82267

RECORD OF DECISION

MacKenzie Chemical Works Superfund Site
Central Islip, Suffolk County, New York

United States Environmental Protection Agency
Region II
New York, New York
March 2003

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

MacKenzie Chemical Works Superfund Site
Central Islip, Suffolk County, New York

Superfund Site Identification Number: NYD980753420
Operable Unit 1[1]

STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) documents the U.S. Environmental Protection Agency's selection of a remedy for the MacKenzie Chemical Works Superfund site (Site), which is chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. §9601, *et seq.*, and the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300. This decision document explains the factual and legal basis for selecting the remedy for the Site. The attached index (see **Appendix III**) identifies the items that comprise the Administrative Record upon which the selection of the remedy is based.

The New York State Department of Environmental Conservation (NYSDEC) was consulted on the planned remedy in accordance with CERCLA Section 121(f), 42 U.S.C. §9621(f), and it concurs with the selected remedy (see **Appendix IV**).

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from the Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The major components of the selected remedy include the following:

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[1] This response action applies a comprehensive approach; therefore, only one operable unit is required to remediate the Site.

- Treatment of the unsaturated soils using thermally-enhanced in-situ soil vapor extraction (ISVE) in on-property source areas which exceed New York State Technical and Administrative Guidance Memorandum No. 94-HWR-4046 (TAGM) levels for volatile organic compounds. Post-treatment confirmatory samples will be collected to ensure that all source areas have been effectively treated to the cleanup levels. Off-gases from the ISVE system may need to be treated to meet air-discharge requirements. Soil-vapor monitoring in the treatment areas and in adjacent residential areas will also be conducted, as necessary. Should this monitoring indicate a potential vapor intrusion problem with respect to residences, appropriate actions will be taken.

- Excavation and off-Site disposal of approximately 100 cubic yards of semi-volatile organic compound (SVOC)-contaminated soils which exceed TAGM levels for SVOCs. In addition, any contaminated drywell structures, cesspools, and associated piping will also be excavated and disposed of off-Site. Confirmatory sampling will be conducted to ensure that all SVOC-contaminated soils above the cleanup levels have been removed. The excavation will be backfilled with certified clean fill.

- Demolition of the laboratory building. The building debris, after decontamination, if necessary, will be disposed of off-Site.

- Treatment of the contaminated groundwater using air sparging with ozone injection. The exact configuration and number of injection wells will be determined during the design phase. The system will be operated until state and federal groundwater standards are attained. Soil-vapor monitoring will be conducted in the treatment areas, as necessary. Should this monitoring indicate a potential vapor intrusion problem, appropriate actions will be taken.

- Long-term groundwater monitoring in order to verify that the concentrations and the extent of groundwater contaminants are declining, that the remedy remains effective, and that public water supplies are protected. The exact frequency and parameters of sampling and the location of any additional monitoring wells will be determined during the design phase.

- Institutional controls restricting the installation and use of groundwater wells at and downgradient of the property until groundwater quality has been restored. Institutional controls will be in the form of existing restrictions limiting the use of groundwater

as a potable or process water, as required by the Suffolk County Department of Health Services and/or NYSDEC.

- Engineering controls, such as fencing and signs, in order to protect the integrity of the remedy and to limit facility access until cleanup levels have been attained.

The effectiveness of thermally-enhanced ISVE (and, potentially, the configuration and number of ISVE wells) will be confirmed based upon the results of pilot-scale treatability studies conducted during the design phase and on groundwater monitoring data. Should the findings of the treatability studies indicate that thermally-enhanced ISVE would not be sufficiently effective in addressing the VOC-contaminated soils at the property, then the contingency remedy, excavation and off-Site treatment/disposal of the contaminated soils, would be implemented.

The effectiveness of air sparging with ozone injection (and, potentially, the configuration and number of injection wells) will be confirmed based upon the results of bench- and pilot-scale treatability studies conducted during the design phase. Should the findings of the treatability studies indicate that this technology will not be sufficiently effective in addressing the contaminated groundwater at the Site, or if its implementation proves logistically impracticable (it will require the installation of piping and other components in street rights-of-way that may contain gas and water lines, utility poles, and large trees), then the contingency remedy, groundwater treatment with a permeable reactive barrier, would be implemented.

DECLARATION OF STATUTORY DETERMINATIONS

The selected remedy meets the requirements for remedial actions set forth in CERCLA Section 121, 42 U.S.C. §9621, in that it: 1) is protective of human health and the environment; 2) meets a level or standard of control of the hazardous substances, pollutants and contaminants, which at least attains the legally applicable or relevant and appropriate requirements under federal and state laws; 3) is cost-effective; and 4) utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable. In keeping with the statutory preference for treatment that reduces toxicity, mobility, or volume of contaminated media as a principal element of the remedy, the contaminated soil and groundwater will be treated.

This remedy will result in the reduction of hazardous substances, pollutants, or contaminants on the property to levels that will permit

unlimited use of, and unrestricted exposure to, soil and groundwater. However, because it will take more than five years to attain cleanup levels in the groundwater, a review will be conducted no less often than once every five years after initiation of the remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

ROD DATA CERTIFICATION CHECKLIST

The ROD contains the remedy selection information noted below. More details may be found in the Administrative Record file for this Site.

- Contaminants of concern and their respective concentrations (see ROD, Pages 5-8);
- Baseline risk represented by the contaminants of concern (see ROD, Pages 9-15);
- Cleanup levels established for contaminants of concern and the basis for these levels (see ROD, **Appendix II, Tables 11 and 12**);
- How source materials constituting principal threats are addressed (see ROD, Page 8);
- Current and reasonably-anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD (see ROD, Page 8);
- Potential land and groundwater use that will be available at the Site as a result of the selected remedy (see ROD, Pages 38-39);
- Estimated capital, annual operation and maintenance, and present-worth costs; discount rate; and the number of years over which the remedy cost estimates are projected (see ROD, Page 38); and
- Key factors that led to selecting the remedy (*i.e.*, how the selected remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision)(see ROD, Pages 34-42).

AUTHORIZING SIGNATURE

Jane M. Kenny
Regional Administrator

3/27/03
Date

RECORD OF DECISION FACT SHEET
EPA REGION II

Site

Site name:	MacKenzie Chemical Works Site
Site location:	Central Islip, Suffolk County, New York
HRS score:	50.00
Listed on the NPL:	September 13, 2001

Record of Decision

Date signed:	March 27, 2003
Selected remedy:	In-situ soil vapor extraction of the VOC-contaminated soil with limited excavation and off-Site disposal of SVOC-contaminated soil and drywell structures, groundwater treatment via air sparging with ozone injection.
Capital cost:	$1,234,000
Operation and maintenance cost:	$188,000, annually for 5 years, $ 90,000, annually thereafter
Present-worth cost:	$2.5 Million (7% discount rate for 5 years for soil remedy, 7% discount rate for 15 years for groundwater remedy)

Lead

EPA

Primary Contact:	Mark Granger, Remedial Project Manager, (212) 637-3351
Secondary Contact:	Joel Singerman, Chief, Central New York Remediation Section, (212) 637-4258

Main PRPs

Ian MacKenzie
Murdoch Corporation
Savita Sen and Nutan Anand

Waste

Waste type:	Volatile and semi-volatile organic compounds; metals
Waste origin:	On-property spills/discharges
Contaminated media:	Subsurface soil and groundwater

DECISION SUMMARY

MacKenzie Chemical Works Superfund Site
Central Islip, Suffolk County, New York

United States Environmental Protection Agency
Region II
New York, New York
March 2003

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ATTACHMENTS

SITE NAME, LOCATION, AND DESCRIPTION

The MacKenzie Chemical Works site[1] (Site) includes a parcel of property located at One Cordello Avenue, Central Islip, Suffolk County, New York in a residential/light commercial area. (See **Figure 1** for a location map.) The property, which contains three one-story block buildings (a former manufacturing building and two warehouses) and a two-story (structurally-unsound) block building (a former laboratory) encompasses approximately 1.4 acres and is currently occupied by a paving and excavation firm. The property is bounded to the north by the Long Island Rail Road and commercial properties, to the east by a residential property and an abandoned parking lot, to the south by Railroad Avenue and residential properties, and to the west by Cordello Avenue and vacant land. (See **Figure 2** for a property layout map.)

The local topography surrounding the Site consists of relatively flat terrain with a very slight southerly downward slope (*i.e.*, a difference in elevation of approximately seventy feet over several miles). The Long Island Rail Road tracks immediately to the north produce a berm approximately two feet above the general ground surface of the property. The eastern half of the property is currently used for storage of construction materials, such as sand and fill. As these materials are stored on the property on a temporary basis, surface features of this nature change regularly. Subsurface features include two former concrete-lined waste lagoons backfilled with clean soils, at least one cesspool, and at least nine storm-water drywells.

The property, which has been used for industrial/commercial purposes since 1948, is presently zoned industrial. According to the Town of Islip Department of Planning and Development, it is not anticipated that the land use will change in the future.

The depth to groundwater is approximately fifty feet below ground surface (bgs). The only known private well near or downgradient of the property is located on a residential property that is hydrologically sidegradient[2]. Sampling of this well has shown that it is not impacted by Site-related contaminants. The nearest municipal drinking water supply well is located approximately 3,500 feet southeast of the property (well beyond the contaminant plume) and is screened at a depth of 710 feet bgs (substantially below the depth of the plume).

There are three primary water-bearing aquifers underlying Suffolk County, comprising a federally-designated sole source of drinking water for Long Island. Therefore, groundwater in the vicinity of the Site is a potential

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[1] The Site's Superfund Site Identification Number is NYD980753420.

[2] Potable water for the property and downgradient areas is obtained from public-supply sources.

source of drinking water. Surficial geology is comprised of one to two feet of topsoil/fill underlain by the sand and gravel of the upper geologic unit. Typically, fill materials are encountered to a maximum depth of two feet bgs. Local groundwater flow at the Site moves south to southeast. No surface water bodies exist at or near the Site. There are no streams or stream-cut channels at or near the property. The nearest surface water bodies are Champlin Creek, which is located over a mile south of the property and the Connetquot River, which is located approximately two miles east of the property.

PROPERTY HISTORY AND ENFORCEMENT ACTIVITIES

The property was used from approximately 1948 to 1987 by MacKenzie Chemical Works, Inc. (MCW) for the manufacture of various chemical products, including fuel additives and metal acetylacetonates. Over the years of operation, the Suffolk County Department of Health Services (SCDHS) and the Suffolk County Fire Department documented poor housekeeping and operational procedures. According to SCDHS, MCW stored 1,2,3-trichloropropane (1,2,3-TCP) in three 10,000-gallon tanks on the property. Other potential historical waste sources include other storage tanks[3], leaking drums, two waste lagoons, a cesspool, and storm-water drywells. Spills, explosions, and fires have occurred at the facility, including a methyl ethyl ketone (MEK) spill in 1977, a nitrous oxide release in 1978, and an MEK fire in 1979. SCDHS fined MCW for the nitrous oxide release and ordered it to perform a general property cleanup, including the excavation and drumming of stained surface soils. This effort was completed in 1979.

An assessment was conducted in 1983 by the Environmental Protection Agency (EPA), which recommended that action be taken at the property. Subsequently, MCW arranged for the disposal of thirty-three drums of stained surface soils (from the 1979 cleanup effort) and twenty-two drums of liquid wastes. MCW operations at the property ceased in 1987. In 1993, SCDHS installed nine downgradient temporary well points in order to assess the horizontal and vertical extent of groundwater contamination. The results of the SCDHS effort indicated the presence of elevated levels of 1,2,3-TCP, tetrachloroethylene (PCE), and trichloroethylene (TCE) in downgradient groundwater. In 1993, New York State Department of Environmental Conservation (NYSDEC) completed an investigation of the property. The results of the NYSDEC effort indicated the presence of

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[3] All tanks associated with MCW operations were decommisioned. Most were scrapped in the 1990s.

elevated levels of 1,2,3-TCP, PCE, and TCE in on-property soils and on-property groundwater. Metals and semi-volatile organic compounds (SVOCs) were also detected in on-property soils. In January 1998, NYSDEC commenced a remedial investigation and feasibility study (RI/FS) under state law to determine the nature and extent of contamination at and emanating from the property and to identify and evaluate remedial alternatives. During this investigation, NYSDEC emptied the two concrete-lined and intact waste lagoons of all soil and sludge materials and backfilled them with clean soils. The excavated material was disposed of at an appropriate waste-receiving facility. In June 1999, based on the preliminary findings of the RI, NYSDEC requested that EPA take a response action at the property. In response to NYSDEC's request, EPA collected groundwater samples from off-property monitoring wells, two municipal supply wells, and one private well in April 2000. Based upon the results of this investigation, EPA concluded that immediate actions were not required, but that remedial actions should be considered to address potential long-term threats. NYSDEC completed the RI/FS in August 2000.

The Site was proposed for inclusion on the National Priorities List (NPL) in June 2001; it was listed on the NPL in September 2001.

Because a number of subsequent occupants have reworked the surface of the property since MCW's operations ceased, EPA undertook sampling in July 2002 in order to assess current conditions related to on-property surface soil. Based in part upon these sample results, an RI/FS report addendum was completed by EPA in January 2003.

A search for viable potentially responsible parties (PRPs) is ongoing.

HIGHLIGHTS OF COMMUNITY PARTICIPATION

The RI/FS and RI/FS Addendum describe the nature and extent of the contamination at and emanating from the Site and evaluate remedial alternatives to address this contamination. The Proposed Plan identifies EPA and NYSDEC's preferred remedy and the basis for that preference. These documents were made available to the public in both the Administrative Record and information repositories maintained at the EPA Docket Room in the Region II New York City office and at the Central Islip Public Library located at 33 Hawthorne Avenue, Central Islip, New York. A notice of the commencement of the public comment period, the public meeting date, the preferred remedy, contact information, and the availability of above-referenced documents was published in the *Islip Bulletin* on January 23, 2003. The public comment period opened on

January 23, 2003. Due to inclement weather, EPA postponed the February 18, 2003 public meeting to present the findings of the RI/FS and to answer questions from the public about the Site and the remedial alternatives under consideration. The meeting was rescheduled for and held on March 3, 2003, at 7:00 p.m. at the Central Islip Public Library. In addition, the closure of the public comment period was extended from February 21, 2003 to March 6, 2003. A second notice identifying the new public meeting date and the extension of the public comment period was published in the *Islip Bulletin* on February 27, 2003. Approximately 25 people, including residents, local business people, representatives of civic groups, and state and local government officials, attended the public meeting. On the basis of comments received, the public generally supports the selected remedy. Public comment was related to current Site conditions, groundwater plume, water supply, public awareness, soil-vapor intrusion monitoring, residents' health problems, emergency situations, remediation costs, remediation equipment, and remedy implementation. Responses to the written comments received during the public comment period and to comments received at the public meeting are included in the Responsiveness Summary (see **Appendix V**).

Since it is not anticipated that the industrial zoning of the property will change in the future, the public's views on the assumptions about reasonably anticipated future land were not solicited. Since the area is served by municipal water and the aquifer is already designated as a drinking water source (although it is not likely that the groundwater underlying the property and downgradient will be used for potable purposes in the foreseeable future), the public's views on potential future beneficial groundwater uses were not solicited.

SCOPE AND ROLE OF OPERABLE UNIT

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Section 300.5, defines an operable unit as a discrete action that comprises an incremental step toward comprehensively addressing Site problems. This discrete portion of a remedial response manages migration, or eliminates or mitigates a release, threat of a release, or pathway of exposure. The cleanup of a site can be divided into a number of operable units, depending on the complexity of the problems associated with the Site. This response action applies a comprehensive approach to all Site problems; therefore, only one operable unit is required to remediate the Site. The primary objectives of this action are to remediate the source of contamination at the Site, to reduce and minimize the downward migration of contaminants to the

aquifer, and to minimize any potential future health and environmental impacts.

SUMMARY OF SITE CHARACTERISTICS

The purpose of the RI, conducted from 1998 to 2002, was to determine the nature and extent of the contamination at and emanating from the Site. The results of the RI are summarized below.

Groundwater

Groundwater samples were collected from four on-property monitoring wells, eleven temporary vertical profile wells, four temporary wells, eight downgradient monitoring wells, and two upgradient background monitoring wells. The samples were analyzed for volatile organic compounds (VOCs), SVOCs, pesticides/PCBs, and metals. Groundwater data may be found in **Table 1**.

The primary VOC of concern in the groundwater beneath and downgradient of the property is 1,2,3-TCP. 1,2,3-TCP was detected in two on-property monitoring wells at concentrations of 40 micrograms per liter (µg/l) and 250 µg/l. Downgradient groundwater detections for 1,2,3-TCP included a concentration as high as 34,000 µg/l in a shallow (sixty feet bgs) temporary well point located approximately one-hundred feet downgradient of the property[4] and 9,300 µg/l in an intermediate (eighty feet bgs) temporary well point located five-hundred feet downgradient. Much lower concentrations of 1,2,3-TCP (220 µg/l) were found in a deep (140 feet bgs) monitoring well located approximately fifteen hundred feet downgradient from the source area. No contamination was detected in the most recent sample collected from this well. **Figure 3** delineates the 1,2,3-TCP plume.

PCE was detected in three on-property monitoring wells at concentrations ranging from 13 to 54 µg/l. PCE was detected at 5,600 µg/l in a shallow (sixty feet bgs) downgradient temporary well point; PCE was not detected in deeper samples at this location or in any of the sampling points located

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[4] If the presence of VOCs in groundwater are greater than 1% of the pure phase solubility, then it can be inferred that dense non-aqueous phase liquid (DNAPL) is present (EPA/540/F-94/049; Shiu, 1988; Feenstra, Mackay, & Cherry, 1991). The water solubility of 1,2,3-TCP is reported to be between 19,000 - 27,000 µg/l. Since the maximum 1,2,3-TCP concentration in the groundwater is 34,000 µg/l, the maximum concentration exceeds 1% of the pure phase solubility. Therefore, it is likely that DNAPL is present.

downgradient. Additionally, low concentrations of TCE were detected in some groundwater samples.

For SVOCs, bis-(2-ethylhexyl)phthalate and 2-nitroanaline were detected at 35 µg/l and 14 µg/l, respectively, in on-property monitoring wells. Bis-(2-ethylhexyl)phthalate was detected at 40 µg/l in a downgradient monitoring well.

For metals, manganese was detected in three on-property monitoring wells at concentrations ranging from 388 µg/l to 5,110 µg/l. Arsenic, cadmium, and lead were detected at 30 µg/l, 19 µg/l, and 74 µg/l, respectively.

Based upon the sampling results, it has been determined that an approximately 1,500-foot long, 300-foot wide, and 140-foot deep groundwater VOC plume extends in a southeasterly direction from the western portion of the property. Concentrations of 1,2,3-TCP tend to be significantly lower downgradient from South Road (approximately eight-hundred feet from the property). Further, although 1,2,3-TCP is resistant to biological and chemical degradation, it appears that the groundwater contaminant plume is no longer expanding.

Subsurface Soil

Subsurface soil sampling locations were selected on the basis of soil-gas sampling results and by screening the sampling results of numerous shallow soil borings using a mobile laboratory. In addition, all nine on-property storm-water drywells were sampled. Subsurface soil sampling data may be found in **Table 2**. **Figure 4** shows subsurface soil sampling locations and sampling results for 1,2,3-TCP.

Significant concentrations of 1,2,3-TCP were detected in the unsaturated (above the water table) subsurface soils at five of the eighteen on-property soil-boring locations; the maximum concentration detected was 680 milligrams per kilogram (mg/kg). The 1,2,3-TCP-contaminated soils are located predominantly immediately east of the laboratory building, to a maximum depth of approximately forty feet. 1,2,3-TCP was also detected southeast of the laboratory building and east of the warehouse buildings. PCE was detected at 2.3 mg/kg toward the north of the warehouse buildings. Several other VOCs, including TCE, were detected in subsurface soils, generally at low concentrations.

Soil borings were collected from the nine on-property storm-water drywells. 1,2,3-TCP was detected in a number of the drywells that were located east of the laboratory building, with the highest concentration

being 87 mg/kg. The SVOCs benzo(b)fluoranthene (28 mg/kg), benzo(a)pyrene (23 mg/kg), benzo(a)anthracene (17 mg/kg), and benzo(k)fluoranthene (11 mg/kg) were detected in a drywell located east of the warehouse buildings.

Mercury at 1 mg/kg was detected in a subsurface soil sample collected southeast of the warehouse buildings. Zinc at 224 mg/kg was detected in a soil sample collected from east of the warehouse buildings.

A sample from the bottom of a manhole located at the entrance to 1 Cordello Drive had arsenic at 2,180 mg/kg and zinc at 67 mg/kg.

Surface Soil

Twenty on-property surface soil samples were collected from ten locations. Because a number of subsequent occupants have reworked the surface of the property since MCW's operations ceased, surface soil sampling locations were randomly selected to assess current property conditions. SVOCs were detected in all sample locations. The detected compounds and their maximum concentrations included benzo(a)pyrene (8 mg/kg), dibenzo(a,h)anthracene (1.5 mg/kg), and benzo(a)anthracene (10 mg/kg). It is likely that the nature of several businesses that have occupied the property since MCW ceased operations have contributed to SVOC contamination of surface soils. Surface soil sampling data may be found in **Table 3**.

Aqueous Samples

An aqueous sample collected from an excavated subsurface drain pipe had a 1,2,3-TCP concentration of 11,000,000 µg/l.

Soil Gas

Soil gas samples were analyzed for VOCs in order to evaluate the potential for subsurface gas migration. Samples were collected from four on-property locations southeast of the laboratory building and at twelve downgradient locations immediately to the south of this area (*i.e.*, in the direction of groundwater flow and toward the residential area). Samples were collected from five feet, ten feet, and fifteen feet bgs at each of the locations. In general, the concentrations of VOCs in soil gas tended to increase with depth. Soil-gas sampling data may be found in **Table 4**.

The VOCs 1,2,3-TCP, PCE, and TCE were found at elevated concentrations throughout the soil column in each of the four on-property

locations. Most notably, the maximum concentration of 1,2,3-TCP was 2,200 micrograms per cubic meter ($\mu g/m^3$). PCE was detected up to a concentration of 600 $\mu g/m^3$ and TCE was detected up to a concentration of 300 $\mu g/m^3$. The high soil gas concentrations were generally associated with soil source areas.

1,2,3-TCP was not found in any of the twelve off-property soil-gas sampling locations. PCE levels were approximately half of those found on-property, with a maximum detection of 330 $\mu g/m^3$; TCE was found at levels ten times lower than those on-property, with a maximum detection of 19 $\mu g/m^3$.

PRINCIPAL THREAT WASTE

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP Section 300.430 (a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for the migration of contamination to groundwater, surface water, or air, or act as a source for direct exposure. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of alternatives, using the remedy selection criteria which are described below. This analysis provides a basis for making a statutory finding that the remedy employs treatment as a principal element.

The magnitude of the 1,2,3-TCP concentrations in the aquifer indicates the potential presence of this contaminant in the form of a DNAPL, a principal threat waste.

CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

The property, which has been used for industrial purposes since 1948, is presently zoned industrial; it is not anticipated that the land use will change in the future.

The property is bounded to the north by the Long Island Rail Road and commercial properties, to the east by a residential property and an

abandoned parking lot, to the south by Railroad Avenue and residential properties, and to the west by Cordello Avenue and vacant land.

The groundwater underlying the property and downgradient is contaminated. Potable water for the property and downgradient areas is obtained from public-supply sources. Although it is not likely that the groundwater underlying the property or downgradient will be used for potable purposes in the foreseeable future, regional groundwater is a sole source of potable water and is designated as a drinking water source by NYSDEC.

SUMMARY OF SITE RISKS

Based upon the results of the RI, a baseline risk assessment was conducted to estimate the risks associated with current and future Site conditions. A baseline risk assessment is an analysis of the potential adverse human health and ecological effects caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these under current and anticipated future land uses.

The risk assessment document for this Site, entitled *Hazards and Risks Associated with Surface and Subsurface Soil, Groundwater, and Surface Water Exposure from the MacKenzie Chemical Property in Central Islip, New York* (U.S. Environmental Protection Agency, January 2003) is available in the Administrative Record file.

Human Health Risk Assessment

A Superfund baseline human health risk assessment is an analysis of the potential adverse health effects caused by hazardous substance exposure from a site in the absence of any actions to control or mitigate these under current- and future-land uses. A four-step process is utilized for assessing site-related human health risks for reasonable maximum exposure scenarios.

Hazard Identification: In this step, the contaminants of concern (COCs) at the Site in various media (*i.e.*, soil, groundwater, surface water, and air) are identified based on such factors as toxicity, frequency of occurrence, and fate and transport of the contaminants in the environment, concentrations of the contaminants in specific media, mobility, persistence, and bioaccumulation.

Exposure Assessment: In this step, the different exposure pathways through which people might be exposed to the contaminants identified in the previous step are evaluated. Examples of exposure pathways include incidental ingestion of and dermal contact with contaminated soil. Factors relating to the exposure assessment include, but are not limited to, the concentrations that people might be exposed to and the potential frequency and duration of exposure. Using these factors, a "reasonable maximum exposure" scenario, which portrays the highest level of human exposure that could reasonably be expected to occur, is calculated.

Toxicity Assessment: In this step, the types of adverse health effects associated with contaminant exposures and the relationship between magnitude of exposure and severity of adverse effects are determined. Potential health effects are contaminant-specific and may include the risk of developing cancer over a lifetime or other noncancer health effects, such as changes in the normal functions of organs within the body (*e.g.*, changes in the effectiveness of the immune system). Some contaminants are capable of causing both cancer and noncancer health effects.

Risk Characterization: This step summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site risks. Exposures are evaluated based on the potential risk of developing cancer and the potential for noncancer health hazards. The likelihood of an individual developing cancer is expressed as a probability. For example, a 10^{-4} cancer risk means a "one-in-ten-thousand excess cancer risk"; or one additional cancer may be seen in a population of 10,000 people as a result of exposure to site contaminants under the conditions explained in the Exposure Assessment. Current Superfund guidelines for acceptable exposures are an individual lifetime excess cancer risk in the range of 10^{-4} to 10^{-6} (corresponding to a one-in-ten-thousand to a one-in-a-million excess cancer risk) with 10^{-6} being the point of departure. For noncancer health effects, a "hazard index" (HI) is calculated. An HI represents the sum of the individual exposure levels compared to their corresponding reference doses. The key concept for a noncancer HI is that a "threshold level" (measured as an HI of less than 1) exists below which noncancer health effects are not expected to occur.

The human-health estimates summarized here are based on current reasonable maximum exposure scenarios and were developed by taking into account various conservative estimates about the frequency and duration of an individual's exposure to the COCs in the various media that would be representative of site risks, as well as the toxicity of these contaminants. As was noted above, the current land use of the property is industrial/commercial, and it is not anticipated that the land use will

change in the future. Since the area is served by municipal water, it is not likely that the groundwater underlying the property will be used for potable purposes in the foreseeable future; however, since regional groundwater is designated as a drinking water source, hypothetical exposure to groundwater was evaluated. The other media that were evaluated included surface and subsurface soil. The primary COCs in groundwater are 1,2,3-TCP, other VOCs, and metals. In subsurface soil, the primary COCs are 1,2,3-TCP and SVOCs, and in surface soil, they are SVOCs and metals. **Table 5** summarizes COCs for all media evaluated and the medium-specific exposure point concentrations.

The baseline risk assessment evaluated the health effects which could result from exposure to contaminated property-related media through ingestion, dermal contact, or inhalation. The assessment evaluated hazards and risks to on-property trespassers and future on-property workers exposed to surface soils, future on-property construction and utility workers exposed to subsurface soils, and hypothetical on-property workers and hypothetical off-property adult and child residents exposed to potable groundwater. **Table 6** summarizes exposure pathways for the Site. In addition, a qualitative risk evaluation was performed to assess potential risks for current off-property residents and future on-property workers exposed to soil gas.

The results of the baseline risk assessment indicate that the contaminated subsurface soils on the property and the contaminated groundwater at the Site pose an unacceptable risk to human health due, primarily, to the presence of VOCs, SVOCs, and metals. **Table 7** presents a summary of the cancer toxicity data used to calculate carcinogenic risks. **Table 8** presents a summary of the non-cancer toxicity data used to calculate non-carcinogenic risks. The estimated excess cancer risks related to the ingestion of and dermal contact with subsurface soils at the property for future on-property construction and utility workers exceed the acceptable risk range at 9.4×10^{-3}. For potable groundwater ingestion and inhalation by hypothetical on-property workers and hypothetical off-property adult and child residents, the risks were 2.8×10^{-2}, 3.8×10^{-2}, and 2.2×10^{-2}, respectively, which exceed the acceptable risk range for each receptor population. Risks are driven by 1,2,3-TCP. To determine potential downgradient risks, a separate calculation was performed using data from the downgradient monitoring wells to estimate the risks to hypothetical off-property residents from ingestion and inhalation of groundwater contaminated with 1,2,3-TCP. The resulting risk estimate was 4.1×10^{-4}, which is above the acceptable risk range. The estimated excess cancer risks for future on-property workers and trespassers exposed to surface soil were within the

acceptable risk range. **Table 9** presents a summary of the risk characterization for carcinogens.

The total estimated HI value for individual contaminants and combinations of contaminants for ingestion of and dermal contact with subsurface soils at the property for future on-property construction and utility workers was 4, which is above the acceptable level of 1 and is driven by 1,2,3-TCP. Total estimated HI values for future on-property workers and trespassers exposed to surface soil did not exceed 1. For potable groundwater ingestion and inhalation by hypothetical on-property workers and hypothetical off-property adult and child residents, the HIs were 37, 52, and 120, respectively, which are all above the acceptable level of 1. These HIs are primarily driven by 1,2,3-TCP and iron. **Table 10** presents a summary of the risk characterization for non-carcinogens.

In assessing potential inhalation risk for the soil-gas medium, the sampling results for soil gas were compared against the target values in EPA's Subsurface Vapor Intrusion Guidance (SVIG). For Site-related VOCs, the SVIG values used correspond with the 10^{-4} cancer risk threshold value for vapor concentrations in shallow soil. The comparison suggests that there may be an unacceptable risk to a future on-property worker performing tasks in a basement, driven almost exclusively by 1,2,3-TCP. The maximum on-property soil-gas concentration for 1,2,3-TCP was 2,200 $\mu g/m^3$. The SVIG value for 1,2,3-TCP is 49 $\mu g/m^3$.

Based on the SVIG values, there is no apparent qualitative risk to a current off-property resident. 1,2,3-TCP was not found in any of the thirty-six soil-gas samples collected from twelve off-property locations. With a maximum concentration of 330 $\mu g/m^3$, the 810 $\mu g/m^3$ SVIG value for PCE was not exceeded. All PCE levels were approximately half of those found on the property. TCE was found at levels ten times lower than those on-property, with all reported values being below the SVIG value for TCE of 22 $\mu g/m^3$. **Table 11** includes a summary of the risk-based SVIG values.

Uncertainties

The procedures and inputs used to assess risks in this evaluation, as in all such assessments, are subject to a wide variety of uncertainties. In general, the main sources of uncertainty include:

- environmental contaminant sampling
- chemical analysis
- toxicological data
- exposure assessment estimation

- site-specific considerations

Uncertainty in environmental contaminant sampling arises in part from the potentially uneven distribution of contaminants in the media sampled. Consequently, there is significant uncertainty as to the actual levels present, which could be higher or lower. Uncertainty in chemical analysis can stem from several sources including the errors inherent in the analytical methods and the characteristics of the matrix being sampled. Uncertainties in toxicological data occur in extrapolating both from animals to humans and from high to low doses of exposure, as well as from the difficulties in assessing the toxicity of a mixture of contaminants. Uncertainties in the exposure assessment are related to estimates of how often an individual will actually come in contact with the COCs, the period of time over which such exposure will occur, and in the models used to estimate the concentrations of the COCs at the point of exposure. All of these uncertainties are addressed by making conservative assumptions concerning risk and exposure parameters throughout the assessment. As a result, the Risk Assessment provides upper bound estimates of the risks to populations near the Site, and is highly unlikely to underestimate actual risks related to the Site.

The primary Site-specific uncertainties associated with the exposure assessment for the Site include physical setting and toxicity assumptions.

With respect to the physical setting, while the Town of Central Islip has indicated that it is not anticipated that there will be a zoning change for the Site, future land use is often hard to identify with certainty as short-term planning and current land use in the near term (*i.e.*, 1-5 years) may change substantially over time (*i.e.*, 10-20 years). Future use of the contaminated groundwater by residents or workers is estimated to pose a significant risk. Despite the fact that the groundwater at the Site is designated as a potable water supply, it is not currently being used as such. This may tend to overestimate the risk attributable to groundwater exposure.

With respect to the toxicity assumptions, in addition to 1,2,3-TCP driving the cancer risks for ingestion of groundwater, several metals (aluminum, antimony, arsenic, cadmium, iron, and manganese) were identified as presenting potential non-cancer hazards. All of these metals are commonly found in food and water. In general, these metals can be grouped into several categories (*i.e.*, essential nutrients and trace elements). Essential nutrients would include cadmium, chromium (trivalent), iron, and manganese. Essential nutrients have beneficial properties at low concentrations but may be toxic at higher concentrations. The HI for the essential nutrients is 82.4 for the most

sensitive population, child resident, and 24.8 for the least sensitive, the adult worker. Trace elements would include aluminum, antimony, and arsenic. Trace elements are commonly found in low concentrations in food and water but they are not needed for biological functions. The HI for the trace elements is 37.7 for the child resident (the most sensitive) and 2.8 for the adult worker (the least sensitive). These assumptions may overestimate the actual hazard due to essential-nutrient and trace-element exposures. Also, it should be noted that one of the metals, chromium, was assumed to be 100% in the hexavalent form, which is the most toxic form of chromium. This assumption may also overestimate the actual hazard due to chromium exposure.

Ecological Risk Assessment

EPA conducted a screening of ecological risks and concluded that property conditions do not necessitate a quantitative ecological risk assessment. A qualitative evaluation is summarized below.

Information from the NYSDEC Bureau of Wildlife indicates that there are no endangered or threatened plant or animal species at or in the vicinity of the Site. Therefore, EPA evaluated potential exposure pathways for non-endangered and non-threatened animal and plant species. Since the property includes an industrial/commercial facility, there is minimal habitat available for ecological receptors on the property. Due to the suburban/commercial setting, the potential for the presence of ecological receptors and, consequently, ecological risk to those receptors, is minimal in the area surrounding the property, as well.

Because the main medium of concern is groundwater, and the depth to the surface of the groundwater is approximately fifty feet bgs, direct contact with groundwater by ecological receptors is unlikely. Because there are no wetlands or surface water bodies on or in the immediate vicinity of the Site, there is no potential for contaminated groundwater to discharge into surface water. Therefore, groundwater is not considered to be an exposure pathway for ecological receptors.

Soil samples did contain VOCs, some of which (*e.g.*, 1,2,3-TCP) are present in concentrations greater than screening criteria considered protective of soil invertebrate species. Therefore, there is a potential for an unacceptable risk to burrowing animals that may come into contact with these contaminated surface soils (zero to two-foot depth).

Summary of Human Health and Ecological Risks

The results of the risk assessment indicate that ingestion of and dermal contact with on-property subsurface soils by future on-property construction and utility workers, ingestion and inhalation of groundwater by hypothetical on-property workers and hypothetical off-property adult and child residents, and inhalation of on-property soil gas by future on-property workers pose unacceptable excess cancer risks.

The total estimated HI values for future on-property construction and utility workers exposed to subsurface soil and ingestion and inhalation of groundwater by hypothetical on-property workers and hypothetical off-property adult and child residents pose a chronic adverse non-cancer health risk to such receptors.

Contamination in the surface soil may pose a potential unacceptable risk to burrowing animals that may come into contact with these soils.

Basis for Action

Based upon the quantitative human-health risk assessment and the qualitative ecological evaluation, EPA has determined that actual or threatened releases of hazardous substances from the Site, if not addressed by the response action selected in this ROD, may present a current or potential threat to human health and the environment.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives are specific goals to protect human health and the environment. These objectives are based on available information and standards, such as applicable or relevant and appropriate requirements (ARARs); other federal or state advisories, criteria, or guidance (To-Be-Considered guidance or "TBCs"); and Site-specific risk-based levels.

The following remedial action objectives were established for the Site:

- Restore groundwater to levels which meet state and federal standards within a reasonable time frame;

- Mitigate the potential for contaminants to migrate from soils and drainage structures on the property into groundwater;

- Mitigate the migration of the affected groundwater; and

- Reduce or eliminate any direct contact, ingestion, or inhalation threat associated with contaminated soil on the property.

Soil cleanup levels for the COCs will be those established pursuant to the New York State Technical and Administrative Guidance Memorandum No. 94-HWR-4046 (TAGM). These levels are the more stringent cleanup level between a human-health protection value and a value based on protection of groundwater as specified in the TAGM. All of these levels fall within EPA's acceptable risk range.

Groundwater cleanup goals will be the more stringent of the state or federal promulgated standards.

DESCRIPTION OF ALTERNATIVES

CERCLA §121(b)(1), 42 U.S.C. §9621(b)(1), mandates that remedial actions must be protective of human health and the environment, cost-effective, comply with ARARS, and utilize permanent solutions and alternative treatment technologies and resource recovery alternatives to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ, as a principal element, treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants and contaminants at a site. CERCLA §121(d), 42 U.S.C. §9621(d), further specifies that a remedial action must attain a level or standard of control of the hazardous substances, pollutants, and contaminants, which at least attains ARARs under federal and state laws, unless a waiver can be justified pursuant to CERCLA §121(d)(4), 42 U.S.C. §9621(d)(4).

As was noted previously, principal threat wastes are those source materials that act as a reservoir for the migration of contamination to groundwater (such as the DNAPL potentially present at the Site). Principal threat wastes are those source materials considered to be highly toxic and which present a significant risk to human health or the environment should exposure occur, or are highly mobile such that they generally cannot be reliably contained. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of alternatives using the remedy selection criteria which are described

below. This analysis provides a basis for making a statutory finding that the remedy employs treatment as a principal element[5].

Detailed descriptions of the remedial alternatives for addressing the contamination associated with the Site can be found in the RI/FS report and the RI/FS report addendum. These documents present five soil remediation alternatives and five groundwater remediation alternatives. To facilitate the presentation and evaluation of these alternatives, the RI/FS report and RI/FS report addendum's ten alternatives were condensed into the eight remedial alternatives discussed below[6].

The construction time for each alternative reflects only the time required to construct or implement the remedy and does not include the time required to design the remedy, negotiate the performance of the remedy with any PRPs, or procure contracts for design and construction. The present-worth costs associated with the soil alternatives are calculated using a discount rate of seven percent and a five-year time interval. The present-worth costs associated with the groundwater alternatives are calculated using a discount rate of seven percent and a fifteen-year time interval.

The remedial alternatives are:

Soil Alternatives

Alternative S-1: No Action

Capital Cost:	$0
Annual Operation Maintenance (O&M) Cost	$0
Present-Worth Cost:	$0
Construction Time:	0 months

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5 *A Guide to Principal Threat and Low Level Threat Wastes*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, 9380.3-06FS, November 1991.

6 The two RI/FS report alternatives, groundwater treatment by in-situ chemical oxidation and groundwater extraction and treatment by carbon adsorption, were eliminated from further consideration. Since groundwater extraction with carbon adsorption and groundwater extraction with air stripping and carbon polishing are very similar, EPA consolidated these groundwater alternatives into a single alternative, groundwater extraction and treatment. In-situ chemical oxidation was eliminated because of public safety concerns related to the utilization of large quantities of oxidizing agents.

The Superfund program requires that the "no-action" alternative be considered as a baseline for comparison with the other alternatives. The no-action remedial alternative for soil does not include any physical remedial measures that address the problem of soil contamination at the property.

Because this alternative would result in contaminants remaining on-property above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the Site be reviewed at least once every five years. If justified by the review, remedial actions may be implemented to remove, treat, or contain the wastes.

Alternative S-2: Excavation of Contaminated Soils and Off-Site Treatment/Disposal

Capital Cost:	$1,542,000
O&M:	$0
Present-Worth Cost:	$1,542,000
Construction Time:	6 months

This remedial alternative includes the excavation of all source-area soils which exceed the TAGM cleanup levels, along with any contaminated drywell structures, cesspools, and associated piping.

To obtain access to all of the contaminated soils, this alternative also includes the demolition of the laboratory building. The building debris, after decontamination, if necessary, would be disposed of off-Site.

The estimated volume of contaminated soil to be excavated is 5,000 cubic yards (contamination is as deep as forty-one feet). The actual extent of the excavation and the volume of the excavated material would be based on post-excavation confirmatory sampling. Shoring of the excavation and extraction and treatment of any water that enters the trench would be necessary.

The excavated areas would be backfilled with clean fill and revegetated. All excavated material would be characterized and transported for treatment/disposal at an off-Site Resource Conservation and Recovery Act (RCRA)-compliant facility.

Alternative S-3: Excavation of Contaminated Soils, On-Property Treatment via Low Temperature Thermal Desorption, and Redeposition

Capital Cost:	$2,502,000
O&M:	$0
Present-Worth Cost:	$2,502,000
Construction Time:	1 year

This alternative is the same as Alternative S-2, except that instead of off-Site treatment/disposal, the excavated soils would be fed to a mobile Low-Temperature Thermal Desorption (LTTD) unit brought to the property, where hot air injected at a temperature above the boiling points of the organic contaminants of concern would allow them to be volatilized into gases and escape from the soil. The organic vapors extracted from the soil would then be either condensed, transferred to another medium (such as granular activated carbon), or thermally treated in an afterburner operated to ensure complete destruction of the VOCs. The off-gases would be filtered through a carbon vessel. Once the treated soil achieved the TAGM levels, it would be tested in accordance with the Toxicity Characteristic Leaching Procedure (TCLP) to determine whether it constitutes a RCRA hazardous waste for metals and, provided that it passes the test, it would be used as backfill material for the excavated area. Soil above TCLP metals levels would be either pre-treated or disposed of at an approved off-Site facility, as appropriate.

