-7B RE	SB-7C	SB-7C RE
	Date Collected:	2/9/95	2/9/95	2/9/95	2/9/95	2/10/95	2/10/95
	Depth:	10-12'	10-12'	10-12'	10-12'	8-10'	8-10'
Phenol		410 U	420 U	420 U	420 U	2900 J	13000 U
bis(2-Chloroethyl)ether		410 U	420 U	420 U	420 U	13000 U	13000 U
2-Chlorophenol		410 U	420 U	420 U	420 U	13000 U	13000 U
1,3-Dichlorobenzene(*)		410 U	420 U	420 U	420 U	13000 U	13000 U
1,4-Dichlorobenzene(*)		410 U	420 U	420 U	420 U	13000 U	13000 U
1,2-Dichlorobenzene(*)		410 U	420 U	420 U	420 U	13000 U	13000 U
2-Methylphenol		410 U	420 U	420 U	420 U	3700 J	13000 U
2,2'-Oxybis(1-Chloropropane)		410 U	420 U	420 U	420 U	13000 U	13000 U
4-Methylphenol		410 U	420 U	420 U	420 U	7400 J	5600 J
N-Nitroso-di-n-propylamine		410 U	420 U	420 U	420 U	13000 U	13000 U
Hexachloroethane		410 U	420 U	420 U	420 U	13000 U	13000 U
Nitrobenzene		410 U	420 U	420 U	420 U	13000 U	13000 U
Isophorone		410 U	420 U	420 U	420 U	13000 U	13000 U
2-Nitrophenol		410 U	420 U	420 U	420 U	13000 U	13000 U
2,4-Dichlorophenol		410 U	420 U	420 U	420 U	7200 J	5800 J
bis(2-Chloroethoxy)methane		410 U	420 U	420 U	420 U	13000 U	13000 U
2,4-Dichlorophenol		410 U	420 U	420 U	420 U	13000 U	13000 U
1,2,4-Trichlorobenzene(*)		410 U	420 U	420 U	420 U	13000 U	13000 U
Naphthalene		59 J	46 J	77 J	59 J	4700 J	3100 J
4-Chloroaniline		410 U	420 U	420 U	420 U	13000 U	13000 U
Hexachlorobutadiene(*)		410 U	420 U	420 U	420 U	13000 U	13000 U
4-Chloro-3-methylphenol		410 U	420 U	420 U	420 U	13000 U	13000 U
2-Methylnaphthalene		63 J	48 J	120 J	86 J	7700 J	5500 J
Hexachlorocyclopentadiene(*)		410 U	420 U	420 U	420 U	13000 U	13000 U
2,4,6-Trichlorophenol		410 U	420 U	420 U	420 U	13000 U	13000 U
2,4,5-Trichlorophenol(*)		1000 U	1000 U	1100 U	1100 U	32000 U	32000 U
2-Chloronaphthalene		410 U	420 U	420 U	420 U	13000 U	13000 U
2-Nitroaniline		1000 U	1000 U	1100 U	1100 U	32000 U	32000 U
Dimethylphthalate		410 U	420 U	420 U	420 U	13000 U	13000 U
Acenaphthylene		410 U	420 U	420 U	420 U	7200 J	5700 J
2,6-Dinitrotoluene		410 U	420 U	420 U	420 U	13000 U	13000 U
3-Nitroaniline		1000 U	1000 U	1100 U	1100 U	32000 U	32000 U
Acenaphthene		410 U	420 U	420 U	420 U	13000 U	13000 U
2,4-Dinitrophenol		1000 U	1000 U	1100 U	1100 U	32000 U	32000 U
4-Nitrophenol		1000 U	1000 U	1100 U	1100 U	32000 U	32000 U
Dibenzofuran		410 U	28 J	38 J	420 U	5400 J	4100 J
2,4-Dinitrotoluene		410 U	420 U	420 U	420 U	13000 U	13000 U
Diethylphthalate		410 U	420 U	420 U	420 U	13000 U	13000 U
4-Chlorophenyl-phenylether		410 U	420 U	420 U	420 U	13000 U	13000 U
Fluorene		410 U	420 U	420 U	420 U	13000 U	13000 U
4-Nitroaniline		1000 U	1000 U	1100 U	1100 U	32000 U	32000 U
4,6-Dinitro-2-methylphenol		1000 U	1000 U	1100 U	1100 U	32000 U	32000 U
N-Nitrosodiphenylamine		410 U	420 U	420 U	420 U	13000 U	13000 U
4-Bromophenyl-phenylether		410 U	420 U	420 U	420 U	13000 U	13000 U
Hexachlorobenzene(*)		410 U	420 U	420 U	420 U	13000 U	13000 U
Pentachlorophenol		1000 U	1000 U	1100 U	1100 U	32000 U	32000 U
Phenanthrene(**)		270	210 J	160 J	130 J	28000	21000
Anthracene(**)		71 J	47 J	29 J	25 J	14000	11000 J
Carbazole(**)		410 U	420 U	420 U	420 U	6400 J	4000 J
Di-n-butylphthalate(**)		42 J	37 J	420 U	47 J	13000 U	13000 U
Fluoranthene(**)		340 J	240 J	140 J	99 J	20000	12000 J
Pyrene(**)		380 J	360 J	180 J	160 J	17000	18000
Butylbenzylphthalate(**)		410 U	420 U	420 U	420 U	13000 U	13000 U
3,3'-Dichlorobenzidine(**)		250 J	420 U	420 U	420 U	6700 J	3600 J
Benzo(a)anthracene(**)		260 J	190 J	110 J	73 J	15000	12000 J
Chrysene(**)		290 J	190 J	140 J	96 J	12000 J	9400 J
bis(2-Ethylhexyl)phthalate(**)		150 BJ	130 BJ	420 U	240 BJ	13000 U	3200 BJ
Di-n-octylphthalate(**)		410 U	420 U	420 U	420 U	13000 U	13000 U

Table 12
Preliminary Investigation
Water Treatment Plant - Eastern Area
One-Acre Parcel - Subsurface Soil Semivolatile Organic Compounds
Niagara Falls, New York

Location:	SB-7A	SB-7A RE	SB-7B	SB-7B RE	SB-7C	SB-7C RE
Date Collected:	2/9/95	2/9/95	2/9/95	2/9/95	2/10/95	2/10/95
Depth:	10-12'	10-12'	10-12'	10-12'	8-10'	8-10'
Benzo(b)fluoranthene(**)	410 U	260 J	420 U	420 U	13000 U	13000 U
Benzo(k)fluoranthene(**)	410 U	230 J	420 U	420 U	13000 U	13000 U
Benzo(a)pyrene(**)	410 U	250 J	420 U	420 U	13000 U	13000 U
Indeno(1,2,3-cd)pyrene(**)	410 U	170 J	420 U	420 U	13000 U	13000 U
Dibenz(a,h)anthracene(**)	410 U	420 U	420 U	420 U	13000 U	13000 U
Benzo(g,h,i)perylene(**)	410 U	420 U	420 U	420 U	13000 U	13000 U
1,3,5-Trichlorobenzene(*)	420 U	420 U	420 U	420 U	13000 U	13000 U
1,2,3-Trichlorobenzene(*)	420 U	420 U	420 U	420 U	13000 U	13000 U
1,2,4,5-Tetrachlorobenzene(*)	420 U	420 U	420 U	420 U	13000 U	13000 U
1,2,3,4-Tetrachlorobenzene(*)	420 U	420 U	420 U	420 U	13000 U	13000 U
Total "S" Area Indicator Parameters.	ND	ND	ND	ND	ND	ND
Total PAH Concentrations	1903	2184	759	630	119100	91000
Total TICs	700 J	500 J	3800 J	8200 JN	266000 JN	300000 J
Total TICs in Blanks	40000 BJN	30000 BJN	30000 BJN	20000 BJN	20000 BJN	20000 BJN

Notes: Concentration units in ug/kg (ppb).
J - Estimated value.
U - Not detected.
N - Spiked sample recovery not within control limits.
B - Analyte is found in the associated blank as well as in the sample.
E - Identifies compounds whose concentrations exceed the calibration range of the GC/MS instrument for that specific analysis.
D - Identifies all compounds identified in an analysis at a secondary dilution factor.
ND - Not detected.
DL - Dilution
RE - The sample was reanalyzed due to a surrogate failer, yielding the same results as the first analysis.
TICs - Tentatively Identified Compounds.
(*) - "S" Area indicator Parameters.
(**) - Polynuclear Aromatic Hydrocarbons.

Table 12
Preliminary Investigation
Water Treatment Plant - Eastern Area
One-Acre Parcel - Subsurface Soil Semivolatile Organic Compounds
Niagara Falls, New York

Location:	SB-7D	SB-7D DL	SB-7E	SB-7E DL	SB-7E BLD DUP	SB-7E BLD DUP RE
Date Collected:	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95
Depth:	8-10'	8-10'	8-10'	8-10'	8-10'	8-10'
Phenol	120000 U	120000 U	450 U	4500 U	500 U	500 U
bis(2-Chloroethyl)ether	120000 U	120000 U	450 U	4500 U	500 U	500 U
2-Chlorophenol	120000 U	120000 U	450 U	4500 U	500 U	500 U
1,3-Dichlorobenzene(*)	2400 J	120000 U	450 U	4500 U	500 U	500 U
1,4-Dichlorobenzene(*)	1000 J	120000 U	2700	1600 JD	870	550
1,2-Dichlorobenzene(*)	120000 U	120000 U	450 U	4500 U	2300	1500
2-Methylphenol	120000 U	120000 U	450 U	4500 U	500 U	500 U
2,2'-Oxybis(1-Chloropropane)	120000 U	120000 U	450 U	4500 U	500 U	500 U
4-Methylphenol	120000 U	120000 U	450 U	4500 U	500 U	500 U
N-Nitroso-di-n-propylamine	120000 U	120000 U	450 U	4500 U	500 U	500 U
Hexachloroethane	120000 U	120000 U	450 U	4500 U	500 U	500 U
Nitrobenzene	120000 U	120000 U	450 U	4500 U	500 U	500 U
Isophorone	120000 U	120000 U	450 U	4500 U	500 U	500 U
2-Nitrophenol	120000 U	120000 U	450 U	4500 U	500 U	500 U
2,4-Dichlorophenol	120000 U	120000 U	450 U	4500 U	500 U	500 U
bis(2-Chloroethoxy)methane	120000 U	120000 U	450 U	4500 U	500 U	500 U
2,4-Dichlorophenol	120000 U	120000 U	450 U	4500 U	500 U	500 U
1,2,4-Trichlorobenzene(*)	120000 U	120000 U	940	690 JD	500 U	82 J
Naphthalene	11000 J	6400 JD	560	360 JD	99 J	75 J
4-Chloroaniline	120000 U	120000 U	450 U	4500 U	500 U	21 J
Hexachlorobutadiene(*)	120000 U	120000 U	450 U	4500 U	500 U	500 U
4-Chloro-3-methylphenol	120000 U	120000 U	450 U	4500 U	500 U	500 U
2-Methylnaphthalene	4300 J	120000 U	520	350 JD	500 U	38 J
Hexachlorocyclopentadiene(*)	120000 U	120000 U	450 U	4500 U	500 U	500 U
2,4,6-Trichlorophenol	120000 U	120000 U	450 U	4500 U	500 U	500 U
2,4,5-Trichlorophenol(*)	310000 U	310000 U	1100 U	11000 U	1200 U	1200 U
2-Chloronaphthalene	120000 U	120000 U	120 J	4500 U	500 U	500 U
2-Nitroaniline	310000 U	310000 U	1100 U	11000 U	1200 U	1200 U
Dimethylphthalate	120000 U	120000 U	450 U	4500 U	500 U	500 U
Acenaphthylene	120000 U	120000 U	450 U	150 JD	140 J	90 J
2,6-Dinitrotoluene	120000 U	120000 U	450 U	4500 U	500 U	500 U
3-Nitroaniline	310000 U	310000 U	1100 U	11000 U	1200 U	1200 U
Acenaphthene	9600 J	6500 JD	450 U	4500 U	500 U	50 J
2,4-Dinitrophenol	310000 U	310000 U	1100 U	11000 U	1200 U	1200 U
4-Nitrophenol	310000 U	310000 U	1100 U	11000 U	1200 U	1200 U
Dibenzofuran	4800 J	120000 U	330 J	190 JD	75 J	62 J
2,4-Dinitrotoluene	120000 U	120000 U	450 U	4500 U	500 U	220 J
Diethylphthalate	120000 U	120000 U	450 U	4500 U	500 U	500 U
4-Chlorophenyl-phenylether	120000 U	120000 U	450 U	4500 U	500 U	500 U
Fluorene	8300 J	120000 U	450 U	4500 U	500 U	85 J
4-Nitroaniline	310000 U	310000 U	1100 U	11000 U	1200 U	1200 U
4,6-Dinitro-2-methylphenol	310000 U	310000 U	1100 U	11000 U	1200 U	1200 U
N-Nitrosodiphenylamine	120000 U	120000 U	450 U	4500 U	500 U	500 U
4-Bromophenyl-phenylether	120000 U	120000 U	450 U	4500 U	500 U	500 U
Hexachlorobenzene(*)	120000 U	120000 U	450 U	4500 U	500 U	500 U
Pentachlorophenol	310000 U	310000 U	1100 U	11000 U	1200 U	1200 U
Phenanthrene(**)	90000	71000 JD	2800	2200 JD	1000	710
Anthracene(**)	28000	19000 JD	570	440 JD	300 J	200 J
Carbazole(**)	27000	16000 JD	310 J	220 JD	190 J	120 J
Di-n-butylphthalate(**)	120000 U	120000 U	450 U	4500 U	500 U	39 J
Fluoranthene(**)	140000 E	150000 D	4100 E	4400 JD	2400	1400
Pyrene(**)	210000 E	99000 JD	6200 E	2900 JD	3000	4800
Butylbenzylphthalate(**)	120000 U	120000 U	450 U	210 JD	500 U	500 U
3,3'-Dichlorobenzidine(**)	91000	68000 JD	2500	1500 JD	1000	520
Benzo(a)anthracene(**)	140000 E	77000 JD	3300	1900 JD	1600	1000
Chrysene(**)	140000 E	80000 JD	3600	2000 JD	1500	1000
bis(2-Ethylhexyl)phthalate(**)	5400 BJ	120000 U	450 U	4500 U	500 U	190 BJ
Di-n-octylphthalate(**)	120000 U	120000 U	450 U	4500 U	500 U	500 U