To obtain access to all of the contaminated soils, this alternative also includes the demolition of the laboratory building. The building debris, after decontamination, if necessary, would be disposed of off-Site.

The excavated drywell structures, cesspools, and associated piping would be disposed of off-Site at a RCRA-compliant facility.

Alternative S-4: Treatment of VOC-Contaminated Soils Using Thermally-Enhanced ISVE; Excavation of SVOC-Contaminated Soils with Off-Site Treatment/Disposal

Capital Cost:	$ 789,000
O&M:	$ 98,000
Present-Worth Cost:	$1,192,000
Construction Time:	3 months

Under this alternative, the VOC-contaminated soils (approximately 5,000 cubic yards) would be remediated by thermally-enhanced ISVE[7]. Under this treatment process, either steam or heated air would be forced through a series of wells to volatilize the solvents contaminating the soils in the unsaturated zone (above the water table). The extracted vapors would be treated by granular activated carbon and/or other appropriate technologies before being vented to the atmosphere. The exact configuration and number of vacuum extraction wells and heat-injection points would be determined based on the results of a pilot-scale treatability study.

While the actual period of operation of the ISVE system would be based upon soil sampling results which demonstrate that the affected soils have been treated to soil TAGM levels, it is estimated that the system would operate for a period of five years.

Since thermally-enhanced ISVE would not be effective at remediating the SVOC-contaminated soils located primarily east of the warehouse buildings, these soils (approximately 100 cubic yards in total) would be excavated and disposed of off-Site. In addition, contaminated drywell structures, cesspools, and associated piping would be excavated and removed.

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[7] Factors that contribute to the effectiveness of a conventional ISVE system are the chemical and physical properties of the contaminants and the soil characteristics. Based on the results of the RI, the property's soils should be conducive to vapor extraction. The chemical and physical properties of 1,2,3-TCP suggest that thermal enhancement would be necessary for ISVE to be effective in the contaminant's removal (*i.e.*, heating would make 1,2,3-TCP more volatile).

To obtain access to all of the contaminated soils, this alternative also includes the demolition of the laboratory building. The building debris, after decontamination, if necessary, would be disposed of off-Site.

The excavated areas would be backfilled with clean fill and revegetated. All excavated materials would be characterized and transported for treatment/disposal at an off-Site RCRA-compliant facility.

This alternative also includes engineering controls, such as fencing and signs, to protect the integrity of the soil treatment system and to limit access until the soil remediation effort has been completed.

Groundwater Alternatives

Alternative GW-1: No Action

Capital Cost:	$0
O&M:	$0
Present-Worth Cost:	$0
Construction Time:	0 months

The Superfund program requires that the "no-action" alternative be considered as a baseline for comparison with the other alternatives. The no-action remedial alternative would not include any physical remedial measures to address the groundwater contamination at the Site.

Because this alternative would result in contaminants remaining on-Site above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the Site be reviewed at least once every five years. If justified by the review, remedial actions may be implemented to remove or treat the wastes.

Alternative GW-2: Groundwater In-Situ Air Sparging with Ozone Injection

Capital Cost:	$ 445,000
O&M:	$ 90,000
Present-Worth Cost:	$1,262,000
Construction Time:	4 months

Under this alternative, a mixture of ozone and air would be injected under pressure into the aquifer through injection-well points installed into the plume along the southern boundary of the property or at the source areas (immediately east of the laboratory building, southeast of the laboratory building, and east of the warehouse buildings) and within the downgradient plume (see Figure 3). It is anticipated that six injection-well points with a pallet-mounted injection system would be required to treat the source area contamination and eight injection-well points with a street curb-mounted injection system would be required in downgradient areas to address the existing plume. The injection-well points would be installed to depths of up to 140 feet bgs. Because the area downgradient from the source areas is highly-developed and densely-populated, the injection-well points and the associated piping installed downgradient of the source areas would be placed beneath roadways or in road rights-of-way so as to avoid having to install them on residential properties.

Under this process, bubbles are formed from the injected ozone and air, which strip and oxidize[8] the VOCs from the groundwater, a reaction that breaks down VOCs (including 1,2,3-TCP) into carbon dioxide and chlorides. Ozone is required to enhance air sparging both because of the depth to which 1,2,3-TCP is present and due to the solubility of 1,2,3-TCP in groundwater.

Bench- and pilot-scale treatability studies would be performed to optimize the effectiveness of the injection system and to determine optimum installation locations for the injection-well points.

As part of a long-term groundwater monitoring program, groundwater samples would be collected and analyzed regularly in order to verify that the concentration and the extent of groundwater contaminants are declining. The exact frequency and parameters of sampling and location

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[8] An oxidizing agent uses oxygen to degrade VOCs.

of any additional monitoring wells would be determined during the design phase. Soil-vapor monitoring in the treatment areas would also be conducted, as necessary.

It has been estimated that it would take fifteen years to remediate the contaminated groundwater through air sparging and ozone injection.

This alternative also includes institutional controls restricting the installation and use of groundwater wells at and downgradient of the property until groundwater quality has been restored. Institutional controls will be in the form of existing restrictions limiting the use of groundwater as a potable or process water, as required by SCDHS and/or NYSDEC.

Engineering controls, such as fencing and signs, would be used to protect the integrity of all system installations.

Because under this alternative it will take more than five years to attain cleanup levels in the groundwater, CERCLA requires that the Site be reviewed at least once every five years.

Alternative GW-3: Groundwater Extraction and Treatment

Capital Cost:	$1,149,000
O&M:	$ 155,000
Present-Worth Cost:	$2,561,000
Construction Time:	6 months

Under this alternative, a network of wells installed into the plume along the southern boundary of the property or within the source areas (immediately east of the laboratory building, southeast of the laboratory building, and east of the warehouse buildings) and within the downgradient plume would extract contaminated groundwater. The extracted groundwater would be piped to an on-property facility where it would be treated by air stripping and/or other appropriate technologies, and would be reinjected to the aquifer. It is anticipated that three wells would be required to extract contaminated groundwater from the source areas and three wells would be required in downgradient areas. Because the area downgradient from the source areas is highly-developed and densely-populated, the extraction wells and the associated piping installed downgradient of the source areas would be placed beneath

roadways or in road rights-of-way so as to avoid having to install them on residential properties.

Air stripping involves pumping untreated groundwater to the top of a "packed" column, which contains a specified amount of inert packing material. The column receives ambient air under pressure in an upward direction from the bottom of the column as the water flows downward, transferring VOCs to the air phase. The air-stripping process would be followed by a groundwater polishing system using granular activated carbon and/or other appropriate technologies. To comply with New York State air guidelines, granular activated carbon treatment of the air strippers' air exhaust streams may be necessary.

As part of a long-term groundwater monitoring program, groundwater samples would be collected and analyzed regularly in order to verify that the concentration and the extent of groundwater contaminants are declining. The exact frequency and parameters of sampling and the location of any additional monitoring wells would be determined during the design phase.

It has been estimated that it would take approximately fifteen years of groundwater extraction and treatment to remediate the entire groundwater plume.

This alternative also includes institutional controls restricting the installation and use of groundwater wells at and downgradient of the property until groundwater quality has been restored. Institutional controls will be in the form of existing restrictions limiting the use of groundwater as a potable or process water, as required by SCDHS and/or NYSDEC.

Engineering controls, such as fencing and signs, would be used to protect the integrity of all system installations.

Because under this alternative it will take more than five years to attain cleanup levels in the groundwater, CERCLA requires that the Site be reviewed at least once every five years.

Alternative GW-4: In-Situ Permeable Reactive Barrier

Capital Cost:	$ 2,400,000
O&M:	$ 18,000
Present-Worth Cost:	$ 2,564,000
Construction Time:	6 months

Under this alternative, subsurface permeable reactive barriers would be installed across the width and depth of the groundwater plume along the southern boundary of the property (immediately east of the laboratory building, southeast of the laboratory building, and east of the warehouse buildings) and within the downgradient plume to catalytically break down VOCs into carbon dioxide and chlorides as the groundwater passes through the barrier.

Installation of a permeable reactive barrier involves the fracturing of the subsurface using standard drilling technologies and immediately filling the fracture with a soluble slurry containing catalytic iron, a substance proven to break down VOCs (including 1,2,3-TCP). The controlled fracturing and filling are accomplished in up to thirty-foot wide reactive panels, requiring the installation of a number of panels into the water table with a drill rig to approximately 140 feet bgs. The thickness of the reactive panel can also be controlled and is determined as a function of contaminant concentration and groundwater velocity. With a panel porosity higher than the surrounding formation, VOCs are degraded to harmless compounds as they pass through the barrier.

As part of a long-term groundwater monitoring program, groundwater samples would be collected and analyzed regularly in order to verify that the concentrations and the extent of groundwater contaminants are declining. The exact frequency and parameters of sampling and the location of any additional monitoring wells would be determined during the design phase.

It has been estimated that it would take approximately fifteen years to remediate the groundwater plume using permeable reactive barriers.

This alternative also includes institutional controls restricting the installation and use of groundwater wells at and downgradient of the property until groundwater quality has been restored. Institutional controls will be in the form of existing restrictions limiting the use of

groundwater as a potable or process water, as required by SCDHS and/or NYSDEC.

Engineering controls, such as fencing and signs, would be used to protect the integrity of all system installations.

Because under this alternative it will take more than five years to attain cleanup levels in the groundwater, CERCLA requires that the Site be reviewed at least once every five years.

COMPARATIVE ANALYSIS OF ALTERNATIVES

In selecting a remedy, EPA considered the factors set out in CERCLA Section 121, 42 U.S.C. §9621, by conducting a detailed analysis of the viable remedial alternatives pursuant to the NCP, 40 CFR §300.430(e)(9), and OSWER Directive 9355.3-01 (*Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA: Interim Final*, October 1988). The detailed analysis consisted of an assessment of the individual alternatives against each of nine evaluation criteria and a comparative analysis focusing upon the relative performance of each alternative against those criteria.

The following "threshold" criteria are the most important and must be satisfied by any alternative in order to be eligible for selection:

1. *Overall protection of human health and the environment* addresses whether or not a remedy provides adequate protection and describes how risks posed through each exposure pathway (based on a reasonable maximum exposure scenario) are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

2. *Compliance with ARARs* addresses whether or not a remedy would meet all of the applicable or relevant and appropriate requirements of other federal and state environmental statutes and regulations or provide grounds for invoking a waiver. Other federal or state advisories, criteria, or guidance are TBCs. TBCs are not required by the NCP, but may be very useful in determining what is protective of a site or how to carry out certain actions or requirements.

The following "primary balancing" criteria are used to make comparisons and to identify the major tradeoffs between alternatives:

3. *Long-term effectiveness and permanence* refers to the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met. It also addresses the magnitude and effectiveness of the measures that may be required to manage the risk posed by treatment residuals and/or untreated wastes.

4. *Reduction of toxicity, mobility, or volume through treatment* is the anticipated performance of the treatment technologies, with respect to these parameters, a remedy may employ.

5. *Short-term effectiveness* addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

6. *Implementability* is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

7. *Cost* includes estimated capital, O&M, and net present-worth costs.

The following "modifying" criteria are used in the final evaluation of the remedial alternatives after the formal comment period, and may prompt modification of the preferred remedy that was presented in the Proposed Plan:

8. *State acceptance* indicates whether, based on its review of the RI/FS report, RI/FS report addendum, and Proposed Plan, the State concurs with, opposes, or has no comments on the selected remedy.

9. *Community acceptance* refers to the public's general response to the alternatives described in the RI/FS report, RI/FS report addendum, and Proposed Plan.

A comparative analysis of these alternatives based upon the evaluation criteria noted above, follows.

Overall Protection of Human Health and the Environment

Alternative S-1 (no action) would not be protective of human health and the environment, since it would not actively address the contaminated soils, which present unacceptable risks of exposure and are a source of groundwater contamination. Alternative S-2 (excavation of contaminated soils and off-Site treatment/disposal), Alternative S-3 (excavation of

contaminated soils and on-property treatment via LTTD), and Alternative S-4 (thermally-enhanced ISVE) would be protective of human health and the environment, since each alternative relies upon a remedial strategy and/or treatment technology capable of eliminating human exposure and removing the source of groundwater contamination in the unsaturated zone. Under these alternatives, the contaminants would either be treated on-property or treated/disposed of off-Site.

Alternative GW-1 (no action) would be the least protective groundwater alternative in that it would result in no affirmative steps to restore groundwater quality to drinking water standards. Therefore, under this alternative, the restoration of the groundwater would take a significantly longer time (estimated to be at least thirty years) in comparison to the other alternatives. All three of the active groundwater alternatives are estimated to restore groundwater quality significantly faster (approximately fifteen years) and, therefore, would be protective of human health and the environment.

Compliance with ARARs

There are currently no federal or state promulgated standards for contaminant levels in soils. There are, however, TBCs, one of which is the New York State TAGM which is being used as the soil cleanup levels for this Site.

Since the contaminated soils would not be addressed under Alternative S-1 (no action), this alternative would not comply with the soil cleanup levels, Alternative S-2 (excavation of contaminated soils and off-Site treatment/disposal), Alternative S-3 (excavation of contaminated soils and on-property treatment via LTTD), and Alternative S-4 (thermally-enhanced ISVE), would attain the soil cleanup levels specified in the TAGM.

Under Alternative S-4, spent granular activated carbon from the ISVE units would need to be managed in compliance with RCRA treatment/disposal requirements.

Alternative S-2 and Alternative S-4, and, to a lesser extent, Alternative S-3 (for the SVOC-contaminated soils and any contaminated drywell structures, cesspools, and piping), would be subject to New York State and federal regulations related to the transportation and off-Site treatment/disposal of wastes. Alternatives S-2 and S-3 would involve the excavation of contaminated soils and would, therefore, require compliance with fugitive dust and VOC emission regulations. In the case of Alternative S-3, compliance with air emission standards would be

required at the LTTD unit, as well. Any emissions from the ISVE system for Alternative S-4 would require similar compliance. Specifically, treatment of off-gases would have to meet the substantive requirements of New York State Regulations for Prevention and Control of Air Contamination and Air Pollution (6 NYCRR Part 200 *et.seq.*) and comply with the substantive requirements of other state and federal air emission standards.

EPA and NYSDOH have promulgated health-based protective Maximum Contaminant Levels (MCLs), which are enforceable standards for various drinking water contaminants (chemical-specific ARARs). Although the groundwater at the Site is not presently being utilized as a potable water source, State and Federal MCLs in the groundwater are ARARs because the groundwater at the Site is a potential source of drinking water. The aquifer is classified as Class GA, meaning that it is designated as a potable water supply; therefore, Class GA Groundwater Quality Standards are also ARARs.

Alternative GW-1 (no action) does not provide for any direct remediation of the groundwater and would, therefore, involve no actions to achieve chemical-specific ARARs. All three of the active groundwater alternatives would be effective in reducing groundwater contaminant concentrations below state and federal groundwater standards.

Any emissions from the air stripper under Alternative GW-3 would be required to comply with the substantive requirements of state and federal air emission standards.

Long-Term Effectiveness and Permanence

Alternative S-1 (no action) would involve no active remedial measures and, therefore, would not be effective in eliminating the potential exposure to contaminants in soil and would allow the migration of contaminants in soil and groundwater. Alternative S-2 (excavation of contaminated soils and off-Site treatment/disposal), Alternative S-3 (excavation of contaminated soils and on-property treatment via LTTD), and Alternative S-4 (thermally-enhanced ISVE) would all be effective in the long term and would provide permanent remediation by either removing the wastes from the property or treating them on-Site.

Alternatives S-3 and S-4 would generate treatment residuals which would have to be appropriately handled; Alternative S-2 would not generate such residuals.

Alternative GW-1 (no action) would be far less effective in the long term in restoring groundwater quality, since it would take at least twice as long to restore groundwater than Alternative GW-2 (in-situ air sparging with ozone injection), Alternative GW-3 (groundwater extraction and treatment), and Alternative GW-4 (permeable reactive barrier). All of the active groundwater alternatives would effectively restore groundwater quality in approximately fifteen years.

Alternative GW-3 may generate treatment residuals which would have to be appropriately handled; Alternatives GW-1, GW-2, and GW-4 would not generate such residuals.

Reduction in Toxicity, Mobility, or Volume Through Treatment

Alternative S-1 (no action) would provide no reduction in toxicity, mobility or volume. Under Alternative S-3 (excavation of contaminated soils and on-property treatment via LTTD) and Alternative S-4 (thermally-enhanced ISVE), the toxicity, mobility, and volume of contaminants would be reduced or eliminated through on-property treatment. Under Alternative S-2 (excavation of contaminated soils and off-Site treatment/disposal), the toxicity, mobility, and volume of the contaminants would be eliminated from the Site by removing the contaminated soil from the property for treatment/disposal.

Alternative GW-1 (no action) would not effectively reduce the toxicity, mobility, or volume of contaminants in the groundwater, as this alternative involves no active remedial measures. Alternative GW-2 (in-situ air sparging with ozone injection), Alternative GW-3 (groundwater extraction and treatment), and Alternative GW-4 (permeable reactive barrier) would reduce the toxicity, mobility, or volume of contaminants in the groundwater through treatment at (or adjacent to) the source and in downgradient areas, thereby satisfying CERCLA's preference for treatment. Alternatives GW-2 and GW-3 possess the added flexibility of being constructed within the source areas, thus, potentially reducing the toxicity, mobility, or volume of contaminants in the source areas in a shorter time period.

Short-Term Effectiveness

Alternative S-1 (no action) does not include any physical construction measures in any areas of contamination and, therefore, would not present any potential adverse impacts to on-property workers or the community as a result of its implementation. Alternatives S-2 (excavation of contaminated soils and off-Site treatment/disposal) and S-3 (excavation of contaminated soils and on-property treatment via LTTD) could present

some limited adverse impact to on-property workers through dermal contact and inhalation related to post-excavation sampling activities. Similarly, Alternative S-4 (thermally-enhanced ISVE) could result in some adverse impacts to on-property workers through dermal contact and inhalation related to the installation of ISVE wells through contaminated soils. Noise from the treatment units associated with Alternatives S-3 and S-4 could present some limited adverse impacts to on-property workers and nearby residents. In addition, interim and post-remediation soil sampling activities would pose some risk. The risks to on-property workers and nearby residents under all of the alternatives could, however, be mitigated by following appropriate health and safety protocols, by exercising sound engineering practices, and by utilizing proper protective equipment.

Alternative S-2 would require the off-Site transport of contaminated waste material, which may pose the potential for traffic accidents, which could result in releases of hazardous substances. Alternatives S-3 and S-4 would also require the off-Site transport of contaminated wastes, but at a volume substantially less than the other active alternatives.

Under Alternatives S-2 and S-3, substantial disturbance of the land during excavation activities could affect the surface water hydrology of the property. There is a potential for increased stormwater runoff and erosion during excavation and construction activities that would have to be properly managed to prevent or minimize any adverse impacts. For these alternatives, appropriate measures would have to be taken during excavation activities to prevent transport of fugitive dust and exposure of workers and downgradient receptors to VOCs.

Since no actions would be performed under Alternative S-1, there would be no implementation time. It is estimated that it would take six months to excavate and transport the contaminated soils to an EPA-approved treatment/disposal facility under Alternative S-2 and one year to excavate and treat the contaminated soils using LTTD under Alternative S-3. It is estimated that Alternative S-4 would require three months to install the ISVE system and five years to achieve soil cleanup levels.

All of the groundwater alternatives could present some limited adverse short-term impacts to on-property workers through dermal contact and inhalation related to groundwater sampling activities. Alternative GW-2 (in-situ air sparging with ozone injection), Alternative GW-3 (groundwater extraction and treatment), and Alternative GW-4 (permeable reactive barrier) could present adverse impacts to on-property workers, since these alternatives would involve the installation of either injection wells, extraction wells, or reactive panels through potentially contaminated soils

and groundwater. Alternative GW-2 could pose more adverse impacts than Alternatives GW-3 and GW-4, since it would require the installation of significantly more well points than Alternatives GW-3 and GW-4. On the other hand, both Alternatives GW-2 and GW-3 require the installation of piping and other components in the street rights-of-way, thus, increasing the potential for adverse impacts. Noise from the treatment units associated with Alternatives GW-2 and GW-3 could present some limited adverse impacts to on-property workers and nearby residents. The risks to on-property workers and nearby residents under all of the alternatives could, however, be minimized by following appropriate health and safety protocols, by exercising sound engineering practices, and by utilizing proper protective equipment.

Since no activities would be performed under Alternative GW-1, no time would be required to implement this alternative. It is estimated that the groundwater remediation systems under Alternative GW-2, Alternative GW-3, and Alternative GW-4 would be constructed in four, six, and six months, respectively.

It is estimated that Alternative GW-1 would require at least thirty years to remediate the source areas and the contaminant plume. Alternatives GW-2, GW-3, and GW-4, with similar configurations with respect to the source areas and the plume, but with varying technologies, would require approximately fifteen years to remediate the contaminated groundwater. The actual time for the groundwater to be remediated under all of the alternatives may vary and may need to be refined based on the results of groundwater monitoring and, as appropriate, groundwater modeling.

Implementability

Alternative S-1 (no action) would be the easiest to implement, as there are no activities to undertake. Potentially difficult factors related to the excavation of soils down to fifty feet bgs adjacent to on-property buildings and on a property that is so small may need to be resolved for Alternative S-2 (excavation of contaminated soils and off-Site treatment) and Alternative S-3 (excavation of contaminated soils and on-property treatment via LTTD). Additional measures, such as building demolition (in addition to the laboratory building), may be required to make space. In addition, finding sufficient space for the placement of an LTTD unit on-property could be problematic. Alternative S-4 (thermally-enhanced ISVE) would be much easier to implement than Alternative S-2 and Alternative S-3 since large-scale soil excavation and handling would not be required. All three active soil alternatives would require the demolition of the laboratory building in order to facilitate the goal of attaining cleanup levels. Staging the building debris for off-Site disposal may be

difficult for all of these alternatives because of the small size of the property. Under Alternatives S-2 and S-3, the excavation of soils down to fifty feet bgs adjacent to on-property buildings and on a property that is so small may necessitate additional building demolition, further complicating the building debris staging requirements. Also, because of space limitations, staging the excavated soil for off-Site treatment/disposal and on-property treatment, under Alternatives S-2 and S-3, respectively, may prove difficult.

All three soil action alternatives would employ technologies known to be reliable and that can be readily implemented. In addition, equipment, services, and materials needed for these alternatives are readily available, and the actions under these alternatives would be administratively feasible. Sufficient facilities are available for the treatment/disposal of the excavated soils under Alternative S-2. Thermally-enhanced ISVE (Alternative S-4) is an effective technology for removing VOCs, although pilot-scale treatability studies would need to be performed to confirm that it will be fully effective in treating 1,2,3-TCP.

Under Alternative S-2 and Alternative S-3, monitoring the effectiveness of the excavation could be easily accomplished through post-excavation soil sampling and analysis. Monitoring the effectiveness of the LTTD system under Alternative S-3 could be easily accomplished through post-treatment soil sampling and analysis, although, based on EPA's experience at other Superfund sites, there may be implementation issues related to public acceptance with respect to locating an LTTD unit in a densely-populated area. Monitoring the effectiveness of the ISVE system under Alternative S-4 would be easily accomplished through soil and soil-vapor sampling and analysis.

Alternative GW-1 (no action) would be the easiest to implement, since it would not entail the performance of any activities. While the air sparging/ozone injection system related to Alternative GW-2 and the groundwater extraction and treatment system related to Alternative GW-3 would be relatively easy to implement, the implementation of Alternative GW-4 (permeable reactive barrier) would be the easiest to implement as there are no piping or facilities to construct or maintain. While there is sufficient space on the property for most of the constructed components of each of the active groundwater alternatives, Alternative GW-4 would be substantially easier to implement than either Alternatives GW-2 or GW-3 in the highly-developed and densely-populated downgradient plume area; both Alternatives GW-2 and GW-3 would require the installation of piping and other components in the street rights-of-way potentially complicated by the presence of gas and water lines, utility poles, and large trees. Alternative GW-3 would be the most difficult to implement

due to the size and quantity of the water piping that would be required to be installed along the street rights-of-way back to the on-property treatment system and due to the limited options related to the discharge of a relatively high volume of treated groundwater. Both Alternative GW-2 and Alternative GW-3 would use conventional well and piping installation techniques and equipment. Alternative GW-4 would use conventional installation techniques, but would require the use of sophisticated control technology in the placement of the reactive panels.

Air sparging, as a general rule, is only effective to a depth of fifty feet below the water table. At the Site, the saturated thickness of the plume is over seventy feet. A recently developed air sparging technology appears to be viable. This system injects an air/ozone mixture into the aquifer up to 150 feet below the water surface using an injection-well point system. Because 1,2,3-TCP is not a typical contaminant, there has been no experience using this technology for this particular contaminant. However, because the chemical nature of 1,2,3-TCP is similar to other VOCs for which this technology performs well, it appears likely that it would be amenable to treatment with this technology. Consequently, bench- and pilot-scale treatability studies would be required to verify its effectiveness.

The groundwater extraction and treatment system that would be used under Alternative GW-3 has been implemented successfully at numerous sites to extract, treat, and hydraulically control contaminated groundwater. Though relatively new, the groundwater treatment system that would be used under Alternative GW-4 has also been implemented successfully at numerous sites in treating contaminated groundwater.

The air stripping and granular activated carbon technologies that might be used for Alternative GW-3 are proven and reliable in achieving the specified performance goals and are readily available, as is the catalytic iron technology associated with Alternative GW-4.

Cost

The present-worth costs associated with the soil alternatives are calculated using a discount rate of seven percent and a five-year time interval. The present-worth costs associated with the groundwater alternatives are calculated using a discount rate of seven percent and a fifteen-year time interval.

The estimated capital, O&M, and present-worth costs for each of the alternatives are presented below.

Alternative	Capital Cost	Annual O&M Cost	Present-Worth Cost
S-1	$0	$0	$0
S-2	$1,542,000	$0	$1,542,000
S-3	$2,502,000	$0	$2,502,000
S-4	$789,000	$98,000	$1,192,000
GW-1	$0	$0	$0
GW-2	$445,000	$90,000	$1,262,000
GW-3	$1,149,000	$155,000	$2,561,000
GW-4	$2,400,000	$18,000	$2,564,000

As can be seen by the cost estimates, Alternative S-1 (no action) is the least costly soil alternative at $0. Alternative S-3 (excavation of contaminated soils and on-property treatment via LTTD) is the most costly soil alternative at $2,502,000. The least costly groundwater remedy is Alternative GW-1 (no action) at $0. Alternative GW-3 and GW-4 are the most costly groundwater alternatives, each estimated at an approximate cost of $2,560,000.

State Acceptance

NYSDEC concurs with the selected remedy; a letter of concurrence is attached (see **Appendix IV**).

Community Acceptance

Comments received during the public comment period indicate that the public generally supports the selected remedy. These comments are summarized and addressed in the Responsiveness Summary, which is attached as **Appendix V** to this document.

SELECTED REMEDY

Summary of the Rationale for the Selected Remedy

Based upon consideration of the requirements of CERCLA, the detailed analysis of the alternatives, and public comments, EPA has determined that Alternative S-4 (thermally-enhanced ISVE) and Alternative GW-2 (in-

situ air sparging with ozone injection), for the soil and groundwater, respectively, best satisfy the requirements of CERCLA Section 121, 42 U.S.C. §9621, and provide the best balance of tradeoffs among the remedial alternatives with respect to the NCP's nine evaluation criteria, 40 CFR §300.430(e)(9). See **Figure 5** and **Figure 6** for a conceptual plan of Alternative S-4 and Alternative GW-2, respectively.

While Alternative S-2 (excavation of contaminated soils and off-Site treatment/disposal), Alternative S-3 (excavation of contaminated soils and on-property treatment via LTTD), and Alternative S-4 (thermally-enhanced ISVE) would all effectively achieve the soil cleanup levels, Alternative S-2 and Alternative S-3 would be more expensive than Alternative S-4. Potentially difficult factors exist for Alternative S-2 and Alternative S-3 related to the excavation of soils down to fifty feet bgs adjacent to on-property buildings because the property is so small. Additional measures, such as building demolition (in addition to the laboratory building), would likely be required. Also, because of space limitations, staging the excavated soil for off-Site treatment/disposal and on-property treatment, under Alternatives S-2 and S-3, respectively, as well as staging any additional building demolition debris, may prove difficult. While Alternative S-4 would require the performance of pilot-scale treatability studies and would take significantly longer to achieve the soil cleanup levels than the other action alternatives (five years for thermally-enhanced ISVE, as compared to six months to excavate and transport the contaminated soils to an EPA-approved treatment/disposal facility and one year to excavate and treat the contaminated soils using LTTD), considering that the groundwater component of the preferred remedy would address the contaminated groundwater in an estimated fifteen years, the increase in the time needed to clean up the soil would not be a significant concern. Therefore, EPA believes that Alternative S-4 would still effectuate the soil cleanup while providing the best balance of tradeoffs with respect to the evaluation criteria.

Alternative S-2 has been retained as the contingency remedy because, while Alternative S-3 is as effective as Alternative S-2, it would take more time to implement, require on-property space for the placement of an LTTD unit (which may be problematic), and is estimated to be more than twice as costly, as noted above.

Alternative GW-2 would effectuate the groundwater cleanup while providing the best balance of tradeoffs among the alternatives with respect to the evaluating criteria. All three of the active groundwater alternatives are estimated to take approximately fifteen years to restore groundwater quality. Alternative GW-4 (permeable reactive barrier) would be easier to implement than the two other action alternatives (especially

in the highly-developed and densely-populated downgradient plume area, where implementation would be complicated by the presence of gas and water lines, utility poles, and large trees) because there are no piping or facilities to construct or maintain; however, Alternative GW-4 is approximately twice the cost of Alternative GW-2 (in-situ air sparging with ozone injection). Alternative GW-3 (groundwater extraction and treatment) would require the installation of considerably more piping and other components in the street rights-of-way than Alternative GW-2. In addition, there are limited options related to the discharge of a relatively high volume of treated groundwater.

Alternative GW-4 has been retained as the contingency remedy because, while Alternative GW-4 is as effective as Alternative GW-3, would take about the same time to implement, and is estimated to cost approximately the same, it is considerably easier to implement than GW-3, as noted above.

In summary, the selected remedy is believed to provide the greatest protection of human health and the environment, provide the greatest long-term effectiveness, be able to achieve the ARARs as quickly as the other alternatives, and is cost effective. Therefore, the selected remedy will provide the best balance of tradeoffs among alternatives with respect to the evaluation criteria. EPA and NYSDEC believe that the selected remedy will treat principal threats, be protective of human health and the environment, comply with ARARs, be cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. The selected remedy also will meet the statutory preference for the use of treatment as a principal element.

Description of the Selected Remedy

The major components of the selected remedy include the following:

- Treatment of the unsaturated soils using ISVE in on-property source areas which exceed TAGM levels for VOCs. Post-treatment confirmatory samples will be collected to ensure that all source areas have been effectively treated to the cleanup levels. Off-gases from the ISVE system may need to be treated to meet air-discharge requirements. Soil-vapor monitoring in the treatment areas and in adjacent residential areas will also be conducted, as necessary. Should this monitoring indicate a potential vapor intrusion problem with respect to residences, appropriate actions will be taken. (See **Table 12** for relevant TAGM levels.)

- Excavation and off-Site disposal of approximately 100 cubic yards of SVOC-contaminated soils which exceed NYSDEC's soil TAGM levels for SVOCs. In addition, any contaminated drywell structures, cesspools, and associated piping will also be excavated and disposed of off-Site. Confirmatory sampling will be conducted to ensure that all SVOC-contaminated soils above the cleanup levels have been removed. The excavation will be backfilled with certified clean fill. (See **Table 12** for relevant TAGM levels.)

- Demolition of the laboratory building. The building debris, after decontamination (if necessary) will be disposed of off-Site.

- Treatment of the contaminated groundwater using air sparging with ozone injection. The exact configuration and number of injection wells will be determined during the design phase. The system will be operated until state and federal groundwater standards are attained. (See **Table 13** for federal and state groundwater standards.) Soil-vapor monitoring will be conducted in the treatment areas, as necessary. Should this monitoring indicate a potential vapor intrusion problem, appropriate actions will be taken.

- Long-term groundwater monitoring in order to verify that the concentrations and the extent of groundwater contaminants are declining, that the remedy remains effective, and that public water supplies are protected. The exact frequency and parameters of sampling and the location of any additional monitoring wells will be determined during the design phase.

- Institutional controls restricting the installation and use of groundwater wells at and downgradient of the property until groundwater quality has been restored. Institutional controls will be in the form of existing restrictions limiting the use of groundwater as a potable or process water, as required by SCDHS and/or NYSDEC.

- Engineering controls, such as fencing and signs, to protect the integrity of the remedy and to limit facility access until cleanup levels have been attained.

The effectiveness of thermally-enhanced ISVE (and, potentially, the configuration and number of ISVE wells) will be confirmed based upon the results of pilot-scale treatability studies conducted during the design phase and on groundwater monitoring data. Should the findings of the treatability studies indicate that thermally-enhanced ISVE would not be sufficiently effective in addressing the VOC-contaminated soils at the

property, then the contingency remedy retained is that the soils will be excavated and treated/disposed off-Site.

The effectiveness of air sparging with ozone injection (and, potentially, the configuration and number of injection wells) will be confirmed based upon the results of bench- and pilot-scale treatability studies conducted during the design phase. Should the findings of the treatability studies indicate that this technology will not be sufficiently effective in addressing the contaminated groundwater at the Site, or if its implementation proves logistically impracticable (it will require the installation of piping and other components in street rights-of-way that may contain gas and water lines, utility poles, and large trees), then the contingency remedy, groundwater treatment with a permeable reactive barrier, would be implemented.

This remedy will result in the reduction of hazardous substances, pollutants, or contaminants on the property to levels that will permit unlimited use of, and unrestricted exposure to, soil and groundwater. However, because it will take more than five years to attain cleanup levels in the groundwater, a review will be conducted no less often than once every five years after initiation of the remedial action to ensure that the remedy is, or will be, protective of human health and the environment. If justified by the review, remedial actions may be implemented to remove, treat, or contain the wastes.

Summary of the Estimated Remedy Costs

The estimated capital, annual O&M, and present-worth costs (using a 7% discount rate for a period of five years) for the selected soil remedy are $789,000, $98,000, and $1,192,000, respectively. The estimated capital, annual O&M and monitoring, and present-worth costs (using a 7% discount rate for a period of fifteen years) for the selected groundwater remedy are $445,000, $90,000, and $1,262,000, respectively. **Tables 14** and **15** provide the basis for these cost estimates.

It should be noted that these cost estimates are order-of-magnitude engineering cost estimates that are expected to be within +50 to -30 percent of the actual project cost. These cost estimates are based on the best available information regarding the anticipated scope of the selected remedy. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedy.

Expected Outcomes of the Selected Remedy

The results of the risk assessment indicate that ingestion of and dermal contact with on-property subsurface soils by future on-property construction and utility workers, ingestion and inhalation of groundwater by hypothetical on-property workers and hypothetical off-property adult and child residents, and inhalation of on-property soil gas by future on-property workers pose unacceptable excess cancer and non-cancer risks. Under the selected remedy, the treatment of the contaminated soils, which will eliminate the source of the groundwater contamination, in combination with groundwater treatment in the source area and within the plume, will result in the restoration of water quality in the aquifer.

The property has been and is now used for commercial-business purposes, and the reasonably-anticipated future land use of the property is industrial/commercial. Therefore, it is not anticipated that achieving the cleanup levels will alter that land use in the future. Potable water for the property and surrounding area is currently obtained from the public-supply well system. Therefore, it is not anticipated that achieving the cleanup levels will alter groundwater use in the future. Achieving the cleanup levels will, however, be beneficial to the sole-source aquifer.

Under the selected remedy, it is estimated that it will require five years to achieve soil cleanup levels and fifteen years to achieve groundwater standards.

STATUTORY DETERMINATIONS

Under CERCLA Section 121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants, or contaminants at a site.

For the reasons discussed below, EPA has determined that the selected remedy meets these statutory requirements.

Protection of Human Health and the Environment

The selected remedy will be protective of human health and the environment in that the treatment of contaminated soil will eliminate the source of the groundwater contamination. In-situ groundwater treatment will eventually achieve groundwater standards. The selected remedy will reduce exposure levels to protective ARAR levels or to within EPA's generally acceptable risk range of 10^{-4} to 10^{-6} for carcinogenic risk and below the HI of 1 for noncarcinogens in the soils and groundwater. The implementation of the selected remedy will not pose unacceptable short-term risks or cross-media impacts that cannot possibly be mitigated. The selected remedy will also provide overall protection by reducing the toxicity, mobility, and volume of contamination through the treatment of the contaminated soils and groundwater.

Compliance with ARARs and Other Environmental Criteria

While there are no federal or New York State soil ARARs, one of the remedial action goals is to meet NYSDEC soil cleanup levels as TBCs. A summary of action-specific, chemical-specific, and location-specific ARARs, as well as TBCs, which will be complied with during implementation of the selected remedy, is presented below.

Action-Specific ARARs:

- National Emissions Standards for Hazardous Air Pollutants (40 CFR Parts 51, 52, and 60)
- 6 NYCRR Part 257, Air Quality Standards
- 6 NYCRR Part 200, New York State Regulations for Prevention and Control of Air Contamination and Air Pollution
- 6 NYCRR Part 376, Land Disposal Restrictions
- Resource Conservation and Recovery Act (42 U.S.C. § 6901, *et seq.*)

Chemical-Specific ARARs:

- Safe Drinking Water Act (SDWA) MCLs and nonzero MCL Goals (40 CFR Part 141)
- 6 NYCRR Parts 700-705 Groundwater and Surface Water Quality Regulations
- 10 NYCRR Part 5 State Sanitary Code

Location-Specific ARARs:

- Fish and Wildlife Coordination Act, 16 U.S.C. 661

Other Criteria, Advisories, or Guidance TBCs:

- New York Guidelines for Soil Erosion and Sediment Control
- New York State Air Cleanup Criteria, January 1990
- SDWA Proposed MCLs and nonzero MCL Goals
- NYSDEC Technical and Operational Guidance Series 1.1.1, November 1991
- Soil cleanup levels specified in NYSDEC Technical Administrative Guidance Memorandum No. 94-HWR-4046
- NYSDEC Guidelines for the Control of Toxic Ambient Air Contaminants, DAR-1, November 12, 1997

Cost-Effectiveness

A cost-effective remedy is one whose costs are proportional to its overall effectiveness (NCP §300.430(f)(1)(ii)(D)). Overall effectiveness is based on the evaluations of: long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness. Based on the comparison of overall effectiveness (discussed above) to cost, the selected remedy meets the statutory requirement that Superfund remedies be cost-effective in that it is the least-cost action alternative and would achieve the remediation goals in the same amount of time in comparison to the more costly alternatives. The contingent remedy, while more expensive, would also nevertheless be cost-effective as it would only be implemented if the selected remedy is ineffective in achieving the remediation goals.

Each of the alternatives has undergone a detailed cost analysis. In that analysis, capital and annual O&M costs have been estimated and used to develop present-worth costs. In the present-worth cost analysis, annual O&M costs were calculated for the estimated life of an alternative using a seven percent discount rate.

The estimated present-worth cost of the soil component of the selected remedy (Alternative S-4), using a 5-year time interval, is $1,192,000. EPA believes that the cost of this alternative is proportional to its overall effectiveness. With regard to the soil contingency remedy, while Alternative S-3 is as effective as Alternative S-2, it would take more time to implement, require on-property space for the placement of an LTTD unit (which may be problematic), and is estimated to be more than twice

as costly, as is noted above. Therefore, Alternative S-2 is the more cost-effective contingency remedy for soil.

The estimated present-worth cost of the groundwater component of the selected remedy (Alternative GW-2), using a 15-year time interval, is $1,262,000. EPA believes that the cost of this alternative is proportional to its overall effectiveness. With regard to the groundwater contingency remedy, while Alternative GW-4 is as effective as Alternative GW-3 and would take about the same time to implement, it is considerably easier to implement while being as cost-effective.

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The selected remedy provides the best balance of tradeoffs among the alternatives with respect to the balancing criteria set forth in NCP §300.430(f)(1)(i)(B), such that it represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the Site.

The soil component of the selected remedy will employ an alternative treatment technology (ISVE) to reduce the toxicity, mobility, and volume of the contaminants in the soil source areas. The selected remedy will permanently address this soil contamination.

With regard to the groundwater, the selected remedy will provide a permanent remedy and will employ a treatment technology to reduce the toxicity, mobility, and volume of the contaminants in the groundwater.

Preference for Treatment as a Principal Element

The statutory preference for remedies that employ treatment as a principal element is satisfied under the selected remedy in that contaminated soils and groundwater will be treated in-situ and treatment will be used to reduce the toxicity, mobility, and volume of contamination and achieve cleanup levels.

Five-Year Review Requirements

The selected remedy, once fully implemented, will not result in hazardous substances, pollutants, or contaminants remaining on-Site above levels that allow for unlimited use and unrestricted exposure. However, it will take more than five years to attain remedial action objectives and cleanup levels for the groundwater. Consequently, a policy review will be

conducted within five years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan, released for public comment on January 23, 2003, identified Alternative S-4, ISVE, as the preferred soil remedy. For the preferred groundwater remedy, it identified Alternative GW-2, air sparging with ozone injection. Based upon its review of the written and verbal comments submitted during the public comment period, EPA determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

MACKENZIE CHEMICAL WORKS SITE

ROD APPENDIX I

FIGURES

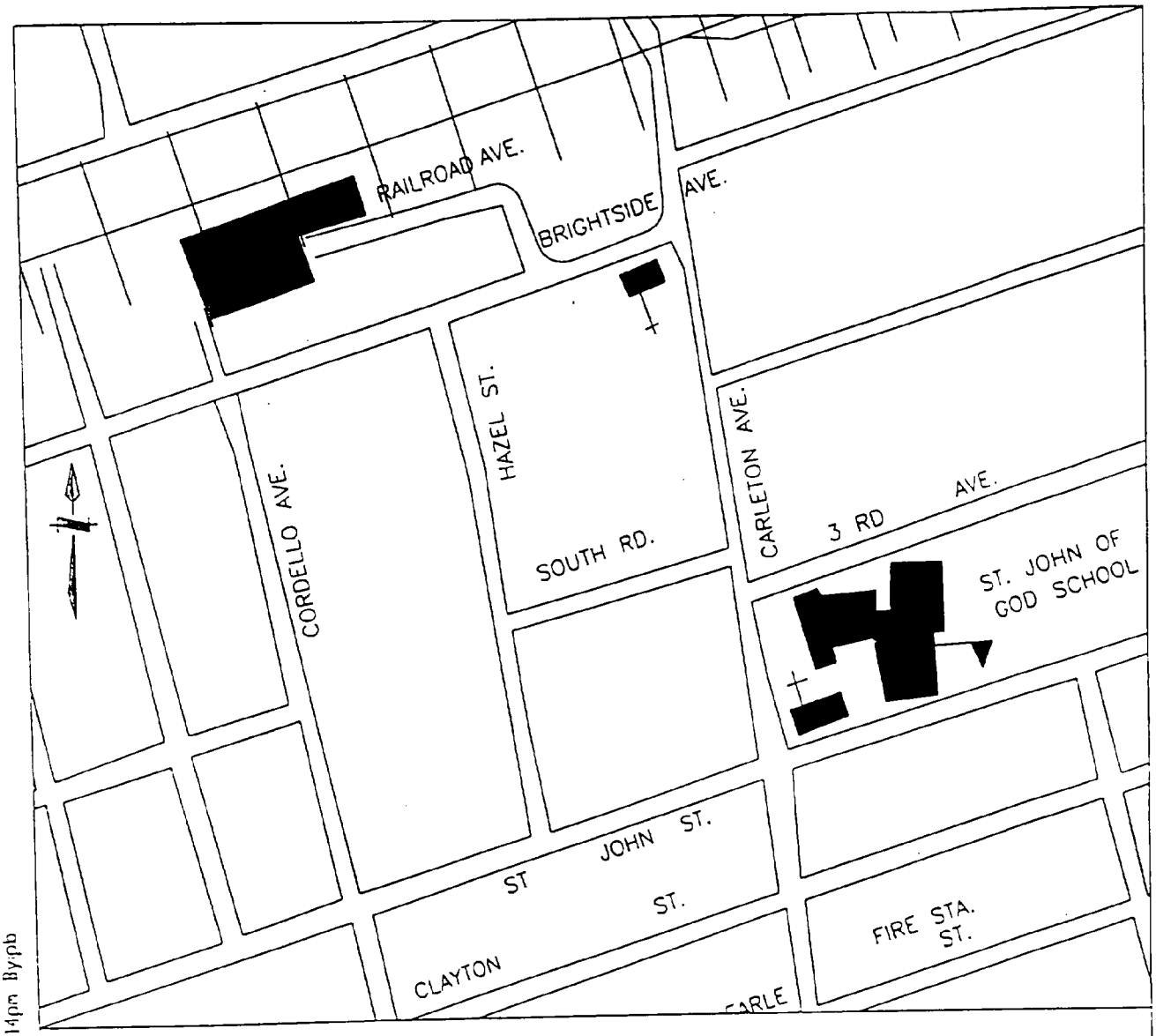

FIGURE 1

MACKENZIE CHEMICAL

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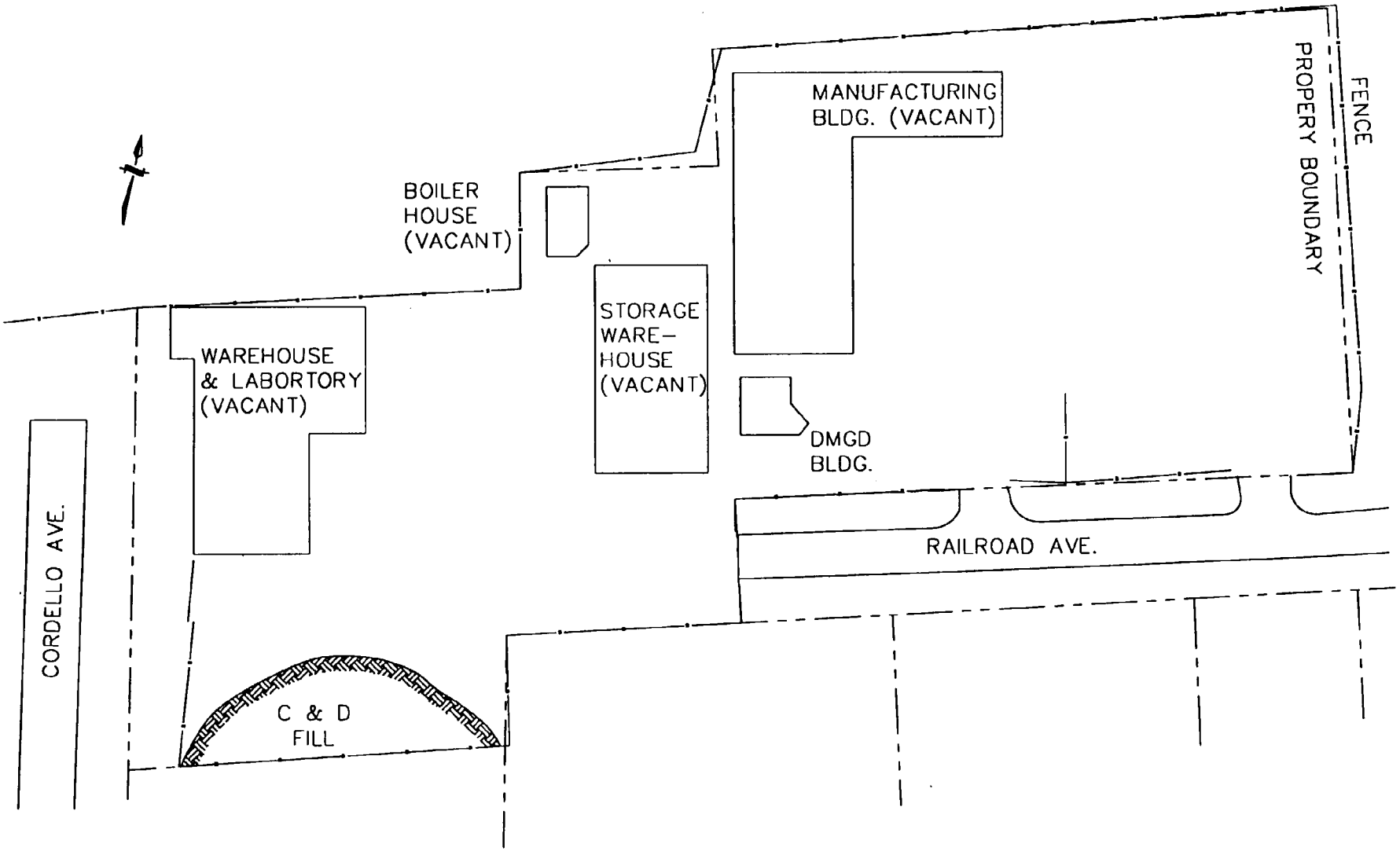
Figure 2: Site Layout
MacKenzie Chemical Works Site



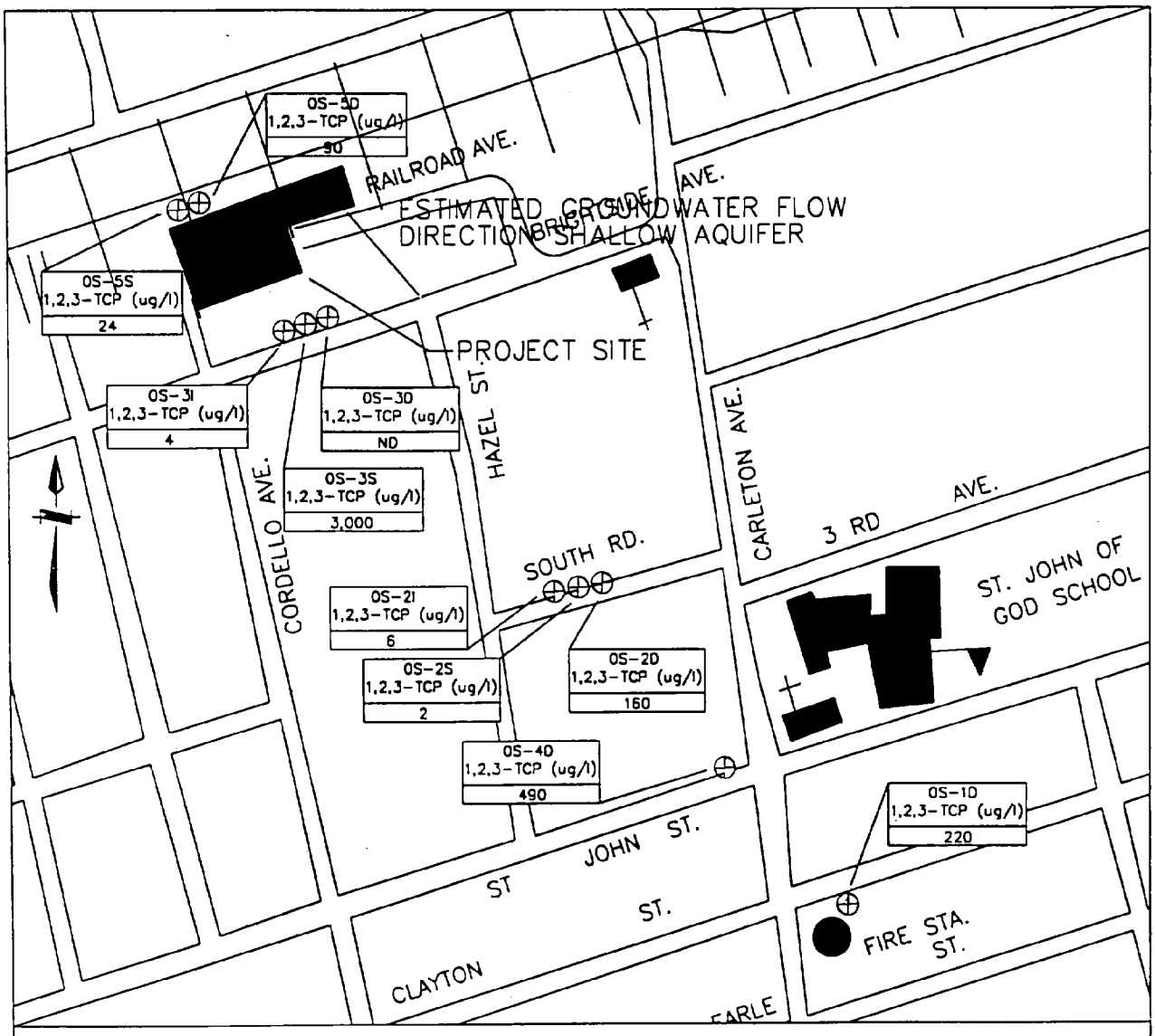


FIGURE 3
OFF-SITE MONITORING WELLS
AUGUST 1999
CONCENTRATIONS OF
1,2,3-TRICHLOROPROPANE
MACKENZIE CHEMICAL

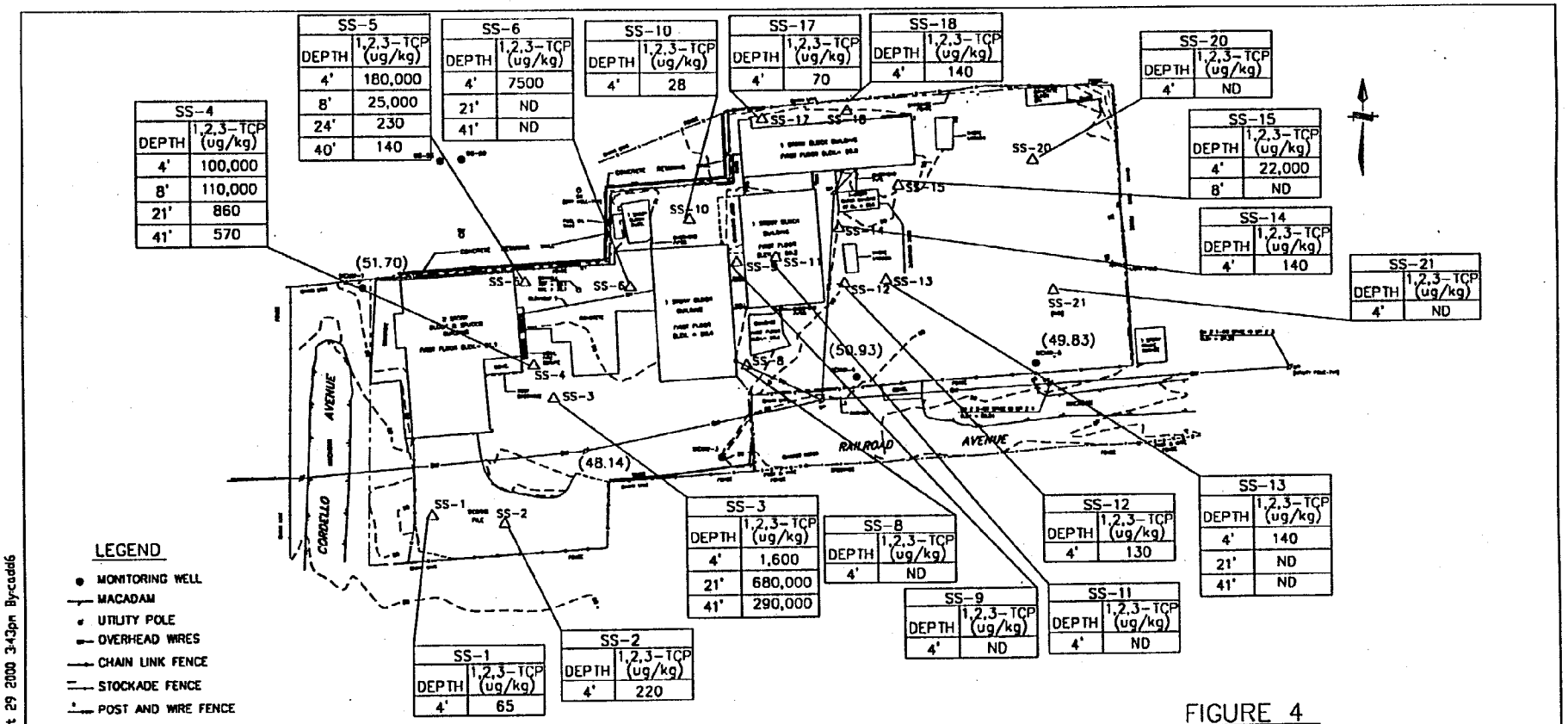
OFF-SITE WELLS LEGEND:

S 60' BGS
I 120'-130' BGS
D 130'-160' BGS
ND NON DETECT
SAMPLE DATA IS FROM ANALYTICAL LABORATORY
⊕ MONITORING WELL

SCALE: 1"=300'

H2MGROUP ENGINEERS ARCHITECTS PLANNERS SCIENTISTS SURVEYORS
MELVILLE, N.Y. SHELTON, CT. TOTOWA, N.J.

M:\cadd\DECS\9801\FIG4-6-2.dwg August 11 2000 3:55pm By:CADD3



LEGEND

- MONITORING WELL
- MACADAM
- UTILITY POLE
- OVERHEAD WIRES
- CHAIN LINK FENCE
- STOCKADE FENCE
- POST AND WIRE FENCE
- PROPERTY LINE
- DRYWELL
- CONTOUR LINE (5 FOOT INTERVAL)
- CONTOUR LINE (1 FOOT INTERVAL
- ND NON DETECT
- △ SURFACE SOIL SAMPLE
- SS-2

NOTE:

THERE IS NO SS-7, SS-16 OR SS-19

FIGURE 4
SOIL SAMPLES LOCATIONS WITH CONCENTRATIONS OF 1,2,3-TRICHLOROPROPANE MACKENZIE CHEMICAL

SCALE: 1"= 50'

H2MGROUP. ENGINEERS · ARCHITECTS · PLANNERS · SCIENTISTS · SURVEYORS
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H:\cadd\DECS\9801\Mackchem8.dwg August 29 2000 3:43pm Bycadd6

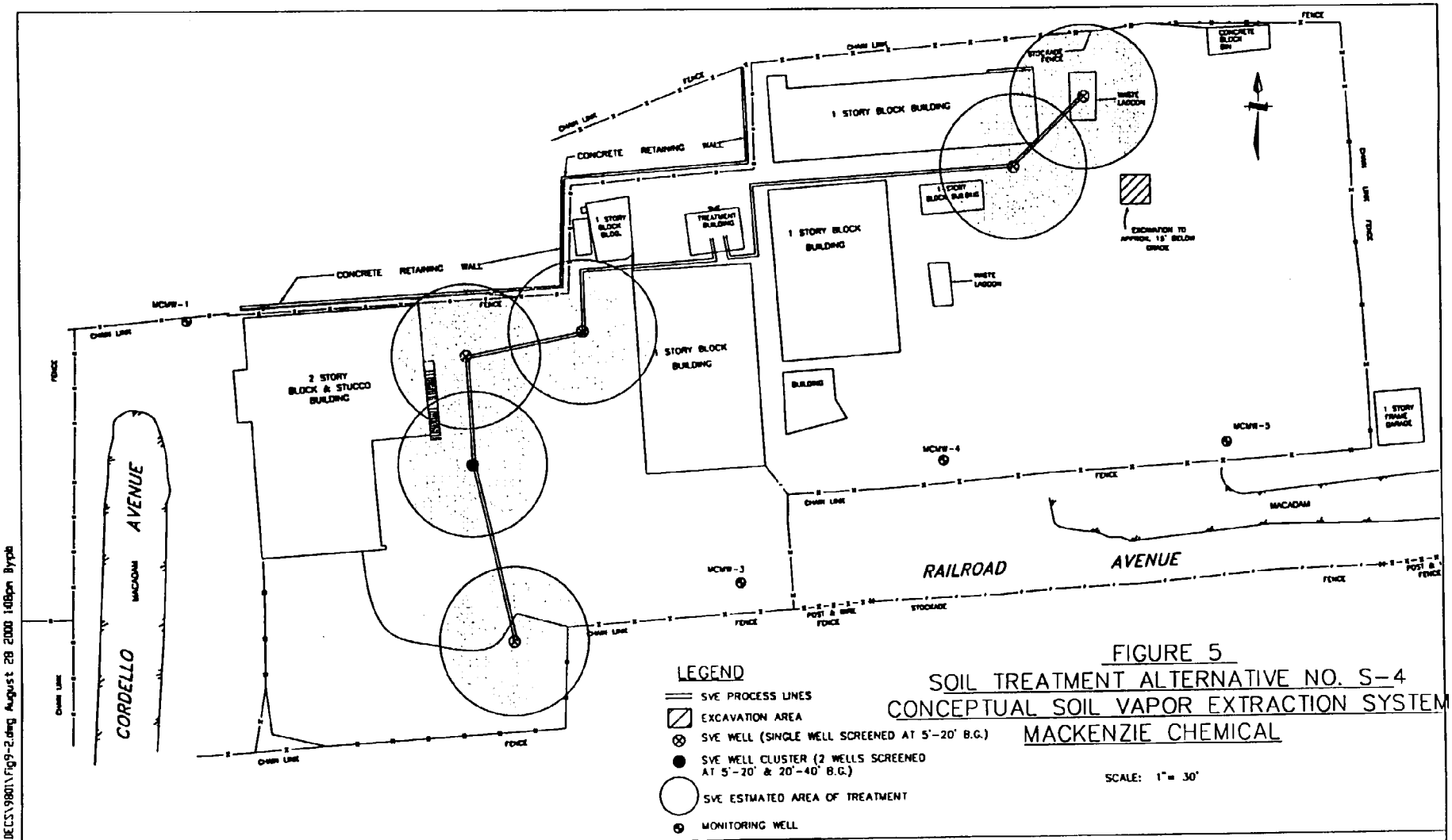

FIGURE 5
SOIL TREATMENT ALTERNATIVE NO. S-4
CONCEPTUAL SOIL VAPOR EXTRACTION SYSTEM
MACKENZIE CHEMICAL

SCALE: 1" = 30'

H2MGROUP ENGINEERS MELVILLE, N.Y. ARCHITECTS PLANNERS SHELTON, CT. SCIENTISTS SURVEYORS TOTOWA, N.J.

M:\cadd\DECS\9801\Fig9-2.dwg August 28 2000 1:08pm Byrds

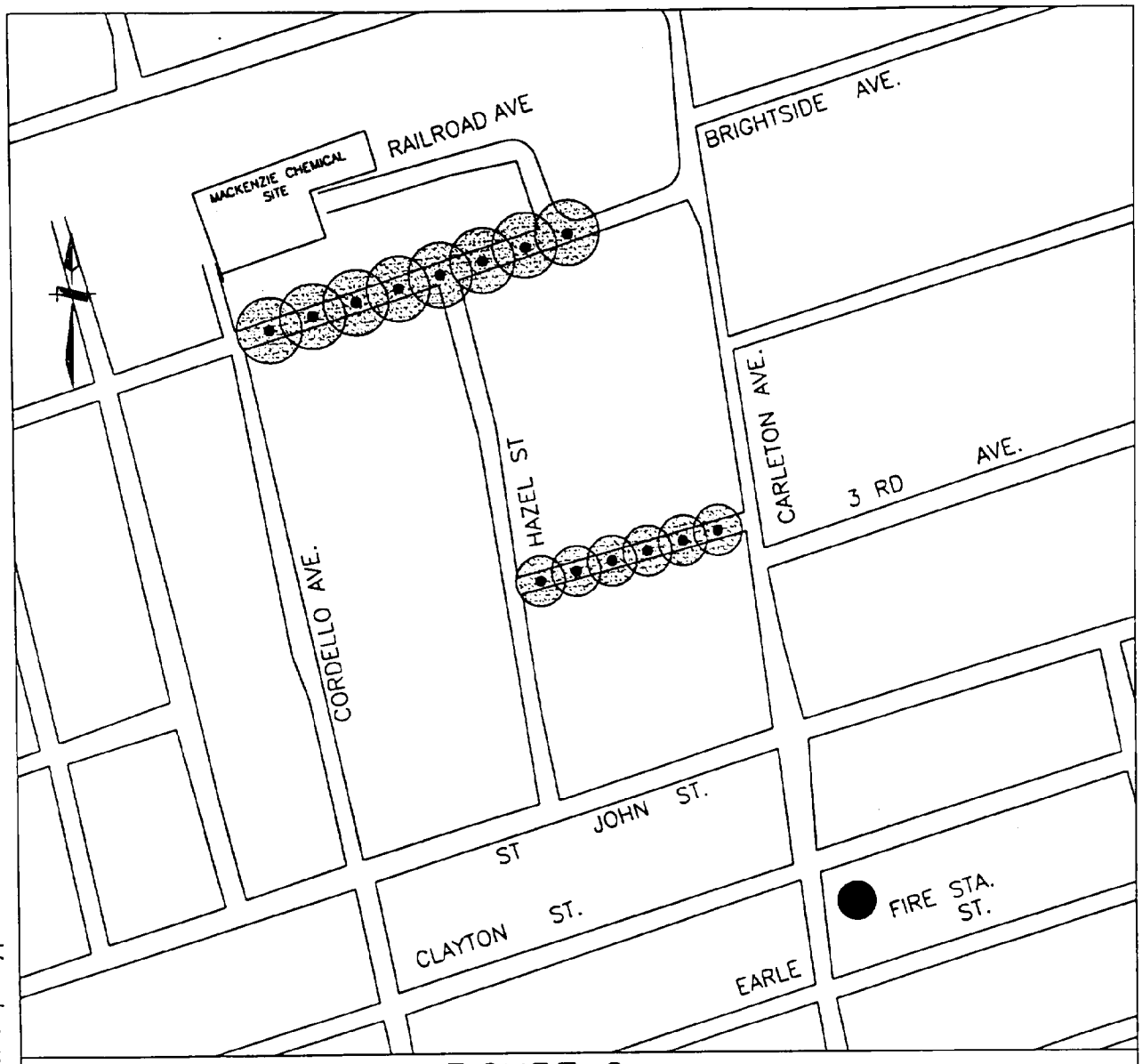

FIGURE 6
CONCEPTUAL GROUNDWATER ALTERNATIVE NO. GW-2
AIR SPARGE/ OZONE INJECTION SYSTEM
MACKENZIE CHEMICAL

LEGEND:

● TREATMENT WELL

◯ – C-SPARGER BUBBLE FENCE ESTIMATED ZONE OF INFLUENCE

SCALE: 1"=300'

NOTE: HIGHEST 1,2,3 – TCP CONC. USED FOR G.W. SAMPLES COLLECTED AT MULTIPLE DEPTHS

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M:\cadd\DECS\9801\fig9-4.dwg August 28 2000 1:10pm By:pb

MACKENZIE CHEMICAL WORKS SITE

ROD APPENDIX II

TABLES

TABLE 1

MACKENZIE CHEMICAL SITE

ON-SITE MONITORING WELLS - GROUNDWATER SAMPLES
VOLATILE ORGANIC COMPOUNDS - ANALYTICAL LABORATORY

SAMPLE ID	MW-XX[2]		MCMW-1		MCMW-3		MCMW-4		MCMW-5		Field Blank		NYSDEC GW STAND.[1]
PARAMETERS (ug/l)													
Chloromethane	10	U	10	U	10	U	10	U	10	U	10	U	NA
Bromomethane	10	U	10	U	10	U	10	U	10	U	10	U	5
Vinyl Chloride	10	U	10	U	10	U	10	U	10	U	10	U	2
Chloroethane	10	U	10	U	10	U	10	U	10	U	10	U	5
Methylene Chloride	10	U	10	U	10	U	10	U	10	U	7	JB	5
Acetone	10	U	10	U	10	U	10	U	10	U	10	U	NA
Carbon Disulfide	10	U	10	U	10	U	10	U	10	U	10	U	NA
1,1-Dichloroethene	10	U	10	U	10	U	10	U	10	U	10	U	5
1,1-Dichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	5
1,2-Dichloroethene (Total)	10	U	10	U	10	U	10	U	10	U	10	U	NA
Chloroform	10	U	10	U	10	U	10	U	10	U	10	U	7
1,2-Dichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	0.6
2-Butanone (MEK)	10	U	10	U	10	U	10	U	10	U	10	U	NA
1,1,1-Trichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	5
Carbon Tetrachloride	10	U	10	U	10	U	10	U	10	U	10	U	5
Bromodichloromethane	10	U	10	U	10	U	10	U	10	U	10	U	NA
1,2-Dichloropropane	10	U	10	U	10	U	10	U	10	U	10	U	1
cis -1,3-Dichloropropene	10	U	10	U	10	U	10	U	10	U	10	U	0.4
Trichloroethene (TCE)	10	U	10	U	10	U	10	U	2	J	10	U	5
Dibromochloromethane	10	U	10	U	10	U	10	U	10	U	10	U	NA
1,1,2-Trichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	1
Benzene	10	U	10	U	10	U	10	U	10	U	10	U	1
trans -1,3-Dichloropropene	10	U	10	U	10	U	10	U	10	U	10	U	0.4
Bromoform	10	U	10	U	10	U	10	U	10	U	10	U	NA
4-Methyl-2-Pentanone	10	U	10	U	10	U	10	U	10	U	10	U	NA
2-Hexanone	10	U	10	UJ	10	UJ	10	UJ	10	UJ	10	U	NA
Tetrachloroethene (PCE)	10	U	10	U	13		21		54		10	U	5
1,1,2,2-Tetrachloroethane	10	U	10	U	10	U	10	U	10	U	10	U	5
Toluene	10	U	10	U	10	U	10	U	10	U	10	U	5
Chlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U	5
Ethylbenzene	10	U	10	U	10	U	10	U	10	U	10	U	5
Styrene	10	U	10	U	10	U	10	U	10	U	10	U	5
Xylenes (Total)	10	U	10	U	10	U	10	U	10	U	10	U	5
1,2,3- Trichloropropane	10	U	10	U	250	NJ	10	U	40	NJ	10	U	0.04
TICs (Total Concentration)	23	B	10	U	11	N	10	U	10	U	24	B	NA

NOTES:

[1] - Referenced from NYSDEC Final Express Terms for Amendments to Title 6, Chapter X Parts 700-706, 3/98.

[2] - MW-XX represents blind duplicate of MCMW-1.

U - Indicates compound was analyzed for but not detected.

J - Indicates an estimated value.

B - Indicates analyte was found in method blank.

N - Indicates presumtavive evidence of a compound

NA - Class GA Groundwater Standard not established

TABLE 1 (con't)

MACKENZIE CHEMICAL SITE

ON-SITE MONITORING WELLS - GROUNDWATER SAMPLES
SEMI-VOLATILE ORGANIC COMPOUNDS - ANALYTICAL LABORATORY

SAMPLE ID	MW-XX[1]		MCMW-1		MCMW-3		MCMW-4		MCMW-5		Field Blank		NYSDEC GW STAND.[2]
PARAMETERS (ug/l)													
Phenol	13	U	12	U	12	U	13	U	12	U	15	U	1[3]
bis(2-Chloroethyl)Ether	13	U	12	U	12	U	13	U	12	U	15	U	NA
2-Chlorophenol	13	U	12	U	12	U	13	U	12	U	15	U	NA
1,3-Dichlorobenzene	13	U	12	U	12	U	13	U	12	U	15	U	3
1,4-Dichlorobenzene	13	U	12	U	12	U	13	U	12	U	15	U	3
1,2-Dichlorobenzene	13	U	12	U	12	U	13	U	12	U	15	U	3
2-Methylphenol	13	U	12	U	12	U	13	U	12	U	15	U	NA
2,2'-oxybis(1-Chloropropane)	13	U	12	U	12	U	13	U	12	U	15	U	NA
4-Methylphenol	13	U	12	U	12	U	13	U	12	U	15	U	NA
N-Nitroso-di-n-propylamine	13	U	12	U	12	U	13	U	12	U	15	U	NA
Hexachloroethane	13	U	12	U	12	U	13	U	12	U	15	U	5
Nitrobenzene	13	U	12	U	12	U	13	U	12	U	15	U	0.4
Isophorone	13	U	12	U	12	U	13	U	12	U	15	U	NA
2-Nitrophenol	13	U	12	U	12	U	13	U	12	U	15	U	NA
2,4-Dimethylphenol	13	U	12	U	12	U	13	U	12	U	15	U	1[3]
bis(2-Chloroethoxy)Methane	13	U	12	U	12	U	13	U	12	U	15	U	NA
2,4-Dichlorophenol	13	U	12	U	12	U	13	U	12	U	15	U	1[3]
1,2,4-Trichlorobenzene	13	U	12	U	12	U	13	U	12	U	15	U	5
Naphthalene	13	U	12	U	12	U	13	U	12	U	15	U	NA
4-Chloroaniline	13	U	12	U	12	U	13	U	12	U	15	U	5
Hexachlorobutadiene	13	U	12	U	12	U	13	U	12	U	15	U	0.5
4-Chloro-3-Methylphenol	13	U	12	U	12	U	13	U	12	U	15	U	1[3]
2-Methylnaphthalene	13	U	12	U	12	U	13	U	12	U	15	U	NA
Hexachlorocyclopentadiene	13	U	12	U	12	U	13	U	12	U	15	U	5
2,4,6-Trichlorophenol	13	U	12	U	12	U	13	U	12	U	15	U	1[3]
2,4,5-Trichlorophenol	32	U	31	U	30	U	32	U	30	U	38	U	1[3]
2-Chloronaphthalene	13	U	12	U	12	U	13	U	12	U	15	U	NA
2-Nitroaniline	32	U	31	U	30	U	32	U	14	J	38	U	5
Dimethylphthalate	13	U	12	U	12	U	13	U	12	U	15	U	NA
Acenaphthylene	13	U	12	U	12	U	13	U	12	U	15	U	NA
2,6-Dinitrotoluene	13	U	12	U	12	U	13	U	12	U	15	U	5
3-Nitroaniline	32	U	31	U	30	U	32	U	30	U	38	U	5
Acenaphthene	13	U	12	U	12	U	13	U	12	U	15	U	NA
2,4-Dinitrophenol	32	UJ	31	UJ	30	UJ	32	UJ	30	UJ	38	UJ	1[3]
4-Nitrophenol	32	U	31	U	30	U	32	U	30	U	38	U	1[3]
Dibenzofuran	13	U	12	U	12	U	13	U	12	U	15	U	NA
2,4-Dinitrotoluene	13	U	12	U	12	U	13	U	12	U	15	U	5
Diethylphthalate	13	U	12	U	12	U	13	U	12	U	15	U	NA
4-Chlorophenyl-phenylether	13	U	12	U	12	U	13	U	12	U	15	U	NA
Fluorene	13	U	12	U	12	U	13	U	12	U	15	U	NA
4-Nitroaniline	32	U	31	U	30	U	32	U	30	U	38	U	5
4,6-Dinitro-2-Methylphenol	32	U	31	U	30	U	32	U	30	U	38	U	NA
N-Nitrosodiphenylamine	13	U	12	U	12	U	13	U	12	U	15	U	NA
4-Bromophenyl-phenylether	13	U	12	U	12	U	13	U	12	U	15	U	NA
Hexachlorobenzene	13	U	12	U	12	U	13	U	12	U	15	U	0.04
Pentachlorophenol	32	U	31	U	30	U	32	U	30	U	38	U	1[3]
Phenanthrene	13	U	12	U	12	U	13	U	12	U	15	U	NA
Anthracene	13	U	12	U	12	U	13	U	12	U	15	U	NA
Carbazole	13	U	12	U	12	U	13	U	12	U	15	U	NA
Di-n-butylphthalate	13	U	12	U	12	U	13	U	12	U	15	U	NA
Fluoranthene	13	U	12	U	12	U	13	U	12	U	15	U	NA
Pyrene	13	U	12	U	12	U	13	U	12	U	15	U	NA
Butylbenzylphthalate	13	U	12	U	12	U	13	U	12	U	15	U	NA
3,3'-Dichlorobenzidine	13	U	12	U	12	U	13	U	12	U	15	U	5
Benzo(a)anthracene	13	U	12	U	12	U	13	U	12	U	15	U	NA
Chrysene	13	U	12	U	12	U	13	U	12	U	15	U	NA
bis(2-Ethylhexyl)phthalate	13	U	12	U	23	U	35		26	U	2	J	5
Di-n-octylphthalate	13	U	12	U	12	U	13	U	12	U	15	U	NA
Benzo(b)fluoranthene	13	U	12	U	12	U	13	U	12	U	15	U	NA
Benzo(k)fluoranthene	13	U	12	U	12	U	13	U	12	U	15	U	NA
Benzo(a)pyrene	13	U	12	U	12	U	13	U	12	U	15	U	ND
Indeno(1,2,3-cd)pyrene	13	U	12	U	12	U	13	U	12	U	15	U	NA
Dibenzo(a,h)anthracene	13	U	12	U	12	U	13	U	12	U	15	U	NA
Benzo(g,h,i)perylene	13	U	12	U	12	U	13	U	12	U	15	U	NA

NOTES:

[1] - MW-XX represents blind duplicate of MCMW-1.

[2] - Referenced from NYSDEC 'Final Express Terms for Amendments to Title 6, Chapter X Parts 700-706', 3/98.

[3] - 1 ug/l standard applies to the sum of all phenolic compounds.

U - Indicates compound was analyzed for but not detected

J - Indicates an estimated value.

NA - Class GA Groundwater Standard not established

ND - Non-detectable

TABLE 1 (con't)

MACKENZIE CHEMICAL SITE

ON-SITE MONITORING WELLS - GROUNDWATER SAMPLES
PESTICIDES/PCBs - ANALYTICAL LABORATORY

SAMPLE ID	MW-XX[2]		MCMW-1		MCMW-3		MCMW-4		MCMW-5		Field Blank		NYSDEC GW STAND[1]
PARAMETERS (ug/l)													
alpha-BHC	.057	U	.066	U	.062	U	.071	U	.071	U	.054	U	NA
beta-BHC	.057	U	.066	U	.062	U	.071	U	.071	U	.054	U	NA
delta-BHC	.057	U	.066	U	.062	U	.071	U	.071	U	.054	U	NA
gamma-BHC (Lindane)	.057	U	.066	U	.062	U	.071	U	.071	U	.054	U	NA
Heptachlor	.057	U	.066	U	.062	U	.071	U	.071	U	.054	U	NA
Aldrin	.057	U	.066	U	.062	U	.071	U	.071	U	.054	U	ND
Heptachlor Epoxide	.057	U	.066	U	.062	U	.071	U	.071	U	.054	U	0.03
Endosulfan I	.057	U	.066	U	.062	U	0.62	J	.071	U	.054	U	NA
Dieldrin	.11	U	.13	U	.12	U	.14	U	.14	U	.11	U	0.004
4,4'-DDE	.11	U	.13	U	.12	U	.14	U	.14	U	.11	U	0.2
Endrin	.11	U	.13	U	.12	U	.14	U	.14	U	.11	U	ND
Endosulfan II	.11	U	.13	U	.12	U	.14	U	.14	U	.11	U	NA
4,4'-DDD	.11	U	.13	U	.12	U	.14	U	.14	U	.11	U	0.3
Endosulfan Sulfate	.11	U	.13	U	.12	U	.14	U	.14	U	.11	U	NA
4,4'-DDT	.11	U	.13	U	.12	U	.14	U	.14	U	.11	U	0.2
Methoxychlor	.57	U	.66	U	.62	U	.71	U	.71	U	.54	U	35
Endrin Ketone	.11	U	.13	U	.12	U	.14	U	.14	U	.11	U	5
Endrin Aldehyde	.11	U	.13	U	.12	U	.14	U	.14	U	.11	U	5
alpha-Chlordane	.057	U	.066	U	.062	U	.071	U	.071	U	.054	U	0.05
gamma-Chlordane	.057	U	.066	U	.062	U	.071	U	.071	U	.054	U	0.05
Toxaphene	5.7	U	6.6	U	6.2	U	7.1	U	7.1	U	5.4	U	0.06
Aroclor-1016	1.1	U	1.3	U	1.2	U	1.4	U	1.4	U	1.1	U	0.09[3]
Aroclor-1221	2.3	U	2.6	U	2.5	U	2.8	U	2.8	U	2.2	U	0.09[3]
Aroclor-1232	1.1	U	1.3	U	1.2	U	1.4	U	1.4	U	1.1	U	0.09[3]
Aroclor-1242	1.1	U	1.3	U	1.2	U	1.4	U	1.4	U	1.1	U	0.09[3]
Aroclor-1248	1.1	U	1.3	U	1.2	U	1.4	U	1.4	U	1.1	U	0.09[3]
Aroclor-1254	1.1	U	1.3	U	1.2	U	1.4	U	1.4	U	1.1	U	0.09[3]
Aroclor-1260	1.1	U	1.3	U	1.2	U	1.4	U	1.4	U	1.1	U	0.09[3]

NOTES:

[1] - Referenced from NYSDEC 'Final Express Terms for Amendments to Title 6, Chapter X Parts 700-706', 3/98.

[2] - MW-XX represents blind duplicate of MCMW-1.

[3] - Class GA Groundater Effluent Standard reflects sum of all aroclors

U - Indicates compound was analyzed for but not detected

NA - NYSDEC Class GA Water Quality Standard not established.

ND - Non-detectable

TABLE 1 (con't)

MACKENZIE CHEMICAL SITE

ON-SITE MONITORING WELLS - GROUNDWATER SAMPLES
TAL METALS - ANALYTICAL LABORATORY

SAMPLE ID	MW-XX[2]		MCMW-1		MCMW-3		MCMW-4		MCMW-5		Field Blank		NYSDEC GW STANDARDS[1]
PARAMETERS (ug/l)													
Aluminum	4,210		3,688		6,270		4,270		3,710		126	U	NA
Antimony	53.8	U	53.8	U	53.8	U	53.8	U	53.8	U	53.8	U	3
Arsenic	2.6	U	2.6	U	25.2		2.7	B	29.5		2.6	U	25
Barium	139	B	160	B	159	B	129	B	233		3.5	U	1,000
Beryllium	0.50	U	0.50	U	0.50	U	1.5	B	0.50	U	0.50	U	NA
Cadmium	4.3	U	4.3	U	16.8		4.8	B	19.2		4.3	U	5
Calcium	11,000		12,200		24,900		13,300		30,300		120	U	NA
Chromium	6.6	U	6.6	U	12.9		17.1		242		6.6	U	50
Cobalt	12.6	U	12.6	U	136		331		136		12.6	U	NA
Copper	7.6	U	14.8	B	26.7		7.6	U	18.6	B	7.6	U	200
Iron	7,110		6,590		116,000		13,300		54,200		45.0	U	300
Lead	10.6		7.1		73.8		13.1		27.2		0.90	U	25
Magnesium	2,210	B	2,490	B	1,850	B	1,930	B	2,930	B	112	U	NA
Manganese	393		388		1,730		5,110		281		2.7	U	300
Mercury	0.09	U	0.09	U	0.09	U	0.09	U	0.09	U	0.09	U	0.7
Nickel	11.4	U	11.4	U	35.3	B	131		44.1		11.4	U	100
Potassium	1,220	B	2,200	B	5,700		9,240		3,510	B	1,140	U	NA
Selenium	2.1	U	2.1	U	2.1	U	2.1	U	2.1	UJ	2.1	U	10
Silver	8.6	UJ	8.6	UJ	8.6	UJ	8.6	UJ	8.6	UJ	8.6	U	50
Sodium	8,660		9,750		13,200		8,040		25,800		393	U	20,000
Thallium	0.80	U	0.80	U	0.80	U	0.80	U	0.80	U	0.80	U	NA
Vanadium	10.8	U	10.8	U	10.8	U	10.8	U	10.8	U	10.8	U	NA
Zinc	62.5	J	62	J	742		560		2,410		16.5	U	NA
Cyanide	1.4	UJ	1.4	UJ	1.4	UJ	1.4	UJ	1.4	UJ	1.4	UJ	200

NOTES:

[1] - Referenced from NYSDEC 'Final Express Terms for Amendments to Title 6, Chapter X Parts 700-706', 3/98.