Table 12
Preliminary Investigation
Water Treatment Plant - Eastern Area
One-Acre Parcel - Subsurface Soil Semivolatile Organic Compounds
Niagara Falls, New York

	Location:	SB-7D	SB-7D DL	SB-7E	SB-7E DL	SB-7E BLD DUP	SB-7E BLD DUP RE
	Date Collected:	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95	2/10/95
	Depth:	8-10'	8-10'	8-10'	8-10'	8-10'	8-10'
Benzo(b)fluoranthene(**)		93000	78000 JD	3000	2800 JD	1200	910
Benzo(k)fluoranthene(**)		130000 E	78000 JD	3000	1700 JD	1400	930
Benzo(a)pyrene(**)		120000 E	93000 JD	2800	2200 JD	1400	910
Indeno(1,2,3-cd)pyrene(**)		60000	41000 JD	450 U	1300 JD	500 U	550
Dibenz(a,h)anthracene(**)		120000 U	120000 U	450 U	4500 U	500 U	500 U
Benzo(g,h,i)perylene(**)		53000	35000 JD	450 U	1000 JD	500 U	550
1,3,5-Trichlorobenzene(*)		120000 U	120000 U	450 U	4500 U	500 U	500 U
1,2,3-Trichlorobenzene(*)		120000 U	120000 U	350 J	280 J	32 J	32 J
1,2,4,5-Tetrachlorobenzene(*)		120000 U	120000 U	90 J	4500 U	500 U	500 U
1,2,3,4-Tetrachlorobenzene(*)		120000 U	120000 U	200 J	4500 U	500 U	500 U
Total "S" Area Indicator Parameters.		3400	ND	4280	4280	3202	2164
Total PAH Concentrations		1019000	1019000	31690	31690	14990	13639
Total TICs		338900 JN	130000 J	57100 JN			1700 J
Total TICs in Blanks		20000 BJN		30000 BJN	500000 BJN	30000 BJN	30000 BJN

Notes: Concentration units in ug/kg (ppb).
J - Estimated value.
U - Not detected.
N - Spiked sample recovery not within control limits.
B - Analyte is found in the associated blank as well as in the sample.
E - Identifies compounds whose concentrations exceed the calibration range of the GC/MS instrument for that specific analysis.
D - Identifies all compounds identified in an analysis at a secondary dilution factor.
ND - Not detected.
DL - Dilution
RE - The sample was reanalyzed due to a surrogate failer, yielding the same results as the first analysis.
TICs - Tentatively Identified Compounds.
(*) - "S" Area indicator Parameters.

Table 13
Preliminary Investigation
Water Treatment Plant - Eastern Area
One-Acre Parcel - Subsurface Soil - PCB/Pesticides
Niagara Falls, New York

	Location:	SB-7A	SB-7B	SB-7C	SB-7D	SB-7E
	Date Collected:	2/9/95	2/9/95	2/10/95	2/10/95	2/10/95
	Depth:	10-12'	10-12'	8-10'	8-10'	8-10'
	Max Conc. from Buffalo Ave. Site					
alpha-BHC	ND	0.19 JP	0.38 JP	2.1 U	0.91 JP	2.3 U
beta-BHC	23.0	2.1 U	2.1 U	2.1 U	2.1 U	2.3 U
delta-BHC	ND	2.1 U	2.1 U	2.1 U	2.1 U	63 EP
Lindane	22.0	2.1 U	2.1 U	2.1 UB	2.1 UB	24 B
Heptachlor	6.7	2.1 UB	0.038 BJP	2.3 BP	2.1 UB	2.3 UB
Aldrin	11.0	2.1 U	2.1 U	2.1 U	2.1 U	2.3 U
Heptachlor epoxide	24.0	2.1 U	0.075 JP	2.1 U	2.1 U	2.3 U
Endosulfan I	ND	2.1 U	2.1 U	0.78 JP	2.1 U	2.3 U
Dieldrin	11.0	4.2 U	0.077 JP	1.2 JP	3.4 J	15 P
4,4'-DDE	19.0	4.2 U	4.2 UB	4.3 UB	4.1 UB	26 BP
Endrin	ND	4.2 U	4.2 U	4.3 U	4.1 U	4.5 U
Endosulfan II	ND	4.2 UB	0.43 BJP	4.3 UB	4.1 UB	39 BP
4,4'-DDD	16.0	4.2 U	0.074 BJP	1 BJ	1.2 BJP	29 B
Endosulfan sulfate	7.0	4.2 UB	4.2 UB	4.3 UB	4.1 UB	13 BP
4,4'-DDT	21.0	4.2 UB	1.1 BJP	1.6 BJP	4.1 UB	4.5 UB
Methoxychlor	ND	21 UB	21 U	28 P	21 U	23 U
Endrin ketone	ND	4.2 UB	4.2 UB	4.3 UB	3 BJP	4.5 UB
Endrin aldehyde	ND	4.2 U	4.2 UB	4.3 UB	4.1 UB	4.5 UB
A-Chlordane	ND	1.6 BJP	2.1 UB	2.1 UB	1.5 BJP	2.3 UB
G-Chlordane	ND	2.1 U	2.1 U	2.1 U	2.1 U	12 P
Toxaphene	ND	210 U	210 U	210 U	210 U	230 U
PCB-1016	ND	42 U	42 U	43 U	41 U	45 U
PCB-1221	ND	83 U	84 U	85 U	82 U	90 U
PCB-1232	ND	42 U	42 U	43 U	41 U	45 U
PCB-1242	ND	42 U	42 U	43 U	41 U	45 U
PCB-1248	ND	42 U	42 U	43 U	41 U	45 U
PCB-1254	ND	42 U	42 U	43 U	41 U	45 U
PCB-1260	ND	42 U	42 U	43 U	41 U	45 U

Notes: Concentration units in ug/kg (ppb).

J - Estimated value.

U - Not detected.

N - Spiked sample recovery not within control limits.

B - Analyte is found in the associated blank as well as in the sample.

P - Analyzed by ICP techniques.

E - The flag identifies compounds whose concentrations exceed the calibration range of the GC/MS instrument for that specific analysis.

ND - Not detected.

DL - Dilution.

Maximum Concentration Detected at De-listed Buffalo Avenue Site.
(O'Brien & Gere 1991a)

Table 13
Preliminary Investigation
Water Treatment Plant - Eastern Area
One-Acre Parcel - Subsurface Soil - PCB/Pesticides
Niagara Falls, New York

	Location: SB-7E DL	SB-7E
Date Collected:	2/10/95	BLD DUP
Depth:	8-10'	2/10/95
	8-10'	
	Max Conc. from Buffalo Ave. Site	
alpha-BHC	ND	23 U
beta-BHC	23.0	23 U
delta-BHC	ND	110
Lindane	22.0	20 JP
Heptachlor	6.7	23 UB
Aldrin	11.0	23 U
Heptachlor epoxide	24.0	23 U
Endosulfan I	ND	23 U
Dieldrin	11.0	21 JP
4,4'-DDE	19.0	36 JP
Endrin	ND	45 U
Endosulfan II	ND	56 BP
4,4'-DDD	16.0	42 J
Endosulfan sulfate	7.0	45 UB
4,4'-DDT	21.0	22 BJP
Methoxychlor	ND	230 UB
Endrin ketone	ND	45 UB
Endrin aldehyde	ND	45 U
A-Chlordane	ND	23 UB
G-Chlordane	ND	23 U
Toxaphene	ND	2300 U
PCB-1016	ND	450 U
PCB-1221	ND	900 U
PCB-1232	ND	450 U
PCB-1242	ND	450 U
PCB-1248	ND	450 U
PCB-1254	ND	450 U
PCB-1260	ND	450 U
		2.5 U
		2.5 U
		2.3 JP
		2.5 UB
		0.77 BJP
		2.5 U
		2.5 U
		9.8 P
		5 UB
		5 U
		5 UB
		4.8 BJP
		5 UB
		49 B
		25 U
		5 UB
		5 U
		1.6 BJP
		2.5 U
		250 U
		50 U
		100 U
		50 U
		50 U
		50 U
		50 U
		50 U

Notes: Concentration units in ug/kg (ppb).

J - Estimated value.

U - Not detected.

N - Spiked sample recovery not within control limits.

B - Analyte is found in the associated blank as well as in the sample.

P - Analyzed by ICP techniques.

E - The flag identifies compounds whose concentrations exceed the calibration range of the GC/MS instrument for that specific analysis.

ND - Not detected.

DL - Dilution.

Maximum Concentration Detected at De-listed Buffalo Avenue Site.
(O'Brien & Gere 1991a)

Table 14
Preliminary Investigation
Water treatment Plant - Eastern Area
One Acre Parcel - Subsurface Soil - Inorganics
Niagara Falls, New York

Location:			SB-7A	SB-7B	SB-7C	SB-7D	SB-7E	SB-7E BLD DUP
Date Collected:			2/9/95	2/9/95	2/10/95	2/10/95	2/10/95	2/10/95
Depth:			10-12'	10-12'	8-10'	8-10'	8-10'	8-10'
	Max. Conc. from Buffalo Ave. Site	Typical Range						
Chromium	708	1.5 - 40	13.4	10.3	16.1	42.8	14.2	29.3
Lead	928	1 - 12.5	19.1	40.7	246	292	77.2	132
% Total Solids			80.4	79.0	78.2	81.2	74.1	66.7

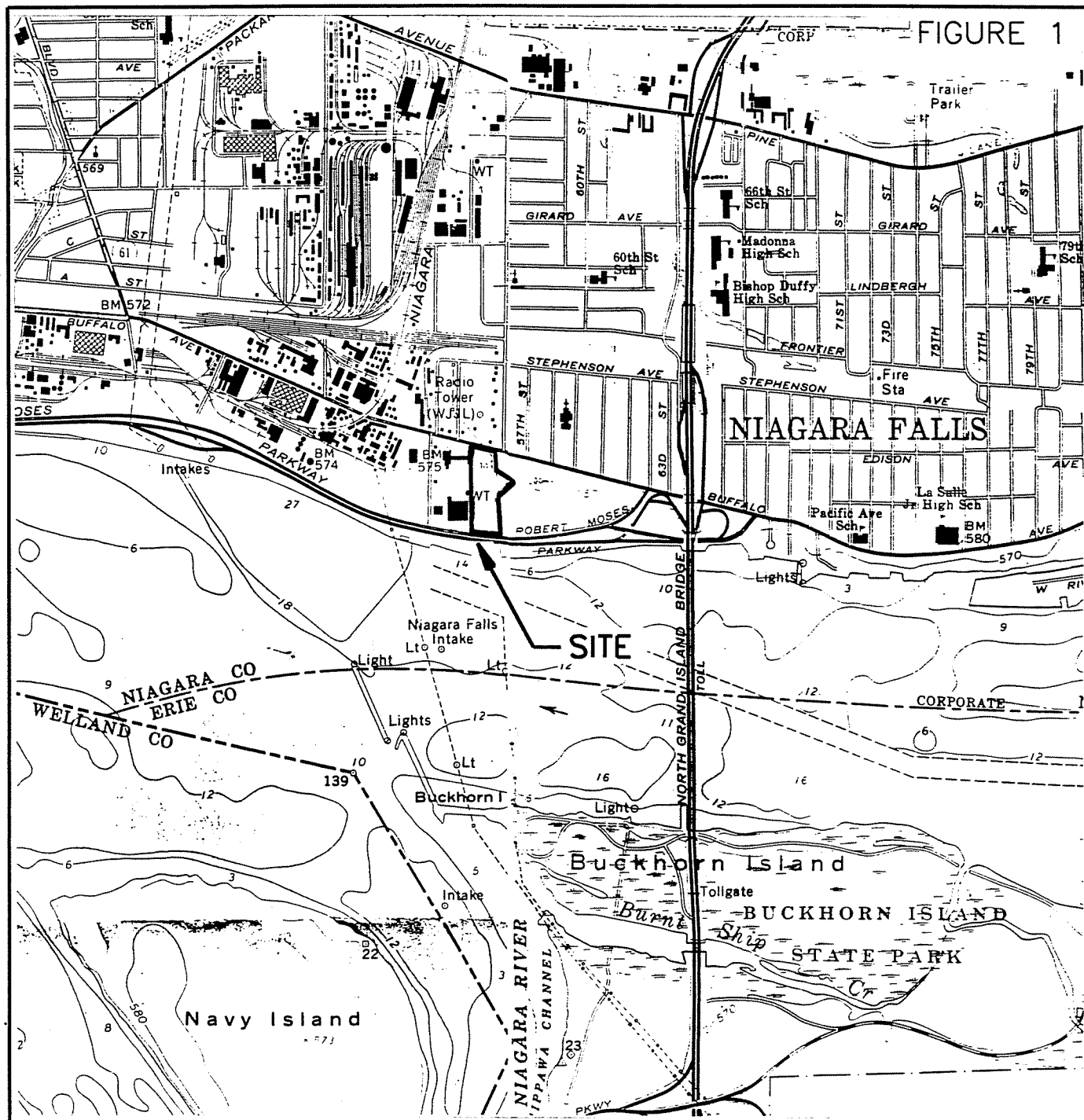
Notes: Concentration units in mg/kg (ppm).

Figures



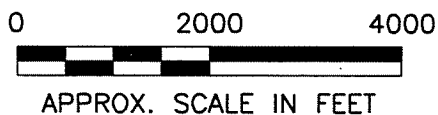
O'BRIEN & GERE
ENGINEERS, INC.