[2] - MW-XX represents blind duplicate of MCMW-1.

U - Indicates compound was analyzed for but not detected.

B - Indicates analyte was found in method blank.

NA - Class GA Groundwater Standard not established

TABLE 1 (con't)

MACKENZIE CHEMICAL SITE
January 1999
OFF-SITE MONITORING WELLS - GROUNDWATER SAMPLES
VOLATILE ORGANIC COMPOUNDS - ANALYTICAL LABORATORY

SAMPLE ID	OS-1D		OS-2S		OS-2I		OS-2D		OS-3S		OS-3I		OS-3D		OS-4D		OS-5S		OS-5D		Field		NYSDEC
DEPTH OF SAMPLE [1]	160ft		60ft		130ft		160ft		60ft		120ft		158ft		155ft		60ft		150ft		Blank		GW STAND.[2]
PARAMETERS (ug/l)																							
Chloromethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	NA
Bromomethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	5
Vinyl Chloride	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	2
Chloroethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	5
Methylene Chloride	12	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	7	JB	5
Acetone	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	NA
Carbon Disulfide	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	NA
1,1-Dichloroethene	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	5
1,1-Dichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	5
1,2-Dichloroethene (Total)	10	U	1	J	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	NA
Chloroform	10	U	10	U	10	U	10	U	10	U	1	J	10	U	10	U	1	J	3	J	10	U	7
1,2-Dichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	0.6
2-Butanone (MEK)	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	NA
1,1,1-Trichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	5
Carbon Tetrachloride	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	5
Bromodichloromethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	1	J	10	U	NA
1,2-Dichloropropane	10	U	10	U	10	U	10	U	9	J	10	U	10	U	10	U	10	U	10	U	10	U	1
cis -1,3-Dichloropropene	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	0.4
Trichloroethene (TCE)	10	U	10	U	10	U	10	U	9	J	10	U	10	U	10	U	10	U	10	U	10	U	5
Dibromochloromethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	NA
1,1,2-Trichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	1
Benzene	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	1
trans -1,3-Dichloropropene	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	0.4
Bromoform	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	NA
4-Methyl-2-Pentanone	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	NA
2-Hexanone	10	UJ	10	U	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	10	U	10	U	10	U	10	U	NA
Tetrachloroethene (PCE)	10	U	10	U	3	J	10	U	6	J	10	U	10	U	10	U	10	U	10	U	10	U	5
1,1,2,2-Tetrachloroethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	5
Toluene	2	J	1	J	10	U	1	J	1	J	10	U	10	U	10	U	10	U	1	J	10	U	5
Chlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	5
Ethylbenzene	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	5
Styrene	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	5
Xylenes (Total)	10	U	10	U	10	U	10	U	4	J	10	U	10	U	10	U	10	U	10	U	10	U	5
1,2,3- Trichloropropane	10	U	10	U	10	NJ	10	U	>>1000	NJ	10	NJ	150	NJ	10	U	10	U	10	U	10	U	0.04
TICs (Total Concentration)	10	U	150	B	10	U	10	U	379	N	10	U	10	U	10	U	10	U	10	U	24	B	NA

NOTES:

[1] - Indicates depth below ground surface.

[2] - Referenced from NYSDEC Final Express Terms for Amendments to Title 6, Chapter X Parts 700-706, 3/98.

U - Indicates compound was analyzed for but not detected.

J - Indicates an estimated value.

B - Indicates analyte was found in method blank.

N - Indicates presumtavive evidence of a compound

NA - Class GA Groundwater Standard not established

TABLE 1 (con't)

MACKENZIE CHEMICAL SITE
August 1999
OFF-SITE MONITORING WELLS - GROUNDWATER SAMPLES
VOLATILE ORGANIC COMPOUNDS

SAMPLE ID	OS-1D		OS-2S		OS-2I		OS-2D		OS-3S		OS-3I		OS-3D		OS-4D		OS-5S		OS-5D		NYSDEC [1]
PARAMETERS (ug/l)																					
Dichlorodifluoromethane	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
Chloromethane	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
Vinyl Chloride	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	2
Bromomethane	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
Chloroethane	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
1,1-Dichloroethene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
Methylene Chloride	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
trans -1,2-Dichloroethene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
1,1-Dichloroethane	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
2,2-Dichloropropane	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	1
cis -1,2-Dichloroethene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
Chloroform	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	7
Bromochloromethane	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
1,1,1-Trichloroethane	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
1,1-Dichloropropene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	NA
Carbon Tetrachloride	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
1,2-Dichloroethane	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	0.6
Trichloroethene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
1,2-Dichloropropane	1	U	1	U	1	U	6	U	50	U	1	U	1	U	1	U	1	U	1	U	1
Bromodichloromethane	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	NA
Dibromomethane	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
cis -1,3-Dichloropropene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	NA
trans -1,3-Dichloropropene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	NA
1,1,2-Trichloroethane	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	1
1,3-Dichloropropane	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
Tetrachloroethene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
Dibromochloromethane	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	NA
Chlorobenzene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
1,1,1,2-Tetrachloroethane	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
Bromoform	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	NA
1,1,2,2-Tetrachloroethane	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
1,2,3-Trichloropropane	220	D	2		6		160	D	3000		4		1	U	490	D	24		90	D	0.04
m-Dichlorobenzene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	NA
p-Dichlorobenzene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	NA
o-Dichlorobenzene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	NA
1,2,4-Trichlorobenzene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
Hexachlorobutadadiene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	0.5
1,2,3-Trichlorobenzene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
Methyl tert Butyl ether	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	NA
Benzene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	1
Toluene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
Ethylbenzene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
m-Xylene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	NA
p-Xylene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	NA
o-Xylene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	NA
Stryene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
Isopropylbenzene (Cumene)	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
n-Propylbenzene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	2		1	U	1	U	5
Bromobenzene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
1,3,5-Trimethylbenzene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
o-Chlorotoluene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	NA
p-Chlorotoluene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	NA
tert. Butylbenzene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
1,2,4-Trimethylbenzene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
sec-Butylbenzene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
p-Isopropyltoluene (p-Cymene)	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	NA
n-Butylbenzene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	5
Napthalene	1	U	1	U	1	U	1	U	50	U	1	U	1	U	1	U	1	U	1	U	NA

NOTES:
[1] - Ground Water Standard Referenced from NYSDEC Final Express Terms for Amendments to Title 6, Chapter X Parts 700-706, 3/98.
U - Indicates compound was analyzed for but not detected.
J - Indicates an estimated value.
B - Indicates analyte was found in method blank.
N - Indicates presumtavive evidence of a compound
NA - Class GA Groundwater Standard not established

TABLE 1 (con't)

MACKENZIE CHEMICAL SITE
February 2000
OFF-SITE MONITORING WELLS - GROUNDWATER SAMPLES
VOLATILE ORGANIC COMPOUNDS - ANALTYICAL LABORATORY

SAMPLE ID	OS-1D		OS-2S		OS-2I		OS-2D		OS-3S		OS-3I		OS-3D		OS-4D		OS-5S		OS-5D		FIELD		NYSDEC
DEPTH OF SAMPLE[1]	160 ft.		60 ft.		130 ft.		160 ft.		60 ft.		120 ft.		158 ft.		155 ft.		60 ft		150 ft.		BLANK		GW STAND.[2]
PARAMETERS (ug/l)																							
Chloromethane	10	U	10	U	10	U	10	U	50	U	10	U	10	U	10	U	10	U	10	U	10	U	NA
Bromomethane	10	U	10	U	10	U	10	U	50	U	10	U	10	U	10	U	10	U	10	U	10	U	5
Vinyl Chloride	10	U	10	U	10	U	10	U	50	U	10	U	10	U	10	U	10	U	10	U	10	U	2
Chloroethane	10	U	10	U	10	U	10	U	50	U	10	U	10	U	10	U	10	U	10	U	10	U	5
Methylene Chloride	10	U	10	U	10	U	15	U	50	U	10	U	10	U	2	JB	2	JB	2	JB	2	JB	5
Acetone	10	U	10	U	10	U	10	U	50	U	10	U	2	J	10	U	10	U	10	U	10	U	NA
Carbon Disulfide	10	U	10	U	10	U	10	U	50	U	10	U	10	U	10	U	10	U	10	U	10	U	NA
1,1-Dichloroethene	10	U	10	U	10	U	10	U	50	U	10	U	10	U	10	U	10	U	10	U	10	U	5
1,1-Dichloroethane	10	U	10	U	10	U	10	U	50	U	10	U	10	U	10	U	10	U	10	U	10	U	5
1,2-Dichloroethene (Total)	10	U	10	U	10	U	10	U	50	U	10	U	10	U	10	U	10	U	10	U	10	U	NA
Chloroform	10	U	2	J	10	U	10	U	50	U	10	U	10	U	10	U	10	U	10	U	10	U	7
1,2-Dichloroethane	10	U	10	U	10	U	10	U	50	U	10	U	10	U	10	U	10	U	10	U	10	U	0.6
2-Butanone (MEK)	10	U	10	U	10	U	3	J	50	U	10	U	10	U	10	U	10	U	10	U	10	U	NA
1,1,1-Trichloroethane	10	U	10	U	10	U	10	U	50	U	10	U	10	U	1	J	10	U	10	U	10	U	5
Carbon Tetrachloride	10	U	10	U	10	U	10	U	50	U	10	U	10	U	10	U	10	U	10	U	10	U	5
Bromodichloromethane	10	U	10	U	10	U	10	U	50	U	10	U	10	U	10	U	10	U	10	U	10	U	NA
1,2-Dichloropropane	10	U	10	U	10	U	10	U	50	U	10	U	10	U	10	U	10	U	10	U	10	U	1
cis -1,3-Dichloropropene	10	U	10	U	10	U	10	U	50	U	10	U	10	U	10	U	10	U	10	U	10	U	0.4
Trichloroethene (TCE)	10	U	10	U	10	U	10	U	50	U	10	U	10	U	10	U	10	U	10	U	10	U	5
Dibromochloromethane	10	U	10	U	10	U	10	U	50	U	10	U	10	U	10	U	10	U	10	U	10	U	NA
1,1,2-Trichloroethane	10	U	10	U	10	U	10	U	50	U	10	U	10	U	10	U	10	U	10	U	10	U	1
Benzene	10	U	10	U	1	J	10	U	110	D	10	U	10	U	10	U	10	U	10	U	10	U	1
trans -1,3-Dichloropropene	10	U	10	U	10	U	10	U	50	U	10	U	10	U	10	U	10	U	10	U	10	U	0.4
Bromoform	10	U	10	U	10	U	10	U	50	U	10	U	10	U	10	U	10	U	10	U	10	U	NA
4-Methyl-2-Pentanone	10	U	10	U	10	U	10	U	50	U	10	U	10	U	10	U	10	U	10	U	10	U	NA
2-Hexanone	10	U	10	U	10	U	10	U	50	U	10	U	10	UJ	10	U	10	U	10	U	10	U	NA
Tetrachloroethene (PCE)	10	U	10	U	10	U	10	U	50	U	10	U	10	U	10	U	10	U	10	U	10	U	5
1,1,2,2-Tetrachloroethane	10	U	10	U	10	U	10	U	50	U	10	U	10	U	10	U	10	U	10	U	10	U	5
Toluene	10	J	10	U	3	J	10	U	50	U	10	U	10	U	10	U	10	U	10	U	10	U	5
Chlorobenzene	10	U	10	U	10	U	10	U	50	U	10	U	10	U	10	U	10	U	10	U	10	U	5
Ethylbenzene	10	U	10	U	10	U	10	U	50	U	10	U	10	U	10	U	10	U	10	U	10	U	5
Styrene	10	U	10	U	10	U	10	U	50	U	10	U	10	U	10	U	10	U	10	U	10	U	5
Xylenes (Total)	10	U	10	U	10	U	10	U	50	U	10	U	10	U	10	U	10	U	10	U	10	U	5
1,2,3-Trichloropropane	69	J	10	U	4	J	1	J	8900	J	6	J	10	UJ	26	J	10	UJ	10	UJ	10	U	0.04
TICs (Total Concentration)																							NA

Notes :

[1] - Indicates depth below ground surface

[2] - Referenced from NYSDEC Final Express Terms for Amendments to Title 6, Chapter X Parts 700-706, 3/98

U - Indicates compound was analyzed for but not detected.

J - Indicates as estimated value.

B - Indicates analyte was found in method blank.

N - Indicates presumtavive evidence of a compound

NA - Class GA Groundwater Standard not established

TABLE 1 (con't)

MACKENZIE CHEMICAL SITE
January 1999
OFF-SITE MONITORING WELLS - GROUNDWATER SAMPLES
SEMI-VOLATILE ORGANIC COMPOUNDS - ANALYTICAL LABORATORY

SAMPLE ID	OS-1D		OS-2S		OS-2I		OS-2D		OS-3S		OS-3I		OS-3D		NYSDEC
DEPTH OF SAMPLE[1]	160ft		60ft		130ft		160ft		60ft		120ft		158ft		GW STAND.[2]
PARAMETERS (ug/l)															
Phenol	12	U	12	U	12	U	11	U	12	U	13	U	12	U	1[3]
bis(2-Chloroethyl)Ether	12	U	12	U	12	U	11	U	12	U	13	U	12	U	NA
2-Chlorophenol	12	U	12	U	12	U	11	U	12	U	13	U	12	U	NA
1,3-Dichlorobenzene	12	U	12	U	12	U	11	U	8	J	13	U	12	U	3
1,4-Dichlorobenzene	12	U	12	U	12	U	11	U	6	J	13	U	12	U	3
1,2-Dichlorobenzene	12	U	12	U	12	U	11	U	10	J	13	U	12	U	3
2-Methylphenol	12	U	12	U	12	U	11	U	12	U	13	U	12	U	NA
2,2'-oxybis(1-Chloropropane)	12	U	12	U	12	U	11	U	12	U	13	U	12	U	NA
4-Methylphenol	12	U	12	U	12	U	11	U	12	U	13	U	12	U	NA
N-Nitroso-di-n-propylamine	12	U	12	U	12	U	11	U	12	U	13	U	12	U	NA
Hexachloroethane	12	U	12	U	12	U	11	U	12	U	13	U	12	U	5
Nitrobenzene	12	U	12	U	12	U	11	U	12	U	13	U	12	U	0.4
Isophorone	12	U	12	U	12	U	11	U	12	U	13	U	12	U	NA
2-Nitrophenol	12	U	12	U	12	U	11	U	12	U	13	U	12	U	NA
2,4-Dimethylphenol	12	U	12	U	12	U	11	U	12	U	13	U	12	U	1[3]
bis(2-Chloroethoxy)Methane	12	U	12	U	12	U	11	U	12	U	13	U	12	U	NA
2,4-Dichlorophenol	12	U	12	U	12	U	11	U	12	U	13	U	12	U	1[3]
1,2,4-Trichlorobenzene	12	U	12	U	12	U	11	U	12	U	13	U	12	U	5
Naphthalene	12	U	12	U	12	U	11	U	6	J	13	U	12	U	NA
4-Chloroaniline	12	U	12	U	12	U	11	U	12	U	13	U	12	U	5
Hexachlorobutadiene	12	U	12	U	12	U	11	U	12	U	13	U	12	U	0.5
4-Chloro-3-Methylphenol	12	U	12	U	12	U	11	U	12	U	13	U	12	U	1[3]
2-Methylnaphthalene	12	U	12	U	12	U	11	U	20		13	U	12	U	NA
Hexachlorocyclopentadiene	12	U	12	U	12	U	11	U	12	UJ	13	U	12	U	5
2,4,6-Trichlorophenol	12	U	12	U	12	U	11	U	12	UJ	13	U	12	U	1[3]
2,4,5-Trichlorophenol	29	U	30	U	29	U	29	U	30	UJ	32	U	29	U	1[3]
2-Chloronaphthalene	12	U	12	U	12	U	11	U	12	UJ	13	U	12	U	NA
2-Nitroaniline	29	U	30	U	29	U	29	U	30	UJ	32	U	29	U	5
Dimethylphthalate	12	U	12	U	12	U	11	U	12	UJ	13	U	12	U	NA
Acenaphthylene	12	U	12	U	12	U	11	U	12	UJ	13	U	12	U	NA
2,6-Dinitrotoluene	12	U	12	U	12	U	11	U	12	UJ	13	U	12	U	5
3-Nitroaniline	29	U	30	U	29	U	29	U	30	UJ	32	U	29	U	5
Acenaphthene	12	U	12	U	12	U	11	U	12	UJ	13	U	12	U	NA
2,4-Dinitrophenol	29	UJ	30	UJ	29	UJ	29	UJ	30	UJ	32	UJ	29	UJ	1[3]
4-Nitrophenol	29	U	30	U	29	U	29	U	30	UJ	32	U	29	U	1[3]
Dibenzofuran	12	U	12	U	12	U	11	U	12	UJ	13	U	12	U	NA
2,4-Dinitrotoluene	12	U	12	U	12	U	11	U	12	UJ	13	U	12	U	5
Diethylphthalate	12	U	12	U	12	U	11	U	12	UJ	13	U	12	U	NA
4-Chlorophenyl-phenylether	12	U	12	U	12	U	11	U	12	UJ	13	U	12	U	NA
Fluorene	12	U	12	U	12	U	11	U	4	J	13	U	12	U	NA
4-Nitroaniline	29	U	30	U	29	U	29	U	30	UJ	32	U	29	U	5
4,6-Dinitro-2-Methylphenol	29	U	30	U	29	U	29	U	30	U	32	U	29	U	NA
N-Nitrosodiphenylamine	12	U	12	U	12	U	11	U	12	U	13	U	12	U	NA
4-Bromophenyl-phenylether	12	U	12	U	12	U	11	U	12	U	13	U	12	U	NA
Hexachlorobenzene	12	U	12	U	12	U	11	U	12	U	13	U	12	U	0.04
Pentachlorophenol	29	U	30	U	29	U	29	U	30	U	32	U	29	U	1[3]
Phenanthrene	12	U	12	U	12	U	11	U	12	U	13	U	12	U	NA
Anthracene	12	U	12	U	12	U	11	U	12	U	13	U	12	U	NA
Carbazole	12	U	12	U	12	U	11	U	12	U	13	U	12	U	NA
Di-n-butylphthalate	12	U	12	U	12	U	11	U	12	U	13	U	12	U	NA
Fluoranthene	12	U	12	U	12	U	11	U	12	U	13	U	12	U	NA
Pyrene	12	U	12	U	12	U	11	U	12	U	13	U	12	U	NA
Butylbenzylphthalate	12	U	12	U	12	U	11	U	12	U	13	U	12	U	NA
3,3'-Dichlorobenzidine	12	U	12	U	12	U	11	U	12	U	13	U	12	U	5
Benzo(a)anthracene	12	U	12	U	12	U	11	U	12	U	13	U	12	U	NA
Chrysene	12	U	12	U	12	U	11	U	12	U	13	U	12	U	NA
bis(2-Ethylhexyl)phthalate	12	U	12	U	12	U	40		12	U	13	U	12	U	5
Di-n-octylphthalate	12	U	12	U	12	U	11	U	12	U	13	U	12	U	NA
Benzo(b)fluoranthene	12	U	12	U	12	U	11	U	12	U	13	U	12	U	NA
Benzo(k)fluoranthene	12	U	12	U	12	U	11	U	12	U	13	U	12	U	NA
Benzo(a)pyrene	12	U	12	U	12	U	11	U	12	U	13	U	12	U	ND
Indeno(1,2,3-cd)pyrene	12	U	12	U	12	U	11	U	12	U	13	U	12	U	NA
Dibenzo(a,h)anthracene	12	U	12	U	12	U	11	U	12	U	13	U	12	U	NA
Benzo(g,h,i)perylene	12	U	12	U	12	U	11	U	12	U	13	U	12	U	NA

NOTES:

[1] - Indicates depth below ground surface.

[2] - Referenced from NYSDEC 'Final Express Terms for Amendments to Title 6, Chapter X Parts 700-706', 3/98.

[3] - 1 ug/l standard applies to the sum of all phenolic compounds.

U - Indicates compound was analyzed for but not detected

J - Indicates an estimated value.

NA - Class GA Groundwater Standard not established

ND - Non-detectable

TABLE 1 (con't)

MACKENZIE CHEMICAL SITE
January 1999
OFF-SITE MONITORING WELLS - GROUNDWATER SAMPLES
SEMI-VOLATILE ORGANIC COMPOUNDS - ANALYTICAL LABORATORY

SAMPLE ID	OS-4D		OS-5S		OS-5D		Field		NYSDEC
DEPTH OF SAMPLE[1]	155ft		60ft		150ft		Blank		GW STAND.[2]
PARAMETERS (ug/l)									
Phenol	11	U	12	U	12	U	15	U	1[3]
bis(2-Chloroethyl)Ether	11	U	12	U	12	U	15	U	NA
2-Chlorophenol	11	U	12	U	12	U	15	U	NA
1,3-Dichlorobenzene	11	U	12	U	12	U	15	U	3
1,4-Dichlorobenzene	11	U	12	U	12	U	15	U	3
1,2-Dichlorobenzene	11	U	12	U	12	U	15	U	3
2-Methylphenol	11	U	12	U	12	U	15	U	NA
2,2'-oxybis(1-Chloropropane)	11	U	12	U	12	U	15	U	NA
4-Methylphenol	11	U	12	U	12	U	15	U	NA
N-Nitroso-di-n-propylamine	11	U	12	U	12	U	15	U	NA
Hexachloroethane	11	U	12	U	12	U	15	U	5
Nitrobenzene	11	U	12	U	12	U	15	U	0.4
Isophorone	11	U	12	U	12	U	15	U	NA
2-Nitrophenol	11	U	12	U	12	U	15	U	NA
2,4-Dimethylphenol	11	U	12	U	12	U	15	U	1[3]
bis(2-Chloroethoxy)Methane	11	U	12	U	12	U	15	U	NA
2,4-Dichlorophenol	11	U	12	U	12	U	15	U	1[3]
1,2,4-Trichlorobenzene	11	U	12	U	12	U	15	U	5
Naphthalene	11	U	12	U	12	U	15	U	NA
4-Chloroaniline	11	U	12	U	12	U	15	U	5
Hexachlorobutadiene	11	U	12	U	12	U	15	U	0.5
4-Chloro-3-Methylphenol	11	U	12	U	12	U	15	U	1[3]
2-Methylnaphthalene	11	U	12	U	12	U	15	U	NA
Hexachlorocyclopentadiene	11	U	12	U	12	U	15	U	5
2,4,6-Trichlorophenol	11	U	12	U	12	U	15	U	1[3]
2,4,5-Trichlorophenol	28	U	31	U	30	U	38	U	1[3]
2-Chloronaphthalene	11	U	12	U	12	U	15	U	NA
2-Nitroaniline	28	U	31	U	30	U	38	U	5
Dimethylphthalate	11	U	12	U	12	U	15	U	NA
Acenaphthylene	11	U	12	U	12	U	15	U	NA
2,6-Dinitrotoluene	11	U	12	U	12	U	15	U	5
3-Nitroaniline	28	U	31	U	30	U	38	U	5
Acenaphthene	11	U	12	U	12	U	15	U	NA
2,4-Dinitrophenol	28	UJ	31	UJ	30	UJ	38	UJ	1[3]
4-Nitrophenol	28	U	31	U	30	U	38	U	1[3]
Dibenzofuran	11	U	12	U	12	U	15	U	NA
2,4-Dinitrotoluene	11	U	12	U	12	U	15	U	5
Diethylphthalate	11	U	12	U	12	U	15	U	NA
4-Chlorophenyl-phenylether	11	U	12	U	12	U	15	U	NA
Fluorene	11	U	12	U	12	U	15	U	NA
4-Nitroaniline	28	U	31	U	30	U	38	U	5
4,6-Dinitro-2-Methylphenol	28	U	31	U	30	U	38	U	NA
N-Nitrosodiphenylamine	11	U	12	U	12	U	15	U	NA
4-Bromophenyl-phenylether	11	U	12	U	12	U	15	U	NA
Hexachlorobenzene	11	U	12	U	12	U	15	U	0.04
Pentachlorophenol	28	U	31	U	30	U	38	U	1[3]
Phenanthrene	11	U	12	U	12	U	15	U	NA
Anthracene	11	U	12	U	12	U	15	U	NA
Carbazole	11	U	12	U	12	U	15	U	NA
Di-n-butylphthalate	11	U	12	U	12	U	15	U	NA
Fluoranthene	11	U	12	U	12	U	15	U	NA
Pyrene	11	U	12	U	12	U	15	U	NA
Butylbenzylphthalate	11	U	12	U	12	U	15	U	NA
3,3'-Dichlorobenzidine	11	U	12	U	12	U	15	U	5
Benzo(a)anthracene	11	U	12	U	12	U	15	U	NA
Chrysene	11	U	12	U	12	U	15	U	NA
bis(2-Ethylhexyl)phthalate	11	U	12	U	12	U	15	J	5
Di-n-octylphthalate	11	U	12	U	12	U	15	U	NA
Benzo(b)fluoranthene	11	U	12	U	12	U	15	U	NA
Benzo(k)fluoranthene	11	U	12	U	12	U	15	U	NA
Benzo(a)pyrene	11	U	12	U	12	U	15	U	ND
Indeno(1,2,3-cd)pyrene	11	U	12	U	12	U	15	U	NA
Dibenzo(a,h)anthracene	11	U	12	U	12	U	15	U	NA
Benzo(g,h,i)perylene	11	U	12	U	12	U	15	U	NA

NOTES:

[1] - Indicates depth below ground surface.
[2] - Referenced from NYSDEC Final Express Terms for Amendments to Title 6, Chapter X Parts 700-706, 3/98
[3] - 1 ug/l standard applies to the sum of all phenolic compounds.
U - Indicates compound was analyzed for but not detected
J - Indicates an estimated value.
NA - Class GA Groundwater Standard not established
ND - Non-detectable

TABLE 2

MACKENZIE CHEMICAL SITE

SOIL SAMPLES
VOLATILE ORGANIC COMPOUNDS - MOBILE LABORATORY

SAMPLE ID	SS-1	SS-2	SS-3			SS-4				NYSDEC
DEPTH OF SAMPLE[1]	0-4ft	0-4ft	0-4ft	21ft	41ft	0-4ft	4-8ft	21ft	41ft	RSCO[2]
PARAMETERS - (ug/kg)										
Chloromethane	< 10	< 100	< 100	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	NA
Vinyl Chloride	< 10	< 100	< 100	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	200
Bromomethane	< 10	< 100	< 100	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	NA
Chloroethane	< 10	< 100	< 100	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	1,900
1,1-Dichloroethene	< 10	< 100	< 100	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	400
Methylene Chloride	< 10	< 100	< 100	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	100
trans-1,2-Dichloroethene	< 10	< 100	< 100	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	250
1,1-Dichloroethane	< 10	< 100	< 100	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	200
cis-1,2-Dichloroethene	< 10	< 100	< 100	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	250
Chloroform	< 10	< 100	< 100	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	300
1,1,1-Trichloroethane	< 10	< 100	< 100	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	800
Carbon Tetrachloride	< 10	< 100	< 100	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	600
1,2-Dichloroethane	< 10	< 100	< 100	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	100
Trichloroethene	< 10	< 100	< 100	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	700
1,2-Dichloropropane	< 10	< 100	< 100	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	NA
Bromodichloromethane	< 10	< 100	< 100	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	NA
cis-1,3-Dichloropropene	< 10	< 100	< 100	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	NA
trans-1,3-Dichloropropene	< 10	< 100	< 100	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	NA
1,1,2-Trichloroethane	< 10	< 100	< 100	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	NA
Tetrachloroethylene	< 10	< 100	< 100	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	1,400
Dibromochloromethane	< 10	< 100	< 100	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	NA
Bromoform	< 10	< 100	< 100	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	NA
1,1,2,2,-Tetrachloroethane	< 10	< 100	< 100	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	600
1,2,3-Trichloropropane	65	220 D	1,600 D	680,000 D	290,000 D	100,000 D	110,000 D	860 D	570 D	400
Acetone	< 10	< 100	< 500	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	200
MEK	< 10	< 100	< 500	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	300
Benzene	< 10	< 100	< 500	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	60
MIBK	< 10	< 100	< 500	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	NA
Toluene	< 10	< 100	< 500	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	1500
MBK	< 10	< 100	< 500	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	NA
Chlorobenzene	< 10	< 100	< 500	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	1,700
Ethylbenzene	< 10	< 100	< 500	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	5,500
M&P Xylene	< 10	< 100	< 500	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	1,200
O- Xylene	< 10	< 100	< 500	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	1,200
Styrene	< 10	< 100	< 500	< 20,000	< 20,000	< 20,000	< 2,500	< 100	< 100	NA

NOTES:

[1] - Indicates depth below ground surface.

[2] - Recommended Soil Cleanup Objectives referenced from NYSDEC Division Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives and Cleanup Levels (4/95).

D - Indicates a secondary dilution factor used for analysis

NA - Recommended Soil Cleanup Objective not established

TABLE 2 (con't)

MACKENZIE CHEMICAL SITE

SOIL SAMPLES
VOLATILE ORGANIC COMPOUNDS - MOBILE LABORATORY

SAMPLE ID	SS-5				SS-6			SS-8	SS-9	SS-10	SS-11	SS-12	NYSDEC
DEPTH OF SAMPLE[1]	0-4ft	4-8ft	20-24ft	40ft	0-4ft	21ft	41ft	0-4ft	0-4ft	0-4ft	0-4ft	0-4ft.	RSCO[2]
PARAMETERS - (ug/kg)													
Chloromethane	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	NA
Vinyl Chloride	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	200
Bromomethane	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	NA
Chloroethane	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	1,900
1,1-Dichloroethene	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	400
Methylene Chloride	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	100
trans-1,2-Dichloroethene	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	250
1,1-Dichloroethane	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	200
cis-1,2-Dichloroethene	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	250
Chloroform	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	300
1,1,1-Trichloroethane	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	800
Carbon Tetrachloride	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	600
1,2-Dichloroethane	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	100
Trichloroethene	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	2	700
1,2-Dichloropropane	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	NA
Bromodichloromethane	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	NA
cis-1,3-Dichloropropene	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	NA
trans-1,3-Dichloropropene	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	NA
1,1,2-Trichloroethane	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	NA
Tetrachloroethylene	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	1,400
Dibromochloromethane	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	NA
Bromoform	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	NA
1,1,2,2,-Tetrachloroethane	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	600
1,2,3-Trichloropropane	180,000 D	25,000 D	230 D	140 D	7,500 D	< 100	< 100	< 100	< 100	28	< 100	130 D	400
Acetone	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	3	200
MEK	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	300
Benzene	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	60
MIBK	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	NA
Toluene	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	1500
MBK	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	NA
Chlorobenzene	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	1,700
Ethylbenzene	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	5,500
M&P Xylene	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	1,200
O- Xylene	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	1,200
Styrene	< 10,000	< 500	< 100	< 100	< 500	< 100	< 100	< 100	< 100	< 10	< 100	< 1	NA

NOTES:

[1] - Indicates depth below ground surface.

[2] - Recommended Soil Cleanup Objectives referenced from NYSDEC Division Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives and Cleanup Levels (4/95).

D - Indicates a secondary dilution factor used for analysis

NA - Recommended Soil Cleanup Objective not established

TABLE 2 (con't)

MACKENZIE CHEMICAL SITE

SOIL SAMPLES
VOLATILE ORGANIC COMPOUNDS - MOBILE LABORATORY

SAMPLE ID	SS-13			SS-14	SS-15		SS-17	SS-18	SS-20	SS-21	NYSDEC
DEPTH OF SAMPLE[1]	0-4ft	21ft	41ft	0-4ft	0-4ft	4-8ft	0-4ft	0-4ft	0-4ft	0-4ft	RSCO[2]
PARAMETERS - (ug/kg)											
Chloromethane	< 100	< 100	< 100	< 10	< 100	< 1,000	< 10	< 100	< 200	< 100	NA
Vinyl Chloride	< 100	< 100	< 100	< 10	< 100	< 1,000	< 10	< 100	< 200	< 100	200
Bromomethane	< 100	< 100	< 100	< 10	< 100	< 1,000	< 10	< 100	< 200	< 100	NA
Chloroethane	< 100	< 100	< 100	< 10	< 100	< 1,000	< 10	< 100	< 200	< 100	1,900
1,1-Dichloroethene	< 100	< 100	< 100	< 10	< 100	< 1,000	< 10	< 100	< 200	< 100	400
Methylene Chloride	< 100	< 100	< 100	< 10	< 100	< 1,000	< 10	< 100	< 200	< 100	100
trans-1,2-Dichloroethene	< 100	< 100	< 100	< 10	< 100	< 1,000	< 10	< 100	< 200	< 100	250
1,1-Dichloroethane	< 100	< 100	< 100	< 10	< 100	< 1,000	< 10	< 100	< 200	< 100	200
cis-1,2-Dichloroethene	< 100	< 100	< 100	< 10	< 100	< 1,000	< 10	< 100	< 200	< 100	250
Chloroform	< 100	< 100	< 100	< 10	< 100	< 1,000	< 10	< 100	< 200	< 100	300
1,1,1-Trichloroethane	< 100	< 100	< 100	41	< 100	< 1,000	< 10	< 100	< 200	< 100	800
Carbon Tetrachloride	< 100	< 100	< 100	< 10	< 100	< 1,000	< 10	< 100	< 200	< 100	600
1,2-Dichloroethane	< 100	< 100	< 100	< 10	< 100	< 1,000	< 10	< 100	< 200	< 100	100
Trichloroethene	< 100	< 100	< 100	< 10	< 100	< 1,000	< 10	< 100	< 200	< 100	700
1,2-Dichloropropane	< 100	< 100	< 100	< 10	< 100	< 1,000	< 10	< 100	< 200	< 100	NA
Bromodichloromethane	< 100	< 100	< 100	< 10	< 100	< 1,000	< 10	< 100	< 200	< 100	NA
cis-1,3-Dichloropropene	< 100	< 100	< 100	< 10	< 100	< 1,000	< 10	< 100	< 200	< 100	NA
trans-1,3-Dichloropropene	< 100	< 100	< 100	< 10	< 100	< 1,000	< 10	< 100	< 200	< 100	NA
1,1,2-Trichloroethane	< 100	< 100	< 100	< 10	< 100	< 1,000	< 10	< 100	< 200	< 100	NA
Tetrachloroethylene	< 100	< 100	< 100	16	< 100	< 1,000	18	2,340 D	< 200	< 100	1,400
Dibromochloromethane	< 100	< 100	< 100	< 10	< 100	< 1,000	< 10	< 100	< 200	< 100	NA
Bromoform	< 100	< 100	< 100	< 10	< 100	< 1,000	< 10	< 100	< 200	< 100	NA
1,1,2,2,-Tetrachloroethane	< 100	< 100	< 100	< 10	< 100	< 1,000	< 10	< 100	< 200	< 100	600
1,2,3-Trichloropropane	140 D	< 100	< 100	140	22,000 E	< 1,000	70	140 D	< 200	< 100	400
Acetone	< 100	< 100	< 100	< 10	< 100	< 1,000	< 10	< 100	< 200	< 100	200
MEK	< 100	< 100	< 100	< 10	< 100	< 1,000	< 10	< 100	< 200	< 100	300
Benzene	< 100	< 100	< 100	< 10	< 100	< 1,000	< 10	< 100	< 200	< 100	60
MIBK	< 100	< 100	< 100	< 10	< 100	< 1,000	< 10	< 100	< 200	< 100	NA
Toluene	< 100	< 100	< 100	70	< 100	< 1,000	240	< 100	< 200	< 100	1500
MBK	< 100	< 100	< 100	< 10	< 100	< 1,000	< 10	< 100	< 200	< 100	NA
Chlorobenzene	< 100	< 100	< 100	< 10	< 100	< 1,000	< 10	< 100	< 200	< 100	1,700
Ethylbenzene	< 100	< 100	< 100	27	140 D	< 1,000	< 10	< 100	< 200	< 100	5,500
M&P Xylene	< 100	< 100	< 100	89	120 D	< 1,000	< 10	< 100	< 200	< 100	1,200
O- Xylene	< 100	< 100	< 100	37	230 D	< 1,000	< 10	< 100	< 200	< 100	1,200
Styrene	< 100	< 100	< 100	< 10	< 100	< 1,000	< 10	< 100	< 200	< 100	NA

NOTES:

[1] - Indicates depth below ground surface.

[2] - Recommended Soil Cleanup Objectives referenced from NYSDEC Division Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives and Cleanup Levels (4/95).

D - Indicates a secondary dilution factor used for analysis

NA - Recommended Soil Cleanup Objective not established

E - Indicates an estimate value, instrument calibration was exceeded.

TABLE 2 (con't)

MACKENZIE CHEMICAL SITE

DRAINAGE STRUCTURES - SOIL SAMPLES
VOLATILE ORGANIC COMPOUNDS - MOBILE LABORATORY

SAMPLE ID	DS-2		DS-3		DS-6		DS-9		DS-11		NYSDEC
DEPTH OF SAMPLE[1]	25ft	40ft	25ft	40ft	25ft	40ft	14ft	40ft	25ft	40ft	RSCO[2]
PARAMETERS - (ug/kg)											
Chloromethane	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	NA
Vinyl Chloride	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	200
Bromomethane	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	NA
Chloroethane	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	1,900
1,1-Dichloroethene	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	400
Methylene Chloride	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	100
trans-1,2-Dichloroethene	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	250
1,1-Dichloroethane	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	200
cis-1,2-Dichloroethene	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	250
Chloroform	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	300
1,1,1-Trichloroethane	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	800
Carbon Tetrachloride	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	600
1,2-Dichloroethane	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	100
Trichloroethene	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	700
1,2-Dichloropropane	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	NA
Bromodichloromethane	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	NA
cis-1,3-Dichloropropene	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	NA
trans-1,3-Dichloropropene	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	NA
1,1,2-Trichloroethane	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	NA
Tetrachloroethylene	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	1,400
Dibromochloromethane	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	NA
Bromoform	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	NA
1,1,2,2,-Tetrachloroethane	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	600
1,2,3-Trichloropropane	< 200	< 100	< 100	< 100	< 100	< 100	20,400 D	< 100	< 100	< 100	400
Acetone	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	200
MEK	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	300
Benzene	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	60
MIBK	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	NA
Toluene	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	1500
MBK	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	NA
Chlorobenzene	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	1,700
Ethylbenzene	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	5,500
M&P Xylene	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	1,200
O- Xylene	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	1,200
Styrene	< 200	< 100	< 100	< 100	< 100	< 100	< 1,000	< 100	< 100	< 100	NA

NOTES:

[1] - Indicates depth below ground surface.

[2] - Referenced from NYSDEC Division Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives and Cleanup Levels (4/95)

NA - Recommended Soil Cleanup Objective not established

D - Indicates a secondary dilution factor used for analysis

TABLE 2 (con't)

MACKENZIE CHEMICAL SITE

DRAINAGE STRUCTURES - SOIL SAMPLES
VOLATILE ORGANIC COMPOUNDS - MOBILE LABORATORY

SAMPLE ID	DS-12		DS-13		DS-13X[3]	DS-14			DS-15		Field	NYSDEC
DEPTH OF SAMPLE[1]	25ft	40ft	25ft	40ft		8-12ft	21ft	41ft	25ft	40ft	Blank #3[4]	RSCO[2]
PARAMETERS - (ug/kg)												
Chloromethane	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	NA
Vinyl Chloride	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	200
Bromomethane	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	NA
Chloroethane	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	1,900
1,1-Dichloroethene	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	400
Methylene Chloride	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	100
trans-1,2-Dichloroethene	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	250
1,1-Dichloroethane	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	200
cis-1,2-Dichloroethene	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	250
Chloroform	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	300
1,1,1-Trichloroethane	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	800
Carbon Tetrachloride	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	600
1,2-Dichloroethane	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	100
Trichloroethene	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	700
1,2-Dichloropropane	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	NA
Bromodichloromethane	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	NA
cis-1,3-Dichloropropene	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	NA
trans-1,3-Dichloropropene	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	NA
1,1,2-Trichloroethane	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	NA
Tetrachloroethylene	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	1,400
Dibromochloromethane	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	NA
Bromoform	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	NA
1,1,2,2,-Tetrachloroethane	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	600
1,2,3-Trichloropropane	< 100	250 D	250 D	< 100	< 100	87,000 D	7.2	2,300 D	< 500	< 500	< 1	400
Acetone	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	200
MEK	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	300
Benzene	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	60
MIBK	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	NA
Toluene	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	1500
MBK	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	NA
Chlorobenzene	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	1,700
Ethylbenzene	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	5,500
M&P Xylene	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	1,200
O- Xylene	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	1,200
Styrene	< 100	< 100	< 100	< 100	< 100	< 10,000	< 5	< 100	< 500	< 500	< 1	NA

NOTES:

[1] - Indicates depth below ground surface.