H:\PROJECTS\111111\176\BX11 SF: 1-1



PRELIMINARY INVESTIGATION
WATER TREATMENT PLANT—EASTERN AREA
NIAGARA FALLS, NEW YORK

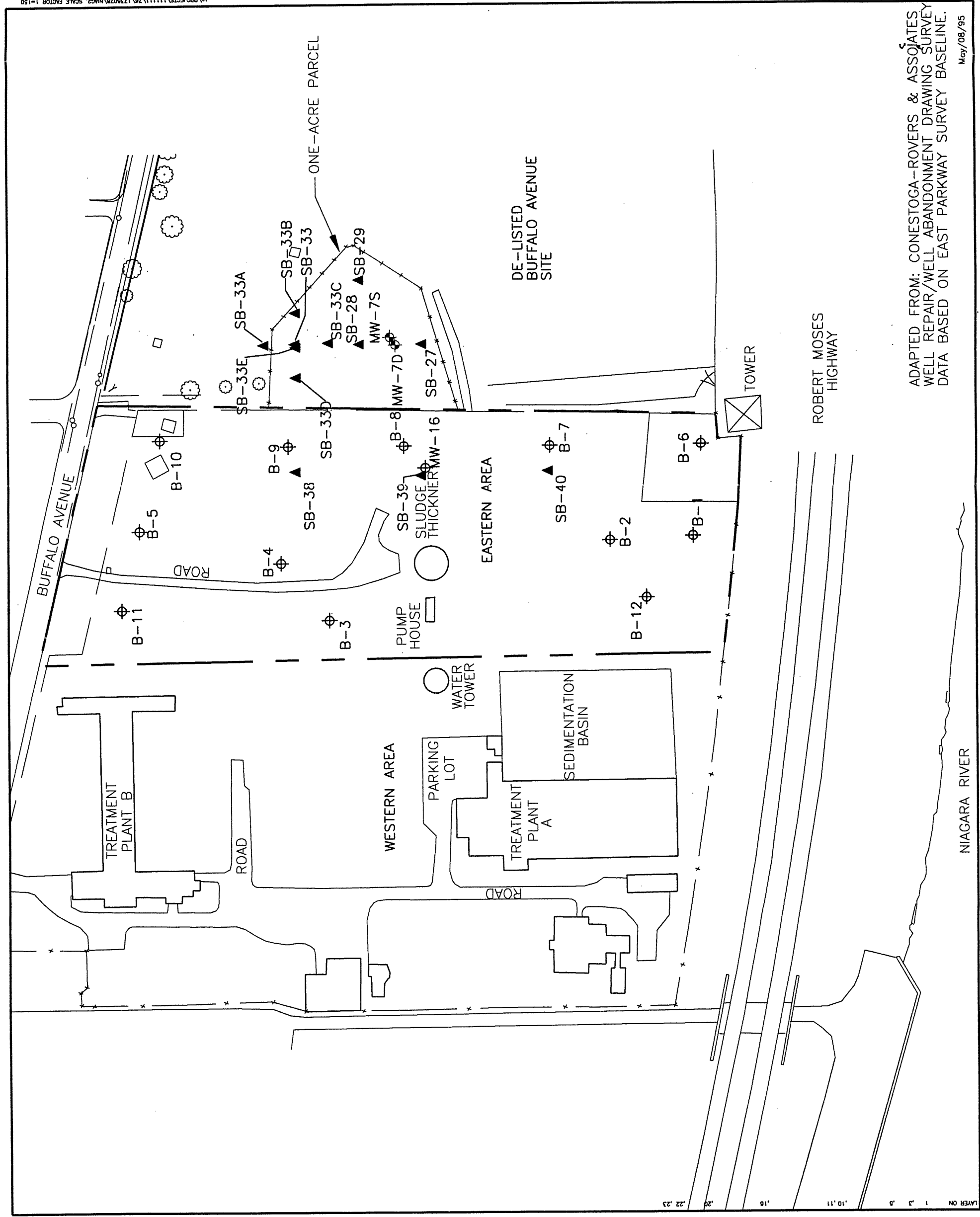
SITE LOCATION MAP



ADAPTED FROM USGS NIAGARA FALLS, NEW YORK AND TONAWANDA WEST QUADRANGLE
7.5 MINUTE SERIES

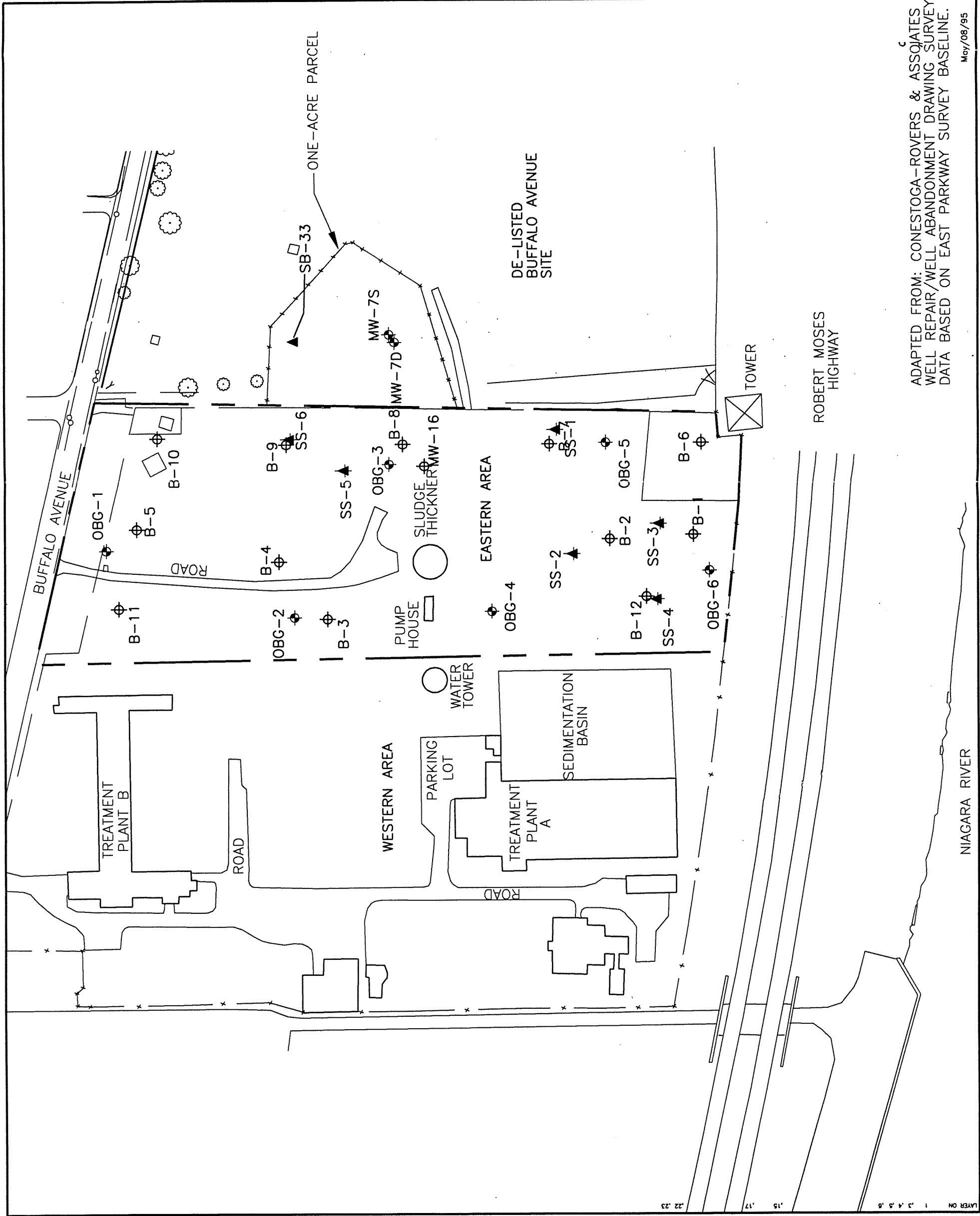
1736.078.001F
APRIL/18/95

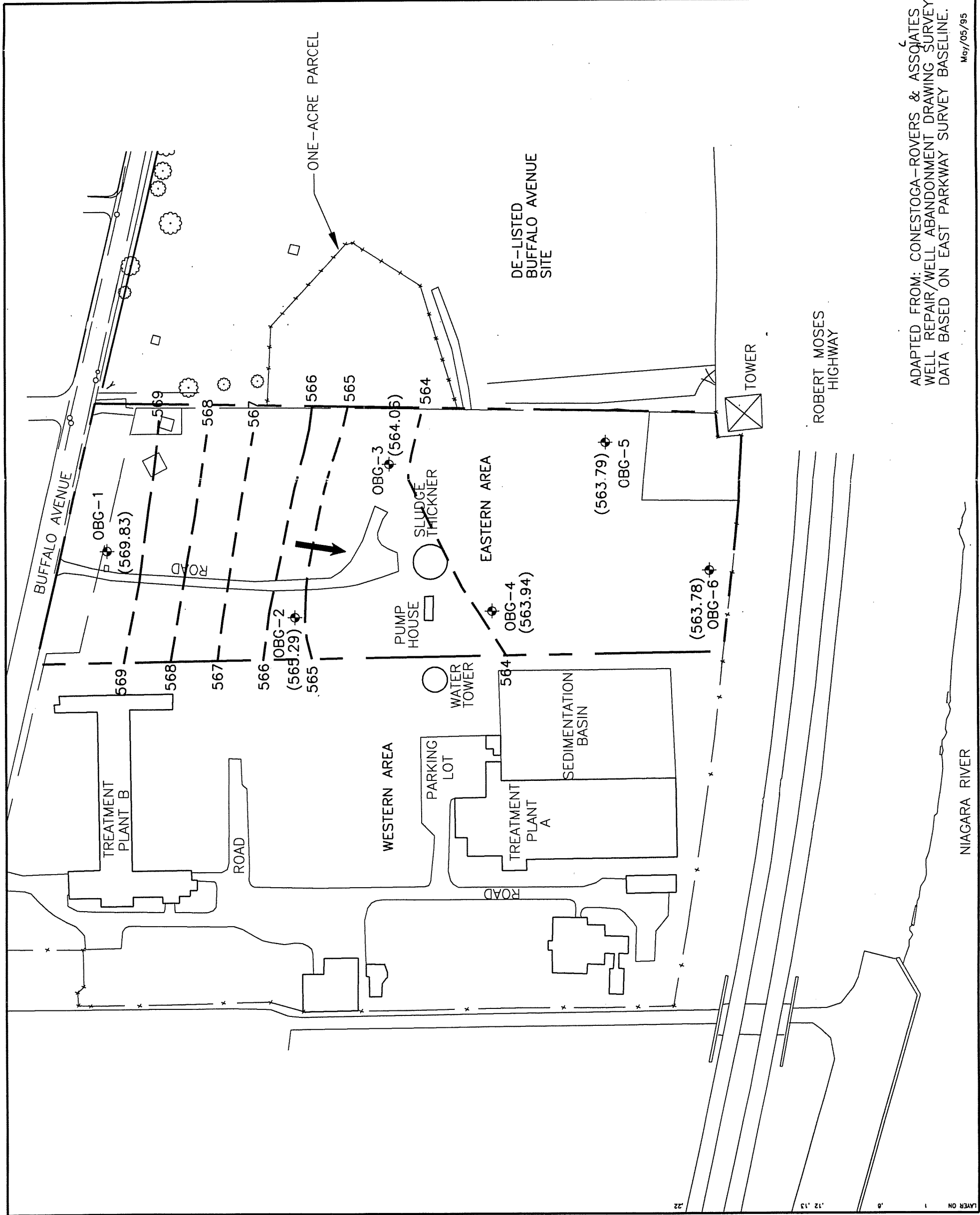
FIGURE 2



PRELIMINARY INVESTIGATION
WATER TREATMENT PLANT-EASTERN AREA
NIAGARA FALLS, NEW YORK

PREVIOUS SAMPLE LOCATIONS





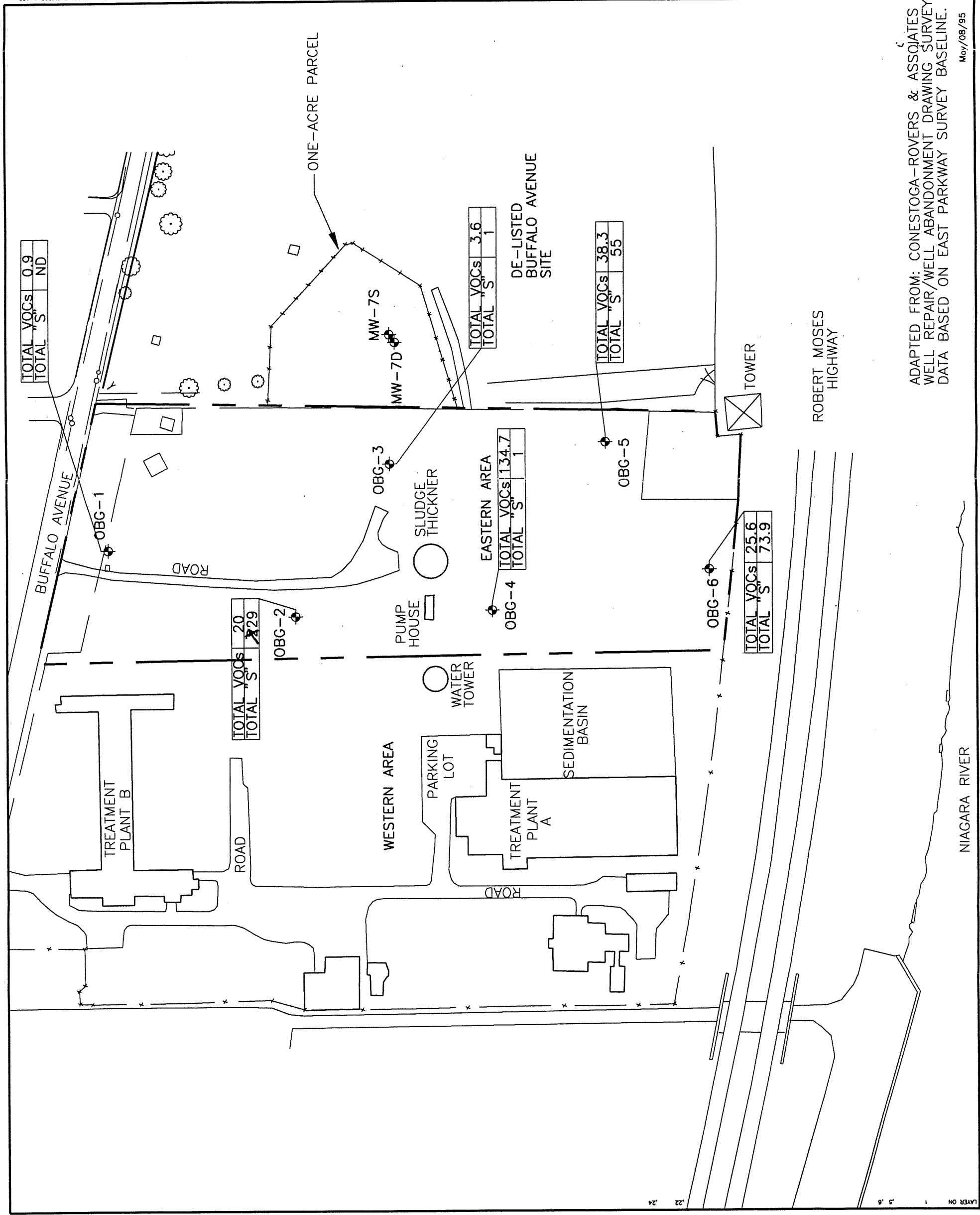
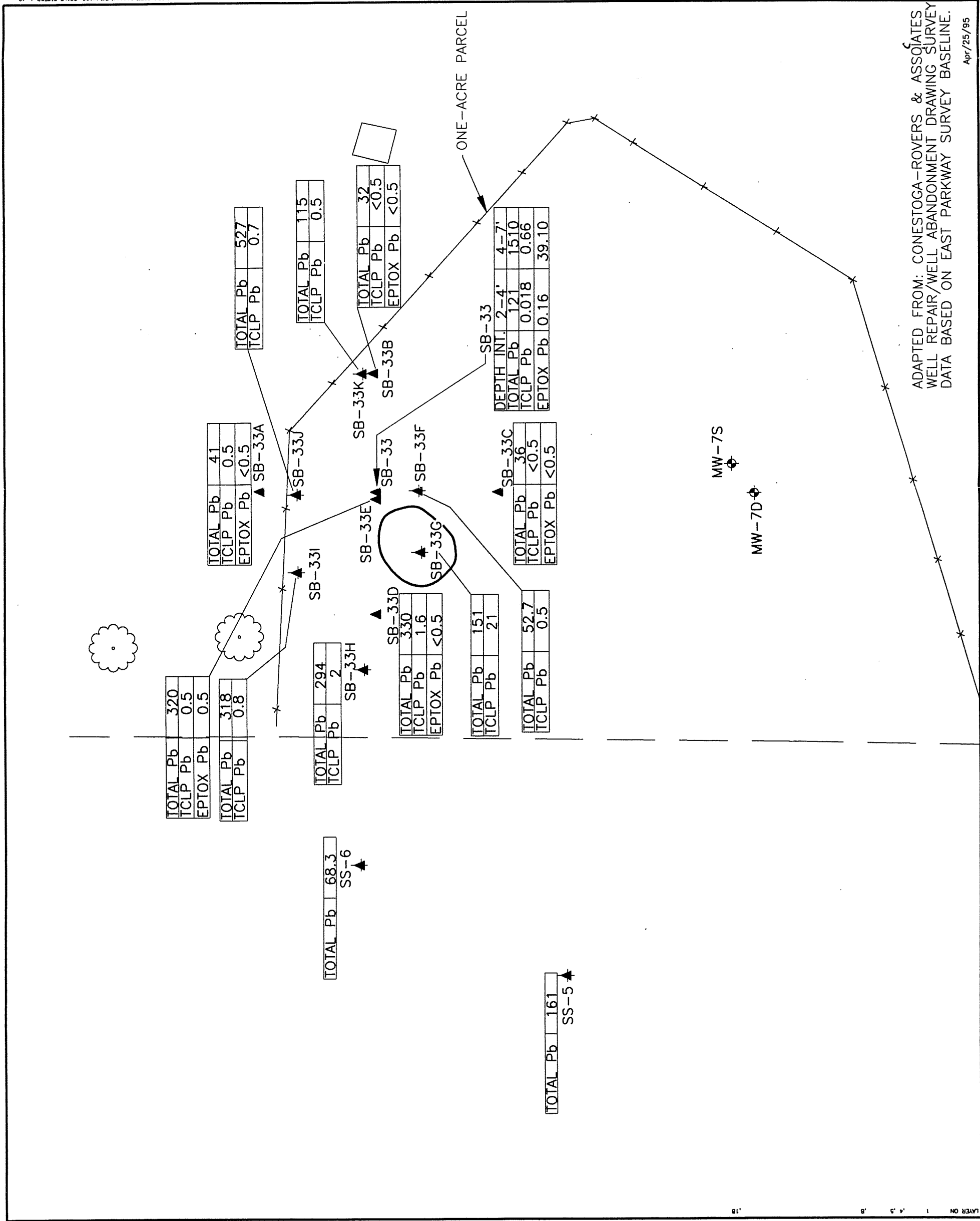


FIGURE 5

1736.062-07F



FIGURE 6



PRELIMINARY INVESTIGATION
WATER TREATMENT PLANT--EASTERN AREA
NIAGARA FALLS, NEW YORK

ONE-ACRE PARCEL SOIL
LOCATION MAP AND
LEAD CONCENTRATIONS

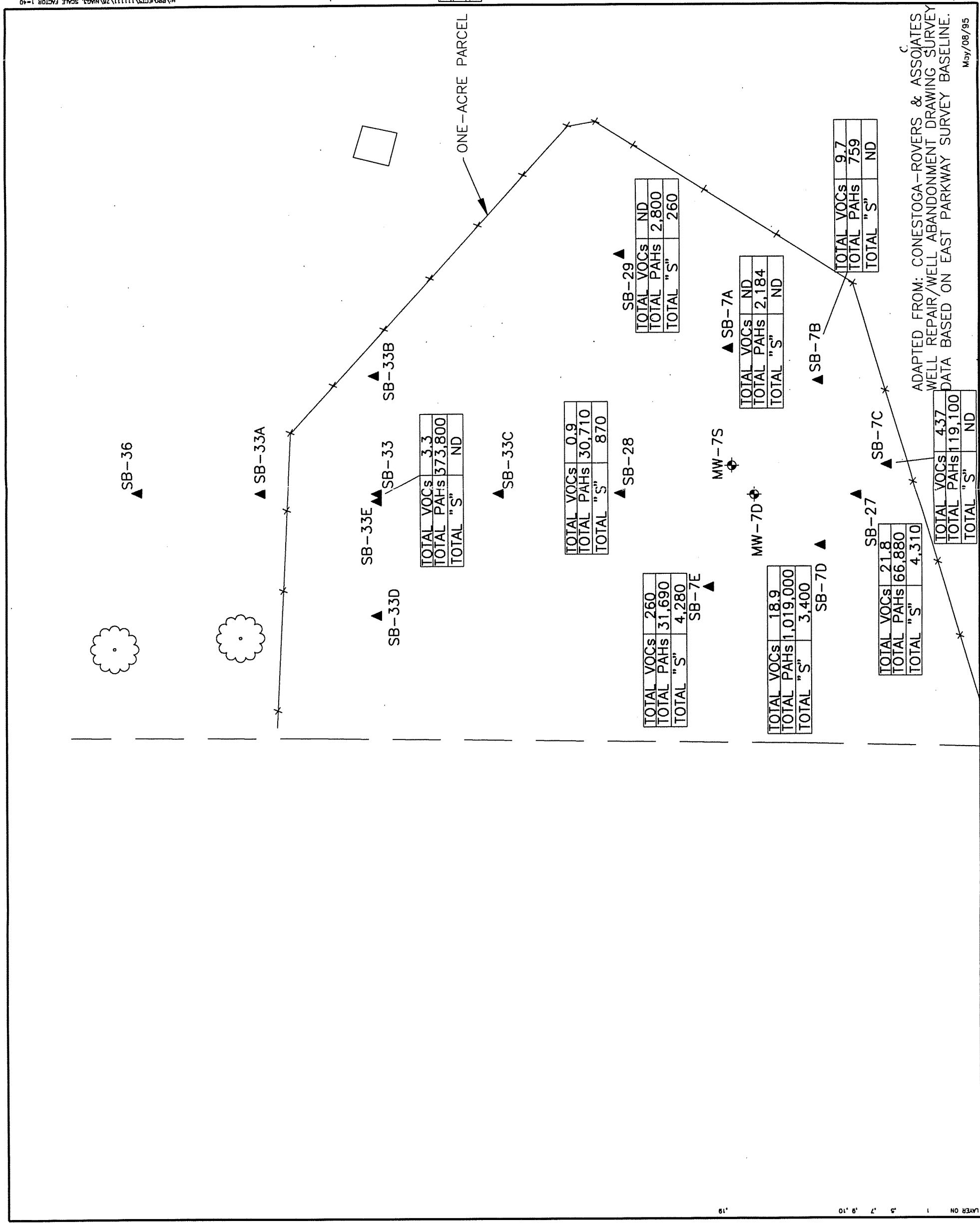


APPROX. SCALE IN FEET

1736.062-05F



FIGURE 7



H:\PROJECTS\111111\78\WMS, SCALE FACTOR 1=40

LEGEND

- FENCE
- MONITORING WELL (OBG)
- SOIL BORING LOCATION
- TOTAL VOCs CONCENTRATION (ug/Kg)
- TOTAL PAHs CONCENTRATION (ug/Kg)
- TOTAL "S" AREA INDICATOR PARAMETER CONCENTRATION (ug/Kg)

TOTAL VOCs	0.9
TOTAL PAHs	30,710
TOTAL "S"	870

ND NOT DETECTED

PRELIMINARY INVESTIGATION
WATER TREATMENT PLANT-EASTERN AREA
NIAGARA FALLS, NEW YORK

ONE-ACRE PARCEL
SUBSURFACE LOCATION AND
CHEMICAL CONCENTRATION
MAP



APPROX. SCALE IN FEET

1736.062-06F

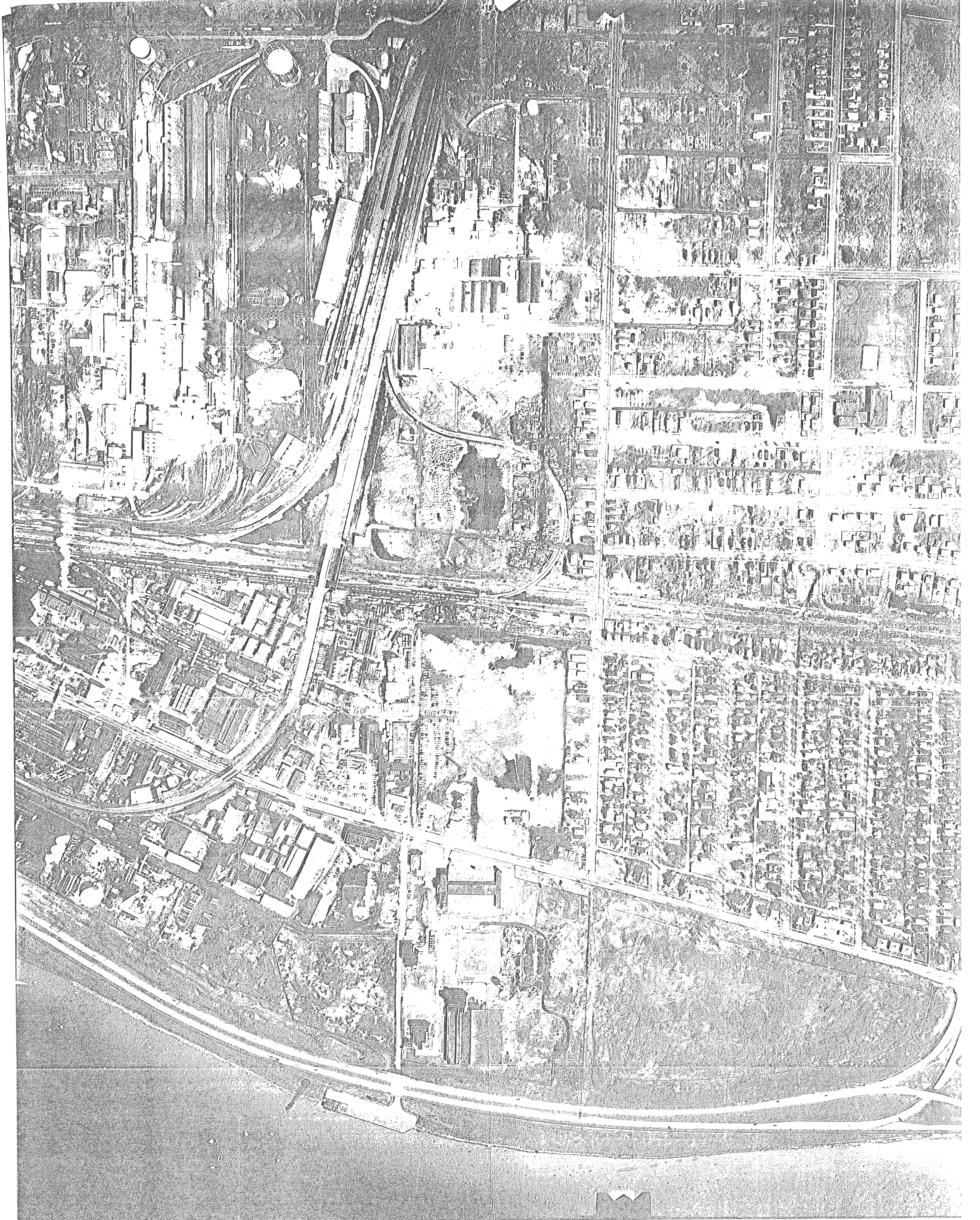


Appendices



O'BRIEN & GERE
ENGINEERS, INC.