[2] - Referenced from NYSDEC Division Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives and Cleanup Levels (4/95)

[3] - DS-13X represents blind duplicate of DS-13, 40ft

[4] - Field Blank #3 is an aqueous sample, reported in ug/l

D - Indicates a secondary dilution factor used for analysis

NA - Recommended Soil Cleanup Objective not established

TABLE 2 (con't)

MACKENZIE CHEMICAL SITE

DRAINAGE STRUCTURES - SOIL SAMPLES
VOLATILE ORGANIC COMPOUNDS - ANALYTICAL LABORATORY

SAMPLE ID	DS-2		DS-3		DS-6		DS-9		DS-11		DS-12		DS-13		DS-XX[3]		DS-14		DS-15		NYSDEC
DEPTH OF SAMPLE[1]	10-12ft		10-12ft		10-12ft		25-27ft		8-10ft		10-12ft		10-12ft				4-8ft		10-12ft		RSCO[1]
PARAMETERS (ug/kg)																					
Chloromethane	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	10	U	11	U	11	U	100	U	10	U	NA
Bromomethane	10	U	10	U	10	U	10	U	10	U	10	U	11	U	11	U	100	U	10	U	NA
Vinyl Chloride	10	U	10	U	10	U	10	U	10	U	10	U	11	U	11	U	100	U	10	U	200
Chloroethane	10	U	10	U	10	U	10	U	10	U	10	U	11	U	11	U	100	U	10	U	1,900
Methylene Chloride	10	U	10	U	10	U	10	U	10	U	10	U	11	U	11	U	100	U	10	U	100
Acetone	10	U	10	U	10	U	10	U	10	U	10	U	11	U	11	U	100	U	10	U	200
Carbon Disulfide	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	10	U	11	UJ	11	UJ	100	U	10	U	2,700
1,1-Dichloroethene	10	U	10	U	10	U	10	U	10	U	10	U	11	U	11	U	100	U	10	U	400
1,1-Dichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	11	U	11	U	100	U	10	U	200
1,2-Dichloroethene (Total)	10	U	10	U	10	U	10	U	10	U	10	U	11	U	11	U	100	U	10	U	250
Chloroform	10	U	10	U	10	U	10	U	10	U	10	U	11	U	11	U	100	U	10	U	300
1,2-Dichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	11	U	11	U	100	U	10	U	100
2-Butanone (MEK)	10	U	10	U	10	U	10	U	10	U	10	U	11	U	11	U	100	U	10	U	300
1,1,1-Trichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	11	U	11	U	100	U	10	U	800
Carbon Tetrachloride	10	U	10	U	10	U	10	U	10	U	10	U	11	U	11	U	100	U	10	U	600
Bromodichloromethane	10	U	10	U	10	U	10	U	10	U	10	U	11	U	11	U	100	U	10	U	NA
1,2-Dichloropropane	10	U	10	U	10	U	10	U	10	U	10	U	11	U	11	U	100	U	10	U	NA
cis -1,3-Dichloropropene	10	U	10	U	10	U	10	U	10	U	10	U	11	U	11	U	100	U	10	U	NA
Trichloroethene (TCE)	10	U	3	J	10	U	10	U	10	U	10	U	11	U	11	U	100	U	10	U	700
Dibromochloromethane	10	U	10	U	10	U	10	U	10	U	10	U	11	U	11	U	100	U	10	U	NA
1,1,2-Trichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	11	U	11	U	100	U	10	U	NA
Benzene	10	U	10	U	10	U	10	U	10	U	10	U	11	U	11	U	100	U	10	U	60
trans -1,3-Dichloropropene	10	U	10	U	10	U	10	U	10	U	10	U	11	U	11	U	100	U	10	U	NA
Bromoform	10	U	10	U	10	U	10	U	10	U	10	U	11	U	11	U	100	U	10	U	NA
4-Methyl-2-Pentanone	10	U	10	U	10	U	10	U	10	U	10	U	11	U	11	U	100	U	10	U	1,000
2-Hexanone	10	U	10	U	10	U	10	U	10	U	10	U	11	U	11	U	100	U	10	U	NA
Tetrachloroethene (PCE)	14		10	U	10	U	10	U	10	U	10	U	4	J	11	U	100	U	10	U	1,400
1,1,2,2-Tetrachloroethane	10	U	10	U	10	U	10	U	10	U	10	U	11	U	11	U	100	U	10	U	600
Toluene	10	U	10	U	10	U	10	U	10	U	10	U	11	J	1	J	100	U	10	U	1,500
Chlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U	11	J	1	J	100	U	10	U	1,700
Ethylbenzene	10	U	10	U	10	U	10	U	10	U	10	U	11	U	11	U	100	U	10	U	5,500
Styrene	10	U	10	U	10	U	10	U	10	U	10	U	11	U	11	U	100	U	10	U	NA
Xylenes (Total)	10	U	10	U	10	U	10	U	10	U	10	U	11	U	11	U	100	U	10	U	1,200
1,2,3- Trichloropropane	10	NJ	10	U	10	U	10	U	10	U	150	NJ	10	U	10	U	10,000	NJ	10	U	400
TICs (Total Concentration)	134	NJ	64	NJ	130	NJ	49	NJ	33	NJ	90	NJ	120	NJ	130	NJ	23,360	NJ	14	NJ	NA

NOTES:

[1] - Indicates depth below ground surface.

[2] - Recommended Soil Cleanup Objectives referenced from NYSDEC Division Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives and Cleanup Levels (4/95)

[3] - DS-XX is a blind duplicate of sample DS-13, 10 ft.

U - Indicates compound was analyzed for but not detected.

J - Indicates an estimated value.

N - Indicates presumtavive evidence of a compound

NA - Recommended Soil Cleanup Objective not established

TABLE 2 (con't)

MACKENZIE CHEMICAL SITE

DRAINAGE STRUCTURES - SOIL SAMPLES
SEMI-VOLATILE ORGANIC COMPOUNDS - ANALYTICAL LABORATORY

SAMPLE ID	DS-2	DS-3	DS-6	DS-9	DS-11	DS-12	DS-13	DS-XX[3]	DS-14	DS-15	NYSDEC
DEPTH OF SAMPLE[1]	10-12ft	10-12ft	10-12ft	25-27ft	8-10ft	10-12ft	10-12ft		4-8ft	10-12ft	RSCO[2]
PARAMETERS (ug/kg)											
Phenol	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	30 or MDL
bis(2-Chloroethyl)Ether	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	NA
2-Chlorophenol	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	800
1,3-Dichlorobenzene	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	NA
1,4-Dichlorobenzene	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	NA
1,2-Dichlorobenzene	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	NA
2-Methylphenol	83 J	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	100 or MDL
2,2'-oxybis(1-Chloropropane)	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	NA
4-Methylphenol	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	900
N-Nitroso-di-n-propylamine	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	NA
Hexachloroethane	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	NA
Nitrobenzene	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	200 or MDL
Isophorone	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	4,400
2-Nitrophenol	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	330 or MDL
2,4-Dimethylphenol	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	NA
bis(2-Chloroethoxy)Methane	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	NA
2,4-Dichlorophenol	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	400
1,2,4-Trichlorobenzene	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	NA
Naphthalene	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	13,000
4-Chloroaniline	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	220 or MDL
Hexachlorobutadiene	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	NA
4-Chloro-3-Methylphenol	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	240 or MDL
2-Methylnaphthalene	340 U	350 U	340 U	340 U	340 U	340 U	360 U	79 J	350 U	350 U	36,400
Hexachlorocyclopentadiene	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 UJ	NA
2,4,6-Trichlorophenol	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	NA
2,4,5-Trichlorophenol	850 U	870 U	850 U	860 U	850 U	850 U	890 U	890 U	870 U	860 U	100
2-Chloronaphthalene	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	NA
2-Nitroaniline	850 U	870 U	850 U	860 U	850 U	850 U	890 U	890 UJ	870 U	860 U	430 or MDL
Dimethylphthalate	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	2,000
Acenaphthylene	340 U	350 U	340 U	340 U	340 U	340 U	190 J	180 J	350 U	350 U	41,000
2,6-Dinitrotoluene	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	1,000
3-Nitroaniline	850 U	870 U	850 U	860 U	850 U	850 U	890 U	890 U	870 U	860 U	500 or MDL
Acenaphthene	340 U	350 U	340 U	340 U	340 U	340 U	320 J	1,200	350 U	350 U	50,000
2,4-Dinitrophenol	850 UJ	870 UJ	850 UJ	860 UJ	850 UJ	850 UJ	890 UJ	890 UJ	870 UJ	860 UJ	200 or MDL
4-Nitrophenol	850 U	870 U	850 U	860 U	850 U	850 U	890 U	890 U	870 U	860 U	100 or MDL
Dibenzofuran	340 U	350 U	340 U	340 U	340 U	340 U	72 J	690	350 U	350 U	6,200
2,4-Dinitrotoluene	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	NA
Diethylphthalate	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	7,100
4-Chlorophenyl-phenylether	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	NA
Fluorene	120 J	350 U	340 U	340 U	340 U	340 U	330 J	1,900	350 U	350 U	50,000
4-Nitroaniline	850 U	870 U	850 U	860 U	850 U	850 U	890 U	890 U	870 U	860 U	NA
4,6-Dinitro-2-Methylphenol	850 U	870 U	850 U	860 U	850 U	850 U	890 U	890 U	870 U	860 U	NA
N-Nitrosodiphenylamine	340 U	59 J	340 U	39 J	340 U	1,200	6,000 JD	1,400 JD	350 U	350 U	NA
4-Bromophenyl-phenylether	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	NA
Hexachlorobenzene	340 U	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	410
Pentachlorophenol	850 U	870 U	850 U	860 U	850 U	850 U	890 U	890 U	870 U	860 U	1000 or MDL
Phenanthrene	340 U	350 U	340 U	340 U	340 U	310 J	2,500	14,000 D	350 U	350 U	50,000
Anthracene	340 U	140 J	340 U	340 U	340 U	85 J	1,300	9,200 D	350 U	350 U	50,000
Carbazole	340 U	350 U	340 U	340 U	340 U	46 J	210 J	1,400	350 U	350 U	NA
Di-n-butylphthalate	45 J	350 U	340 U	340 U	340 U	340 U	360 U	350 U	350 U	350 U	8,100
Fluoranthene	74 J	350 U	340 U	340 U	340 U	450	30,000 D	36,000 D	350 U	350 U	50,000
Pyrene	130 J	350 U	340 U	340 U	340 U	420	25,000 D	27,000 D	63 J	350 U	50,000
Butylbenzylphthalate	340 U	350 U	340 U	340 U	340 U	37 J	7,000 U	7,000 U	350 U	350 U	50,000
3,3'-Dichlorobenzidine	340 U	350 U	340 U	340 U	340 U	340 U	7,000 U	7,000 U	350 U	350 U	NA
Benzo(a)anthracene	340 U	350 U	340 U	340 U	340 U	230 J	17,000 D	20,000 D	350 U	350 U	224 or MDL
Chrysene	54 J	350 U	340 U	340 U	340 U	250 J	14,000 D	16,000 D	350 U	350 U	400
bis(2-Ethylhexyl)phthalate	520 U	350 U	340 U	340 U	340 U	340 U	7,000 U	7,000 U	350 U	350 U	50,000
Di-n-octylphthalate	340 U	350 U	340 U	340 U	340 U	340 UJ	370 J	160 J	49 J	350 U	50,000
Benzo(b)fluoranthene	67 J	350 U	340 U	340 U	340 U	330 J	28,000 D	24,000 D	350 UJ	350 U	224 or MDL
Benzo(k)fluoranthene	56 J	350 U	340 U	340 U	340 U	240 J	11,000 D	10,000 D	350 UJ	350 U	224 or MDL
Benzo(a)pyrene	40 J	350 U	340 U	340 U	340 U	250 J	23,000 D	20,000 D	350 UJ	350 U	61 or MDL
Indeno(1,2,3-cd)pyrene	340 U	350 U	340 U	340 U	340 U	75 J	14,000 D	12,000 D	350 UJ	350 U	3,200
Dibenzo(a,h)anthracene	340 U	350 U	340 U	340 U	340 U	340 UJ	2,400	2,500 J	350 UJ	350 U	14 or MDL
Benzo(g,h,i)perylene	340 U	350 U	340 U	340 U	340 U	65 J	15,000 D	13,000 D	350 UJ	350 U	50,000

NOTES:

[1] - Indicates depth below ground surface.

[2] - Recommended Soil Cleanup Objectives referenced from NYSDEC Division Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives and Cleanup Levels (4/95)

[3] - DS-XX represents blind duplicate of DS-13, 10 ft.

J - Indicates an estimated value

D - Indicates a secondary dilution factor used for analysis

U - Indicates compound was analyzed for but not detected

NA - Soil Cleanup Objective not established.

MDL - Method Detection Limit

TABLE 2 (con't)

MACKENZIE CHEMICAL SITE

DRAINAGE STRUCTURE - SOIL SAMPLES
TAL METALS - ANALYTICAL LABORATORY

SAMPLE ID	DS-2		DS-3		DS-6		DS-9		DS-11		DS-12		DS-13		DS-14		DS-15		DS-XX [3]		CONCENTRATIONS OF CONCERN [2]	
DEPTH OF SAMPLE [1]	10ft		10ft		10ft		25ft		8ft		10ft		10ft		4-8ft		10ft				RSCO [A]	EUS BG [B]
PARAMETERS (mg/kg)																						
Aluminum	202		620		1,290		1,850		982		1,880		3,050		1,060		562		1,200		SB	33,000
Antimony	11.1	U	11.4	U	10.8	U	11.2	U	11.1	U	11.1	U	11.5	U	11.1	U	11.0	U	11.5	U	SB	N/A
Arsenic	0.34	U	0.35	U	0.35	B	0.34	U	0.35	U	0.60	BJ	0.46	B	0.38	UJ	0.34	UJ	0.37	U	7.5 or SB	3 - 12
Barium	10.7	B	8.5	B	4.6	B	9.9	B	10.0	B	27.9	B	33.3	B	8.1	B	7.6	B	15.2	B	300 or SB	15 - 600
Beryllium	0.08	U	0.08	U	0.07	U	0.08	U	0.08	U	0.08	U	0.23	B	0.08	U	0.08	U	0.08	U	0.16 or SB	0 - 1.75
Cadmium	0.90	B	0.90	U	0.86	U	1.0		0.88	U	0.88	U	0.92	B	0.88	U	0.87	U	0.91	U	10	0.1 - 1
Calcium	110	BJ	241	BJ	166	BJ	212	BJ	122	BJ	2,100	J	2,380	J	154	BJ	111	BJ	726	BJ	SB	130 - 35,000
Chromium	3.8		6.3		4.3		8.7		8.4	J	6.4		21.6		7.1		2.4		13.6		50	1.5 - 40
Cobalt	3.2	U	3.3	U	3.1	U	3.3	U	3.2	U	3.8	B	3.3	U	3.2	U	3.2	U	3.4	U	30 or SB	2.5 - 60
Copper	3.2	U	5.0		3.1	U	3.9	B	3.2	U	10.4		24.2		3.8	B	3.1	U	12.4		25 or SB	1 - 50
Iron	956		1,350		2,380		1,710		2,870		2,860		6,460		2,380		1,890		2,800		2000 or SB	2,000 - 550,000
Lead	65.0		2.6		2.7		19.8		20.8		27.1		32.7		2.5		2.2		16.4		SB	200 - 500
Magnesium	23.0	B	99.6	B	244	B	216	B	206	B	571	B	848	B	165	B	109	B	244	B	SB	100 - 5,000
Manganese	5.6		9.9		17.1		13.6		20.6		28.6	J	42.2		31.5	J	11.6	J	32.9		SB	50 - 5,000
Mercury	0.05	U	0.05	U	0.05	U	0.27		0.05	U	1.0	J	0.05	U	0.05	UR	0.05	UR	0.05	U	0.1	0.001 - 0.2
Nickel	5.6	U	5.7	U	5.4	U	5.6	U	5.6	U	5.6	U	8.7		5.6	U	5.5	U	5.8	U	13 or SB	0.5 - 25
Potassium	355	U	362	U	345	U	356	U	354	U	353	U	394	B	353	U	350	U	367	U	SB	8,500 - 43,000
Selenium	0.29	U	0.29	U	0.28	U	0.29	U	0.29	U	0.29	U	0.30	U	0.31	U	0.28	U	0.31	U	2 or SB	0.1 - 3.9
Silver	1.9	UJ	2.1	J	1.8	UJ	1.9	UJ	1.9	UJ	0.10	U	3.6	J	0.10	U	0.09	U	1.9	UJ	SB	N/A
Sodium	438	B	468	B	107	U	110	U	432	B	466	B	553	B	523	B	506	B	460	B	SB	6,000 - 8,000
Thallium	0.23	U	0.23	U	0.22	U	0.23	U	0.23	U	0.23	U	0.24	U	0.25	U	0.23	U	0.24	U	SB	N/A
Vanadium	2.5	U	2.5	U	3.1	B	5.2	B	3.1	B	3.7	B	7.4	B	3.2	B	2.4	U	3.5	B	150 or SB	1 - 300
Zinc	6.9	J	7.6	J	11.8	J	19.6	J	21.4	J	52.5		224	J	7.0		6.9		78.5	J	20 or SB	9 - 50
Cyanide	0.07	B	0.12	B	0.07	U	0.05	U	0.07	B	0.08	BJ	0.17	B	0.06	UJ	0.05	UJ	0.09	B	SB	N/A

NOTES:

[1] - Indicates depth below ground surface.

[2] - Recommended Soil Cleanup Objectives referenced from NYSDEC Division Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives and Cleanup Levels (4/95).

[3] - DS-XX represents blind duplicate of DS-13, 10 ft.

[A] - Recommended Soil Cleanup Objective.

[B] - Eastern United States Background levels.

SB - Site Background, refer to EUS BG.

U - Indicates compound was analyzed for but not detected.

B - Indicates analyte was found in method blank.

R - Duplicate analysis not within control limits

N/A - Recommended Soil Cleanup Objective not established

TABLE 3
MACKENZIE CHEMICAL
ORGANIC SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-01A	B0N22	Volatile Organics	Non-detect			
		Base-Neutral Extractables	Fluorene	0.19	J	50
			Phenanthrene	2.9		50
			Anthracene	0.52	J	50
			Carbazole	0.34	J	
			Fluoranthene	4.8		50
			Pyrene	6.5		50
			Benzo(a)anthracene	2.3		0.224
			Chrysene	3.0		0.4
			bis(2-ethylhexyl)phthalate	0.79	J	50
			Benzo(b)fluoranthene	2.6		1.1
			Benzo(k)fluoranthene	2.5		1.1
			Benzo(a)pyrene	2.2		0.061
			Indeno(1,2,3-cd)pyrene	1.2	J	3.2
			Dibenzo(a,h)anthracene	0.42	J	0.014
			Benzo(g,h,i)perylene	1.0	J	50
		PCBs, Pesticides	Heptachlor	0.0085	J	0.1
			Heptachlor epoxide	0.015	J^8	0.02
			Dieldrin	0.0098	NJ	0.044
			4,4'-DDE	0.023		2.1
			Endrin	0.0081	R	0.1
			4,4'-DDT	0.027	J^5	2.1
			Endrin ketone	0.015	NJ	
			alpha-Chlordane	0.11	J^8	
			gamma-Chlordane	0.077	*	0.54

J - Due to the low level of the result, it cannot be precisely determined, and is therefore estimated.
J^5 - The samples are associated with a three point initial calibration in which the % relative standard deviation (RSD) of calibration factors for a target compound exceeded primary criteria.
J^8 - The pesticide samples have analytes for which the percent difference between column results exceeds primary criteria, hits are flagged, "J".
NJ/R - The pesticide samples have analytes for which the percent difference between column results exceeds expanded criteria, hits are flagged "NJ" or "R".

TABLE 3 - Continued
MACKENZIE CHEMICAL
SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-01B	B0N23	Volatile Organics	Tetrachloroethene	0.001	J	1.4
		Base-Neutral Extractables	Fluorene	0.21	J	50
			Phenanthrene	2.9		50
			Anthracene	0.51	J	50
			Carbazole	0.41	J	
			Fluoranthene	3.7		50
			Pyrene	6.1	J[6]	50
			Benzo(a)anthracene	1.8	J[6]	0.224
			Chrysene	2.4	J[6]	0.4
			bis(2-ethylhexyl)phthalate	0.52	J[6]	50
			Benzo(b)fluoranthene	2.1	J[6]	1.1
			Benzo(k)fluoranthene	1.8	J[6]	1.1
			Benzo(a)pyrene	1.7	J[6]	0.061
			Indeno(1,2,3-cd)pyrene	1.1	J[6]	3.2
			Dibenzo(a,h)anthracene	0.35	J[6]	0.014
			Benzo(g,h,i)perylene	1.0	J[6]	50
		PCBs, Pesticides	Heptachlor	0.0071		0.1
			Heptachlor epoxide	0.0089	J[8]	0.02
			Dieldrin	0.025	NJ	0.044
			4,4'-DDE	0.013	J[8]	2.1
			Endrin	0.0079	R	0.1
			4,4'-DDT	0.021	J[5]	2.1
			Methoxychlor	0.038	NJ	
			Endrin ketone	0.016	J[8]	
			alpha-Chlordane	0.069	J[8]	
			gamma-Chlordane	0.054	*	0.54

J - Due to the low level of the result, it cannot be precisely determined, and is therefore estimated.
* - Due to a high results from the initial screening, the above compounds were transferred from a dilution.
J[5] - The samples are associated with a three point initial calibration in which the % relative standard deviation (RSD) of calibration factors for a target compound exceeded primary criteria.
J[6] - The samples have internal standard area counts that are outside the lower limit of primary criteria, hits are estimated.
J[8] - The pesticide samples have analytes for which the percent difference between column results exceeds primary criteria, hits are flagged, "J".
NJ/R - The pesticide samples have analytes for which the percent difference between column results exceeds expanded criteria, hits are flagged "NJ" or "R".

TABLE 3 - Continued
MACKENZIE CHEMICAL
SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-02A	B0N24	Volatile Organics	Non-detect			
		Base-Neutral Extractables	Naphthalene	0.34	J	13
			Acenaphthene	1.8	J	50
			Dibenzofuran	1.4	J	6.2
			Fluorene	2.5		50
			Phenanthrene	26.0	*	50
			Anthracene	4.0		50
			Carbazole	2.7		
			Fluoranthene	24.0	*	50
			Pyrene	24.0	*	50
			Butylbenzylphthalate	0.63	J[6]	50
			Benzo(a)anthracene	9.6	*	0.224
			Chrysene	11.0	*	0.4
			bis(2-ethylhexyl)phthalate	0.44	J[6]	50
			Benzo(b)fluoranthene	7.9	*	1.1
			Benzo(k)fluoranthene	7.7	*	1.1
			Benzo(a)pyrene	7.8	*	0.061
			Indeno(1,2,3-cd)pyrene	3.8	J[6]	3.2
			Dibenzo(a,h)anthracene	1.4	J[6]	0.014
			Benzo(g,h,i)perylene	3.5	J[6]	50
		PCBs, Pesticides	delta-BHC	0.0039	J[8]	0.3
			Heptachlor	0.003		0.1
			Heptachlor epoxide	0.008	J[8]	0.02
			Dieldrin	0.019	NJ	0.044
			4,4'-DDE	0.0098	J[8]	2.1
			Endrin	0.0074	R	0.1
			4,4'-DDT	0.031	J[5]	2.1
			Endrin ketone	0.013	J[8]	
			alpha-Chlordane	0.059	J[8]	
			gamma-Chlordane	0.044	*	0.54

J - Due to the low level of the result, it cannot be precisely determined, and is therefore estimated.
* - Due to a high results from the initial screening, the above compounds were transferred from a dilution.
J[5] - The samples are associated with a three point initial calibration in which the % relative standard deviation (RSD) of calibration factors for a target compound exceeded primary criteria.
J[6] - The samples have internal standard area counts that are outside the lower limit of primary criteria, hits are estimated.
J[4] - The pesticide samples have analytes for which the percent difference between column results exceeds primary criteria, hits are flagged, "J".
NJ/R - The pesticide samples have analytes for which the percent difference between column results exceeds expanded criteria, hits are flagged "NJ" or "R".

TABLE 3 - Continued
MACKENZIE CHEMICAL
SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-02B	B0N25	Volatile Organics	Non-detect			
		Base-Neutral Extractables	Naphthalene	0.23	J	13
			2-Methylnaphthalene	0.15	J	36.4
			1,1'-biphenols	0.053	J	
			Acenaphthylene	0.038	J	41
			Acenaphthene	0.86		50
			Dibenzofuran	0.6		6.2
			Fluorene	1.0		50
			Phenanthrene	10.0	*	50
			Anthracene	1.8		50
			Carbazole	0.99		
			Fluoranthene	12.0	*	50
			Pyrene	14.0	*	50
			Butylbenzylphthalate	0.048	J	50
			Benzo(a)anthracene	4.9		0.224
			Chrysene	5.6		0.4
			bis(2-ethylhexyl)phthalate	0.12	J	50
			Benzo(b)fluoranthene	4.4	*	1.1
			Benzo(k)fluoranthene	4.3	*	1.1
			Benzo(a)pyrene	3.9	*	0.061
			Indeno(1,2,3-cd)pyrene	4.0	J^9	3.2
			Dibenzo(a,h)anthracene	1.5		0.014
			Benzo(g,h,i)perylene	3.7	J^9	50
		PCBs, Pesticides	delta-BHC	0.013	J^8	0.3
			Heptachlor	0.0046		0.1
			Heptachlor epoxide	0.0097	NJ	0.02
			Dieldrin	0.021	NJ	0.044
			4,4'-DDE	0.016	J^8	2.1
			Endrin	0.013	R	0.1
			4,4'-DDT	0.056	J^5	2.1
			Endrin ketone	0.018	NJ	
			alpha-Chlordane	0.08	J^8	
			gamma-Chlordane	0.064	*	0.54

J - Due to the low level of the result, it cannot be precisely determined, and is therefore estimated.
* - Due to a high results from the initial screening, the above compounds were transferred from a dilution.
J^5 - The samples are associated with a three point initial calibration in which the % relative standard deviation (RSD) of calibration factors for a target compound exceeded primary criteria.
J^8 - The pesticide samples have analytes for which the percent difference between column results exceeds primary criteria, hits are flagged, "J".
NJ/R - The pesticide samples have analytes for which the percent difference between column results exceeds expanded criteria, hits are flagged "NJ" or "R".
J^9 - The values are over the calibration range and are therefore estimated and qualified as "J".

TABLE 3 - Continued
MACKENZIE CHEMICAL
SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-03A	B0N26	Volatile Organics	Tetrachloroethene	0.001	J	1.4
MS/MSD		Base-Neutral Extractables	Naphthalene	0.36	J	13
			2-Methylnaphthalene	0.15	J	36.4
			1,1'-Biphenols	0.056	J	
			Acenaphthene	0.62		50
			Dibenzofuran	0.52		6.2
			Fluorene	0.72		50
			Phenanthrene	6.8	*	50
			Anthracene	0.83		50
			Carbazole	0.78		
			Fluoranthene	5.9	*	50
			Pyrene	8.3	*	50
			Benzo(a)anthracene	2.5		0.224
			Chrysene	3.1		0.4
			bis(2-ethylhexyl)phthalate	0.23	J	50
			Benzo(b)fluoranthene	2.1		1.1
			Benzo(k)fluoranthene	1.7		1.1
			Benzo(a)pyrene	2.0		0.061
			Indeno(1,2,3-cd)pyrene	1.6		3.2
			Dibenzo(a,h)anthracene	0.57		0.014
			Benzo(g,h,i)perylene	1.7		50
		PCBs, Pesticides	Heptachlor	0.0028	J^8	0.1
			Heptachlor epoxide	0.01	J^8	0.02
			Dieldrin	0.014	NJ	0.044
			4,4'-DDE	0.015	J^8	2.1
			Endrin	0.0097	R	0.1
			4,4'-DDT	0.04	J^5	2.1
			Methoxychlor	0.034	NJ	
			Endrin ketone	0.0083	J^8	
			alpha-Chlordane	0.069	J^8	
			gamma-Chlordane	0.058	*	0.54

J - Due to the low level of the result, it cannot be precisely determined, and is therefore estimated.
* - Due to a high results from the initial screening, the above compounds were transferred from a dilution.
J^5 - The samples are associated with a three point initial calibration in which the % relative standard deviation (RSD) of calibration factors for a target compound exceeded primary criteria.
J^8 - The pesticide samples have analytes for which the percent difference between column results exceeds primary criteria, hits are flagged, "J".
NJ/R - The pesticide samples have analytes for which the percent difference between column results exceeds expanded criteria, hits are flagged "NJ" or "R".

TABLE 3 - Continued
MACKENZIE CHEMICAL
SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-03B	B0N27	Volatile Organics	Non-detect			
		Base-Neutral Extractables	N-Nitrosodiphenylamine (1)	2.5		
			Phenanthrene	0.49		50
			Anthracene	0.12	J	50
			Fluoranthene	0.9		50
			Pyrene	1.2	J^4	50
			Butylbenzylphthalate	0.41	J	50
			Benzo(a)anthracene	0.54		0.224
			Chrysene	0.62		0.4
			bis(2-ethylhexyl)phthalate	0.48		50
			Benzo(b)fluoranthene	0.48		1.1
			Benzo(k)fluoranthene	0.42	J	1.1
			Benzo(a)pyrene	0.48		0.061
			Indeno(1,2,3-cd)pyrene	0.53		3.2
			Dibenzo(a,h)anthracene	0.19	J	0.014
			Benzo(g,h,i)perylene	0.5		50
		PCBs, Pesticides	Heptachlor	0.0058		0.1
			Heptachlor epoxide	0.016	NJ	0.02
			4,4'-DDE	0.075	*	2.1
			4,4'-DDT	0.059	J^5J^8	2.1
			Endrin ketone	0.015		
			alpha-Chlordane	0.076	J^8	
			gamma-Chlordane	0.073	J^8*	0.54

J - Due to the low level of the result, it cannot be precisely determined, and is therefore estimated.
* - Due to a high results from the initial screening, the above compounds were transferred from a dilution.
J^4 - There is a continuing percent difference (%D) outside the primary criteria, the result is therefore estimated.
J^5 - The samples are associated with a three point initial calibration in which the % relative standard deviation (RSD) of calibration factors for a target compound exceeded primary criteria.
J^8 - The pesticide samples have analytes for which the percent difference between column results exceeds primary criteria, hits are flagged, "J".
NJ - The pesticide samples have analytes for which the percent difference between column results exceeds expanded criteria, hits are flagged "NJ".

TABLE 3 - Continued
MACKENZIE CHEMICAL
SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-04A	B0N28	Volatile Organics	Non-detect			
		Base-Neutral Extractables	Phenanthrene	3.4		50
			Anthracene	0.64	J	50
			Carbazole	0.34	J	
			Fluoranthene	4.6		50
			Pyrene	6.4		50
			Benzo(a)anthracene	2.2	J	0.224
			Chrysene	2.7		0.4
			bis(2-ethylhexyl)phthalate	0.3	J	50
			Benzo(b)fluoranthene	2.2	J	1.1
			Benzo(k)fluoranthene	2.0	J	1.1
			Benzo(a)pyrene	2.1	J	0.061
			Indeno(1,2,3-cd)pyrene	1.0	J	3.2
			Dibenzo(a,h)anthracene	0.41	J	0.014
			Benzo(g,h,i)perylene	0.85	J	50
		PCBs, Pesticides	Heptachlor	0.0055		0.1
			Heptachlor epoxide	0.019	J^8	0.02
			Dieldrin	0.031	J^8	0.044
			4,4'-DDE	0.032		2.1
			Endrin	0.019	R	0.1
			4,4'-DDT	0.095	J^5*	2.1
			Endrin ketone	0.014	NJ	
			alpha-Chlordane	0.12	J^8	
			gamma-Chlordane	0.091	*	0.54

J - Due to the low level of the result, it cannot be precisely determined, and is therefore estimated.
* - Due to a high results from the initial screening, the above compounds were transferred from a dilution.
J^5 - The samples are associated with a three point initial calibration in which the % relative standard deviation (RSD) of calibration factors for a target compound exceeded primary criteria.
J^8 - The pesticide samples have analytes for which the percent difference between column results exceeds primary criteria, hits are flagged, "J". NJ/R - The pesticide samples have analytes for which the percent difference between column results exceeds expanded criteria, hits are flagged "NJ" or "R".

TABLE 3 - Continued
MACKENZIE CHEMICAL
SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-04B	B0N29	Volatile Organics	Non-detect			
		Base-Neutral Extractables	Acenaphthene	0.062	J	50
			Fluorene	0.082	J	50
			Phenanthrene	1.4		50
			Anthracene	0.37	J	50
			Carbazole	0.14	J	
			Fluoranthene	2.5		50
			Pyrene	3.0	J[4]	50
			Benzo(a)anthracene	1.3		0.224
			Chrysene	1.5		0.4
			bis(2-ethylhexyl)phthalate	0.27	J	50
			Benzo(b)fluoranthene	1.2		1.1
			Benzo(k)fluoranthene	1.0		1.1
			Benzo(a)pyrene	1.4		0.061
			Indeno(1,2,3-cd)pyrene	1.4		3.2
			Dibenzo(a,h)anthracene	0.52		0.014
			Benzo(g,h,i)perylene	1.5		50
		PCBs, Pesticides	Heptachlor	0.014	J[11]	0.1
			Heptachlor epoxide	0.048	J[8]	0.02
			Dieldrin	0.16		0.044
			4,4'-DDE	0.063		2.1
			4,4'-DDT	0.17	J[5]	2.1
			alpha-Chlordane	0.39	J[8]	
			gamma-Chlordane	0.33	*	0.54

J - Due to the low level of the result, it cannot be precisely determined, and is therefore estimated.
* - Due to a high results from the initial screening, the above compounds were transferred from a dilution.
J[4] - There is a continuing percent difference (%D) outside the primary criteria, the result is therefore estimated.
J[5] - The samples are associated with a three point initial calibration in which the % relative standard deviation (RSD) of calibration factors for a target compound exceeded primary criteria.
J[8] - The pesticide samples have analytes for which the percent difference between column results exceeds primary criteria, hits are flagged, "J".
J[11] - The percent difference between the nominal and the calculated amount of an analyte in the midpoint INDA/INDB exceeded criteria, hits are flagged, "J".

TABLE 3 - Continued
MACKENZIE CHEMICAL
SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-05A	B0N30	Volatile Organics	Non-detect			
		Base-Neutral Extractables	Acenaphthene	0.21	J	50
			Fluorene	0.24	J	50
			Phenanthrene	2.7		50
			Anthracene	0.49	J	50
			Carbazole	0.25	J	
			Fluoranthene	4.0		50
			Pyrene	6.3	*	50
			Butylbenzylphthalate	1.3	J[6]	50
			Benzo(a)anthracene	2.0	J[6]	0.224
			Chrysene	2.6	J[6]	0.4
			bis(2-ethylhexyl)phthalate	24.0	*	50
			Benzo(b)fluoranthene	2.5	J[7]	1.1
			Benzo(k)fluoranthene	1.9	J[7]	1.1
			Benzo(a)pyrene	2.1	J[7]	0.061
			Indeno(1,2,3-cd)pyrene	1.4	J[7]	3.2
			Dibenzo(a,h)anthracene	0.53	J[7]	0.014
			Benzo(g,h,i)perylene	1.4	J[7]	50
		PCBs, Pesticides	Heptachlor	0.0034	J[11]	0.1
			Heptachlor epoxide	0.01		0.02
			Dieldrin	0.018	J[8]	0.044
			4,4'-DDE	0.022		2.1
			Endrin	0.0094	NJ	0.1
			4,4'-DDT	0.039	J[5]	2.1
			Endrin ketone	0.013		
			alpha-Chlordane	0.06	J[8]	
			gamma-Chlordane	0.042	*	0.54

J - Due to the low level of the result, it cannot be precisely determined, and is therefore estimated.
* - Due to a high results from the initial screening, the above compounds were transferred from a dilution.
J[5] - The samples are associated with a three point initial calibration in which the % relative standard deviation (RSD) of calibration factors for a target compound exceeded primary criteria.
J[6] - The samples have internal standard area counts that are outside the lower limit of primary criteria, hits are estimated.
J[7] - The samples have internal standard area counts outside expanded criteria, hits are estimated.
J[8] - The pesticide samples have analytes for which the percent difference between column results exceeds primary criteria, hits are flagged, "J".
NJ - The pesticide samples have analytes for which the percent difference between column results exceeds expanded criteria, hits are flagged "NJ".
J[11] - The percent difference between the nominal and the calculated amount of an analyte in the midpoint INDA/INDB exceeded criteria, hits are flagged, "J".

TABLE 3 - Continued
MACKENZIE CHEMICAL
SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-05B	B0N31	Volatile Organics	Acetone	0.025	J^4	0.2
		Base-Neutral Extractables	Naphthalene	0.086	J	13
			Acenaphthylene	0.059	J	41
			Acenaphthene	0.29	J	50
			Dibenzofuran	0.14	J	6.2
			Fluorene	0.26	J	50
			N-Nitrosodiphenylamine (1)	0.4	J	
			Phenanthrene	2.7		50
			Anthracene	0.73		50
			Carbazole	0.3	J	
			Fluoranthene	4.3	*	50
			Pyrene	6.5	$*J^4$	50
			Butylbenzylphthalate	0.088	J	50
			Benzo(a)anthracene	2.4		0.224
			Chrysene	2.8		0.4
			bis(2-ethylhexyl)phthalate	0.3	J	50
			Benzo(b)fluoranthene	2.0		1.1
			Benzo(k)fluoranthene	1.8		1.1
			Benzo(a)pyrene	2.5		0.061
			Indeno(1,2,3-cd)pyrene	2.6		3.2
			Dibenzo(a,h)anthracene	0.95		0.014
			Benzo(g,h,i)perylene	2.6		50
		PCBs, Pesticides	delta-BHC	0.0046	J^1	0.3
			Heptachlor epoxide	0.007	J^1 J^8	0.02
			Dieldrin	0.0091	J^1 NJ	0.044
			4,4'-DDE	0.018	J^1	2.1
			Endrin	0.0058	R	0.1
			4,4'-DDD	0.025	J^1 J^5 J^8	2.9
			4,4'-DDT	0.017	J^1 J^5	2.1
			Endrin ketone	0.0062	J^1 NJ	
			alpha-Chlordane	0.052	J^1 J^8	
			gamma-Chlordane	0.041	J^1*	0.54

J - Due to the low level of the result, it cannot be precisely determined, and is therefore estimated.
* - Due to a high results from the initial screening, the above compounds were transferred from a dilution.
J^1 - The contractual holding time was exceeded, therefore, the result is estimated
J^4 - There is a continuing percent difference (%D) outside the primary criteria, the result is therefore estimated.
J^5 - The samples are associated with a three point initial calibration in which the % relative standard deviation (RSD) of calibration factors for a target compound exceeded primary criteria.
J^8 - The pesticide samples have analytes for which the percent difference between column results exceeds primary criteria, hits are flagged, "J". NJ/R - The pesticide samples have analytes for which the percent difference between column results exceeds expanded criteria, hits are flagged "NJ" or "R".

TABLE 3 - Continued
MACKENZIE CHEMICAL
SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-06A	B0N32	Volatile Organics	Non-detect			
MS/MSD		Base-Neutral Extractables RE	N-Nitrosodiphenylamine (1)	2.4	J^1	
			Phenanthrene	1.2	J^1	50
			Fluoranthene	1.6	J^1	50
			Pyrene	2.2	J^1	50
			Benzo(a)anthracene	0.72	J^1	0.224
			Chrysene	1.1	J^1	0.4
			bis(2-ethylhexyl)phthalate	0.74	J^1	50
			Benzo(b)fluoranthene	1.0	J^1 J^6	1.1
			Benzo(k)fluoranthene	0.89	J^1 J^6	1.1
			Benzo(a)pyrene	0.69	J^1 J^6	0.061
			Indeno(1,2,3-cd)pyrene	0.5	J^1 J^6	3.2
			Benzo(g,h,i)perylene	0.44	J^1 J^6	50
		PCBs, Pesticides	beta-BHC	0.0026	J^1 J^{10}NJ	0.2
			Heptachlor epoxide	0.0025	J^1J^8	0.02
			4,4'-DDE	0.0047	J^1 NJ	2.1
			4,4'-DDT	0.026	J^1J^5	2.1
			Endrin aldehyde	0.0081	J^1	
			alpha-Chlordane	0.015	J^1(NJ	
			gamma-Chlordane	0.004	R	0.54

J^1 - The contractual holding time was exceeded, therefore, the result is estimated
J^5 - The samples are associated with a three point initial calibration in which the % relative standard deviation (RSD) of calibration factors for a target compound exceeded primary criteria.
J^6 - The samples have internal standard area counts that are outside the lower limit of primary criteria, hits are estimated.
J^8 - The pesticide samples have analytes for which the percent difference between column results exceeds primary criteria, hits are flagged, "J".
J^{10} - The percent difference value of each of the single component pesticides and surrogates in the INDA and INDB of the sample is greater than 25.0%, therefore hits are estimated with a "J".
NJ/R - The pesticide samples have analytes for which the percent difference between column results exceeds primary cisterna. Hits are flagged, "NJ" or "R".

TABLE 3 - Continued
MACKENZIE CHEMICAL
SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-06B	B0N33	Volatile Organics	Non-detect			
		Base-Neutral Extractables	N-Nitrosodiphenylamine (1)	0.71		
			Phenanthrene	0.31	J	50
			Anthracene	0.094	J	50
			Fluoranthene	0.66		50
			Pyrene	0.73	J[4]	50
			Butylbenzylphthalate	0.056	J	50
			Benzo(a)anthracene	0.31	J	0.224
			Chrysene	0.38		0.4
			bis(2-ethylhexyl)phthalate	0.19	J	50
			Benzo(b)fluoranthene	0.37		1.1
			Benzo(k)fluoranthene	0.25	J	1.1
			Benzo(a)pyrene	0.43		0.061
			Indeno(1,2,3-cd)pyrene	0.52		3.2
			Dibenzo(a,h)anthracene	0.17	J	0.014
			Benzo(g,h,i)perylene	0.37		50
		PCBs, Pesticides	delta-BHC	0.0036		0.3
			4,4'-DDT	0.016	J[5]	2.1
			alpha-Chlordane	0.012	J[8]	
			gamma-Chlordane	0.011		0.54

J - Due to the low level of the result, it cannot be precisely determined, and is therefore estimated.
J[4] - There is a continuing percent difference (%D) outside the primary criteria, the result is therefore estimated
J[5] - The samples are associated with a three point initial calibration in which the % relative standard deviation (RSD) of calibration factors for a target compound exceeded primary criteria.
J[8] - The pesticide samples have analytes for which the percent difference between column results exceeds primary criteria, hits are flagged, "J".

TABLE 3 - Continued
MACKENZIE CHEMICAL
SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-07A	B0N34	Volatile Organics	Acetone	0.008	J[4]	0.2
		Base-Neutral Extractables	Naphthalene	0.061	J	13
			2-Methylnaphthalene	0.21	J	36.4
			Acenaphthene	0.12	J	50
			Dibenzofuran	0.071	J	6.2
			Fluorene	0.15	J	50
			Phenanthrene	1.5		50
			Anthracene	0.42		50
			Carbazole	0.13	J	
			Fluoranthene	2.8		50
			Pyrene	3.2	J[4]	50
			Butylbenzylphthalate	0.21	J	50
			Benzo(a)anthracene	1.4		0.224
			Chrysene	1.6		0.4
			bis(2-ethylhexyl)phthalate	0.49		50
			Benzo(b)fluoranthene	1.3		1.1
			Benzo(k)fluoranthene	1.0		1.1
			Benzo(a)pyrene	1.7		0.061
			Indeno(1,2,3-cd)pyrene	2.1		3.2
			Dibenzo(a,h)anthracene	0.73		0.014
			Benzo(g,h,i)perylene	2.0		50
		PCBs, Pesticides	delta-BHC	0.0025		0.3
			Heptachlor epoxide	0.007	NJ	0.02
			Dieldrin	0.0075	NJ	0.044
			4,4'-DDE	0.012	J[8]	2.1
			4,4'-DDT	0.021	J[5]	2.1
			Endrin ketone	0.0095	NJ	
			Endrin aldehyde	0.041	J*	
			alpha-Chlordane	0.033	J[8]	0.54
			gamma-Chlordane	0.027		

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J[5] - The samples are associated with a three point initial calibration in which the % relative standard deviation (RSD) of calibration factors for a target compound exceeded primary criteria.
J[4] - The pesticide samples have analytes for which the percent difference between column results exceeds primary criteria, hits are flagged, "J".
NJ - The pesticide samples have analytes for which the percent difference between column results exceeds expanded criteria, hits are flagged "NJ".

TABLE 3 - Continued
MACKENZIE CHEMICAL
SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-07B	B0N35	Volatile Organics	Acetone	0.019	J[4]	0.2
		Base-Neutral Extractables	Acenaphthylene	0.042	J	41
			Acenaphthene	0.17	J	50
			Dibenzofuran	0.068	J	6.2
			Fluorene	0.16	J	50
			N-Nitrosodiphenylamine (1)	0.27	J	
			Phenanthrene	1.7		50
			Anthracene	0.53		50
			Carbazole	0.14	J	
			Fluoranthene	2.4	*	50
			Pyrene	4.0	*J[4]	50
			Butylbenzylphthalate	0.22	J	50
			Benzo(a)anthracene	1.5		0.224
			Chrysene	1.6		0.4
			bis(2-ethylhexyl)phthalate	0.38		50
			Benzo(b)fluoranthene	1.3		1.1
			Benzo(k)fluoranthene	1.1		1.1
			Benzo(a)pyrene	1.5		0.061
			Indeno(1,2,3-cd)pyrene	1.7		3.2
			Dibenzo(a,h)anthracene	0.59		0.014
			Benzo(g,h,i)perylene	1.5		50
		PCBs, Pesticides	Heptachlor epoxide	0.0043		0.02
			Dieldrin	0.0043	NJ	0.044
			4,4'-DDE	0.0096		2.1
			Endrin	0.0043	NJ	0.1
			4,4'-DDD	0.0065	J[5] NJ	2.9
			4,4'-DDT	0.013	J[5]	2.1
			Endrin ketone	0.0057	NJ	
			Endrin aldehyde	0.024	J*	
			alpha-Chlordane	0.028	J[8]	
			gamma-Chlordane	0.024		0.54

J - Due to the low level of the result, it cannot be precisely determined, and is therefore estimated.
* - Due to a high results from the initial screening, the above compounds were transferred from a dilution.
J[4] - There is a continuing percent difference (%D) outside the primary criteria, the result is therefore estimated.
J[5] - The samples are associated with a three point initial calibration in which the % relative standard deviation (RSD) of calibration factors for a target compound exceeded primary criteria.
J[4] - The pesticide samples have analytes for which the percent difference between column results exceeds primary criteria, hits are flagged, "J".
NJ - The pesticide samples have analytes for which the percent difference between column results exceeds expanded criteria, hits are flagged "NJ".

Table 3 - Continued
MACKENZIE CHEMICAL
SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-08A	B0N36	Volatile Organics	Non-detect		J[1]	
		Base-Neutral Extractables	Acenaphthene	0.065	J	50
			Fluorene	0.077	J	50
			N-Nitrosodiphenylamine (1)	0.35	J	
			Phenanthrene	1.2		50
			Anthracene	0.28	J	50
			Carbazole	0.15	J	
			Fluoranthene	2.2		50
			Pyrene	2.6	J[4]	50
			Butylbenzylphthalate	0.061	J	50
			Benzo(a)anthracene	1.1		0.224
			Chrysene	1.4		0.4
			bis(2-ethylhexyl)phthalate	0.56		50
			Benzo(b)fluoranthene	1.0		1.1
			Benzo(k)fluoranthene	0.89		1.1
			Benzo(a)pyrene	1.2		0.061
			Indeno(1,2,3-cd)pyrene	1.5		3.2
			Dibenzo(a,h)anthracene	0.53		0.014
			Benzo(g,h,i)perylene	1.5		50
		PCBs, Pesticides	Heptachlor	0.0028	J	0.1
			Heptachlor epoxide	0.0073	J[8]	0.02
			Dieldrin	0.012	NJ	0.044
			4,4'-DDE	0.0089	J[8]	2.1
			Endrin	0.0049	R	0.1
			4,4'-DDD	0.0042	R	2.9
			4,4'-DDT	0.016	J[5]	2.1
			Endrin ketone	0.0047	NJ	
			alpha-Chlordane	0.058	J[8]	
			gamma-Chlordane	0.046	*	0.54

J - Due to the low level of the result, it cannot be precisely determined, and is therefore estimated.
J[1] - The contractual holding time was exceeded, therefore, the result is estimated
* - Due to a high results from the initial screening, the above compounds were transferred from a dilution.
J[4] - There is a continuing percent difference (%D) outside the primary criteria, the result is therefore estimated.
J[5] - The samples are associated with a three point initial calibration in which the % relative standard deviation (RSD) of calibration factors for a target compound exceeded primary criteria.
J[8] - The pesticide samples have analytes for which the percent difference between column results exceeds primary criteria, hits are flagged, "J".
NJ/R - The pesticide samples have analytes for which the percent difference between column results exceeds expanded criteria, hits are flagged "NJ" or "R".

Table 3 - Continued
MACKENZIE CHEMICAL
SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-08B	B0N37	Volatile Organics	Non-detect		J[1]	
		Base-Neutral Extractables	Acenaphthene	0.17	J	50
			Dibenzofuran	0.082	J	6.2
			Fluorene	0.19	J	50
			Phenanthrene	2.4		50
			Anthracene	0.57		50
			Carbazole	0.16	J	
			Fluoranthene	2.5	*	50
			Pyrene	3.9	*J[4]	50
			Benzo(a)anthracene	1.3		0.224
			Chrysene	1.5		0.4
			bis(2-ethylhexyl)phthalate	0.25	J	50
			Benzo(b)fluoranthene	1.0		1.1
			Benzo(k)fluoranthene	1.0		1.1
			Benzo(a)pyrene	1.2		0.061
			Indeno(1,2,3-cd)pyrene	1.1		3.2
			Dibenzo(a,h)anthracene	0.34	J	0.014
			Benzo(g,h,i)perylene	0.94		50
		PCBs, Pesticides	Heptachlor	0.0022	NJ	0.1
			Heptachlor epoxide	0.0062	NJ	0.02
			Dieldrin	0.01	NJ	0.044
			4,4'-DDE	0.01	R	2.1
			Endrin	0.0063	R	0.1
			4,4'-DDD	0.0059	R	2.9
			4,4'-DDT	0.022	J[5]	2.1
			Endrin ketone	0.0065	NJ	
			alpha-Chlordane	0.059	J[8]	
			gamma-Chlordane	0.044		0.54

J - Due to the low level of the result, it cannot be precisely determined, and is therefore estimated.
J[1] - The contractual holding time was exceeded, therefore, the result is estimated
* - Due to a high results from the initial screening, the above compounds were transferred from a dilution.
J[4] - There is a continuing percent difference (%D) outside the primary criteria, the result is therefore estimated.
J[5] - The samples are associated with a three point initial calibration in which the % relative standard deviation (RSD) of calibration factors for a target compound exceeded primary criteria.
J[8] - The pesticide samples have analytes for which the percent difference between column results exceeds primary criteria, hits are flagged, "J". NJ/R - The pesticide samples have analytes for which the percent difference between column results exceeds expanded criteria, hits are flagged "NJ" or "R".

Table 3 - Continued
MACKENZIE CHEMICAL
SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-09A	B0N38	Volatile Organics	Trichlorofluoromethane	0.0009	J^1J^2	
		Base-Neutral Extractables RE - sample was re-analyzed	Naphthalene	0.23	J	13
			Acenaphthene	0.79	J	50
			Dibenzofuran	0.63	J	6.2
			Fluorene	1.1	J	50
			Phenanthrene	9.3		50
			Anthracene	1.9		50
			Carbazole	1.1	J	
			Fluoranthene	8.6		50
			Pyrene	11.0		50
			Benzo(a)anthracene	3.2		0.224
			Chrysene	4.2		0.4
			bis(2-ethylhexyl)phthalate	0.59	J	50
			Benzo(b)fluoranthene	3.4	J^6	1.1
			Benzo(k)fluoranthene	3.2	J^6	1.1
			Benzo(a)pyrene	2.7	J^6	0.061
			Indeno(1,2,3-cd)pyrene	1.6	J^6	3.2
			Dibenzo(a,h)anthracene	0.65	J^6	0.014
			Benzo(g,h,i)perylene	1.5	J^6	50
		PCBs, Pesticides	Heptachlor	0.003		0.1
			Aldrin	0.13	*	0.041
			Heptachlor epoxide	0.0048	J^8	0.02
			Dieldrin	0.027	J^8	0.044
			4,4'-DDE	0.0088	J^8	2.1
			Endrin	0.0066	R	0.1
			4,4'-DDT	0.02	J^5	2.1
			Endrin ketone	0.0096	J^8	
			alpha-Chlordane	0.032	J^8	
			gamma-Chlordane	0.025	*	0.54

J - Due to the low level of the result, it cannot be precisely determined, and is therefore estimated.
* - Due to a high results from the initial screening, the above compounds were transferred from a dilution.
J^1 - The contractual holding time was exceeded, therefore, the result is estimated.
J^2 - The volatile samples have system monitoring compound recoveries above or below the limit of the criteria window and are therefore estimated.
J^5 - The samples are associated with a three point initial calibration in which the % relative standard deviation (RSD) of calibration factors for a target compound exceeded primary criteria.
J^6 - The samples have internal standard area counts that are outside the lower limit of primary criteria, hits are estimated.
J^8/R - The pesticide samples have analytes for which the percent difference between column results exceeds primary criteria, hits are flagged, "J" or "R".

Table 3 - Continued
MACKENZIE CHEMICAL
SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-09B	B0N39	Volatile Organics	Toluene	0.002	J^1J^2	1.5
		Base-Neutral Extractables	Acenaphthene	0.18	J	50
			Fluorene	0.21	J	50
			N-Nitrosodiphenylamine (1)	0.42	J	
		RE - sample was re-analyzed	Phenanthrene	2.8		50
			Anthracene	0.49	J	50
			Carbazole	0.39	J	
			Fluoranthene	3.9		50
			Pyrene	5.2		50
			Benzo(a)anthracene	1.7	J	0.224
			Chrysene	2.3		0.4
			bis(2-ethylhexyl)phthalate	0.35	J	50
			Benzo(b)fluoranthene	2.1	J^6	1.1
			Benzo(k)fluoranthene	1.7	J^6	1.1
			Benzo(a)pyrene	1.7	J^6	0.061
			Indeno(1,2,3-cd)pyrene	0.99	J^6	3.2
			Dibenzo(a,h)anthracene	0.4	J^6	0.014
			Benzo(g,h,i)perylene	0.9	J^6	50
		PCBs, Pesticides	delta-BHC	0.0031	J^8	0.3
			Heptachlor	0.004		0.1
			Aldrin	0.056	*	0.041
			Heptachlor epoxide	0.01	J^8	0.02
			Dieldrin	0.017	J^8	0.044
			4,4'-DDE	0.016	J^8	2.1
			Endrin	0.0081	R	0.1
			4,4'-DDT	0.028	J^5	2.1
			Endrin ketone	0.0095	J^8	
			alpha-Chlordane	0.07	J^8	
			gamma-Chlordane	0.052	*	0.54

J - Due to the low level of the result, it cannot be precisely determined, and is therefore estimated.
* - Due to a high results from the initial screening, the above compounds were transferred from a dilution.
J^1 - The contractual holding time was exceeded, therefore, the result is estimated.
J^2 - The volatile samples have system monitoring compound recoveries above or below the limit of the criteria window and are therefore estimated.
J^5 - The samples are associated with a three point initial calibration in which the % relative standard deviation (RSD) of calibration factors for a target compound exceeded primary criteria.
J^6 - The samples have internal standard area counts that are outside the lower limit of primary criteria, hits are estimated.
J^8/R - The pesticide samples have analytes for which the percent difference between column results exceeds primary criteria, hits are flagged, "J" or "R".

Table 3 - Continued
MACKENZIE CHEMICAL
SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-10A Background Sample	B0N40	Volatile Organics	Non-detect		J[1]	
		Base-Neutral Extractables	Fluoranthene	0.12	J	50
			Pyrene	0.16	J[4]	50
			Benzo(a)anthracene	0.091	J	0.224
			Chrysene	0.17	J	0.4
			bis(2-ethylhexyl)phthalate	0.12	J	50
			Benzo(b)fluoranthene	0.21	J	1.1
			Benzo(k)fluoranthene	0.19	J	1.1
			Benzo(a)pyrene	0.14	J	0.061
			Indeno(1,2,3-cd)pyrene	0.093	J	3.2
			Benzo(g,h,i)perylene	0.2	J	50
		PCBs, Pesticides	4,4'-DDE	0.015		2.1
			4,4'-DDT	0.031	J	2.1
			Endrin ketone	0.01	NJ	
MC-SS-10B Background Sample	B0N41	Volatile Organics	Toluene	0.003	J[1]	1.5
			Tetrachloroethene	0.004	J[1]	1.4
		Base-Neutral Extractables	Fluoranthene	0.053	J	50
			Pyrene	0.074	J[4]	50
			Benzo(a)anthracene	0.049	J	0.224
			Chrysene	0.1	J	0.4
			bis(2-ethylhexyl)phthalate	0.063	J	50
			Benzo(b)fluoranthene	0.12	J	1.1
			Benzo(k)fluoranthene	0.069	J	1.1
			Benzo(a)pyrene	0.064	J	0.061
			Indeno(1,2,3-cd)pyrene	0.056	J	3.2
			Benzo(g,h,i)perylene	0.15	J	50
		PCBs, Pesticides	4,4'-DDE	0.0054		2.1
			4,4'-DDT	0.012	J[5]	2.1
RB-01 Rinsate Blank	B0N42	Volatile Organics	1,1,2-Trichloro-1,2,2-trifluoroethane	0.001	J[3]	
			Chloroform	0.003	J	0.3
			Trichloroethene	0.003	J	0.7
		Base-Neutral Extractables	Non-detect			
		PCBs, Pesticides	Non-detect			

J - Due to the low level of the result, it cannot be precisely determined, and is therefore estimated.
J[1] - The contractual holding time was exceeded, therefore, the result is estimated.
J[3] -A continuing calibration whose corresponding initial calibration has percent relative standard deviation (%RSD) outside primary criteria.
J[4] - There is a continuing percent difference (%D) outside the primary criteria, the result is therefore estimated.
J[5] - The samples are associated with a three point initial calibration in which the % relative standard deviation (RSD) of calibration factors for a target compound exceeded primary criteria.
NJ - The pesticide samples have analytes for which the percent difference between column results exceeds expanded criteria, hits are flagged "NJ".

Table 3 - Continued
MACKENZIE CHEMICAL
SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-12A Duplicate of MC-SS-02A	B0N45	Volatile Organics RE - sample was re-analyzed	Non-detect			
		Base-Neutral Extractables RE - sample was re-analyzed	Acenaphthene	0.4	J^1	50
			Dibenzofuran	0.22	J^1	6.2
			Fluorene	0.46	J^1	50
			N-Nitrosodiphenylamine (1)	0.31	J^1	
			Phenanthrene	5.7	J^1	50
			Anthracene	1.2	J^1	50
			Carbazole	0.54	J^1	
			Fluoranthene	7.5	J^1	50
			Pyrene	11.0	J^1	50
			Butylbenzylphthalate	0.44	J^1	50
			Benzo(a)anthracene	3.8	J^1	0.224
			Chrysene	4.5	J^1	0.4
			bis(2-ethylhexyl)phthalate	0.41	J^1	50
			Benzo(b)fluoranthene	3.9	J^1 J^6	1.1
			Benzo(k)fluoranthene	3.7	J^1 J^6	1.1
			Benzo(a)pyrene	3.6	J^1 J^6	0.061
			Indeno(1,2,3-cd)pyrene	2.2	J^1 J^6	3.2
			Dibenzo(a,h)anthracene	0.81	J^1 J^6	0.014
			Benzo(g,h,i)perylene	1.6	J^1 J^6	50
		PCBs, Pesticides	alpha-BHC	0.0022	J^1 J^{10}NJ	0.11
			delta-BHC	0.0089	J^1 J^{10} J^8	0.3
			Heptachlor	0.0098	J^1 J^{10}	0.1
			Dieldrin	0.034	J^1 NJ	0.044
			4,4'-DDE	0.036	J^1 J^8	2.1
			Endrin	0.025	J^1	0.1
			Endosulfan II	0.005	R	0.9
			4,4'-DDD	0.058	*J^1 $J^{10}$$J^5$NJ	2.9
			4,4'-DDT	0.049	*J^1 NJ^5 J^8	2.1
			Endrin ketone	0.029	J^1 NJ	
			Endrin aldehyde	0.09	*J^1 NJ	
			alpha-Chlordane	0.13	*J^1 NJ	
			gamma-Chlordane	0.13	*J^1 NJ	0.54

J - Due to the low level of the result, it cannot be precisely determined, and is therefore estimated.
* - Due to a high results from the initial screening, the above compounds were transferred from a dilution.
J^1 - The contractual holding time was exceeded, therefore, the result is estimated.
J^5 - The samples are associated with a three point initial calibration in which the % relative standard deviation (RSD) of calibration factors for a target compound exceeded primary criteria.
J^6 - The samples have internal standard area counts that are outside the lower limit of primary criteria, hits are estimated.
J^8 - The pesticide samples have analytes for which the percent difference between column results exceeds primary criteria, hits are flagged, "J".
J^{10} - The percent difference value of each of the single component pesticides and surrogates in the INDA and INDB of the sample is greater than 25.0%, therefore hits are estimated with a "J".
NJ/R - The pesticide samples have analytes for which the percent difference between column results exceeds expanded criteria, hits are flagged "NJ" or "R".

Table 3 - Continued
MACKENZIE CHEMICAL
SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-13B Duplicate of MC-SS-08B	B0N46	Volatile Organics RE - sample was re-analyzed	Tetrachloroethene	0.0007	J^2	1.4
		Base-Neutral Extractables	Phenanthrene	1.3	J^1	50
			Anthracene	0.29	J^1	50
			Fluoranthene	2.3	J^1	50
			Pyrene	2.1	J^1	50
			Benzo(a)anthracene	1.0	J^1	0.224
			Chrysene	1.3	J^1	0.4
			Bis(2-ethylhexyl)phthalate	0.42	J^1	50
			Benzo(b)fluoranthene	1.1	J^1	1.1
			Benzo(k)fluoranthene	1.0	J^1	1.1
			Benzo(a)pyrene	1.1	J^1	0.061
			Indeno(1,2,3-cd)pyrene	0.93	J^1	3.2
			Dibenzo(a,h)anthracene	0.35	J^1	0.014
			Benzo(g,h,i)perylene	0.89	J^1	50
		PCBs, Pesticides	Heptachlor	0.002	J^1 J^{10}	0.1
			Heptachlor epoxide	0.0051	J^1 J^8	0.02
			Dieldrin	0.0076	J^1	0.044
			4,4'-DDE	0.0052	J^1 NJ	2.1
			4,4'-DDD	0.012	J^1 J^{10} J^5NJ	2.9
			4,4'-DDT	0.011	J^1J^5	2.1
			Endrin aldehyde	0.018	J^1 J^8	
			alpha-Chlordane	0.035	* J^1 NJ	
			gamma-Chlordane	0.028	*J^1 J^8	0.54

J^1 - The contractual holding time was exceeded, therefore, the result is estimated.
* - Due to a high results from the initial screening, the above compounds were transferred from a dilution.
J^2 - The volatile samples have system monitoring compound recoveries above or below the limit of the criteria window and are therefore estimated.
J^5 - The samples are associated with a three point initial calibration in which the % relative standard deviation (RSD) of calibration factors for a target compound exceeded primary criteria.
J^4 - The pesticide samples have analytes for which the percent difference between column results exceeds primary criteria, hits are flagged, "J".
J^{10} - The percent difference value of each of the single component pesticides and surrogates in the INDA and INDB of the sample is greater than 25.0%, therefore hits are estimated with a "J".
NJ/R - The pesticide samples have analytes for which the percent difference between column results exceeds expanded criteria, hits are flagged "NJ" or "R".

TABLE 3 - Continued
MACKENZIE CHEMICAL
INORGANIC SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-01A	MB0KY5	Total Metals	Aluminum	5400		SB (3860)
			Antimony	0.64	BNJ[2]	SB (0.64)
			Arsenic	2.5		7.5 or SB (4.5)
			Barium	22.6	B	300 or SB (39.2)
			Beryllium	0.42	B	0.16 or SB (0.4)
			Calcium	7520	*	SB (1180)
			Chromium	56.8		10 or SB (6.2)
			Cobalt	23.7		30 or SB (2.8)
			Copper	13.8	EJ[5]	25 or SB (13.5)
			Iron	8650		2000 or SB (6240)
			Lead	30		SB (83.8)
			Magnesium	1620	*	SB (510)
			Manganese	86.5		SB (42.7)
			Mercury	0.19	J[1]	0.1
			Nickel	5.8	B	13 or SB (4.6)
			Potassium	322	BE	SB (264)
			Sodium	268	B	SB (88.1)
			Vanadium	13.7		150 or SB (14.5)
			Zinc	50.9	*	20 or SB (37.4)
MC-SS-01B	MB0KY6	Total Metals	Aluminum	4910	J[7]	SB (2970)
			Antimony	0.75	BNJ[2]J[7]	SB (0.74)
			Arsenic	2.8	J[7]	7.5 or SB (3.4)
			Barium	39.7	BJ[7]	300 or SB (40.1)
			Beryllium	0.46	BJ[7]	0.16 or SB (0.4)
			Calcium	12,500	*J[7]	SB (1040)
			Chromium	46.3	J[7]	10 or SB (5.2)
			Cobalt	3.7	BJ[7]	30 or SB (1.7)
			Copper	16.6	EJ[5]J[7]	25 or SB (17.3)
			Iron	9040	J[7]	2000 or SB (5740)
			Lead	211	J[7]	SB (55.7)
			Magnesium	4700	*J[7]	SB (370)
			Manganese	116	J[7]	SB (24.3)
			Mercury	0.11	J[1]J[7]	0.1
			Nickel	8.0	BJ[7]	13 or SB (4.2)
			Potassium	780	BEJ[7]	SB (210)
			Sodium	2230	J[7]	SB (127)
			Vanadium	21.7	J[7]	150 or SB (10.5)
			Zinc	67.7	*J[7]	20 or SB (19.2)

B - The reported value was obtained from a reading that was less than the contract required detection limit (CRDL), but greater than or equal to the Instrument Detection Limit (IDL).
N - Indicates a matrix-related interference in the sample preparation procedure and/or analysis for the flagged analyte (antimony).
* - Indicates a non-homogenous sample matrix in regard to the flagged analytes (calcium, magnesium and zinc).
E - Indicates that a chemical or physical interference effect was encountered during the analysis of the flagged analytes (copper and potassium).
J[1] - The CRDL recoveries fell outside the control limits of 80 - 120% for mercury..
J[2] - The matrix spike recovery was outside the control limits of 75 - 125% when sample concentration was less than 4 times spike concentrations for antimony.
J[5]- The ICP serial dilution analysis yielded percent differences greater than 10 but less than 100 when the initial concentration was equal to or greater than 10 x IDL for copper.
J[7] - As explained in th e text, page 4, the sample is estimated due to possible cross-contamination because the sample jars allowed cooler water to infiltrate the sample.

TABLE 3 - CONTINUED
MACKENZIE CHEMICAL
INORGANIC SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-02A	MB0KY7	Total Metals	Aluminum	3290		SB (3860)
			Antimony	0.74	BNJ[2]	SB (0.64)
			Arsenic	2.9		7.5 or SB (4.5)
			Barium	19.8	B	300 or SB (39.2)
			Beryllium	0.39	B	0.16 or SB (0.4)
			Calcium	6040	*J[3]	SB (1180)
			Chromium	9.2		10 or SB (6.2)
			Cobalt	2.8	B	30 or SB (2.8)
			Copper	16.6	EJ[5]	25 or SB (13.5)
			Iron	11,100		2000 or SB (6240)
			Lead	64.8		SB (83.8)
			Magnesium	2340	*J[3]	SB (510)
			Manganese	79.3		SB (42.7)
			Mercury	0.13	J[1]	0.1
			Nickel	5.6	B	13 or SB (4.6)
			Potassium	206	BE	SB (264)
			Sodium	601	B	SB (88.1)
			Vanadium	12.1		150 or SB (14.5)
			Zinc	63.7	*	20 or SB (37.4)
MC-SS-02B	MB0KY8	Total Metals	Aluminum	3670		SB (2970)
			Antimony	0.39	BNJ[2]	SB (0.74)
			Arsenic	3.8		7.5 or SB (3.4)
			Barium	18.9	B	300 or SB (40.1)
			Beryllium	0.39	B	0.16 or SB (0.4)
			Calcium	8610	*	SB (1040)
			Chromium	8.7		10 or SB (5.2)
			Cobalt	1.9	B	30 or SB (1.7)
			Copper	10.7	E	25 or SB (17.3)
			Iron	6020		2000 or SB (5740)
			Lead	38.2		SB (55.7)
			Magnesium	2270	*	SB (370)
			Manganese	76.1		SB (24.3)
			Mercury	0.12	J[1]	0.1
			Nickel	4.5	B	13 or SB (4.2)
			Potassium	217	BE	SB (210)
			Sodium	639	B	SB (127)
			Vanadium	12.6		150 or SB (10.5)
			Zinc	48.2	*	20 or SB (19.2)

B - The reported value was obtained from a reading that was less than the contract required detection limit (CRDL), but greater than or equal to the Instrument Detection Limit (IDL).
N - Indicates a matrix-related interference in the sample preparation procedure and/or analysis for the flagged analyte (antimony).
* - Indicates a non-homogenous sample matrix in regard to the flagged analytes (calcium, magnesium and zinc).
E - Indicates that a chemical or physical interference effect was encountered during the analysis of the flagged analytes (copper and potassium).
J[1] - The CRDL recoveries fell outside the control limits of 80 - 120% for mercury.
J[2] - The matrix spike recovery was outside the control limits of 75 - 125% when sample concentration was less than 4 times spike concentrations for antimony.
J[3] - The relative percent difference (RPD) between sample and duplicate results was greater than 2 x CRDL for calcium when when sample and duplicate results were greater than 5 x CRDL. RPD for magnesium was greater than 100% when both sample and duplicate results were greater than 5 x CRDL.
J[5]- The ICP serial dilution analysis yielded percent differences greater than 10 but less than 100 when the initial concentration was equal to or greater than 10 x IDL for copper.

TABLE 3 - CONTINUED
MACKENZIE CHEMICAL
INORGANIC SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-03A	MB0KY9	Total Metals	Aluminum	4460		SB (3860)
			Antimony	0.81	BNJ[2]	SB (0.64)
MS/MSD			Arsenic	4.1		7.5 or SB (4.5)
			Barium	38.3	B	300 or SB (39.2)
			Beryllium	0.41	B	0.16 or SB (0.4)
			Cadmium	0.62	B	1.0 or SB (0.12)
			Calcium	13,200	*	SB (1180)
			Chromium	12.0		10 or SB (6.2)
			Cobalt	3.6	B	30 or SB (2.8)
			Copper	21.6	EJ[5]	25 or SB (13.5)
			Iron	8120		2000 or SB (6240)
			Lead	98.4		SB (83.8)
			Magnesium	3960	*	SB (510)
			Manganese	87.8		SB (42.7)
			Mercury	0.20	J[1]	0.1
			Nickel	5.5	B	13 or SB (4.6)
			Potassium	413	BE	SB (264)
			Sodium	3170		SB (88.1)
			Vanadium	16.2		150 or SB (14.5)
			Zinc	122	*	20 or SB (37.4)
MC-SS-03B	MB0KZ0	Total Metals	Aluminum	4890		SB (2970)
			Antimony	0.70	BNJ[2]	SB (0.74)
			Arsenic	3.7		7.5 or SB (3.4)
			Barium	47.8	B	300 or SB (40.1)
			Beryllium	0.48	B	0.16 or SB (0.4)
			Cadmium	0.36	B	1.0 or SB (ND)
			Calcium	6610	*	SB (1040)
			Chromium	33.9		10 or SB (5.2)
			Cobalt	25.2		30 or SB (1.7)
			Copper	24.9	EJ[5]	25 or SB (17.3)
			Iron	8380		2000 or SB (5740)
			Lead	142		SB (55.7)
			Magnesium	1460	*	SB (370)
			Manganese	571		SB (24.3)
			Mercury	0.24		0.1
			Nickel	7.8	B	13 or SB (4.2)
			Potassium	326	BE	SB (210)
			Selenium	1.2		2.0 or SB (0.63)
			Sodium	2720		SB (127)
			Vanadium	13.9		150 or SB (10.5)
			Zinc	188	*	20 or SB (19.2)

B - The reported value was obtained from a reading that was less than the contract required detection limit (CRDL), but greater than or equal to the Instrument Detection Limit (IDL).
N - Indicates a matrix-related interference in the sample preparation procedure and/or analysis for the flagged analyte (antimony).
* - Indicates a non-homogenous sample matrix in regard to the flagged analytes (calcium, magnesium and zinc).
E - Indicates that a chemical or physical interference effect was encountered during the analysis of the flagged analytes (copper and potassium).
J[1] - The CRDL recoveries fell outside the control limits of 80 - 120% for mercury.
J[2] - The matrix spike recovery was outside the control limits of 75 - 125% when sample concentration was less than 4 times spike concentrations for antimony.
J[5]- The ICP serial dilution analysis yielded percent differences greater than 10 but less than 100 when the initial concentration was equal to or greater than 10 x IDL for copper.

TABLE 3 - CONTINUED
MACKENZIE CHEMICAL
INORGANIC SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-04A	MB0KZ1	Total Metals	Aluminum	4760		SB (3860)
			Antimony	0.70	BNJ[2]	SB (0.64)
			Arsenic	4.0		7.5 or SB (4.5)
			Barium	63.7		300 or SB (39.2)
			Beryllium	0.44	B	0.16 or SB (0.4)
			Calcium	12,800	*	SB (1180)
			Chromium	9.5		10 or SB (6.2)
			Cobalt	2.6	B	30 or SB (2.8)
			Copper	19.5	EJ[5]	25 or SB (13.5)
			Iron	8690		2000 or SB (6240)
			Lead	73.2		SB (83.8)
			Magnesium	2580	*	SB (510)
			Manganese	111		SB (42.7)
			Mercury	0.21	J[1]	0.1
			Nickel	9.2	J[5]	13 or SB (4.6)
			Potassium	349	BE	SB (264)
			Sodium	766	B	SB (88.1)
			Vanadium	34.5		150 or SB (14.5)
			Zinc	84.1	*	20 or SB (37.4)
MC-SS-04B	MB0KZ2	Total Metals	Aluminum	5460		SB (2970)
			Antimony	0.58	BNJ[2]	SB (0.74)
			Arsenic	7.9		7.5 or SB (3.4)
			Barium	39.5	B	300 or SB (40.1)
			Beryllium	0.43	B	0.16 or SB (0.4)
			Cadmium	0.11	B	1.0 or SB (ND)
			Calcium	5050	*	SB (1040)
			Chromium	16.4		10 or SB (5.2)
			Cobalt	2.0	B	30 or SB (1.7)
			Copper	13.9	EJ[5]	25 or SB (17.3)
			Iron	8090		2000 or SB (5740)
			Lead	64.1		SB (55.7)
			Magnesium	1760	*	SB (370)
			Manganese	92.4		SB (24.3)
			Mercury	0.15	J[1]	0.1
			Nickel	6.1	B	13 or SB (4.2)
			Potassium	287	BE	SB (210)
			Sodium	900	B	SB (127)
			Vanadium	18.2		150 or SB (10.5)
			Zinc	68.1	*	20 or SB (19.2)

B - The reported value was obtained from a reading that was less than the contract required detection limit (CRDL), but greater than or equal to the Instrument Detection Limit (IDL).
N - Indicates a matrix-related interference in the sample preparation procedure and/or analysis for the flagged analyte (antimony).
* - Indicates a non-homogenous sample matrix in regard to the flagged analytes (calcium, magnesium and zinc).
E - Indicates that a chemical or physical interference effect was encountered during the analysis of the flagged analytes (copper and potassium).
J[1] - The CRDL recoveries fell outside the control limits of 80 - 120% for mercury.
J[2] - The matrix spike recovery was outside the control limits of 75 - 125% when sample concentration was less than 4 times spike concentrations for antimony.
J[5]- The ICP serial dilution analysis yielded percent differences greater than 10 but less than 100 when the initial concentration was equal to or greater than 10 x IDL for copper and nickel.

TABLE 3 - CONTINUED
MACKENZIE CHEMICAL
INORGANIC SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-05A	MB0KZ3	Total Metals	Aluminum	3860		SB (3860)
			Antimony	0.62	BNJ[2]	SB (0.64)
			Arsenic	2.5		7.5 or SB (4.5)
			Barium	25.3	B	300 or SB (39.2)
			Beryllium	0.48	B	0.16 or SB (0.4)
			Calcium	42,200	*	SB (1180)
			Chromium	10.5		10 or SB (6.2)
			Cobalt	2.6	B	30 or SB (2.8)
			Copper	11.1	EJ[5]	25 or SB (13.5)
			Iron	8800		2000 or SB (6240)
			Lead	38.8		SB (83.8)
			Magnesium	1 8,300	*	SB (510)
			Manganese	107		SB (42.7)
			Mercury	0.095	BJ[1]	0.1
			Nickel	11.2	J[5]	13 or SB (4.6)
			Potassium	385	BE	SB (264)
			Sodium	828	B	SB (88.1)
			Vanadium	17.6		150 or SB (14.5)
			Zinc	47.8	*	20 or SB (37.4)
MC-SS-05B	MB0KZ4	Total Metals	Aluminum	3720		SB (2970)
			Antimony	0.48	BNJ[2]	SB (0.74)
			Arsenic	2.6		7.5 or SB (3.4)
			Barium	18.7	B	300 or SB (40.1)
			Beryllium	0.38	B	0.16 or SB (0.4)
			Calcium	13,800	*	SB (1040)
			Chromium	8.5		10 or SB (5.2)
			Cobalt	2.8	B	30 or SB (1.7)
			Copper	12.2	EJ[5]	25 or SB (17.3)
			Iron	6440		2000 or SB (5740)
			Lead	35.9		SB (55.7)
			Magnesium	5360	*	SB (370)
			Manganese	74.2		SB (24.3)
			Mercury	0.14	J[1]	0.1
			Nickel	4.8	B	13 or SB (4.2)
			Potassium	272	BE	SB (210)
			Sodium	345	B	SB (127)
			Vanadium	15.4		150 or SB (10.5)
			Zinc	51.5	*	20 or SB (19.2)

B - The reported value was obtained from a reading that was less than the contract required detection limit (CRDL), but greater than or equal to the Instrument Detection Limit (IDL).
N - Indicates a matrix-related interference in the sample preparation procedure and/or analysis for the flagged analyte (antimony).
* - Indicates a non-homogenous sample matrix in regard to the flagged analytes (calcium, magnesium and zinc).
E - Indicates that a chemical or physical interference effect was encountered during the analysis of the flagged analytes (copper and potassium).
J[1] - The CRDL recoveries fell outside the control limits of 80 - 120% for mercury.
J[2] - The matrix spike recovery was outside the control limits of 75 - 125% when sample concentration was less than 4 times spike concentrations for antimony.
J[5]- The ICP serial dilution analysis yielded percent differences greater than 10 but less than 100 when the initial concentration was equal to or greater than 10 x IDL for copper and nickel.

TABLE 3 - CONTINUED
MACKENZIE CHEMICAL
INORGANIC SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-06A	MB0KZ5	Total Metals	Aluminum	5870		SB (3860)
			Antimony	1.2	BNJ[2]	SB (0.64)
MS/MSD			Arsenic	4.9		7.5 or SB (4.5)
			Barium	25.5	B	300 or SB (39.2)
			Beryllium	0.25	B	0.16 or SB (0.4)
			Calcium	6900	*	SB (1180)
			Chromium	96.8	N*J[2]	10 or SB (6.2)
			Cobalt	29.9		30 or SB (2.8)
			Copper	71.1	N*J[2]	25 or SB (13.5)
			Iron	27,900	*J[6]	2000 or SB (6240)
			Lead	36.5		SB (83.8)
			Magnesium	1520		SB (510)
			Manganese	165	N*J[2]	SB (42.7)
			Mercury	0.17	NJ[1]	0.1
			Nickel	30.9	* J[6]	13 or SB (4.6)
			Potassium	340	BE	SB (264)
			Selenium	1.1		2.0 or SB (ND)
			Sodium	361	B	SB (88.1)
			Vanadium	15.0		150 or SB (14.5)
			Zinc	58.0		20 or SB (37.4)
MC-SS-06B	MB0KZ6	Total Metals	Aluminum	3500		SB (2970)
			Antimony	0.56	BNJ[2]	SB (0.74)
			Arsenic	1.7	B	7.5 or SB (3.4)
			Barium	55.0		300 or SB (40.1)
			Beryllium	0.38	B	0.16 or SB (0.4)
			Cadmium	0.24	B	1.0 or SB (ND)
			Calcium	4270	*	SB (1040)
			Chromium	33.1		10 or SB (5.2)
			Cobalt	16.7		30 or SB (1.7)
			Copper	21.2	EJ[5]	25 or SB (17.3)
			Iron	6830		2000 or SB (5740)
			Lead	54.8		SB (55.7)
			Magnesium	1390	*	SB (370)
			Manganese	75.9		SB (24.3)
			Mercury	0.22		0.1
			Nickel	5.5	B	13 or SB (4.2)
			Potassium	240	BE	SB (210)
			Sodium	169	B	SB (127)
			Vanadium	12.6		150 or SB (10.5)
			Zinc	94.7	*	20 or SB (19.2)

B - The reported value was obtained from a reading that was less than the contract required detection limit (CRDL), but greater than or equal to the Instrument Detection Limit (IDL).
N - Indicates a matrix-related interference in the sample preparation procedure and/or analysis for the flagged analyte (antimony).
* - Indicates a non-homogenous sample matrix in regard to the flagged analytes (calcium, magnesium and zinc).
E - Indicates that a chemical or physical interference effect was encountered during the analysis of the flagged analytes (copper and potassium).
J[1] - The CRDL recoveries fell outside the control limits of 80 - 120% for mercury.
J[2] - The matrix spike recovery was outside the control limits of 75 - 125% when sample concentration was less than 4 times spike concentrations for antimony, copper, manganese and chromium.
J[5]- The ICP serial dilution analysis yielded percent differences greater than 10 but less than 100 when the initial concentration was equal to or greater than 10 x IDL for copper.
J[6] - The relative percent difference (RPD) between sample and laboratory duplicate results was greater than 100% for iron when both sample and duplicate results were greater than 5 x CRDL. The absolute difference between sample and duplicate results was greater than 2 x CRDL for nickel when sample and/or duplicate results were less than 5 x CRDL.