APPENDIX A



U.S. AIR FORCE
PHOTOGRAPHIC CENTER
WASHINGTON, D.C. 20330
AUG 10 1970

Apr 1970
Scale: 1" = 400'
1" = 300'

APPENDIX B

O'BRIEN & GERE ENGINEERS, INC.						TEST BORING LOG	REPORT OF BORING OBG-1		
Client: City of Niagara Falls East Area Investigation						Sampler: 2" Split Spoon		Page 1 of 1	
Proj. Loc: Niagara Falls, NY						Hammer: 140 lbs.		Location:	
File No.: 1736.078						Fall: 30"		Start Date: 2/6/95 End Date: 2/6/95	
Boring Company: SJB Services Inc.						Screen = ☐		Grout ☐	
Foreman: Ken Swinnich						Riser ☐		Sand Pack ☐	
OBG Geologist: Chawn O'Dell								Bentonite ☐	
Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	Equip. Installed	Field Testing HS (ppm)
0	1	0-2	1-1-2-1	2.0/1.0	3	Damp, medium to dark brown, loose, SILT, some very fine sand, little clay, trace organics (plant roots).			0.0
1									
2	2	2-4	2-1-2-2	2.0/1.3	3	Damp to wet, medium brown, loose SILT and very fine SAND, little clay.			0.0
3									
4	3	4-6	1-2-3-3	2.0/1.5	5	Damp, olive with orange mottling, loose SILT, changing to CLAY, some silt, little very fine sand, trace shell fragments.			0.0
5									
6	4	6-8	3-4-3-3	2.0/2.0	7	Wet, brown with orange and olive mottling loose, very fine sand, some silt, trace clay.			0.0
7									
8	5	8-10	4-6-8-10	2.0/2.0	14	Damp, red to red brown, medium dense CLAY, little silt, little very fine sand.			0.0
9									
10	6	10-12	6-9	2.0/2.0	19	Damp to wet, red brown medium dense, CLAY, little silt.			0.0
			10-13						
11									
12	7	12-14	53-30	2.0/2.0	41	Wet, red brown, dense CLAY, little silt.			0.0
			11-10						
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									

2" X 0.010" slotted PVC screen: 15.0 to 5.0 ft.; Bentonite to 1.5 ft.; Grout to the surface; 2.5 ft to stickup.
HS - Headspace

O'BRIEN & GERE ENGINEERS, INC.						TEST BORING LOG	REPORT OF BORING OBG-2		
Client: City of Niagara Falls East Area Investigation Proj. Loc: Niagara Falls, NY File No.: 1736.078						Sampler: 2" Split Spoon Hammer: 140 lbs. Fall: 30"	Page 1 of 1 Location: Start Date: 2/9/95 End Date: 2/9/95		
Boring Company: SJB Services Inc. Foreman: Ken Swinnich OBG Geologist: Chawn O'Dell						Screen = ☐ Riser ☐	Grout ☐ Sand Pack ☐ Bentonite ☐		
Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	Equip. Installed	Field Testing HS (ppm)
0	1	0-2	11-11 9-8	2.0/0.8	20	Dry, brown to gray, medium dense, SILT, some very fine sand, little medium to coarse sand, little fine to medium angular gravel.		\	0.1
1									
2	2	2-4	5-3-1-1	2.0/0.2	4	Dry to damp, dark brown to black, loose, fine to oarse SAND, little fine gravel. Poor recovery.			0.5
3									
4	3	4-6	2-1-1-1	2.0/1.0	2	Wet, orange, brown, black, loose, SILT to fine SAND, some white ash, some cinders, little fine angular gravel, trace red brick, trace glass fragments.			0.7
5								=	
6	4	6-8	2-1-5-7	2.0/1.2	6	Wet as above to 7.0 ft, then olive SILT, some clay, little very fine sand.		=	0.2
7								=	
8	5	8-10	4-5-6-6	2.0/1.6	11	Moist, brown to olive green, medium dense, silty CLAY.		=	0.0
9								=	
10	6	10-12	2-2-2-3	2.0/1.5	4	Wet, brown to olive green, loose, CLAY, little silt.		=	0.0
11								=	
12	7	12-14	3-3-4-3	2.0/2.0	7	Wet, brown to olive green, loose, CLAY, little silt.		=	0.0
13								=	
14								=	
15								=	
16									
17									
18									
19									
20									
21									
22									
23									
2" X 0.010" slotted PVC screen: 15.0 to 5.0 ft.; Sand Pack to 3.0 ft.; Bentonite to 1.0 ft.; Grout to the surface; 2.5 ft. of stickup. HS - Headspace									

O'BRIEN & GERE ENGINEERS, INC.						TEST BORING LOG	REPORT OF BORING OBG-3		
Client: City of Niagara Falls East Area Investigation						Sampler: 2" Split Spoon		Page 1 of 1	
Proj. Loc: Niagara Falls, NY						Hammer: 140 lbs.		Location:	
File No.: 1736.078						Fall: 30"		Start Date: 2/7/95 End Date: 2/7/95	
Boring Company: SJB Services Inc.						Screen = ☐		Grout	
Foreman: Ken Swinnich						Riser ☐		Sand Pack	
OBG Geologist: Chawn O'Dell								Bentonite	
Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	Equip. Installed	Field Testing HS (ppm)
0	1	0-2	4-4-5-7	2.0/1.3	9	Damp, dark brown, loose, very fine SAND, some silt, little fine sand, trace fine angular gravel, trace red brick fragments, trace wood and white ash.		\	0.2
1								\	
2	2	2-4	6-3-4-3	2.0/1.0	7	Damp, dark brown to red brown, loose, very fine SAND, some silt, little fine to medium gravel (shot rock-dolomite), trace red brick, trace white ash, trace burnt wood and multi-colored particles.			0.4
3									
4	3	4-6	3-3-3-7	2.0/0.7	6	Wet, dark brown to black, loose SILT and very fine sand, fine to coarse angular gravel.			0.5
5									
6	4	6-8	3-2-1-1	2.0/1.5	3	Wet to saturated, reddish brown to black, loose SILT and fine SAND, some multi-colored glass fragments, little white ash, little black cinders.		=	1.2
7								=	
8	5	8-10	2-1-2-2	2.0/1.0	3	Wet, medium brown, loose, fine SAND and SILT, little clay, turning to CLAY, little silt at tip of spoon.		=	1.4
9								=	
10	6	10-12	3-7	2.0/1.5	18	Wet, brown to reddish brown, medium dense, CLAY, little silt.		=	0.4
11			11-11					=	
12	7	12-14	4-8-9-8	2.0/1.4	17	Wet, brown to reddish brown, medium dense CLAY, little silt.		=	0.3
13								=	
14								=	
15								=	
16								=	
17								=	
18								=	
19								=	
20								=	
21								=	
22								=	
23								=	
2" X 0.010" slotted PVC screen: 15.0 to 5.0 ft.; Sand Pack to 3.0 ft.; Bentonite to 1.0 ft.; Grout to the surface; 2.5 ft. of stickup.									
HS - Headspace									

O'BRIEN & GERE ENGINEERS, INC.						TEST BORING LOG	REPORT OF BORING OBG-4		
Client: City of Niagara Falls East Area Investigation						Sampler: 2" Split Spoon		Page 1 of 1	
Proj. Loc: Niagara Falls, NY						Hammer: 140 lbs.		Location:	
File No.: 1736.078						Fall: 30"		Start Date: 2/7/95 End Date: 2/7/95	
Boring Company: SJB Services Inc.						Screen = ☐		Grout ☐	
Foreman: Ken Swinnich						Riser ☐		Sand Pack ☐	
OBG Geologist: Chawn O'Dell								Bentonite ☐	
Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	Equip. Installed	Field Testing HS (ppm)
0	1	0-2	6-6-8	1.7/1.6	14	Damp, medium to dark brown, medium dense, SILT, some very fine sand, little fine to medium angular gravel, trace white ash and red brick fragments. Spoon refusal at 1.7 ft. Coarse gravel at spoon tip.			0.8
			50/0.2						
1									
2	2	2-4	—			No spoon driven. Augered through gravel/concrete?			—
3									
4	3	4-6	3-6-8-11	2.0/1.5	14	Damp, medium to dark brown, medium dense, SILT to fine SAND, little fine to medium angular gravel, trace white ash, trace cinders.			0.2
5									
6	4	6-8	4-5-8-10	2.0/1.8	13	Wet, medium dense, dark brown, medium to coarse SAND, some white ash, some cinders, little multi-colored glass.			0.3
7									
8	5	8-10	2-2-3-4	2.0/1.0	5	Wet, loose, reddish to dark brown, fine SAND, some medium to coarse sand, some cinders, little white ash, trace slag, trace fine angular gravel.			0.2
9									
10	6	10-12	1-1	2.0/1.0	2	Wet, medium brown to gray, loose, SILT and very fine SAND, some white ash, little cinders, trace shell fragments, multi-colored fragments.			2.1
11			WOH-1						
12	7	12-14	1-1-2-1	2.0/1.0	3	Same as above to 12.5 ft. then olive, loose SILT and very fine SAND, little fine sand,			1.8
13									
14	8	14-16	1-2-1-1	2.0/1.8	3	Saturated, olive, loose, SILT and fine SAND.			2.2
15									
16	9	16-18	1-1	2.0/1.9	2	Same as above.			0.0
17			WOH-1						
18									
19									
20									
21									
22									
23									
2" X 0.010" slotted PVC screen: 17.0 to 7.0 ft.; Bentonite to 3.0 ft.; Sand pack to 5.0 ft.; Grout to the surface; 2.5 ft. of stickup.									
HS - Headspace									

O'BRIEN & GERE ENGINEERS, INC.						TEST BORING LOG	REPORT OF BORING OBG-5		
Client: City of Niagara Falls East Area Investigation						Sampler: 2" Split Spoon		Page 1 of 1	
Proj. Loc: Niagara Falls, NY						Hammer: 140 lbs.		Location:	
File No.: 1736.078						Fall: 30"		Start Date: 2/8/95 End Date: 2/8/95	
Boring Company: SJB Services Inc.						Screen		Grout	
Foreman: Ken Swinnich						Riser		Sand Pack	
OBG Geologist: Chawn O'Dell								Bentonite	
Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	Equip. Installed	Field Testing HS (ppm)
0	1	0-2	3-4-5-3	2.0/1.3	9	Dry to damp, medium brown, loose SILT, little very fine sand, trace fine angular gravel, trace organics (plant roots).			0.3
1									
2	2	2-4	4-5-5-3	2.0/1.5	10	Same as above, little medium SAND.			0.0
3									
4	3	4-6	3-3-2-2	2.0/1.7	4	Damp, orange, white, gray, loose ASH and very fine sand, little cinders, little fine angular gravel, trace silt.			0.0
5									
6	4	6-8	1-1-2-2	2.0/0.7	3	Moist, as above.			0.7
7									
8	5	8-10	1-1-2-1	2.0/1.3	3	Wet, as above, some cinders.			0.3
9									
10	6	10-12	1-1-1-1	2.0/1.5	2	Saturated, brown to gray, loose, very fine SAND and SILT, some cinders, little white ash, little orange brick, trace shell fragments.			1.1
11									
12	7	12-14	1-1-1-5	2.0/1.0	2	As above to 13.5 ft. then olive to gray, SILT and fine SAND, trace organics.			0.9
13									
14	8	14-16	3-5-7-8	2.0/1.5	12	Saturated, olive, medium dense, SILT and fine SAND, trace shell fragments.			0.2
15									
16									
17									
18									
19									
20									
21									
22									
23									
2" X 0.010" slotted PVC screen: 17.0 to 7.0 ft.; Sand pack to 5.0 ft.; Bentonite to 3.0 ft.; Grout to the surface; 2.5 ft. of stickup. HS - Headspace									

O'BRIEN & GERE ENGINEERS, INC.						TEST BORING LOG		REPORT OF BORING OBG-6	
Client: City of Niagara Falls East Area Investigation						Sampler: 2" Split Spoon		Page 1 of 1	
Proj. Loc: Niagara Falls, NY						Hammer: 140 lbs.		Location:	
File No.: 1736.078						Fall: 30"		Start Date: 2/8/95 End Date: 2/8/95	
Boring Company: SJB Services Inc.						Screen =		Grout	
Foreman: Ken Swinnich						Riser		Sand Pack	
OBG Geologist: Chawn O'Dell								Bentonite	
Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	Equip. Installed	Field Testing HS (ppm)
0	1	0-2	5-8	2.0/1.3	18	Dry, medium brown to orange at top of spoon, medium dense very fine SAND and SILT, little angular fine to medium gravel, trace organics (plant roots).			1.1
			10-12						
1									
2	2	2-4	5-3-2-2	2.0/1.2	5	Moist, medium brown, loose, fine SAND, some silt, little medium to coarse gravel (angular), trace clay.			2.1
3									
4	3	4-6	3-5-3-2	2.0/1.5	8	Damp to wet, medium brown, loose, SILT and very fine SAND, little fine to medium angular gravel, little clay.			4.1
5									
6	4	6-8	4-3-4-4	2.0/1.5	7	Same as above, wet.			31.0
7									
8	5	8-10	4-5-6-8	2.0/1.8	11	Wet, dark brown to black, medium dense, CINDERS, some white ash, little glass fragments, little fine angular gravel, little fine to medium sand, trace silt.			32.5
9									
10	6	10-12	3-2-2-2	2.0/1.5	4	Saturated, black, loose CINDERS, some glass, fragments, little silt, little fine angular gravel.			12.5
11									
12	7	12-14	8-12	2.0/1.3	26	Same as above, medium dense.			240
			14-9						
13									
14	8	14-16	2-3-3-2	2.0/0.6	6	Same as above, moderate odor, loose.			220
15									
16	9	16-18	2-2-3-2	2.0/0.4	5	Same as above, odor.			170
17									
18									
19									
20									
21									
22									
23									
2" X 0.010" slotted PVC screen: 17.0 to 7.0 ft.; Sand pack to 5.0 ft.; Bentonite to 3.0 ft.; Grout to the surface; 2.5 ft. of stickup. HS - Headspace									

O'BRIEN & GERE ENGINEERS, INC.						TEST BORING LOG	REPORT OF BORING SB-7A		
Client: City of Niagara Falls One Acre Site Investigation Proj. Loc: Niagara Falls, NY File No.: 1736.078						Sampler: 2" Split Spoon Hammer: 140 lbs. Fall: 30"		Page 1 of 1 Location: Start Date: 2/9/95 End Date: 2/9/95	
Boring Company: SJB Services Inc. Foreman: Ken Swinnich OBG Geologist: Chawn O'Dell						Screen = ☐ Riser ☐		Grout ☐ Sand Pack ☐ Bentonite ☐	
Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	Equip. Installed	Field Testing HS (ppm)
0	1	0-2	34-13 12-10	2.0/1.3	25	Dry, brown, medium dense, SILT, some very fine to fine sand, little fine angular gravel, trace organics (plant roots).			0.9
1									
2	2	2-4	9-9-7-7	2.0/1.5	16	Damp, brown, medium dense, SILT, some very fine to fine sand, little fine angular gravel.			0.8
3									
4	3	4-6	7-8-5-6	2.0/1.3	13	Damp, medium brown to olive, medium dense SILT and fine sand, little clay.			0.3
5									
6	4	6-8	4-5-4-4	2.0/1.2	9	Damp, medium brown to olive, loose SILT and fine SAND, some clay to 7.5 ft., then black cinders and white ash.			0.7
7									
8	5	8-10	10-14 9-8	2.0/1.4	23	Damp, red to medium brown, medium dense SILT, some clay, an ash and cinder layer at 9.0-9.5 ft., then organics (plant stalks).			0.2
9									
10	6	10-12	8-10 12-13	2.0/1.5	22	Damp to wet, brown to olive green, medium dense, SILT, some fine sand, some clay, little cinders, trace angular gravel.			2.1
11									
12	7	12-14	6-7-3-2	2.0/1.7	10	Saturated, dark olive green, medium dense, very fine SAND and SILT.			0.7
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
The borehole was grouted to the surface. HS - Headspace									