TABLE 3 - CONTINUED
MACKENZIE CHEMICAL
INORGANIC SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-07A	MB0KZ7	Total Metals	Aluminum	3110	J[7]	SB (3860)
			Antimony	0.67	BNJ[2]J[7]	SB (0.64)
			Arsenic	1.5	BJ[7]	7.5 or SB (4.5)
			Barium	38.5	BJ[7]	300 or SB (39.2)
			Beryllium	0.42	BJ[7]	0.16 or SB (0.4)
			Cadmium	0.33	BJ[7]	1.0 or SB (0.12)
			Calcium	14,500	*J[7]	SB (1180)
			Chromium	13.6	J[7]	10 or SB (6.2)
			Cobalt	7.7	BJ[7]	30 or SB (2.8)
			Copper	19.8	EJ[5]J[7]	25 or SB (13.5)
			Iron	6250	J[7]	2000 or SB (6240)
			Lead	100	J[7]	SB (83.8)
			Magnesium	5660	*J[7]	SB (510)
			Manganese	85.0	J[7]	SB (42.7)
			Mercury	0.40	J[7]	0.1
			Nickel	4.5	BJ[7]	13 or SB (4.6)
			Potassium	274	BEJ[7]	SB (264)
			Sodium	967	BJ[7]	SB (88.1)
			Vanadium	13.2	BJ[7]	150 or SB (14.5)
			Zinc	213	*J[7]	20 or SB (37.4)
MC-SS-07B	MB0KZ8	Total Metals	Aluminum	6150		SB (2970)
			Antimony	0.48	BNJ[2]	SB (0.74)
			Arsenic	1.8	B	7.5 or SB (3.4)
			Barium	24.0	B	300 or SB (40.1)
			Beryllium	0.36	B	0.16 or SB (0.4)
			Cadmium	0.14	B	1.0 or SB (ND)
			Calcium	9960	*	SB (1040)
			Chromium	12.1		10 or SB (5.2)
			Cobalt	11.1		30 or SB (1.7)
			Copper	31.0	EJ[5]	25 or SB (17.3)
			Iron	17,800		2000 or SB (5740)
			Lead	61.4		SB (55.7)
			Magnesium	4890	*	SB (370)
			Manganese	170		SB (24.3)
			Mercury	0.28		0.1
			Nickel	6.9	B	13 or SB (4.2)
			Potassium	305	BE	SB (210)
			Sodium	932	B	SB (127)
			Vanadium	39.2		150 or SB (10.5)
			Zinc	267	*	20 or SB (19.2)

B - The reported value was obtained from a reading that was less than the contract required detection limit (CRDL), but greater than or equal to the Instrument Detection Limit (IDL).
N - Indicates a matrix-related interference in the sample preparation procedure and/or analysis for the flagged analyte (antimony).
* - Indicates a non-homogenous sample matrix in regard to the flagged analytes (calcium, magnesium and zinc).
E - Indicates that a chemical or physical interference effect was encountered during the analysis of the flagged analytes (copper and potassium).
J[2] - The matrix spike recovery was outside the control limits of 75 - 125% when sample concentration was less than 4 times spike concentrations for antimony.
J[5]- The ICP serial dilution analysis yielded percent differences greater than 10 but less than 100 when the initial concentration was equal to or greater than 10 x IDL for copper.
J[7] - As explained in th e text, page 4, the sample is estimated due to possible cross-contamination because the sample jars allowed cooler water to infiltrate the sample.

TABLE 3 - CONTINUED
MACKENZIE CHEMICAL
INORGANIC SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-08A	MB0KZ9	Total Metals	Aluminum	4100		SB (3860)
			Antimony	0.48	BNJ[2]	SB (0.64)
			Arsenic	3.1		7.5 or SB (4.5)
			Barium	27.2	B	300 or SB (39.2)
			Beryllium	0.37	B	0.16 or SB (0.4)
			Calcium	12,400	*	SB (1180)
			Chromium	10.0		10 or SB (6.2)
			Cobalt	2.8	B	30 or SB (2.8)
			Copper	17.0	EJ[5]	25 or SB (13.5)
			Iron	7500		2000 or SB (6240)
			Lead	37.2		SB (83.8)
			Magnesium	2950	*	SB (510)
			Manganese	91.8		SB (42.7)
			Mercury	0.11	J[1]	0.1
			Nickel	5.2	B	13 or SB (4.6)
			Potassium	323	BE	SB (264)
			Selenium	0.48	B	2.0 or SB (ND)
			Sodium	290	B	SB (88.1)
			Vanadium	17.0		150 or SB (14.5)
			Zinc	53.8	*	20 or SB (37.4)
MC-SS-08B	MB0L00	Total Metals	Aluminum	3340		SB (2970)
			Antimony	0.41	BNJ[2]	SB (0.74)
			Arsenic	2.1		7.5 or SB (3.4)
			Barium	18.1	B J[3]	300 or SB (40.1)
			Beryllium	0.31	B	0.16 or SB (0.4)
			Calcium	10,900	*	SB (1040)
			Chromium	6.1	J[3]	10 or SB (5.2)
			Cobalt	2.6	B	30 or SB (1.7)
			Copper	14.0	EJ[5] J[3]	25 or SB (17.3)
			Iron	6410		2000 or SB (5740)
			Lead	22.6		SB (55.7)
			Magnesium	5430	*	SB (370)
			Manganese	70.2		SB (24.3)
			Mercury	0.092	J[1]	0.1
			Nickel	3.7	B	13 or SB (4.2)
			Potassium	209	BE	SB (210)
			Sodium	290	B	SB (127)
			Vanadium	13.2		150 or SB (10.5)
			Zinc	40.3	*J[3]	20 or SB (19.2)

B - The reported value was obtained from a reading that was less than the contract required detection limit (CRDL), but greater than or equal to the Instrument Detection Limit (IDL).
N - Indicates a matrix-related interference in the sample preparation procedure and/or analysis for the flagged analyte (antimony).
* - Indicates a non-homogenous sample matrix in regard to the flagged analytes (calcium, magnesium and zinc).
E - Indicates that a chemical or physical interference effect was encountered during the analysis of the flagged analytes (copper and potassium).
J[1] - The CRDL recoveries fell outside the control limits of 80 - 120% for mercury.
J[2] - The matrix spike recovery was outside the control limits of 75 - 125% when sample concentration was less than 4 times spike concentrations for antimony.
J[3] - The relative percent difference (RPD) between sample and duplicate results was greater than 2 x CRDL for barium, chromium and copper when both sample and duplicate results were greater than 5 x CRDL. RPD between sample and field duplicate results was greater than 100% for zinc.
J[5]- The ICP serial dilution analysis yielded percent differences greater than 10 but less than 100 when the initial concentration was equal to or greater than 10 x IDL for copper.

TABLE 3 - CONTINUED
MACKENZIE CHEMICAL
INORGANIC SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-09A	MB0L01	Total Metals	Aluminum	4240		SB (3860)
			Antimony	0.65	BNJ[2]	SB (0.64)
			Arsenic	2.4		7.5 or SB (4.5)
			Barium	26.7	B	300 or SB (39.2)
			Beryllium	0.37	B	0.16 or SB (0.4)
			Calcium	19,900	*	SB (1180)
			Chromium	9.8		10 or SB (6.2)
			Cobalt	2.5	B	30 or SB (2.8)
			Copper	11.9	EJ[5]	25 or SB (13.5)
			Iron	7480		2000 or SB (6240)
			Lead	48.8		SB (83.8)
			Magnesium	6280	*	SB (510)
			Manganese	112		SB (42.7)
			Mercury	0.072	BJ[1]	0.1
			Nickel	6.4	B	13 or SB (4.6)
			Potassium	433	BE	SB (264)
			Sodium	4820		SB (88.1)
			Vanadium	18.4		150 or SB (14.5)
			Zinc	54.7	*	20 or SB (37.4)
MC-SS-09B	MB0L02	Total Metals	Aluminum	4040		SB (2970)
			Antimony	0.62	BNJ[2]	SB (0.74)
			Arsenic	2.9		7.5 or SB (3.4)
			Barium	24.4	B	300 or SB (40.1)
			Beryllium	0.34	B	0.16 or SB (0.4)
			Cadmium	0.11	B	1.0 or SB (ND)
			Calcium	17,300	*	SB (1040)
			Chromium	9.1		10 or SB (5.2)
			Cobalt	3.0	B	30 or SB (1.7)
			Copper	13.1	EJ[5]	25 or SB (17.3)
			Iron	7360		2000 or SB (5740)
			Lead	64.4		SB (55.7)
			Magnesium	4560	*	SB (370)
			Manganese	123		SB (24.3)
			Mercury	0.10	BJ[1]	0.1
			Nickel	5.2	B	13 or SB (4.2)
			Potassium	347	BE	SB (210)
			Sodium	4680		SB (127)
			Vanadium	15.3		150 or SB (10.5)
			Zinc	60.8	*	20 or SB (19.2)

B - The reported value was obtained from a reading that was less than the contract required detection limit (CRDL), but greater than or equal to the Instrument Detection Limit (IDL).
N - Indicates a matrix-related interference in the sample preparation procedure and/or analysis for the flagged analyte (antimony).
* - Indicates a non-homogenous sample matrix in regard to the flagged analytes (calcium, magnesium and zinc).
E - Indicates that a chemical or physical interference effect was encountered during the analysis of the flagged analytes (copper and potassium).
J[1] - The CRDL recoveries fell outside the control limits of 80 - 120% for mercury.
J[2] - The matrix spike recovery was outside the control limits of 75 - 125% when sample concentration was less than 4 times spike concentrations for antimony.
J[5]- The ICP serial dilution analysis yielded percent differences greater than 10 but less than 100 when the initial concentration was equal to or greater than 10 x IDL for copper.

TABLE 3 - CONTINUED
MACKENZIE CHEMICAL
INORGANIC SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS10A Background Sample	MB0L03	Total Metals	Aluminum	3860	J^7	SB (3860)
			Antimony	0.64	$BNJ^2 J^7$	SB (0.64)
			Arsenic	4.5	J^7	7.5 or SB (4.5)
			Barium	39.2	BJ^7	300 or SB (39.2)
			Beryllium	0.40	BJ^7	0.16 or SB (0.4)
			Cadmium	0.12	BJ^7	1.0 or SB (0.12)
			Calcium	1180	$*J^7$	SB (1180)
			Chromium	6.2	J^7	10 or SB (6.2)
			Cobalt	2.8	BJ^7	30 or SB (2.8)
			Copper	13.5	EJ^5J^7	25 or SB (13.5)
			Iron	6240	J^7	2000 or SB (6240)
			Lead	83.8	J^7	SB (83.8)
			Magnesium	510	$B*J^7$	SB (510)
			Manganese	42.7	J^7	SB (42.7)
			Mercury	0.093	BJ^1J^7	0.1
			Nickel	4.6	BJ^7	13 or SB (4.6)
			Potassium	264	BEJ^7	SB (264)
			Sodium	88.1	J^7	SB (88.1)
			Vanadium	14.5	J^7	150 or SB (14.5)
			Zinc	37.4	$*J^7$	20 or SB (37.4)
MC-SS-10B Background Sample	MB0L04	Total Metals	Aluminum	2970	J^7	SB (2970)
			Antimony	0.74	$BNJ^2 J^7$	SB (0.74)
			Arsenic	3.4	J^7	7.5 or SB (3.4)
			Barium	40.1	BJ^7	300 or SB (40.1)
			Beryllium	0.40	BJ^7	0.16 or SB (0.40)
			Calcium	1040	$B*J^7$	SB (1040)
			Chromium	5.2	J^7	10 or SB (5.2)
			Cobalt	1.7	BJ^7	30 or SB (1.7)
			Copper	17.3	EJ^5J^7	25 or SB (17.3)
			Iron	5740	J^7	2000 or SB (5740)
			Lead	55.7	J^7	SB (55.7)
			Magnesium	370	$B*J^7$	SB (370)
			Manganese	24.3	J^7	SB (24.3)
			Mercury	0.064	BJ^1J^7	0.1
			Nickel	4.2	BJ^7	13 or SB (4.2)
			Potassium	210	BEJ^7	SB (210)
			Selenium	0.63	BJ^7	2.0 or SB (0.63)
			Sodium	127	BJ^7	SB (127)
			Vanadium	10.5	BJ^7	150 or SB (10.5)
			Zinc	19.2	$*J^7$	20 or SB (19.2)

B - The reported value was obtained from a reading that was less than the contract required detection limit (CRDL), but greater than or equal to the Instrument Detection Limit (IDL).
N - Indicates a matrix-related interference in the sample preparation procedure and/or analysis for the flagged analyte (antimony).
* - Indicates a non-homogenous sample matrix in regard to the flagged analytes (calcium, magnesium and zinc).
E - Indicates that a chemical or physical interference effect was encountered during the analysis of the flagged analytes (copper and potassium).
J^1 - The CRDL recoveries fell outside the control limits of 80 - 120% for mercury.
J^2 - The matrix spike recovery was outside the control limits of 75 - 125% when sample concentration was less than 4 times spike concentrations for antimony.
J^5- The ICP serial dilution analysis yielded percent differences greater than 10 but less than 100 when the initial concentration was equal to or greater than 10 x IDL for copper.
J^7 - As explained in th e text, page 4, the sample is estimated due to possible cross-contamination because the sample jars allowed cooler water to infiltrate the sample.

TABLE 3 - CONTINUED
MACKENZIE CHEMICAL
INORGANIC SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
RB-01 Rinsate Blank	MB0L05	Total Metals	Antimony	2.9	B	
			Barium	1.1	B	
			Calcium	42.6	B	
			Iron	12.4	B	
			Magnesium	75.0	B	
			Manganese	1.6	B	
			Mercury	0.11	BJ[1]	
			Selenium	2.5	B	
			Zinc	2.1	B	
MC-SS-12A Duplicate of MC-SS-02A	MB0L06	Total Metals	Aluminum	4000		SB (3860)
			Antimony	0.43	BNJ[2]	SB (0.64)
			Arsenic	3.8		7.5 or SB (4.5)
			Barium	24.5	BJ[4]	300 or SB (39.2)
			Beryllium	0.26	B	0.16 or SB (0.4)
			Cadmium	0.12	B	1.0 or SB (0.12)
			Calcium	23,100	*J[3]	SB (1180)
			Chromium	9.1	N*J[2]	10 or SB (6.2)
			Cobalt	2.6	B	30 or SB (2.8)
			Copper	15.6	N*J[2]	25 or SB (13.5)
			Iron	6940	*J[6]	2000 or SB (6240)
			Lead	53.0		SB (83.8)
			Magnesium	11,200	J[4] J[3]	SB (510)
			Manganese	81.4	N*J[2]	SB (42.7)
			Mercury	0.16	NJ[1]	0.1
			Nickel	5.0	B*J[6]	13 or SB (4.6)
			Potassium	310	BE	SB (264)
			Sodium	858	B	SB (88.1)
			Vanadium	15.2		150 or SB (14.5)
			Zinc	61.9		20 or SB (37.4)

B - The reported value was obtained from a reading that was less than the contract required detection limit (CRDL), but greater than or equal to the Instrument Detection Limit (IDL).
N - Indicates a matrix-related interference in the sample preparation procedure and/or analysis for the flagged analyte (antimony).
* - Indicates a non-homogenous sample matrix in regard to the flagged analytes (calcium, magnesium and zinc).
E - Indicates that a chemical or physical interference effect was encountered during the analysis of the flagged analytes (copper and potassium).
J[1] - The CRDL recoveries fell outside the control limits of 80 - 120% for mercury.
J[2] - The matrix spike recovery was outside the control limits of 75 - 125% when sample concentration was less than 4 times spike concentrations for antimony, copper, manganese and chromium.
J[3] - The relative percent difference (RPD) between sample and duplicate results was greater than 2 x CRDL for calcium when when sample and duplicate results were greater than 5 x CRDL. RPD for magnesium was greater than 100% when both sample and duplicate results were greater than 5 x CRDL.
J[4] - The absolute difference between sample and duplicate results was greater than 2 x CRDL for barium and magnesium when sample and/or duplicate results were less than 5 x CRDL.
J[6] - The relative percent difference (RPD) between sample and laboratory duplicate results was greater than 100% for iron when both sample and duplicate results were greater than 5 x CRDL. The absolute difference between sample and duplicate results was greater than 2 x CRDL for nickel when sample and/or duplicate results were less than 5 x CRDL.

TABLE 3 - CONTINUED
MACKENZIE CHEMICAL
INORGANIC SOIL SAMPLE SUMMARY

Sample Location	Sample Numbers	Analysis	Compounds & Concentrations (mg/kg)			NYSDEC TAGM (mg/kg)
			Compounds	Conc.	QC	
MC-SS-13B	MB0L07	Total Metals	Aluminum	4100		SB (2970)
			Antimony	0.40	BNJ[2]	SB (0.74)
Duplicate of			Arsenic	2.4		7.5 or SB (3.4)
MC-SS-08B			Barium	132	J[4] J[3]	300 or SB (40.1)
			Beryllium	0.26	B	0.16 or SB (0.4)
			Cadmium	0.17	B	1.0 or SB (ND)
			Calcium	9970	*	SB (1040)
			Chromium	10.8	N*J[2] J[3]	10 or SB (5.2)
			Cobalt	2.8	B	30 or SB (1.7)
			Copper	48.5	N*J[2] J[3]	25 or SB (17.3)
			Iron	7110	*J[6]	2000 or SB (5740)
			Lead	37.2		SB (55.7)
			Magnesium	4570	J[4]	SB (370)
			Manganese	82.8	N*J[2]	SB (24.3)
			Mercury	0.13	NJ[1]	0.1
			Nickel	8.1	B*J[6]	13 or SB (4.2)
			Potassium	263	BE	SB (210)
			Selenium	0.66	B	2.0 or SB (0.63)
			Sodium	263	B	SB (127)
			Vanadium	13.4		150 or SB (10.5)
			Zinc	150	J[3]	20 or SB (19.2)

B - The reported value was obtained from a reading that was less than the contract required detection limit (CRDL), but greater than or equal to the Instrument Detection Limit (IDL).
N - Indicates a matrix-related interference in the sample preparation procedure and/or analysis for the flagged analyte (antimony).
* - Indicates a non-homogenous sample matrix in regard to the flagged analytes (calcium, magnesium and zinc).
E - Indicates that a chemical or physical interference effect was encountered during the analysis of the flagged analytes (copper and potassium).
J[1] - The CRDL recoveries fell outside the control limits of 80 - 120% for mercury.
J[2] - The matrix spike recovery was outside the control limits of 75 - 125% when sample concentration was less than 4 times spike concentrations for antimony, copper, manganese and chromium.
J[3] - The relative percent difference (RPD) between sample and duplicate results was greater than 2 x CRDL for barium, chromium and copper when both sample and duplicate results were greater than 5 x CRDL. RPD between sample and field duplicate results was greater than 100% for zinc.
J[4] - The absolute difference between sample and duplicate results was greater than 2 x CRDL for barium and magnesium when sample and/or duplicate results were less than 5 x CRDL.
J[6] - The relative percent difference (RPD) between sample and laboratory duplicate results was greater than 100% for iron when both sample and duplicate results were greater than 5 x CRDL. The absolute difference between sample and duplicate results was greater than 2 x CRDL for nickel when sample and/or duplicate results were less than 5 x CRDL.

TABLE 4

MACKENZIE CHEMICAL SITE

ON-SITE SOIL GAS SAMPLES
VOLATILE ORGANIC COMPOUNDS - ANALYTICAL LABORATORY

SAMPLE ID	AS#1			AS#2			AS#3			AS#4					OSHA	OSHA
DEPTH OF SAMPLE[1]	5 ft	10 ft	15 ft	5 ft	10 ft	15 ft	5 ft	10 ft	15 ft	5 ft	10 ft	15 ft	SGC[2]	AGC[3]	PEL[4]	CPEL[5]
PARAMETERS (ug/m^3)																
Chloromethane	<2	<2	<2	<2	14	<2	<2	30	<2	<2	<2	<2	22,000	770	NA	NA
Dichlorofluoromethane	19	16	30	11	15	30	16	20	40	11	150	90	NA	NA	NA	NA
Bromomethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
Vinyl Chloride	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	1,300	0.02	2,600	13,000
Methylene Chloride	<2	<2	<2	<2	<2	6	<2	<2	<2	<2	<2	<2	NA	NA	1,765,000	NA
Trichlorofluoromethane	<2	<2	5	4	7	8	22	12	20	<2	50	40	560,000	700	NA	NA
1,1-Dichloroethene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
1,1-Dichloroethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	190,000	500	400,000	NA
Chloroethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
Chloroform	7	5	<2	10	5	10	13	6	3	<2	<2	2	980	23	240,000	NA
1,2-Dichloroethane	<2	<2	<2	15	13	12	<2	<2	3	<2	3	<2	950	0.039	NA	NA
1,1,1-Trichloroethane	<2	4	15	4	8	20	<2	4	16	<2	3	3	NA	NA	NA	NA
Carbon Tetrachloride	<2	<2	<2	<2	<2	3	<2	<2	<2	<2	<2	<2	1,300	0.07	63,900	159,750
Bromodichloromethane	<2	<2	<2	<2	4	<2	3	<2	<2	3	<2	<2	NA	0.02	NA	NA
1,2-Dichloropropane	<2	<2	<2	3	7	10	<2	4	9	7	16	10	83,000	0.15	NA	NA
2/4-Chlorotoluene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
4-Isopropyltoluene	3	3	3	<2	4	<2	4	<2	<2	<2	<2	<2	NA	NA	NA	NA
trans -1,3-Dichloropropene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
Trichloroethene	50	60	150	140	220	300 E	30	60	170	3	7	13	33,000	0.45	100,000	200,000
Dibromochloromethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
1,1,2-Trichloroethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	13,000	0.06	45,000	NA
cis -1,3-Dichloropropene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
Benzene	<2	<2	<2	<2	<2	<2	<2	4	<2	<2	3	<2	30	0.12	3,250	16,250
Bromoform	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	1,200	12	NA	NA
1,1,2,2-Tetrachloroethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	1,600	0.02	NA	NA
Tetrachloroethene	70	120	400 E	140	400 E	600 E	140	210	500 E	60	80	90	81,000	0.075	100,000	200,000
Toluene	3	4	3	3	3	4	<2	6	<2	<2	3	3	89,000	2,000	766,000	1,149,000
Chlorobenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	11,000	20	350,000	NA
Ethylbenzene	<2	<2	<2	<2	<2	<2	<2	3	<2	<2	<2	<2	100,000	1,000	435,000	NA
Acetone	50	40	40	<2	70	<2	<2	50	20	<2	<2	40	140,000	14,000	2,400,000	NA
1,2-Dichlorobenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
1,4-Dichlorobenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	450,000	NA
1,3-Dichlorobenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
4-Methyl-2-Pentanone	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
2-Butanone (MEK)	16	23	16	<2	20	<2	<2	<2	<2	<2	<2	7	NA	NA	590,000	NA
Carbon Disulfide	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	710	7	63,200	94,800
2-Hexanone	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	440,000	NA
Styrene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	51,000	510	433,000	860,000
Bromobenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
n -Butylbenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
sec -Butylbenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
tert -Butylbenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
1,2-Dibromo-3-Chloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	9.83	NA
1,2-Dibromoethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	38	0.004	NA	NA
Dibromomethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
cis -1,2-Dichloroethene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	190,000	1,900	NA	NA
trans -1,2-Dichloroethene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	360	NA	NA
1,3-Dichloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
2,2-Dichloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
1,1-Dichloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
Hexachlorobutadiene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	50	0.05	NA	NA
Isopropylbenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
Naphthalene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	12,000	120	50,000	NA
n -Propylbenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	0.1	NA	NA
1,1,1,2-Tetrachloroethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
1,2,3-Trichlorobenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
1,2,4-Trichlorobenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	50	1.2	NA	NA
1,2,3-Trichloropropane	90	60	500 E	1200 E	1700 E	2100 E	1500 E	1900 E	1500 E	1900 E	2000 E	2200 E	NA	NA	300,000	NA
1,2,4-Trimethylbenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	29,000	290	NA	NA
1,3,5-Trimethylbenzene	<2	3	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	29,000	290	NA	NA
M/P-Xylene	<2	3	<2	<2	<2	<2	<2	3	<2	<2	<2	<2	100,000	NA	435,000	NA
O-Xylene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	100,000	700	435,000	NA

NOTES:

[1] - Indicates depth below ground surface.

[2] - Short-term Guidance Concentration

[3] - Annual Guidance Concentration

[4] - OSHA PEL values represent time weighed average permissable exposure limits based upon an 8 hour workday, during a 40 hour workweek.

[5] - OSHA CPEL values represent maximum ceiling values of permissable exposure limits which should not be exceeded at any time.

E - Indicates an estimated value, instrument calibration exceeded.

NA - OSHA permissable exposure limits not established

TABLE 4 (con't)

MACKENZIE CHEMICAL SITE

OFF-SITE SOIL GAS SAMPLES
VOLATILE ORGANIC COMPOUNDS - ANALYTICAL LABORATORY

SAMPLE ID	AS#5			AS#6			AS#7			AS#8					OSHA	OSHA
DEPTH OF SAMPLE[1]	5 ft	10 ft	15 ft	5 ft	10 ft	15 ft	5 ft	10 ft	15 ft	5 ft	10 ft	15 ft	SGC[2]	AGC[3]	PEL[4]	CPEL[5]
PARAMETERS (ug/m^3)																
Chloromethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	22,000	770	NA	NA
Dichlorofluoromethane	11	16	57	8	15	22	17	5	12	6	<2	15	NA	NA	NA	NA
Bromomethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
Vinyl Chloride	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	1,300	0.02	2,600	13,000
Methylene Chloride	<2	<2	11	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	1,765,000	NA
Trichlorofluoromethane	15	5	15	<2	3	5	13	<2	6	<2	<2	4	560,000	700	NA	NA
1,1-Dichloroethene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
1,1-Dichloroethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	190,000	500	400,000	NA
Chloroethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
Chloroform	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	980	23	240,000	NA
1,2-Dichloroethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	950	0.039	NA	NA
1,1,1-Trichloroethane	<2	<2	6	<2	2	7	6	8	20	<2	<2	5	NA	NA	NA	NA
Carbon Tetrachloride	<2	<2	<2	<2	<2	<2	<2	<2	3	<2	<2	<2	1,300	0.07	63,900	159,750
Bromodichloromethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	0.02	NA	NA
1,2-Dichloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	83,000	0.15	NA	NA
2/4-Chlorotoluene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
4-Isopropyltoluene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
trans - 1,3-Dichloropropene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
Trichloroethene	<2	<2	6	<2	<2	11	<2	7	4	<2	<2	3	33,000	0.45	100,000	200,000
Dibromochloromethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
1,1,2-Trichloroethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	13,000	0.06	45,000	NA
cis - 1,3-Dichloropropene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
Benzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	6	<2	30	0.12	3,250	16,250
Bromoform	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	1,200	12	NA	NA
1,1,2,2-Tetrachloroethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	1,600	0.02	NA	NA
Tetrachloroethene	31	21	75	42	48	150	100	220	330	18	22	180	81,000	0.075	100,000	200,000
Toluene	9	6	14	11	3	13	5	7	4	<2	2	8	89,000	2,000	766,000	1,149,000
Chlorobenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	11,000	20	350,000	NA
Ethylbenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	100,000	1,000	435,000	NA
Acetone	27	<2	110	26	12	33	39	<2	<2	<2	<2	95	140,000	14,000	2,400,000	NA
1,2-Dichlorobenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
1,4-Dichlorobenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	450,000	NA
1,3-Dichlorobenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
4-Methyl-2-Pentanone	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
2-Butanone (MEK)	<2	<2	<2	<2	<2	11	<2	2	<2	<2	25	39	NA	NA	590,000	NA
Carbon Disulfide	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	710	7	63,200	94,800
2-Hexanone	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	4	<2	NA	NA	440,000	NA
Styrene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	51,000	510	433,000	860,000
Bromobenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
n - Butylbenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
sec - Butylbenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
tert - Butylbenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
1,2-Dibromo-3-Chloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	9.83	NA
1,2-Dibromoethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	38	0.004	NA	NA
Dibromomethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
cis - 1,2-Dichloroethene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	190,000	1,900	NA	NA
trans - 1,2-Dichloroethene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	360	NA	NA
1,3-Dichloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
2,2-Dichloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
1,1-Dichloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
Hexachlorobutadiene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	50	0.05	NA	NA
Isopropylbenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
Naphthalene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	12,000	120	50,000	NA
n - Propylbenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	0.1	NA	NA
1,1,1,2-Tetrachloroethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
1,2,3-Trichlorobenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
1,2,4-Trichlorobenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	50	1.2	NA	NA
1,2,3-Trichloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	300,000	NA
1,2,4-Trimethylbenzene	<2	<2	<2	<2	<2	<2	<2	<2	5	<2	<2	8	29,000	290	NA	NA
1,3,5-Trimethylbenzene	<2	<2	<2	<2	<2	<2	<2	<2	4	<2	<2	6	29,000	290	NA	NA
M/P-Xylene	5	<2	<2	4	<2	<2	<2	<2	<2	<2	<2	<2	100,000	NA	435,000	NA
O-Xylene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	100,000	700	435,000	NA

NOTES:

[1] - Indicates depth below ground surface.

[2] - Short-term Guidance Concentration

[3] - Annual Guidance Concentration

[4] - OSHA PEL values represent time weighed average permissable exposure limits based upon an 8 hour workday, during a 40 hour workweek.

[5] - OSHA CPEL values represent maximum ceiling values of permissable exposure limits which should not be exceeded at any time.

E - Indicates an estimated value, instrument calibration exceeded.

NA - OSHA permissable exposure limits not established

TABLE 4 (con't)

MACKENZIE CHEMICAL SITE

OFF-SITE SOIL GAS SAMPLES
VOLATILE ORGANIC COMPOUNDS - ANALYTICAL LABORATORY

SAMPLE ID	AS#9			AS#10			AS#11			AS#12					OSHA	OSHA
DEPTH OF SAMPLE[1]	5 ft	10 ft	15 ft	5 ft	10 ft	15 ft	5 ft	10 ft	15 ft	5 ft	10 ft	15 ft	SGC[2]	AGC[3]	PEL[4]	CPEL[5]
PARAMETERS (ug/m^3)																
Chloromethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	22,000	770	NA	NA
Dichlorofluomethane	13	6	2	12	8	22	88	110	220	8	22	56	NA	NA	NA	NA
Bromomethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
Vinyl Chloride	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	1,300	0.02	2,600	13,000
Methylene Chloride	<2	<2	<2	<2	<2	8	<2	<2	<2	<2	<2	<2	NA	NA	1,765,000	NA
Trichlorofluoromethane	<2	<2	2	11	4	9	14	18	35	2	4	11	560,000	700	NA	NA
1,1-Dichloroethene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
1,1-Dichloroethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	190,000	500	400,000	NA
Chloroethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
Chloroform	8	<2	<2	10	<2	<2	<2	<2	<2	<2	<2	<2	980	23	240,000	NA
1,2-Dichloroethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	950	0.039	NA	NA
1,1,1-Trichloroethane	<2	<2	<2	3	4	9	3	5	9	<2	<2	10	NA	NA	NA	NA
Carbon Tetrachloride	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	1,300	0.07	63,900	159,750
Bromodichloromethane	4	<2	<2	2	<2	<2	<2	<2	<2	<2	<2	<2	NA	0.02	NA	NA
1,2-Dichloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	83,000	0.15	NA	NA
2/4-Chlorotoluene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
4-Isopropyltoluene	<2	<2	<2	<2	<2	<2	<2	<2	4	<2	<2	<2	NA	NA	NA	NA
trans -1,3-Dichloropropene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
Trichloroethene	<2	<2	<2	<2	<2	4	<2	<2	4	<2	<2	9	33,000	0.45	100,000	200,000
Dibromochloromethane	<2	<2	<2	20	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
1,1,2-Trichloroethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	13,000	0.06	45,000	NA
cis -1,3-Dichloropropene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
Benzene	<2	<2	4	<2	<2	<2	<2	<2	<2	<2	<2	<2	30	0.12	3,250	16,250
Bromoform	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	1,200	12	NA	NA
1,1,2,2-Tetrachloroethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	1,600	0.02	NA	NA
Tetrachloroethene	34	<2	49	33	67	200	54	34	65	25	43	140	81,000	0.075	100,000	200,000
Toluene	4	2	10	45	4	3	14	7	19	71	15	16	89,000	2,000	766,000	1,149,000
Chlorobenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	11,000	20	350,000	NA
Ethylbenzene	<2	<2	<2	<2	<2	<2	2	<2	5	4	<2	<2	100,000	1,000	435,000	NA
Acetone	42	6	<2	28	48	66	19	61	280	19	24	26	140,000	14,000	2,400,000	NA
1,2-Dichlorobenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
1,4-Dichlorobenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	450,000	NA
1,3-Dichlorobenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
4-Methyl-2-Pentanone	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
2-Butanone (MEK)	<2	11	88	<2	5	33	5	19	39	<2	5	8	NA	NA	590,000	NA
Carbon Disulfide	<2	<2	<2	<2	<2	<2	<2	<2	2	<2	<2	<2	710	7	63,200	94,800
2-Hexanone	<2	22	<2	<2	<2	<2	28	<2	<2	<2	<2	<2	NA	NA	440,000	NA
Styrene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	51,000	510	433,000	860,000
Bromobenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
n-Butylbenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
sec -Butylbenzene	<2	<2	<2	<2	<2	<2	<2	<2	3	<2	<2	<2	NA	NA	NA	NA
tert -Butylbenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
1,2-Dibromo-3-Chloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	9.83	NA
1,2-Dibromoethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	38	0.004	NA	NA
Dibromomethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
cis -1,2-Dichloroethene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	190,000	1,900	NA	NA
trans -1,2-Dichloroethene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	360	NA	NA
1,3-Dichloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
2,2-Dichloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
1,1-Dichloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
Hexachlorobutadiene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	50	0.05	NA	NA
Isopropylbenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
Naphthalene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	12,000	120	50,000	NA
n-Propylbenzene	<2	<2	<2	<2	<2	<2	<2	<2	5	<2	<2	<2	NA	0.1	NA	NA
1,1,1,2-Tetrachloroethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
1,2,3-Trichlorobenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	NA	NA
1,2,4-Trichlorobenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	50	1.2	NA	NA
1,2,3-Trichloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	NA	NA	300,000	NA
1,2,4-Trimethylbenzene	<2	<2	<2	<2	<2	3	6	5	41	<2	<2	<2	29,000	290	NA	NA
1,3,5-Trimethylbenzene	<2	<2	<2	<2	<2	3	8	5	42	<2	<2	<2	29,000	290	NA	NA
M/P-Xylene	<2	<2	<2	<2	<2	<2	9	<2	19	14	4	<2	100,000	NA	435,000	NA
O-Xylene	<2	<2	<2	<2	<2	<2	3	<2	7	3	<2	<2	100,000	700	435,000	NA

NOTES:

[1] - Indicates depth below ground surface.

[2] - Short-term Guidance Concentration

[3] - Annual Guidance Concentration

[4] - OSHA PEL values represent time weighed average permissable exposure limits based upon an 8 hour workday, during a 40 hour workweek.

[5] - OSHA CPEL values represent maximum ceiling values of permissable exposure limits which should not be exceeded at any time.

E - Indicates an estimated value, instrument calibration exceeded.

NA - OSHA permissable exposure limits not established

TABLE 4 (con't)

MACKENZIE CHEMICAL SITE

OFF-SITE SOIL GAS SAMPLES
VOLATILE ORGANIC COMPOUNDS - ANALYTICAL LABORATORY

SAMPLE ID	AS#13			AS#14			AS#15			AS#16					OSHA	OSHA
DEPTH OF SAMPLE[1]	5 ft	10 ft	15 ft	5 ft	10 ft	15 ft	5 ft	10 ft	15 ft	5 ft	10 ft	15 ft	SGC[2]	AGC[3]	PEL[4]	CPEL[5]
PARAMETERS (ug/m^3)																
Chloromethane	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	5	22,000	770	NA	NA
Dichlorofluomethane	30	40	67	<2	<2	58	9	80	9	9	23	9	NA	NA	NA	NA
Bromomethane	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	NA	NA	NA	NA
Vinyl Chloride	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	1,300	0.02	2,600	13,000
Methylene Chloride	<2	<2	<2	<2	<2	4	<2	<2	<10	<2	<2	<2	NA	NA	1,765,000	NA
Trichlorofluoromethane	5	7	10	<2	<2	9	<2	<2	3	<2	3	3	560,000	700	NA	NA
1,1-Dichloroethene	<2	<2	4	<2	<2	<2	<2	<2	<10	<2	<2	<2	NA	NA	NA	NA
1,1-Dichloroethane	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	190,000	500	400,000	NA
Chloroethane	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	NA	NA	NA	NA
Chloroform	19	<2	<2	<2	<2	<2	2	<2	<10	8	<2	<2	980	23	240,000	NA
1,2-Dichloroethane	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	950	0.039	NA	NA
1,1,1-Trichloroethane	8	11	17	<2	<2	19	<2	<2	<10	<2	<2	<2	NA	NA	NA	NA
Carbon Tetrachloride	<2	<2	4	<2	<2	3	<2	<2	<10	<2	<2	<2	1,300	0.07	63,900	159,750
Bromodichloromethane	4	<2	<2	<2	<2	<2	<2	<2	<10	3	<2	<2	NA	0.02	NA	NA
1,2-Dichloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	83,000	0.15	NA	NA
2/4-Chlorotoluene	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	NA	NA	NA	NA
4-Isopropyltoluene	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	NA	NA	NA	NA
trans -1,3-Dichloropropene	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	NA	NA	NA	NA
Trichloroethene	<2	<2	19	<2	<2	8	<2	<2	4	<2	<2	<2	33,000	0.45	100,000	200,000
Dibromochloromethane	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	NA	NA	NA	NA
1,1,2-Trichloroethane	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	13,000	0.06	45,000	NA
cis -1,3-Dichloropropene	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	NA	NA	NA	NA
Benzene	4	5	<2	<2	<2	<2	<2	<2	4	<2	4	3	30	0.12	3,250	16,250
Bromoform	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	1,200	12	NA	NA
1,1,2,2-Tetrachloroethane	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	1,600	0.02	NA	NA
Tetrachloroethene	130	170	270	4	14	300	13	12	11	41	30	39	81,000	0.075	100,000	200,000
Toluene	5	12	42	4	3	67	3	3	20	21	10	40	89,000	2,000	766,000	1,149,000
Chlorobenzene	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	11,000	20	350,000	NA
Ethylbenzene	<2	<2	9	<2	<2	2	<2	<2	<10	<2	<2	<2	100,000	1,000	435,000	NA
Acetone	80	46	160	<2	<2	48	47	23	35	12	320	40	140,000	14,000	2,400,000	NA
1,2-Dichlorobenzene	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	NA	NA	NA	NA
1,4-Dichlorobenzene	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	NA	NA	450,000	NA
1,3-Dichlorobenzene	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	NA	NA	NA	NA
4-Methyl-2-Pentanone	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	NA	NA	NA	NA
2-Butanone (MEK)	8	31	23	<2	<2	28	<2	<2	65	3	33	6	NA	NA	590,000	NA
Carbon Disulfide	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	3	<2	710	7	63,200	94,800
2-Hexanone	<2	4	<2	<2	<2	4	<2	<2	<10	<2	<2	<2	NA	NA	440,000	NA
Styrene	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	51,000	510	433,000	860,000
Bromobenzene	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	NA	NA	NA	NA
n -Butylbenzene	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	NA	NA	NA	NA
sec -Butylbenzene	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	NA	NA	NA	NA
tert -Butylbenzene	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	NA	NA	NA	NA
1,2-Dibromo-3-Chloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	NA	NA	9.83	NA
1,2-Dibromoethane	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	38	0.004	NA	NA
Dibromomethane	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	NA	NA	NA	NA
cis -1,2-Dichloroethene	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	190,000	1,900	NA	NA
trans -1,2-Dichloroethene	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	NA	360	NA	NA
1,3-Dichloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	NA	NA	NA	NA
2,2-Dichloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	NA	NA	NA	NA
1,1-Dichloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	NA	NA	NA	NA
Hexachlorobutadiene	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	50	0.05	NA	NA
Isopropylbenzene	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	NA	NA	NA	NA
Naphthalene	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	12,000	120	50,000	NA
n -Propylbenzene	<2	<2	3	<2	<2	<2	<2	<2	<10	<2	<2	<2	NA	0.1	NA	NA
1,1,1,2-Tetrachloroethane	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	NA	NA	NA	NA
1,2,3-Trichlorobenzene	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	NA	NA	NA	NA
1,2,4-Trichlorobenzene	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	50	1.2	NA	NA
1,2,3-Trichloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	NA	NA	300,000	NA
1,2,4-Trimethylbenzene	<2	<2	22	<2	<2	16	<2	<2	<10	<2	<2	<2	29,000	290	NA	NA
1,3,5-Trimethylbenzene	<2	<2	25	<2	<2	14	<2	<2	<10	<2	<2	<2	29,000	290	NA	NA
M/P-Xylene	<2	<2	32	<2	<2	8	<2	<2	<10	<2	<2	<2	100,000	NA	435,000	NA
O-Xylene	<2	<2	12	<2	<2	3	<2	<2	<10	<2	<2	<2	100,000	700	435,000	NA

NOTES:

[1] - Indicates depth below ground surface.

[2] - Short-term Guidance Concentration

[3] - Annual Guidance Concentration

[4] - OSHA PEL values represent time weighed average permissable exposure limits based upon an 8 hour workday, during a 40 hour workweek.

[5] - OSHA CPEL values represent maximum ceiling values of permissable exposure limits which should not be exceeded at any time.

E - Indicates an estimated value, instrument calibration exceeded.