O'BRIEN & GERE ENGINEERS, INC.						TEST BORING LOG	REPORT OF BORING SB-7B		
Client: City of Niagara Falls One Acre Site Investigation						Sampler: 2" Split Spoon		Page 1 of 1	
Proj. Loc: Niagara Falls, NY						Hammer: 140 lbs.		Location:	
File No.: 1736.078						Fall: 30"		Start Date: 2/9/95 End Date: 2/9/95	
Boring Company: SJB Services Inc.						Screen = ☐		Grout	
Foreman: Ken Swinnich						Riser ☐		Sand Pack	
OBG Geologist: Chawn O'Dell								Bentonite	
Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	Equip. Installed	Field Testing HS (ppm)
0	1	0-2	14-13	2.0/1.0	23	Dry, brown to gray, medium dense, medium to coarse GRAVEL, little silt, trace fine to medium sand, trace fine gravel.			1.3
			10-8						
1									
2	2	2-4	35-18	2.0/1.3	32	Dry to damp, reddish brown to brown, dense, fine SAND, some silt, some fine to coarse gravel, little clay.			0.4
3			14-13						
4	3	4-6	3-4-3-3	2.0/1.2	7	Damp to wet, brown, loose, SILT and fine SAND, little clay, trace fine angular gravel.			0.0
5									
6	4	6-8	4-3-4-5	2.0/1.5	7	Same as above.			0.3
7									
8	5	8-10	5-2-1-1	2.0/0.3	3	Saturated, black, very loose CINDER and ASH, little recovery.			1.0
9									
10	6	10-12	5-6-6-4	2.0/1.5	12	Saturated, brown to black, medium dense, SILT and very fine SAND, some cinders, little fine angular gravel, trace clay.			1.5
11									
12	7	12-14	4-5-5-10	2.0/1.4	10	Saturated, olive green to brown, medium dense, very fine SAND, some silt (olive) laminations, turning to brown clay, little silt at 13.5 ft.			0.8
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
The borehole was grouted to the surface.									
HS - Headspace									

O'BRIEN & GERE ENGINEERS, INC.						TEST BORING LOG	REPORT OF BORING SB-7C			
Client: City of Niagara Falls One Acre Site Investigation						Sampler: 2" Split Spoon		Page 1 of 1		
Proj. Loc: Niagara Falls, NY						Hammer: 140 lbs.		Location:		
File No.: 1736.078						Fall: 30"		Start Date: 2/10/95 End Date: 2/10/95		
Boring Company: SJB Services Inc.						Screen = ☐		Grout ☐		
Foreman: Dave Maddox						Riser ☐		Sand Pack ☐		
OBG Geologist: Chawn O'Dell								Bentonite ☐		
Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	Equip. Installed	Field Testing HS (ppm)	
0	1	0-2	2-4	2.0/1.5	18	Dry to damp, medium brown to gray, medium dense, SILT, some clay, little very fine sand to 1.5 ft., then coarse gravel.			0.6	
			14-13							
1										
2	2	2-4	7-9-7-6	2.0/1.4	16	Damp, medium brown, medium dense, SILT, some clay, little very fine to fine sand.			0.2	
3										
4	3	4-6	7-9-8-12	2.0/0.5	17	Dry, brownish gray, medium dense, medium to coarse, angular GRAVEL, little silt, little very fine sand.			0.9	
5										
6	4	6-8	10-8-8-7	2.0/0.7	16	Damp, dark brown to black, medium dense, fine to medium SAND, some cinders, little white ash, little silt, trace coarse gravel.			0.5	
7										
8	5	8-10	2-3-5-5	2.0/1.2	8	Wet, black, loose CINDERS, some silt, little orange brick, little fine angular gravel, little fine to coarse sand.			1.1	
9										
10	6	10-12	7-3-4-4	2.0/1.8	7	Saturated, olive green, loose, fine SAND, some silt, little medium sand.			0.3	
11										
12	7	12-14	4-5-7-5	2.0/2.0	12	Same as above, to 13.5 ft., then medium brown, medium dense, CLAY, some silt, trace horizontally and vertically bedded organics (plants).			0.0	
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										

The borehole was grouted to the surface.
HS - Headspace

O'BRIEN & GERE ENGINEERS, INC.						TEST BORING LOG	REPORT OF BORING SB-7D		
Client: City of Niagara Falls One Acre Site Investigation Proj. Loc: Niagara Falls, NY File No.: 1736.078						Sampler: 2" Split Spoon Hammer: 140 lbs. Fall: 30"		Page 1 of 1 Location: Start Date: 2/10/95 End Date: 2/10/95	
Boring Company: SJB Services Inc. Foreman: Dave Maddox OBG Geologist: Chawn O'Dell						Screen = ☐ Riser ☐		Grout ☐ Sand Pack ☒ Bentonite ☐	
Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	Equip. Installed	Field Testing HS (ppm)
0	1	0-2	3-4-4-5	2.0/1.7	8	Dry, medium brown, loose, SILT, some very fine to fine sand, little fine to medium angular gravel, trace cinders.			0.1
1									
2	2	2-4	4-6	2.0/1.0	17	Dry, light to medium brown, medium dense, fine SAND, some silt, some fine to coarse angular gravel, little medium sand, trace coarse sand.			0.9
3			11-11						
4	3	4-6	3-8-7-6	2.0/0.8	15	Damp, medium brown, medium dense, SILT, some very fine sand, little clay, trace fine angular gravel.			0.1
5									
6	4	6-8	6-6-8-6	2.0/1.0	14	Damp to wet, brown to black medium dense, fine SAND, some silt, little cinders, little fine to medium angular gravel, trace orange brick.			0.4
7									
8	5	8-10	3-6	1.2/1.1	87	Wet, black, loose SILT, some fine to coarse sand, little black cinders, little fine angular gravel to 9.0 ft, then very dense gravel/cobble, (spoon refusal).			1.8
9			81/0.2						
10						Auger/spoon refusal at 9.2 ft. Apparent large piece of shot rock. Boring terminated at 9.2 ft.			
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
The borehole was grouted to the surface. HS - Headspace									

O'BRIEN & GERE ENGINEERS, INC.						TEST BORING LOG	REPORT OF BORING SB-7E		
Client: City of Niagara Falls One Acre Site Investigation Proj. Loc: Niagara Falls, NY File No.: 1736.078						Sampler: 2" Split Spoon Hammer: 140 lbs. Fall: 30"		Page 1 of 1 Location: Start Date: 2/10/95 End Date: 2/10/95	
Boring Company: SJB Services Inc. Foreman: Dave Maddox OBG Geologist: Chawn O'Dell						Screen = ☐ Riser ☐		Grout ☐ Sand Pack ☒ Bentonite ☐	
Depth Below Grade	No.	Depth (feet)	Blows /6"	Penetr/ Recovery	"N" Value	Sample Description	Stratum Change General Descript	Equip. Installed	Field Testing HS (ppm)
0	1	0-2	6-12	2.0/0.5	24	Damp, dark brown, medium dense, SILT, little very fine sand, little fine gravel, trace clay.			0.3
			12-14						
1									
2	2	2-4	10-11	2.0/0	20	No recovery.			-
			9-9						
3									
4	3	4-6	14-14	2.0/1.3	24	Damp, white, medium dense, ASH, some brown silt, little fine to medium angular gravel, trace sand, trace cinder (moderate odor).			1.1
			10-7						
5									
6	4	6-8	11-11	2.0/1.5	16	Damp, brown to black, medium dense, CINDER and SILT, little gravel, little white ash.			0.3
			5-5						
7									
8	5	8-10	8-4	2.0/2.0	11	Damp to wet, white, brown, black, medium dense, SILT, CINDERS and ASH, little fine gravel, trace orange brick (moderate odor).			3.5
			7-13						
9									
10	6	10-12	6-5-5-5	2.0/1.5	10	Wet, brown to black, medium dense SILT, some black cinders, little white ash, little fine angular gravel, little fine to coarse sand.			2.9
11									
12	7	12-14	3-3-5-8	2.0/1.8	8	Wet, olive green to brown, loose, fine SAND and SILT to 13.0 ft., then CLAY, some silt.			0.0
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
The borehole was grouted to the surface. HS - Headspace									

DATE	DRILLED FROM	DRILLED TO	WEATHER	TEMP.	TIME	ESI FIELD LOG	HOLE NO. <u>R-1</u>
							GRD. ELEV. _____
	<u>12-7-82</u>						G.W. DEPTH _____
SHEET <u>1</u> OF <u>1</u>			PROJECT LOCATION <u>NIAG. FALLS</u>				

Depth of Sample	SAMPLE NO.	BLOWS ON SAMPLER				BLOWS ON CASING C	MOISTURE	COLOR	CLASSIFICATION OF MATERIAL DRILLED	OTHER DATA
		0	6	12	N					
		6	12	18						
5-7	1			20					FILL	
10-12	2			9					WPA ORG. SAND & SILT	(STRONG odor)
18-17	3			10					WPA SILT & SAND SOME ORG.	
20-22	4			8						
25-27	5			9						
30-32	6			17						
35-37	7			125					35.5 TOP OF TILL	
38.5									TILL	

NOTATION: SIZE CORE _____
 SIZE SHELBY TUBE _____
 SIZE AUGER _____
 N = No. blows to drive "spoon" "with" lb. pln wt. falling "per blow."
 C = No. blows to drive "casing" "with" lb. weight falling "per blow."

SOIL CLASSIFICATIONS BY: _____
 IF OTHER SPECIAL EQUIPMENT HAS BEEN EMPLOYED PLEASE NOTE: _____

FILL OUT BACK OF LOG AND SIGN YOUR NAME

DATE	DRILLED FROM	DRILLED TO	WEATHER	TEMP.	TIME	ESI FIELD LOG	HOLE NO. <u>B-2</u>
							GRD. ELEV.
							G.W. DEPTH

SHEET 1 OF 1

PROJECT LOCATION NIAO FALLS

Depth of Sample	SAMPLE NO.	BLOWS ON SAMPLER				BLOWS ON CASING C	MOISTURE	COLOR	CLASSIFICATION OF MATERIAL DRILLED	OTHER DATA
		0-6	6-12	12-18	N					
5-7	1	8							SILT & CLAY FILL	
10-12	2	4							CINDERS & FILL	(MED. DUCK)
15-17	3	24							SAND, SILT, ORG.	VIRGIN MAT.
~~20-22~~	~~4~~									
~~25-27~~	~~5~~									

AUGERED TO 24.0

INSTALLED 2" O.P.

@ 24.0'

NOTATION: SIZE CORE

SIZE SHELBY TUBE

SIZE AUGER

N = No. blows to drive

C = No. blows to drive

"spoon

"casing

"with

"with

lb. pin wt. falling

lb. weight falling

"per blow.

"per blow.

SOIL CLASSIFICATIONS BY:

IF OTHER SPECIAL EQUIPMENT HAS BEEN EMPLOYED PLEASE NOTE:

FILL OUT BACK OF LOG AND SIGN YOUR NAME

DATE	DRILLED FROM	DRILLED TO	WEATHER	TEMP.	TIME	ESI FIELD LOG	HOLE NO. <u>B-3</u>
							GRD. ELEV. _____
							G.W. DEPTH _____

SHEET

OF

PROJECT
LOCATION

Depth of Sample	SAMPLE NO.	BLOWS ON SAMPLER				BLOWS ON CASING C	MOISTURE	COLOR	CLASSIFICATION OF MATERIAL DRILLED	OTHER DATA
		0-6	6-12	12-18	N					
5-7 10									Fill	
10-12 2									MR CLAY	
15-17 3									MR CLAY	
17-24 4									CLAY	
21-27 5									CLAY	
30-32 6									29.5 TILL	2" w. P To 31.5/2.5 F.U.
									32.6 Hard Ref. Soil	

NOTATION: SIZE CORE _____

SIZE SHELBY TUBE _____

SIZE AUGER _____

N = No. blows to drive

"spoon

"with

lb. pin wt. falling

"per blow.

C = No. blows to drive

"casing

"with

lb. weight falling

"per blow.

SOIL CLASSIFICATIONS BY: _____

IF OTHER SPECIAL EQUIPMENT HAS BEEN EMPLOYED PLEASE NOTE: _____

FILL OUT BACK OF LOG AND SIGN YOUR NAME

FILL OUT BACK OF LOG AND SIGN YOUR NAME

[illegible]

SOIL CLASSIFICATIONS BY: _____
IF OTHER SPECIAL EQUIPMENT HAS BEEN EMPLOYED PLEASE NOTE: _____

FILL OUT BACK OF LOG AND SIGN YOUR NAME

DATE	DRILLED FROM	DRILLED TO	WEATHER	TEMP.	TIME	ESI FIELD LOG	HOLE NO. <u>B-6</u>
<u>12/19/61</u>							GRD. ELEV.
							G.W. DEPTH

SHEET _____ OF _____ PROJECT CITY OF NIAGARA FALLS
LOCATION _____

Depth of Sample	SAMPLE NO.	BLOWS ON SAMPLER					BLOWS ON CASING C	MOISTURE	COLOR	CLASSIFICATION OF MATERIAL DRILLED	OTHER DATA
		0-6	6-12	12-18	18-24	N					
5-9	1	5	7	6	6		m	BR	crushed Stone Clay - Fill		
10-12	2	19	9	8	8		m	BR	Clay w/ gravel - Fill		
15-17	3	5	5	-	-		m	BR	f. Sand		
20-22	4	2	2	2	2		m	BR	Silty S. Sand		
									B.O.H. 22.0		

NOTATION: SIZE CORE _____
 SIZE SHELBY TUBE _____
 SIZE AUGER _____
 N = No. blows to drive "spoon" "with" lb. pin wt. falling "per blow."
 C = No. blows to drive "casing" "with" lb. weight falling "per blow."

SOIL CLASSIFICATIONS BY: _____
 IF OTHER SPECIAL EQUIPMENT HAS BEEN EMPLOYED PLEASE NOTE: _____

FILL OUT BACK OF LOG AND SIGN YOUR NAME

DATE	DRILLED FROM	DRILLED TO	WEATHER	TEMP.	TIME	ESI FIELD LOG	HOLE NO. <u>B-1</u>
							GRD. ELEV. _____
							S.W. DEPTH _____

SHEET 1 OF 1 PROJECT LOCATION X/14th St. / 21st St.

Depth of Sample	SAMPLE NO.	BLOWS ON SAMPLER				BLOWS ON CASING C	MOISTURE	COLOR	CLASSIFICATION OF MATERIAL DRILLED	OTHER DATA
		0-6	6-12	12-18	N					
7 1	1	3	5						PI LL	
12 2	2	4							PI LL	
17	3	3							STRONG OR OR	
22	4	1	4						SAND, SILT OR G.	
27	5	2							SOFT CLAY	2" w.p. To 365
32	6	1	5	7						
37	7	5	0						33.5 TILL	
									39.5 REFUSAL	

NOTATION: SIZE CORE _____
 SIZE SHELBY TUBE _____
 SIZE AUGER _____
 N = No. blows to drive "spoon" "with" lb. pin wt. falling "per blow."
 C = No. blows to drive "casing" "with" lb. weight falling "per blow."

SOIL CLASSIFICATIONS BY: _____
 IF OTHER SPECIAL EQUIPMENT HAS BEEN EMPLOYED PLEASE NOTE: _____

FILL OUT BACK OF LOG AND SIGN YOUR NAME

DATE 11/10/82	DRILLED FROM	DRILLED TO	WEATHER	TEMP.	TIME	ESI FIELD LOG	HOLE NO. 3-87
							ORD. ELEV.
							S.W. DEPTH

SHEET _____ OF _____

PROJECT LOCATION CITY OF NIAGARA FALLS

Depth of Sample	SAMPLE NO.	BLOWS ON SAMPLER					BLOWS ON CASING C	MOISTURE	COLOR	CLASSIFICATION OF MATERIAL DRILLED	OTHER DATA
		0-6	6-12	12-18	18-24	N					
5-7	1	2	2	1	1				Gr	Ashes	
10-12	2	3	4	3	3				m BR	CLAY 2/511	
15-17	3	2	1	2	2				m BR 310	CLAY	
20-22	4	1	1	1	1				m BR	CLAY	
25-27	5	1	1	1	1				m BR	CLAY	
29-31	6	1	1	1	1				m BR	CLAY	
35-37	7	12	26	39	60				m BR	silty clay w/ gravel	Rock S.P.A.
										B.O.H 37.0	

NOTATION: SIZE CORE _____

SIZE SHELBY TUBE _____

SIZE AUGER _____

N = No. blows to drive

"spoon

"with

lb. pin wt. falling

"per blow,

C = No. blows to drive

"coarse

"with

lb. weight falling

"per blow,

SOIL CLASSIFICATIONS BY: _____

IF OTHER SPECIAL EQUIPMENT HAS BEEN EMPLOYED PLEASE NOTE: _____

FILL OUT BACK OF LOG AND SIGN YOUR NAME

DATE <i>12/11/71</i>	DRILLED FROM	DRILLED TO	WEATHER	TEMP.	TIME	ESI FIELD LOG	HOLE NO. <i>B-13</i>
							GRD. ELEV.
							G.W. DEPTH

SHEET _____ OF _____ PROJECT LOCATION *City of Niagara*

Depth of Sample	SAMPLE NO.	BLOWS ON SAMPLER				BLOWS ON CASING C	MOISTURE	COLOR	CLASSIFICATION OF MATERIAL DRILLED	OTHER DATA
		0-6	6-12	12-18	18-24					
5-7	1	2	4	7	9				m Br silty clay	
10-12	2	7	8	11	13				m Br clay	
15-17	3	1	2	2	2				m Br clay	
20-22	4	1	1	1	1				m Br clay	
25-27	5	1	1	1	1				m Br clay	
30-32	6	15	16	15					d Br silty clay / gravel - fill	
34.0	7								No Rec.	
									B.O.H. 34.0	

NOTATION: SIZE CORE _____
 SIZE SHELBY TUBE _____
 SIZE AUGER _____
 N = No. blows to drive "spoon" "with" lb. pin wt. falling "per blow."
 C = No. blows to drive "coaling" "with" lb. weight falling "per blow."

SOIL CLASSIFICATIONS BY: _____
 IF OTHER SPECIAL EQUIPMENT HAS BEEN EMPLOYED PLEASE NOTE: _____

FILL OUT BACK OF LOG AND SIGN YOUR NAME

FILL OUT BACK OF LOG AND SIGN YOUR NAME

DATE	DRILLED FROM	DRILLED TO	WEATHER	TEMP.	TIME	ESI FIELD LOG	HOLE NO. <u>B-12</u>
							GRD. ELEV. _____
							G.W. DEPTH. _____

SHEET _____ OF _____ PROJECT LOCATION NIAO FALLS

Depth of Sample	SAMPLE NO.	BLOWS ON SAMPLER					BLOWS ON CASING C	MOISTURE	COLOR	CLASSIFICATION OF MATERIAL DRILLED	OTHER DATA
		0-6	6-12	12-18	18-24	N					
3-7	1	24								Fill	
10-12	2	14								odor	
15-17	3	14								WGV SAND x ORG SILT	
20-22	4	3									
25-27	5	21									
30-32	6	14								2" S.S. W.P. to 36.0'	
35-37	7	7								PIED TILL	
										RR FVSHL 39'	

NOTATION: SIZE CORE

SIZE SHELBY TUBE _____

SIZE AUGER _____

N = No. blows to drive

"spoon

"with

lb. pin wt. falling

"per blow.

C = No. blows to drive

"coarse

"with

lb. weight falling

"per blow.

SOIL CLASSIFICATIONS BY: _____

IF OTHER SPECIAL EQUIPMENT HAS BEEN EMPLOYED PLEASE NOTE: _____

FILL OUT BACK OF LOG AND SIGN YOUR NAME

APPENDIX C



City of Niagara Falls, New York

P.O. Box 69, Niagara Falls, NY 14302-0069

April 27, 1995

Mr. Robert P. Lannon, Jr., P.E.
O'Brien & Gere Engineers, Inc.
800 Main Street
Niagara Falls, NY 14301

Dear Mr. Lannon:

The City has completed the review of your request to discharge 275 gallons of drummed wastewater from the Water Treatment Plant site. The wastewater was generated as a result of groundwater sampling activities.

Based on the insignificant pollutant load the City hereby grants permission to discharge this wastewater.

Sincerely,

DEPARTMENT OF WASTEWATER FACILITIES

Albert C. Zaepfel
Industrial Monitoring Coordinator

ACZ:md

cc: R. Roll

Quarterly Report to NYSDEC, USEPA

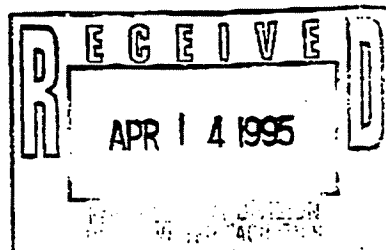
File 39A

\58.95



April 13, 1995

Mr. Al Zaepfel
Industrial Monitoring Coordinator
City of Niagara Falls
Wastewater Treatment Plant
P. O. Box 69
Niagara Falls, New York 14302



Re: City of Niagara Falls
Eastern Area

File: 1736.078

Dear Al:

In accordance with our recent conversations, enclosed are the results of the laboratory analysis performed on a composite water sample obtained from five 55-gallon drums located at the City of Niagara Falls Water Treatment Plant. The sample was composited from a grab from each one of the drums. As requested, the sample was analyzed for metals, PCB's, organics, pH, and SOC.

These drums contain water collected during ground water sampling activities at the one-acre Eastern Area adjacent to the construction site for the City's new water treatment plant. On behalf of the City of Niagara Falls Water Treatment Plant, we are requesting permission to discharge approximately 275 gallons of water to the Niagara Falls Wastewater Treatment Plant via a sanitary sewer in Buffalo Avenue.

If you have any questions or require additional information, please do not hesitate to contact me.

Very truly yours,

O'BRIEN & GERE ENGINEERS, INC.

A handwritten signature in dark ink, appearing to read 'Robert P. Lannon Jr.', written over the printed name.

Robert P. Lannon, Jr., P.E.
Managing Engineer

RPL:bk

cc: Mr. Robert E. Game, City of Niagara Falls
Mr. Richard R. Roll, City of Niagara Falls
Ms. Karen L. Moran, O'Brien & Gere Engineers, Inc.
Ms. Deborah Y. Wright, O'Brien & Gere Engineers, Inc.

**ACTS TESTING LABS, INC.**

25 Anderson Road
Buffalo, NY 14225-4928
Tel (716) 897-3300
Fax (716) 897-0876

April 4, 1995
Page 1 of 4

Technical Report #5B-1679E R
Project # 1736.076
Project Name: City Niagara Falls Water T. Plant
REVISED

Mr. Robert P. Lannon, Jr.
O'BRIEN & GERE ENGINEERS, INC.

SUBJECT:

Analysis of one (1) water sample for various parameters. The sample was received on March 13, 1995.

RESULTS:

See Pages Two and Three.

EXPERIMENTAL:

Organochlorine Pesticides in water were determined according to United States Environmental Protection Agency Method 608: Organochlorine Pesticides and PCBs.

Polychlorinated Biphenyls (PCBs) in water were determined according to United States Environmental Protection Agency Method 608: Organochlorine Pesticides and PCBs.

Priority Pollutant Purgeables in Water were determined according to United States Environmental Protection Agency Method 624: Purgeables.

Priority Pollutant Semi-volatile compounds in water were determined according to United States Environmental Protection Agency Method 625: Base/Neutrals and Acids.

The analyses were determined according to procedures listed in "Standard Methods for the Examination of Water and Wastewater," 17th Edition, 1989.



April 4, 1995
Technical Report #5B-1679ER
Page 2 of 4

ACTS TESTING LABS, INC.

A handwritten signature in cursive script, appearing to read "Charles E. Hartke".

Charles E. Hartke
Manager, Chemistry Laboratory

ACTS TESTING LABS, INC.

A handwritten signature in cursive script, appearing to read "Elizabeth R. Hausler".

Elizabeth R. Hausler, Supervisor
Gas Chromatography Laboratory

ACTS TESTING LABS, INC.

A handwritten signature in cursive script, appearing to read "Lisa M. Clerici".

Lisa M. Clerici, Supervisor
Wet Chemistry Laboratory

cme



April 4, 1995

Technical Report #5B-1679ER

Page 3 of 4

RESULTS:

ACTS #5B-1679E
COMPOSITE DRUM #1,2,3,4,5

Cadmium, Total	< 0.005	
Chromium, Total	< 0.01	
Copper, Total	< 0.01	
Cyanide, Total	< 0.003	
Lead, Total	< 0.03	102/d
Nickel, Total	< 0.01	
Phenols, Total	0.044	0.0001
Phosphorus, Total	< 0.05	
pH, Total	9.10	
Mercury, Total	< 0.0002	
Zinc, Total	1.03	0.002
Total Suspended Solids	48.0 (68.0)*	
Soluble Organic Carbon	3.1	

Results are reported as milligrams per liter (mg/L).

*Duplicate

ACTS #5B-1679E
COMPOSITE DRUM #1,2,3,4,5

EPA 624		
Benzene	0.5	0
Toluene	< 0.5	
Ethylbenzene	< 0.5	
M,P-Xylenes	< 1	
O-Xylene	< 0.5	
Vinyl Chlorine	< 0.5	
1,1-Dichloroethene	< 0.5	
Methylene Chloride	43B	0
Trans 1,2-Dichloroethene	< 0.5	
Chloroform	0.6	0
1,1,1-Trichloroethane	< 0.5	
Carbon Tetrachloride	< 0.5	
Trichloroethene	< 0.5	
Bromodichloromethane	< 0.5	
trans 1,3-Dichloropropene	< 0.5	
cis 1,3-Dichloropropene	< 0.5	
1,1,2-Trichloroethene	< 0.5	
Tetrachloroethane	< 0.5	
Dibromochloromethane	< 0.5	
Chlorobenzene	12	0
Bromoform	< 0.5	
1,1,2,2-Tetrachloroethane	< 0.5	
2-Chlorotoluene	< 0.5	
4-Chlorotoluene	< 0.5	

B-Found in method blank at 30.0 ug/L

Results are reported as micrograms per liter (ug/L).



April 4, 1995
Technical Report #5B-1679ER
Page 4 of 4

EPA 625

ACTS #5B-1679E
COMPOSITE DRUM #1,2,3,4,5

2-Chlorophenol	< 1
1,3-Dichlorobenzene	< 1
1,4-Dichlorobenzene	< 1
1,2-Dichlorobenzene	< 1
2,4-Dichlorophenol	< 10
1,2,4-Trichlorobenzene	< 1
Naphthalene	< 1
Hexachlorobutadiene	< 1
4-Chloro-3-methylphenol	< 1
Hexachlorocyclopentadiene	< 1
2,4,6-Trichlorophenol	< 1
Dimethylphthalate	< 1
Acenaphthene	< 1
N-Nitrosodiphenylamine	< 1
Hexachlorobenzene	< 1
Phenanthrene	< 1
Dibutylphthalate	< 1
Fluoranthene	< 1
Pyrene	< 1
Butyl Benzyl Phthalate	< 1
Benzo(a)anthracene	< 1
Chrysene	< 1
Dichlorotoluene	< 1*
Trichlorotoluene	< 1*
Tetrachlorobenzene	< 1*
Dichlorobenzotrifluoride	< 1*

EPA 608

Heptachlor	< 0.05
Endosulfan sulfate	< 0.05
PCB 1016	< 0.25
PCB 1221	< 0.25
PCB 1232	< 0.25
PCB 1242	< 0.25
PCB 1248	< 0.25
PCB 1254	< 0.25
PCB 1260	< 0.25
Mirex	< 0.10
Dechlorane	< 1.0

* Estimated Values

APPENDIX D

Weather Sunny 18°
Well # OBG-2
Project # _____
Method BAILER

☐ Top of Protective Casing

	84 S Standard	_____
	1413 S Standard	_____
	initial	_____
after	(gal.)	598
after	(gal.)	620
after	(gal.)	971
after	(gal.)	_____
after	(gal.)	_____

Color	Brown
Odor	none
NTUS)	7160
product	none

[illegible]

NOTES:

Date 2/14/95 Weather Sunny 18°
 Site Name City of Niagara Falls E. Area, 1 acre inv. Well # ORG-3
 Site Location Niagara Falls, NY Project # _____
 Personnel PETER LORETTO Excavation Method BAILER

Depth of Well * 17.50 ft.Depth of Water * 10.28 ft.Length of Water Column 7.22 ft.

Water Volume /ft. for:

2" Diameter Well = 0.163 X LWC

4" Diameter Well = 0.653 X LWC

6" Diameter Well = 1.469 X LWC

Volume of Water in Well 1.18 gal.(s)Volume removed before sampling 400 gal.(s)Did well go dry? NO3X Volume of Water in Well 3.53 gal.(s)

(Other, Specify)

* Measurements taken from

☒ Top of Well Casing☐ Top of Protective Casing☐

Water parameters:

Temperature Readings

Initial _____
 after 1.3 (gal.) 42.9
 after 2.6 (gal.) 49.0
 after 4.0 (gal.) 44.7
 after _____ (gal.) _____
 after _____ (gal.) _____

pH Readings

4.0 Standard _____
 7.0 Standard _____
 10.0 Standard _____
 Initial _____
 after _____ (gal.) 6.02
 after _____ (gal.) 6.04
 after _____ (gal.) 6.02
 after _____ (gal.) _____
 after _____ (gal.) _____

Conductivity Readings

84 S Standard _____
 1413 S Standard _____
 Initial _____
 after _____ (gal.) 1006
 after _____ (gal.) 1024
 after _____ (gal.) 1033
 after _____ (gal.) _____
 after _____ (gal.) _____

Water Sample:

Time Collected 1420

Physical Appearance (prior to sampling)

Physical Appearance (after sampling)

Color Light tan
 Odor None
 Turbidity (> 100 NTUs) 2100
 Sheen/Free Product None

Color Light tan
 Odor None
 Turbidity (> 100 NTUs) 2100
 Sheen/Free Product None

Parameters of Samples:

Container Size	Container Type	# Collected	Filtered	Preservative	pH	Temp.	Conductivity

NOTES:

Blind Duplicate Taken here

Date 2/14/95
 Site Name CITY OF NIAGARA FALLS E. AREA
 Site Location NIAGARA FALLS, NY
 Personnel PETER LORETTO

Weather Sunny 18°
 Well # OBG-1
 Project # _____
 Excavation Method BAILER

Depth of Well * 17.45 ft.

Depth of Water * 14.49 ft.

Length of Water Column 2.96 ft.

Volume of Water in Well .48 gal.(s)

Volume removed before sampling 1.3 gal.(s)

3X Volume of Water in Well 1.45 gal.(s)

Did well go dry? yes

(Other, Specify)

* Measurements taken from

☒ Top of Well Casing

☐ Top of Protective Casing

☐

Water parameters:

Temperature Readings

	Initial	
after <u>.50</u> (gal.)	<u>46</u>	
after <u>1.0</u> (gal.)	<u>45.5</u>	
after <u>1.3</u> (gal.)	<u>45.9</u>	
after _____ (gal.)	_____	
after _____ (gal.)	_____	

pH Readings

	Initial	
4.0 Standard _____		
7.0 Standard _____		
10.0 Standard _____		
after _____ (gal.)	<u>6.48</u>	
after _____ (gal.)	<u>7.20</u>	
after _____ (gal.)	<u>7.07</u>	
after _____ (gal.)	_____	
after _____ (gal.)	_____	

Conductivity Readings

	Initial	
84 S Standard _____		
1413 S Standard _____		
after _____ (gal.)	<u>369</u>	
after _____ (gal.)	<u>335</u>	
after _____ (gal.)	<u>375</u>	
after _____ (gal.)	_____	
after _____ (gal.)	_____	

Water Sample:

Time Collected 2/15/95 - 0800

Physical Appearance (prior to sampling)

Physical Appearance (after sampling)

Color Brown
 Odor None
 Turbidity (> 100 NTUs) 2100
 Sheen/Free Product None

Color Silty Brown
 Odor None
 Turbidity (> 100 NTUs) 2100
 Sheen/Free Product None

Parameters of Samples:

Container Size	Container Type	# Collected	Filtered	Preservative	pH	Temp.	Conductivity

NOTES:

Ground Water Sampling Log

Weather Cloudy
Well # Sunny 18°
Project # DBG-5
Method BAILER

Color Blue green
 Odor none
 NTUS) 210
 product 10

NOTES:

Date 2/14/95
 Site Name CITY OF NIAGARA FALLS S. AREA 1 Acre INV.
 Site Location NIAGARA FALLS, NY
 Personnel PETER LORETTO

Weather Sunny 18°
 Well # 10 BG-4
 Project # _____
 Excavation Method BAILER

Depth of Well * 20.36 ft.

Depth of Water * 13.21 ft.

Length of Water Column 7.15 ft.

Volume of Water in Well 1.17 gal.(s)

Volume removed before sampling 3.5 gal.(s)

3X Volume of Water in Well 3.5 gal.(s)

Did well go dry? No

(Other, Specify)

* Measurements taken from

☒ Top of Well Casing

☐ Top of Protective Casing

☐

Water parameters:

Temperature Readings

	Initial
after <u>1.2</u> (gal.)	<u>45.7</u>
after <u>2.4</u> (gal.)	<u>45.8</u>
after <u>3.5</u> (gal.)	<u>44.3</u>
after _____ (gal.)	_____
after _____ (gal.)	_____

pH Readings

	Initial
4.0 Standard _____	
7.0 Standard _____	
10.0 Standard _____	
after _____ (gal.)	<u>6.47</u>
after _____ (gal.)	<u>6.27</u>
after _____ (gal.)	<u>6.32</u>
after _____ (gal.)	_____
after _____ (gal.)	_____

Conductivity Readings

	Initial
84 S Standard _____	
1413 S Standard _____	
after _____ (gal.)	<u>2820</u>
after _____ (gal.)	<u>2172</u>
after _____ (gal.)	<u>1940</u>
after _____ (gal.)	_____
after _____ (gal.)	_____

Water Sample:

Time Collected 1600

Physical Appearance (prior to sampling)

Physical Appearance (after sampling)

Color Black/grey
 Odor None
 Turbidity (> 100 NTUs) > 100
 Sheen/Free Product None

Color Blackish/grey
 Odor None
 Turbidity (> 100 NTUs) > 100
 Sheen/Free Product None

Parameters of Samples:

Container Size	Container Type	# Collected	Filtered	Preservative	pH	Temp.	Conductivity

NOTES:

MS / MSD Taken here

Date 2/14/95
 Site Name City of Niagara Falls E. Area, Lake Env.
 Site Location Niagara Falls, NY
 Personnel PETER LORETTO

Weather Sunny 18°
 Well # OBG-6
 Project # _____
 Excavation Method BAILER

Depth of Well * 20.36 ft.

Depth of Water * 12.46 ft.

Length of Water Column 7.90 ft.

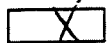
Volume of Water in Well 1.29 gal.(s)

3X Volume of Water in Well 3.86 gal.(s)

Volume removed before sampling 4.0 gal.(s)
 Did well go dry? NO

(Other, Specify)

* Measurements taken from



Top of Well Casing



Top of Protective Casing



Water parameters:

Temperature Readings

	Initial	
after <u>1.3</u> (gal.)	<u>45.3</u>	
after <u>2.6</u> (gal.)	<u>49.6</u>	
after <u>4.0</u> (gal.)	<u>46.9</u>	
after _____ (gal.)	_____	
after _____ (gal.)	_____	

pH Readings

	Initial	
4.0 Standard	_____	
7.0 Standard	_____	
10.0 Standard	_____	
after _____ (gal.)	<u>6.97</u>	
after _____ (gal.)	<u>5.55</u>	
after _____ (gal.)	<u>5.12</u>	
after _____ (gal.)	_____	
after _____ (gal.)	_____	

Conductivity Readings

	Initial	
84 S Standard	_____	
1413 S Standard	_____	
after _____ (gal.)	<u>890</u>	
after _____ (gal.)	<u>737</u>	
after _____ (gal.)	<u>683</u>	
after _____ (gal.)	_____	
after _____ (gal.)	_____	

Water Sample:

Time Collected 1050

Physical Appearance (prior to sampling)

Color Black
 Odor yes
 Turbidity (> 100 NTUs) yes
 Sheen/Free Product spotty

Physical Appearance (after sampling)

Color Black
 Odor same
 Turbidity (> 100 NTUs) yes
 Sheen/Free Product spotty

Parameters of Samples:

Container Size	Container Type	# Collected	Filtered	Preservative	pH	Temp.	Conductivity

NOTES:

APPENDIX E



NIAGARA COUNTY

HEALTH DEPARTMENT
HUMAN RESOURCES BUILDING
MAIN POST OFFICE BOX 428
10th AND EAST FALLS STREET
NIAGARA FALLS, NEW YORK 14302

December 4, 1987

New York State DEC
50 Wolf Road
Room 222
Albany, New York 12233

Attention: Mr. Omar Nagi

Dear Mr. Nagi:

This letter is a response to your request for information on background concentrations of various substances in Niagara Falls area soil. As we discussed, this department has access to the results of thousands of soil sample analyses from the Niagara Falls area. We have compiled background profiles for arsenic, chromium, copper, lead and zinc. That information was previously provided to you. While we have not formally compiled background profiles for other compounds, we have observed fairly consistent patterns of occurrence for the following parameters:

- 1) BHC/HCCH - We have observed that one or more isomers occur in concentrations of up to 1 ppm each in about one sample in ten of soils from the Niagara Falls area. The occurrence seems to be sporadic, without pattern and in both surface and subsurface soils. The occurrence of this substance seems to be distributed throughout the area and we have no scenario as to what the source of this substance is.
- 2) DDT/DDE/DDD: These compounds are detected in about one sample in ten to twenty in concentrations of up to 0.5 ppm for DDT and 0.3 ppm for DDE and DDD. When they are detected the concentrations are typically in a ratio of about 3:2:1 (DDT: DDE: DDD). The compounds have rarely been reported in samples collected at depths exceeding 12 inches in the Niagara Falls area. It appears that when these compounds are detected that they are remnants of historic DDT pesticide application.

- 3) Other Pesticides: Other pesticide compounds are occasionally detected in area soil samples in small concentrations. Our policy has been to regard such detections as background if they occur in less than 10% of the samples, in concentrations less than .5 ppm and where the compound cannot be attributed to any specific source.
- 4) PAH and Related Compounds: One or more of these compounds in concentrations up to 10 ppm each are commonly reported in nearly all surface (less than 12 inches) soil samples from the Niagara Falls area. These compounds are also reported in 10% of the deeper samples at concentrations up to 1 ppm each. Concentrations are higher when ash or asphalt pieces are present in the sample. Phthalate compounds are common in all area soil samples. We assume these compounds have been deposited as airborne particles from combustion sources, vehicle emission, industrial processes, etc. and they seem to be present throughout the Niagara Falls area.
- 5) Chlorobenzene Compounds: Various chlorobenzene compounds are detected in area soils occasionally in concentrations less than 0.1 ppm. We have noted a trend that these compounds are detected fairly commonly in the less than 1 ppb range when detection limits are adequately low. Several scenarios have been suggested as to the possible source of these contaminants.
- 6) Phenol: 5 to 10% of the general soil samples taken in this area report phenol in the 0.5 to 1 ppm range. Total recoverable phenolics are reported in about 75% of the samples in detectable quantities.
- 7) Other Semi-volatile Compounds: Other semi-volatile compounds occur only occasionally (less than 5% of the samples), in particular, other acid extractable semi-volatile compounds occur only rarely in quantities over 2 to 3 times detection limits.
- 8) Methylene Chloride/Acetone: These compounds have been reported in most soil samples from the Niagara Falls area in concentrations up to 0.15ppm and occasionally much higher. These "detections" have often been attributed to the laboratory error or sampling problems but there is still some controversy as to whether or not this is completely correct. It probably was a more substantial factor in older analyses where these compounds were even more predominate. Reports of the occurrence of these compounds is equally common in both shallow and deep soils.
- 9) Toulene/Benzene - Toulene is reported in about 20% of area soil samples and benzene in about 10%, both in concentrations up to about 20 to 30 ppb. Petroleum product use may be responsible for some of this substance.

10) Other Volatiles: Other volatile compounds are rarely observed as "background".

11) Metals: Data and curves for several metals were previously provided. In addition to these we note that antimony is reported in about 10% of samples, usually less than 2 to 3 times the detection limits. Cadmium is detected in 30 to 50% of soil samples, with an average concentration of about 4 ppm (using non-detectable reports as zero for averaging). We would typically consider cadmium over 10 ppm as elevated. Mercury is detected in about 50% of soil samples. We have previously used 0.1 to 0.2 ppm as a typical background range for mercury.

The above guidelines should be considered flexible and not yet fully documented, but we have compared data from several area studies (USGS "Preliminary Evaluation of Chemical Migration to Groundwater and Niagara River..." 1984; NUS, Investigation of eighteen sites in LaSalle Area, Niagara Falls, 1986; Woodward Clyde, Soil sampling from proposed Texas Brine Corporation ROW, 1986; NCHD, Investigation of surface soil contamination at Gratiwick Park, 1986) and there seems to be a general agreement of these data sets and the guidelines given above. The above data sets comprise over 500 individual soil samples from the area.

Please note that reference to background in the above discussion refers to both naturally occurring substances and man-made substances which are typically present across a wide area and not apparently related to a localized source such as a particular disposal site or industrial process.

I hope that you find the above guidelines useful. Feel free to contact me with any questions at 716-284-3128.

Sincerely,

Michael E. Hopkins
Michael E. Hopkins
Ass't. Public Health Engineer

MEH:lj

cc: Messrs. Vaughan & Devald
Mr. Tygert - DEC - Buffalo
Ms. L. Rusin - NYSDOH - Buffalo
Mr. R. Tramantano - NYSDOH - Albany