NA - OSHA permissable exposure limits not established

TABLE 5

Page 1

Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Subsurface Soil (>8 feet)

Exposure Point	Chemical of Concern	Concentration Detected		Concentration Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Min	Max					
Drainage Structures	1,2,3-trichloropropane	10	10000	ug/kg	3/9	1.0E+4	ug/kg	Max
	Benzo(a)anthracene	230	18500	ug/kg	2/9	1.9E+4	ug/kg	Max
	Benzo(b)fluoranthene	67	26000	ug/kg	3/9	2.6E+4	ug/kg	Max
	Benzo(k)fluoranthene	56	10500	ug/kg	3/9	1.1E+4	ug/kg	Max
	Benzo(a)pyrene	40	21500	ug/kg	3/9	2.2E+4	ug/kg	Max
	Indeno(1,2,3-cd)pyrene	75	13000	ug/kg	2/9	1.3E+4	ug/kg	Max
	Dibenzo(a,h)anthracene	2450	2450	ug/kg	1/9	2.5E+3	ug/kg	Max

TABLE 5 (con't)

Page 2

Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Subsurface Soil (>8 feet)

Exposure Point	Chemical of Concern	Concentration Detected		Concen -tration Units	Frequency of Detection	Exposure Point Concen-tration	Exposure Point Concen-tration Units	Statistical Measure
		Min	Max					
Waste Lagoon	1,2,3-trichloropropane	40	500	ug/kg	3/6	5.0E+2	ug/kg	Max
	N-nitrosodiphenylamine	1700	25000	ug/kg	2/2	2.5E+4	ug/kg	Max
	Benzo(a)pyrene	240	240	ug/kg	1/2	2.4E+2	ug/kg	Max

TABLE 5 (con't)

Page 3

Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Concern	Concentration Detected		Concen-tration Units	Frequency of Detection	Exposure Point Concen-tration	Exposure Point Concen-tration Units	Statistical Measure
		Min	Max					
Tap Water/ Shower Head	Benzene	1	110	ug/l	2/53	1.9E+1	ug/l	97.5% UCL - Cheb
	Chloroform	1	3	ug/l	4/53	7.4E0	ug/l	95% UCL - Cheb
	1,2-dichloropropane	9	9	ug/l	1/53	7.7E0	ug/l	95% UCL - Cheb
	Trichloroethene	2	9	ug/l	2/53	7.6E0	ug/l	95% UCL - Cheb
	1,2,3-trichloropropane	1	8900	ug/l	26/53	2.0E+3	ug/l	95% UCL - Cheb
	1,4-dichlorobenzene	6	6	ug/l	1/31	1.0E+1	ug/l	97.5% UCL - Cheb
	bis(2-ethylhexyl)phthalate	35	40	ug/l	2/21	2.0E+1	ug/l	95% UCL - Cheb
	Aluminum	127	31200	ug/l	19/21	4.2E+4	ug/l	95% UCL - Cheb
	Antimony	60.3	60.3	ug/l	1/21	3.6E+1	ug/l	95% UCL - Cheb
	Arsenic	2	34.7	ug/l	10/21	2.3E+1	ug/l	95% UCL - Cheb
	Cadmium	4.8	19.2	ug/l	5/21	1.1E+1	ug/l	95% UCL - Cheb
	Chromium	12.9	1510	ug/l	14/21	1.3E+3	ug/l	95% UCL - Cheb
	Iron	102	184000	ug/l	21/21	2.0E+5	ug/l	95% UCL - Cheb
	Manganese	10.5	14700	ug/l	6/21	1.0E+4	ug/l	95% UCL - Cheb

TABLE 5 (con't)

Page 4

Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil (<2 feet)

Exposure Point	Chemical of Concern	Concentration Detected		Concen -tration Units	Frequency of Detection	Exposure Point Concen- tration	Exposure Point Concen- tration Units	Statistical Measure
		Min	Max					
Surface Soil on Property	Dieldrin	3.4	460	ug/kg	22/27	6.2E+1	ug/kg	95% UCL - LH
	N-Nitroso-di-n-propylamine	210	2500	ug/kg	12/28	8.7E+2	ug/kg	95% UCL - Cheb
	Benzo(a)anthracene	49	9600	ug/kg	24/28	4.3E+3	ug/kg	95% UCL - LH
	Benzo(b)fluoranthene	120	7900	ug/kg	24/28	3.4E+3	ug/kg	95% UCL - LH
	Benzo(a)pyrene	64	7800	ug/kg	24/28	3.5E+3	ug/kg	97.5% UCL - Cheb
	Indeno(1,2,3-cd)pyrene	56	4000	ug/kg	26/28	2.5E+3	ug/kg	97.5% UCL -Cheb
	Dibenzo(a,h)anthracene	130	1500	ug/kg	21/28	7.1E+2	ug/kg	95% UCL - LH

Key

ug/kg: microgram/kilogram
MAX: Maximum Concentration
95% UCL - LH: 95% Upper Confidence Limit - Land's - H Statistic
95% UCL - Cheb: 95% Upper Confidence Limit - Chebyshev Statistic
97.5% UCL - Cheb: 97.5% Upper Confidence Limit - Chebyshev Statistic

Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations

The table presents the chemicals of concern (COPCs) and exposure point concentration for each of the COPCs detected in Mackenzie Chemical soils and the groundwater (*i.e.*, the concentration that will be used to estimate the exposure and risk from each COPC in each media). The table includes the range of concentrations detected for each COPC, as well as the frequency of detection(i.e., the number of times the chemical was detected in the samples collected at the site), the exposure point concentration (EPC), and how the EPC was derived.

TABLE 6

Selection of Exposure Pathways

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Onsite/ Offsite	Rationale for Selection/Exclusion of Exposure Pathway
Current/ Future	Soil	Surface Soil (0-2 feet)	Soils on Property	Worker	Adult	Ingestion	Onsite	Site was operated as a business and workers may be present on the site
						Dermal	Onsite	Site was operated as a business and workers may be present on the site
				Intermittent Visitor	Adolescent	Ingestion	Onsite	Site is located within one mile from a school and is also adjacent to a residential area. There is a potential for children to be present on the site.
						Dermal	Onsite	Site is located within one mile from a school and is also adjacent to a residential area. There is a potential for children to be present on the site.
Future	Soil	Surface Soil (0-2 feet)	Soils on Property	Resident	Adult	Ingestion	Onsite	The site is adjacent to a residential area and the property could potentially be developed as residential.
						Dermal	Onsite	The site is adjacent to a residential area and the property could potentially be developed as residential.
					Child	Ingestion	Onsite	The site is adjacent to a residential area and the property could potentially be developed as residential.
						Dermal	Onsite	The site is adjacent to a residential area and the property could potentially be developed as residential.
		Surface and Subsurface	Soils on Property	Construction Worker	Adult	Ingestion	Onsite	There is potential for construction activities at the site. These activities could be associated with remediation or redevelopment of the property.
						Dermal	Onsite	There is potential for construction activities at the site. These activities could be associated with remediation or redevelopment of the property.
						Inhalation of dust	Onsite	There is potential for construction activities at the site. These activities could be associated with remediation or redevelopment of the property.

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Onsite/ Offsite	Rationale for Selection/Exclusion of Exposure Pathway
Future	Soil	Subsurface Soil (>8 feet)	Soil near the drainage structures and near the waste	Construction Worker	Adult	Ingestion	Onsite	There is potential for construction activities at the site. These activities could be associated with remediation or redevelopment of the property.
						Dermal	Onsite	There is potential for construction activities at the site. These activities could be associated with remediation or redevelopment of the property.
						Inhalation of dust	Onsite	There is potential for construction activities at the site. These activities could be associated with remediation or redevelopment of the property.
Future	Groundwater	Groundwater	Tap water	Resident	Adult	Ingestion	Onsite	The aquifer in which the contamination is located is classified as a potable water source.
					Child	Ingestion	Onsite	The aquifer in which the contamination is located is classified as a potable water source.
				Worker	Adult	Ingestion	Onsite	The aquifer in which the contamination is located is classified as a potable water source.
			Shower head	Resident	Adult	Inhalation	Onsite	The aquifer in which the contamination is located is classified as a potable water source.
					Child	Inhalation	Onsite	The aquifer in which the contamination is located is classified as a potable water source.

Summary of Selection of Exposure Pathways

The table presents all exposure pathways considered for the risk assessment, and the rationale for the inclusion of each pathway. Exposure media, exposure points, and characteristics of receptor populations are included.

TABLE 7

Cancer Toxicity Data Summary

Pathway: Oral/Dermal

Chemical of Concern	Oral Cancer Slope Factor	Units	Adjusted Cancer Slope Factor (for Dermal)	Slope Factor Units	Weight of Evidence/ Cancer Guideline Description	Source	Date
Arsenic	1.5E0	mg/kg-day	1.5E0	mg/kg-day	A	IRIS	04/18/02
Benzene	5.5E-2	mg/kg-day	5.5E-2	mg/kg-day	A	IRIS	04/18/02
Benzo(a)anthracene	7.3E-1	mg/kg-day	7.3E-1	mg/kg-day	B2	NCEA	04/18/02
Benzo(a)pyrene	7.3E0	mg/kg-day	7.3E0	mg/kg-day	B2	IRIS	04/18/02
Benzo(b)fluoranthene	7.3E-1	mg/kg-day	7.3E-1	mg/kg-day	B2	NCEA	04/18/02
Bis(2-ethylhexyl)phthalate	1.4E-2	mg/kg-day	1.4E-2	mg/kg-day	B2	IRIS	04/18/02
Chloroform	6.1E-3	mg/kg-day	6.1E-3	mg/kg-day	B2	IRIS	04/18/02
Dibenzo(a,h)anthracene	7.3E0	mg/kg-day	7.3E0	mg/kg-day	B2	NCEA	04/18/02
1,4-dichlorobenzene	2.4E-2	mg/kg-day	2.4E-2	mg/kg-day	C	HEAST	04/18/02
1,2-dichloropropane	6.8E-2	mg/kg-day	6.8E-2	mg/kg-day	B2	HEAST	04/18/02
Dieldrin	1.6E+1	mg/kg-day	1.6E+1	mg/kg-day	B2	IRIS	11/15/02
Indeno(1,2,3-cd)pyrene	7.3E-1	mg/kg-day	7.3E-1	mg/kg-day	B2	NCEA	04/18/02
N-nitrosodiphenylamine	4.9E-3	mg/kg-day	4.9E-3	mg/kg-day	B2	IRIS	04/18/02
1,2,3-trichloropropane	2.0E0	mg/kg-day	2.0E0	mg/kg-day	withdrawn	NCEA	04/18/02
Trichloroethene	1.1E-2	mg/kg-day	1.1E-2	mg/kg-day	B2-C	NCEA	04/18/02

Pathway: Inhalation

Chemical of Concern	Unit Risk	Units	Inhalation Slope Factor	Slope Factor Units	Weight of Evidence/ Cancer Guideline Description	Source	Date
Arsenic	4.3E0	mg/cu. m.	1.5E+1	mg/kg-day	A	IRIS	04/18/02
Benzene	7.8E-6	mg/cu. m.	2.9E-2	mg/kg-day	A	IRIS	04/18/02
bis(2-ethylhexyl)phthalate		mg/cu. m.	1.4E-2	mg/kg-day	B2	NCEA	04/18/02
Chloroform	2.3E-2	mg/cu. m.	8.1E-2	mg/kg-day	B2	IRIS	04/18/02
1,4-dichlorobenzene		mg/cu. m.	2.2E-2	mg/kg-day	C	NCEA	04/18/02
Trichloroethene	1.0E-4	mg/cu. m.	3.5E-1	mg/kg-day	B2-C	NCEA	04/18/02

Key

NA: No information available
IRIS: Integrated Risk Information System, U.S. EPA
NCEA: National Center for Environmental Assessment
HEAST: Health Effects Assessment Summary Tables

EPA Group:

A - Human carcinogen
B1 - Probable Human Carcinogen - Indicates that limited human data are available
B2 - Probable Human Carcinogen - Indicates sufficient evidence in animals associated with the site and inadequate or no evidence in humans
C - Possible human carcinogen
D - Not classifiable as a human carcinogen
E - Evidence of noncarcinogenicity

Summary of Toxicity Assessment

This table provides carcinogenic risk information which is relevant to the contaminants of concern in groundwater and soils. Toxicity data are provided for both the oral and inhalation routes of exposure.

TABLE 8

Non-Cancer Toxicity Data Summary

Pathway: Oral/Dermal

Chemical of Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Absorp. Efficiency (Dermal)	Adjusted RfD (Dermal)	Adj. Dermal RfD Units	Primary Target Organ	Combined Uncertainty /Modifying Factors	Sources of RfD: Target Organ	Dates of RfD:
Antimony	Chronic	4.0E-4	mg/kg-day	NA	NA	NA	Blood	100	IRIS	04/18/02
Arsenic	Chronic	3.0E-4	mg/kg-day	NA	NA	NA	Skin	3	IRIS	04/18/02
Benzene	Chronic	8.0E-4	mg/kg-day	NA	NA	NA	Blood	10000	NCEA	12/10/01
Cadmium	Chronic	5.0E-4	mg/kg-day	NA	NA	NA	Kidney	10	IRIS	04/18/02
Chloroform	Chronic	1.0E-2	mg/kg-day	NA	NA	NA	Liver	100	IRIS	01/03/02
Chromium	Chronic	3.0E-3	mg/kg-day	NA	NA	NA	GI Tract	900	IRIS	01/03/02
1,2-dichloroethene	Chronic	1.0E-2	mg/kg-day	NA	NA	NA	Blood	3000	HEAST	07/01/97
Dieldrin	Chronic	5.0E-5	mg/kg-day	NA	NA	NA	Liver	100	IRIS	11/15/02
Iron	Chronic	6.0E-1	mg/kg-day	NA	NA	NA	GI Tract/ Liver	1	NCEA	12/10/01
Manganese	Chronic	2.0E-2	mg/kg-day	4%	8.0E-4	mg/ kg-day	CNS	3	IRIS	01/03/02
1,2,3-trichloropropane	Chronic	6.0E-3	mg/kg-day	NA	NA	NA	Blood/ Liver/ Kidney	1000	IRIS	04/18/02
Trichloroethene	Chronic	3.0E-4	mg/kg-day	NA	NA	NA	Fetus	3000	NCEA	12/10/01

Pathway: Inhalation

Chemical of Concern	Chronic/ Subchronic	Inhalation RfC	Inhalation RfC Units	Inhalation RfD	Inhalation RfD Units	Primary Target Organ	Combined Uncertainty /Modifying Factors	Sources of RfD: Target Organ	Dates:
Benzene	Chronic	9.0E-3	mg/cu. m	2.6E-4	mg/kg-day	Bone Marrow	1000	NCEA	04/18/02
Chloroform	Chronic	3.0E-4	mg/cu. m	8.6E-5	mg/kg-day	Liver/ Kidney	1000	NCEA	04/18/02
Chromium	Chronic	1.0E-4	mg/cu. m	2.9E-5	mg/kg-day	Lungs	300	IRIS	04/18/02
1,4-dichlorobenzene	Chronic	8.0E-1	mg/cu. m	2.3E-1	mg/kg-day	Liver	100	IRIS	04/18/02
1,2-dichloropropane	Chronic	4.0E-3	mg/cu. m	1.1E-3	mg/kg-day	Nose	300	IRIS	04/18/02
Manganese	Chronic	5.0E-5	mg/cu. m	1.4E-5	mg/kg-day	CNS	1000	IRIS	04/18/02
Trichloroethene	Chronic	4.0E-2	mg/cu. m	1.1E-2	mg/kg-day	CNS	1000	NCEA	04/18/02

Key

NA: No information available
IRIS: Integrated Risk Information System, U.S. EPA
HEAST: Health Effects Assessment Summary Tables, U.S. EPA
NCEA: National Center for Environmental Assessment, U.S. EPA

Summary of Toxicity Assessment

This table provides non-carcinogenic risk information which is relevant to the contaminants of concern in groundwater and soil. When available, the chronic toxicity data have been used to develop oral reference doses (RfDs) and inhalation reference doses (RfDi).

TABLE 9

Page 1

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Subsurface Soil (> 8 feet)	Drainage Structure	1,2,3-trichloropropane	6.6E-4			6.6E-4
			Benzo(a)anthracene	4.6E-4		1.2E-4	5.8E-4
			Benzo(b)fluoranthene	6.3E-4		1.6E-4	7.9E-4
			Benzo(k)fluoranthene	2.7E-5		6.9E-6	3.4E-5
			Benzo(a)pyrene	5.3E-3		1.4E-3	6.7E-3
			Indeno(1,2,3-cd)pyrene	3.2E-4		8.2E-5	4.0E-4
			Dibenzo(a,h)anthracene	3.6E-5		1.6E-4	1.9E-4
						Total Risk =	9.4E-3

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Subsurface soil (> 8 feet)	Waste Lagoon	1,2,3-trichloropropane	3.3E-5			3.3E-5
			N-nitrosodiphenylamine	4.1E-6			4.1E-6
			Benzo(a)pyrene	5.8E-5		1.5E-5	7.3E-5
						Total Risk =	1.1E-4

TABLE 9 (con't)

Page 2

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap water/ Shower head	Benzene	9.8E-6			9.8E-6
			Chloroform	2.2E-4			2.2E-4
			1,2-dichloropropane	4.9E-6			4.9E-6
			1,2,3-trichloropropane	3.8E-2			3.8E-2
			1,4-dichlorobenzene	2.3E-6			2.3E-6
			bis(2-ethylhexyl)phthalate	2.6E-6			2.6E-6
			Arsenic	3.2E-4			3.2E-4
						Total Risk =	3.9E-2

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water/ Shower Head	1,2,3-trichloropropane	3.8E-2			3.8E-2
						Total Risk =	3.8E-2

TABLE 9 (con't)

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Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water/ Shower Head	Benzene	5.7E-6			5.7E-6
			Chloroform	1.3E-4			1.3E-4
			1,2-dichloropropane	2.9E-6			2.9E-6
			1,2,3-trichloropropane	2.2E-2			2.2E-2
			1,4-dichlorobenzene	1.3E-6			1.3E-6
			bis(2-ethylhexyl)phthalate	1.5E-6			1.5E-6
			Arsenic	1.9E-4			1.9E-4
						Total Risk =	2.2E-2

Scenario Timeframe: Future
Receptor Population: Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water	Benzene	7.3E-6			7.3E-6
			Chloroform	1.6E-4			1.6E-4
			1,2-dichloropropane	3.7E-6			3.7E-6
			1,2,3-trichloropropane	2.8E-2			2.8E-2
			1,4-dichlorobenzene	1.7E-6			1.7E-6
			bis(2-ethylhexyl)phthalate	2.0E-6			2.0E-6
			Arsenic	2.4E-4			2.4E-4
						Total Risk =	2.8E-2

TABLE 9 (con't)

Page 4

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil (0-2 feet)	Surface Soil	N-Nitrosodinpropylamine	2.9E-6			2.9E-6
			Benzo(a)anthracene	1.5E-6			1.5E-6
			Benzo(b)fluoranthene	1.2E-6			1.2E-6
			Benzo(a)pyrene	1.2E-5		7.9E-6	2.0E-5
			Dibenzo(a,h)anthracene	2.4E-6			2.4E-6
						Total Risk =	2.8E-5

TABLE 9 (con't)

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Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil (0-2 feet)	Surface Soil	Dieldrin	1.1E-6			1.1E-6
			N-Nitrosodinpropylamine	6.7E-6			6.7E-6
			Benzo(a)anthracene	3.4E-6			3.4E-6
			Benzo(b)fluoranthene	2.7E-6			2.7E-6
			Benzo(a)pyrene	2.8E-5		1.0E-5	3.9E-5
			Indeno(1,2,3-cd)pyrene	2.0E-6			2.0E-6
			Dibenzo(a,h)anthracene	5.7E-6			5.7E-6
						Total Risk =	6.1E-5

TABLE 9 (con't)

Page 6

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil (0-2 feet)	Surface Soil	N-Nitrosodinpropylamine	1.1E-6			1.1E-6
			Benzo(a)pyrene	4.5E-6		7.7E-6	1.2E-5
						Total Risk =	1.3E-5

TABLE 9 (con't)

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Risk Characterization Summary - Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Intermittent Visitor
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil (0-2 feet)	Surface Soil	Benzo(a)pyrene	1.1E-6		1.3E-5	1.4E-5
						Total Risk =	1.4E-5

Summary of Risk Characterization - Carcinogens

The table presents risk estimates for the significant routes of exposure. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of the receptors exposure to soil and groundwater, as well as the toxicity of the COCs.

TABLE 10

Page 1

Risk Characterization Summary - Noncarcinogens

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil (> 8 feet)	Drainage Structure	1,2,3-trichloropropane	Blood	3.9			3.9
							Soil Hazard Index Total =	3.9

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water/ Shower Head	1,2,3-trichloropropane	Blood	9.1			9.1
			Aluminum	Whole Body	1.2			1.2
			Antimony	Blood	2.5			2.5
			Arsenic	Skin	2.1			2.1
			Chromium	GI Tract	12.0			12.0
			Iron	GI Tract/Liver	9.1			9.1
			Manganese	CNS	14.0			14.0
							Groundwater Hazard Index Total =	50.0

TABLE 10 (con't)

Page 2

Risk Characterization Summary - Noncarcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater (> 8 feet)	Tap Water/ Shower Head	1,2,3-trichloropropane	Blood	9.1			9.1
							Soil Hazard Index Total =	9.1

TABLE 10 (con't)

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Risk Characterization Summary - Noncarcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water/ Shower Head	Benzene	Blood	1.5			1.5
			Trichloroethene	Liver/ Kidney/Fetus	1.6			1.6
			1,2,3-trichloropropane	Blood	21.0			21.0
			Aluminum	Whole Body	2.7			2.7
			Antimony	Blood	5.8			5.8
			Arsenic	Skin	4.9			4.9
			Cadmium	Kidney	1.4			1.4
			Chromium	GI Tract	28.0			28.0
			Iron	GI Tract/ Liver	21.0			21.0
			Manganese	CNS	32.0			32.0
							Groundwater Hazard Index Total =	120.0

TABLE 10 (con't)

Page 4

Risk Characterization Summary - Noncarcinogens

Scenario Timeframe: Future
Receptor Population: Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water	1,2,3-trichloropropane	Blood	6.5			6.5
			Antimony	Blood	1.8			1.8
			Arsenic	Skin	1.5			1.5
			Chromium	GI Tract	8.5			8.5
			Iron	GI Tract/ Liver	6.5			6.5
			Manganese	CNS	9.8			9.8
							Groundwater Hazard Index Total =	35.0

Summary of Risk Characterization - Non-Carcinogens

The table presents hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse non-cancer effects.

Table 11-5 Soil Gas Screening Levels
Risk = 1 x 10^{-6}

				Target Soil Gas Concentrations for Different Attenuation Factors									
		Compounds with Provisional Toxicity Data Extrapolated	Basis of Target Concentration C=cancer risk	$\alpha = 2 \times 10^{-3}$ $C_{soil\text{-}gas}$		$\alpha = 1 \times 10^{-3}$ $C_{soil\text{-}gas}$		$\alpha = 7 \times 10^{-4}$ $C_{soil\text{-}gas}$		$\alpha = 4 \times 10^{-4}$ $C_{soil\text{-}gas}$		$\alpha = 2 \times 10^{-4}$ $C_{soil\text{-}gas}$	
CAS No.	Chemical	From Oral Sources	NC=noncancer risk	(ug/m^3)	(ppbv)	(ug/m^3)	(ppbv)	(ug/m^3)	(ppbv)	(ug/m^3)	(ppbv)	(ug/m^3)	(ppbv)
83329	Acenaphthene	X	NC	--	--	--	--	--	--	--	--	--	--
75070	Acetaldehyde		NC	4.5E+03	2.5E+03	9.0E+03	5.0E+03	1.3E+04	7.1E+03	2.2E+04	1.2E+04	4.5E+04	2.5E+04
67641	Acetone	X	NC	1.8E+05	7.4E+04	3.5E+05	1.5E+05	5.0E+05	2.1E+05	8.8E+05	3.7E+05	1.8E+06	7.4E+05
75058	Acetonitrile		NC	3.0E+04	1.8E+04	6.0E+04	3.6E+04	8.6E+04	5.1E+04	1.5E+05	8.9E+04	3.0E+05	1.8E+05
98862	Acetophenone	X	NC	1.8E+05	3.6E+04	3.5E+05	7.1E+04	5.0E+05	1.0E+05	8.8E+05	1.8E+05	1.8E+06	3.8E+05
107028	Acrolein		NC	1.0E+01	4.4E+00	2.0E+01	8.7E+00	2.9E+01	1.2E+01	5.0E+01	2.2E+01	1.0E+02	4.4E+01
107131	Acrylonitrile		NC	1.0E+03	4.6E+02	2.0E+03	9.2E+02	2.9E+03	1.3E+03	5.0E+03	2.3E+03	1.0E+04	4.6E+03
309002	Aldrin		C	2.5E+01	1.7E+00	5.0E+01	3.3E+00	7.1E+01	4.8E+00	--	--	--	--
319846	alpha-HCH (alpha-BHC)		C	6.6E+01	5.7E+00	1.4E+02	1.1E+01	1.9E+02	1.6E+01	3.4E+02	2.8E+01	6.8E+02	5.7E+01
100527	Benzaldehyde	X	NC	1.8E+05	4.0E+04	3.5E+05	8.1E+04	5.0E+05	1.2E+05	8.8E+05	2.0E+05	1.8E+06	4.0E+05
71432	Benzene		C	1.6E+04	4.9E+03	3.1E+04	9.8E+03	4.5E+04	1.4E+04	7.8E+04	2.4E+04	1.6E+05	4.9E+04
205992	Benzo(b)fluoranthene	X	C	--	--	--	--	--	--	--	--	--	--
100447	Benzylchloride	X	C	2.5E+03	4.8E+02	5.0E+03	9.7E+02	7.2E+03	1.4E+03	1.3E+04	2.4E+03	2.5E+04	4.8E+03
91587	beta-Chloronaphthalene	X	NC	1.4E+05	2.1E+04	--	--	--	--	--	--	--	--
92524	Biphenyl	X	NC	8.8E+04	1.4E+04	--	--	--	--	--	--	--	--
111444	Bis(2-chloroethyl)ether		C	3.7E+02	5.3E+01	7.4E+02	1.3E+02	1.1E+03	1.8E+02	1.8E+03	3.2E+02	3.7E+03	6.3E+02
108601	Bis(2-chloroisopropyl)ether		C	1.2E+04	1.7E+03	2.4E+04	3.5E+03	3.5E+04	5.0E+03	6.1E+04	8.7E+03	1.2E+05	1.7E+04
542881	Bis(chloromethyl)ether		C	2.0E+00	4.2E-01	3.9E+00	8.4E-01	5.6E+00	1.2E+00	9.8E+00	2.1E+00	2.0E+01	4.2E+00
75274	Bromodichloromethane	X	C	6.9E+03	1.0E+03	1.4E+04	2.1E+03	2.0E+04	2.9E+03	3.4E+04	5.1E+03	6.9E+04	1.0E+04
75252	Bromoform		C	1.1E+05	1.1E+04	2.2E+05	2.1E+04	3.2E+05	3.1E+04	5.5E+05	5.4E+04	1.1E+06	1.1E+05
106990	1,3-Butadiene		C	4.3E+02	2.0E+02	8.7E+02	3.9E+02	1.2E+03	5.6E+02	2.2E+03	9.8E+02	4.3E+03	2.0E+03
75150	Carbon disulfide		NC	3.5E+05	1.1E+05	7.0E+05	2.2E+05	1.0E+06	3.2E+05	1.8E+06	5.6E+05	3.5E+06	1.1E+06
56235	Carbon tetrachloride		C	8.1E+03	1.3E+03	1.6E+04	2.6E+03	2.3E+04	3.7E+03	4.1E+04	6.5E+03	8.1E+04	1.3E+04
57749	Chlordane		NC	--	--	--	--	--	--	--	--	--	--
126998	2-Chloro-1,3-butadiene (chloroprene)		NC	3.5E+03	9.7E+02	7.0E+03	1.9E+03	1.0E+04	2.8E+03	1.8E+04	4.8E+03	3.5E+04	9.7E+03
108907	Chlorobenzene		NC	3.0E+04	6.5E+03	6.0E+04	1.3E+04	8.5E+04	1.8E+04	1.5E+05	3.2E+04	3.0E+05	6.5E+04
109693	1-Chlorobutane	X	NC	7.0E+05	1.8E+05	1.4E+06	3.7E+05	2.0E+06	5.3E+05	3.5E+06	9.2E+05	7.0E+06	1.8E+06
124481	Chlorodibromomethane	X	C	5.1E+03	6.0E+02	1.0E+04	1.2E+03	1.4E+04	1.7E+03	2.5E+04	3.0E+03	5.1E+04	6.0E+03
75456	Chlorodifluoromethane		NC	--	--	--	--	--	--	--	--	--	--
75003	Chloroethane (ethyl chloride)		NC	5.0E+06	1.9E+06	1.0E+07	3.8E+06	1.4E+07	5.4E+06	2.5E+07	9.5E+06	5.0E+07	1.9E+07
67663	Chloroform		C	5.3E+03	1.1E+03	1.1E+04	2.2E+03	1.5E+04	3.1E+03	2.6E+04	5.4E+03	5.3E+04	1.1E+04
95578	2-Chlorophenol	X	NC	8.8E+03	1.7E+03	1.8E+04	3.3E+03	2.5E+04	4.8E+03	4.4E+04	8.3E+03	8.8E+04	1.7E+04
75296	2-Chloropropane		NC	5.1E+04	1.6E+04	1.0E+05	3.2E+04	1.5E+05	4.5E+04	2.5E+05	7.9E+04	5.1E+05	1.6E+05
218019	Chrysene	X	*	*	*	*	*	*	*	*	*	*	*
156592	cis-1,2-Dichloroethylene	X	NC	1.8E+04	4.4E+03	3.5E+04	8.8E+03	5.0E+04	1.3E+04	8.8E+04	2.2E+04	1.8E+05	4.4E+04
123739	Crotonaldehyde (2-butenal)	X	C	2.2E+02	7.8E+01	4.5E+02	1.6E+02	6.4E+02	2.2E+02	1.1E+03	3.9E+02	2.2E+03	7.8E+02
98828	Cumene		NC	2.0E+05	4.1E+04	4.0E+05	8.1E+04	5.7E+05	1.2E+05	1.0E+06	2.0E+05	2.0E+06	4.1E+05
72559	DDE	X	C	--	--	--	--	--	--	--	--	--	--
132649	Dibenzofuran	X	NC	--	--	--	--	--	--	--	--	--	--
96128	1,2-Dibromo-3-chloropropane		NC	1.0E+02	1.0E+01	2.0E+02	2.1E+01	2.9E+02	3.0E+01	5.0E+02	5.2E+01	1.0E+03	1.0E+02
106934	1,2-Dibromoethane (ethylene dibromide)		NC	1.0E+02	1.3E+01	2.0E+02	2.6E+01	2.9E+02	3.7E+01	5.0E+02	6.5E+01	1.0E+03	1.3E+02
541731	1,3-Dichlorobenzene	X	NC	5.3E+04	8.7E+03	1.1E+05	1.7E+04	1.5E+05	2.5E+04	2.6E+05	4.4E+04	5.3E+05	8.7E+04
95501	1,2-Dichlorobenzene		NC	1.0E+05	1.7E+04	2.0E+05	3.3E+04	2.9E+05	4.8E+04	5.0E+05	8.3E+04	1.0E+06	1.7E+05
106467	1,4-Dichlorobenzene		NC	4.0E+05	6.7E+04	8.0E+05	1.3E+05	1.1E+06	1.9E+05	2.0E+06	3.3E+05	4.0E+06	6.7E+05

Table 11-S Soil Gas Screening Levels
Risk = 1 x 10^{-4}

				Target Soil Gas Concentrations for Different Attenuation Factors									
				$\alpha = 2\times10^{-3}$		$\alpha = 1\times10^{-3}$		$\alpha = 7\times10^{-4}$		$\alpha = 4\times10^{-4}$		$\alpha = 2\times10^{-4}$	
				$C_{soil\ gas}$		$C_{soil\ gas}$		$C_{soil\ gas}$		$C_{soil\ gas}$		$C_{soil\ gas}$	
CAS No.	Chemical	Compounds with Provisional Toxicity Data Extrapolated From Oral Sources	Basis of Target Concentration C=cancer risk NC=noncancer risk	(ug/m^3)	(ppbv)	(ug/m^3)	(ppbv)	(ug/m^3)	(ppbv)	(ug/m^3)	(ppbv)	(ug/m^3)	(ppbv)
75718	Dichlorodifluoromethane		NC	1.0E+05	2.0E+04	2.0E+05	4.0E+04	2.9E+05	5.8E+04	5.0E+05	1.0E+05	1.0E+06	2.0E+05
75343	1,1-Dichloroethane		NC	2.5E+05	6.2E+04	5.0E+05	1.2E+05	7.1E+05	1.8E+05	1.3E+06	3.1E+05	2.5E+06	6.2E+05
107062	1,2-Dichloroethane		C	4.7E+03	1.2E+03	9.4E+03	2.3E+03	1.3E+04	3.3E+03	2.3E+04	5.8E+03	4.7E+04	1.2E+04
75354	1,1-Dichloroethylene		NC	1.0E+05	2.5E+04	2.0E+05	5.0E+04	2.9E+05	7.2E+04	5.0E+05	1.3E+05	1.0E+06	2.5E+05
78875	1,2-Dichloropropane		NC	2.0E+03	4.3E+02	4.0E+03	8.7E+02	5.7E+03	1.2E+03	1.0E+04	2.2E+03	2.0E+04	4.3E+03
542756	1,3-Dichloropropene		NC	1.0E+04	2.2E+03	2.0E+04	4.4E+03	2.9E+04	6.3E+03	5.0E+04	1.1E+04	1.0E+05	2.2E+04
60571	Dieldrin		C	2.6E+01	1.7E+00	5.3E+01	3.4E+00	7.6E+01	4.9E+00	--	--	--	--
115297	Endosulfan	X	NC	--	--	--	--	--	--	--	--	--	--
106898	Epichlorohydrin		NC	5.0E+02	1.3E+02	1.0E+03	2.6E+02	1.4E+03	3.8E+02	2.5E+03	6.6E+02	5.0E+03	1.3E+03
60297	Ethyl ether	X	NC	3.5E+05	1.2E+05	7.0E+05	2.3E+05	1.0E+06	3.3E+05	1.8E+06	5.8E+05	3.5E+06	1.2E+06
141786	Ethylacetate	X	NC	1.6E+06	4.4E+05	3.2E+06	8.7E+05	4.5E+06	1.2E+06	7.9E+06	2.2E+06	1.6E+07	4.4E+06
100414	Ethylbenzene		C	1.1E+05	2.5E+04	2.2E+05	5.1E+04	3.2E+05	7.3E+04	5.5E+05	1.3E+05	1.1E+06	2.5E+05
75218	Ethylene oxide		C	1.2E+03	6.8E+02	2.4E+03	1.4E+03	3.5E+03	1.9E+03	6.1E+03	3.4E+03	1.2E+04	6.8E+03
97632	Ethylmethacrylate	X	NC	1.6E+05	3.4E+04	3.2E+05	6.8E+04	4.5E+05	9.6E+04	7.9E+05	1.7E+05	1.6E+06	3.4E+05
86737	Fluorene	X	NC	--	--	--	--	--	--	--	--	--	--
110009	Furan	X	NC	1.8E+03	6.3E+02	3.5E+03	1.3E+03	5.0E+03	1.8E+03	8.8E+03	3.1E+03	1.8E+04	6.3E+03
58899	gamma-HCH (Lindane)	X	C	3.3E+02	2.8E+01	6.6E+02	5.5E+01	9.4E+02	7.9E+01	1.6E+03	1.4E+02	3.3E+03	2.8E+02
76448	Heptachlor		C	9.4E+01	6.1E+00	1.9E+02	1.2E+01	2.7E+02	1.8E+01	4.7E+02	3.1E+01	9.4E+02	6.1E+01
87683	Hexachloro-1,3-butadiene		C	5.5E+03	5.2E+02	1.1E+04	1.0E+03	1.6E+04	1.5E+03	2.8E+04	2.8E+03	5.5E+04	5.2E+03
118741	Hexachlorobenzene		C	2.6E+02	2.3E+01	--	--	--	--	--	--	--	--
77474	Hexachlorocyclopentadiene		NC	1.0E+02	9.0E+00	2.0E+02	1.8E+01	2.9E+02	2.6E+01	5.0E+02	4.5E+01	1.0E+03	9.0E+01
67721	Hexachloroethane		C	3.0E+04	3.1E+03	6.1E+04	6.3E+03	8.7E+04	9.0E+03	1.5E+05	1.6E+04	3.0E+05	3.1E+04
110543	Hexane		NC	1.0E+05	2.8E+04	2.0E+05	5.7E+04	2.9E+05	8.1E+04	5.0E+05	1.4E+05	1.0E+06	2.8E+05
74908	Hydrogen cyanide		NC	1.5E+03	1.4E+03	3.0E+03	2.7E+03	4.3E+03	3.9E+03	7.5E+03	6.8E+03	1.5E+04	1.4E+04
78831	Isobutanol	X	NC	5.3E+05	1.7E+05	1.1E+06	3.5E+05	1.5E+06	5.0E+05	2.6E+06	8.7E+05	5.3E+06	1.7E+06
7439976	Mercury (elemental)		NC	1.5E+02	1.8E+01	3.0E+02	3.7E+01	4.3E+02	5.2E+01	7.5E+02	9.1E+01	1.5E+03	1.8E+02
126987	Methacrylonitrile		NC	3.5E+02	1.3E+02	7.0E+02	2.6E+02	1.0E+03	3.8E+02	1.8E+03	6.4E+02	3.5E+03	1.3E+03
72435	Methoxychlor	X	NC	--	--	--	--	--	--	--	--	--	--
79209	Methyl acetate	X	NC	1.8E+06	5.8E+05	3.5E+06	1.2E+06	5.0E+06	1.7E+06	8.8E+06	2.9E+06	--	--
96333	Methyl acrylate	X	NC	5.3E+04	1.5E+04	1.1E+05	3.0E+04	1.5E+05	4.3E+04	2.6E+05	7.5E+04	5.3E+05	1.5E+05
74839	Methyl bromide		NC	2.5E+03	6.4E+02	5.0E+03	1.3E+03	7.1E+03	1.8E+03	1.3E+04	3.2E+03	2.5E+04	6.4E+03
74873	Methyl chloride (chloromethane)		NC	4.5E+04	2.2E+04	9.0E+04	4.4E+04	1.3E+05	6.2E+04	2.3E+05	1.1E+05	4.5E+05	2.2E+05
108872	Methylcyclohexane		NC	1.5E+06	3.7E+05	3.0E+06	7.5E+05	4.3E+06	1.1E+06	7.5E+06	1.9E+06	1.5E+07	3.7E+06
74953	Methylene bromide	X	NC	1.8E+04	2.5E+03	3.5E+04	4.9E+03	5.0E+04	7.0E+03	8.8E+04	1.2E+04	1.8E+05	2.5E+04
75092	Methylene chloride		C	2.6E+05	7.5E+04	5.2E+05	1.5E+05	7.4E+05	2.1E+05	1.3E+06	3.7E+05	2.6E+06	7.5E+05
78933	Methylethylketone (2-butanone)		NC	5.0E+05	1.7E+05	1.0E+06	3.4E+05	1.4E+06	4.8E+05	2.5E+06	8.5E+05	5.0E+06	1.7E+06
108101	Methylisobutylketone		NC	4.0E+04	9.8E+03	8.0E+04	2.0E+04	1.1E+05	2.8E+04	2.0E+05	4.9E+04	4.0E+05	9.8E+04
80626	Methylmethacrylate		NC	3.5E+05	8.6E+04	7.0E+05	1.7E+05	1.0E+06	2.4E+05	1.8E+06	4.3E+05	3.5E+06	8.6E+05
91576	2-Methylnaphthalene	X	NC	3.5E+04	6.0E+03	7.0E+04	1.2E+04	1.0E+05	1.7E+04	1.8E+05	3.0E+04	3.5E+05	6.0E+04
1634044	MTBE		NC	1.5E+06	4.2E+05	3.0E+06	8.3E+05	4.3E+06	1.2E+06	7.5E+06	2.1E+06	1.5E+07	4.2E+06
108383	m-Xylene	X	NC	3.5E+06	8.1E+05	7.0E+06	1.6E+06	1.0E+07	2.3E+06	1.8E+07	4.0E+06	3.5E+07	8.1E+06
91203	Naphthalene		NC	1.5E+03	2.9E+02	3.0E+03	5.7E+02	4.3E+03	8.2E+02	7.5E+03	1.4E+03	1.5E+04	2.9E+03
104518	n-Butylbenzene	X	NC	7.0E+04	1.3E+04	1.4E+05	2.6E+04	2.0E+05	3.6E+04	3.5E+05	6.4E+04	7.0E+05	1.3E+05
98953	Nitrobenzene		NC	1.0E+03	2.0E+02	2.0E+03	4.0E+02	2.9E+03	5.7E+02	5.0E+03	9.9E+02	1.0E+04	2.0E+03

Table 11-S Soil Gas Screening Levels
Risk = 1 x 10^{-6}

				Target Soil Gas Concentrations for Different Attenuation Factors									
		Compounds with Provisional Toxicity Data Extrapolated	Basis of Target Concentration C=cancer risk	$\alpha = 2 \times 10^{-3}$ $C_{subslab}$		$\alpha = 1 \times 10^{-3}$ $C_{subslab}$		$\alpha = 7 \times 10^{-4}$ $C_{subslab}$		$\alpha = 4 \times 10^{-4}$ $C_{subslab}$		$\alpha = 2 \times 10^{-4}$ $C_{subslab}$	
CAS No.	Chemical	From Oral Sources	NC=noncancer risk	(ug/m^3)	(ppbv)	(ug/m^3)	(ppbv)	(ug/m^3)	(ppbv)	(ug/m^3)	(ppbv)	(ug/m^3)	(ppbv)
79469	2-Nitropropane		C	4.5E+01	1.2E+01	9.0E+01	2.5E+01	1.3E+02	3.5E+01	2.3E+02	6.2E+01	4.5E+02	1.2E+02
924163	N-Nitroso-di-n-butylamine		C	7.6E+01	1.2E+01	1.5E+02	2.4E+01	2.2E+02	3.4E+01	3.8E+02	5.9E+01	7.6E+02	1.2E+02
103651	n-Propylbenzene	X	NC	7.0E+04	1.4E+04	1.4E+05	2.8E+04	2.0E+05	4.1E+04	3.5E+05	7.1E+04	7.0E+05	1.4E+05
88722	o-Nitrotoluene	X	NC	1.6E+04	3.1E+03	3.5E+04	6.2E+03	5.0E+04	8.9E+03	8.8E+04	1.6E+04	1.8E+05	3.1E+04
95476	o-Xylene	X	NC	3.5E+06	8.1E+05	7.0E+06	1.6E+06	1.0E+07	2.3E+06	1.8E+07	4.0E+06	3.5E+07	8.1E+06
106423	p-Xylene	X	NC	3.5E+06	8.1E+05	7.0E+06	1.6E+06	1.0E+07	2.3E+06	1.8E+07	4.0E+06	3.5E+07	8.1E+06
129000	Pyrene	X	NC	**	**	**	**	**	**	**	**	**	**
135988	sec-Butylbenzene	X	NC	7.0E+04	1.3E+04	1.4E+05	2.6E+04	2.0E+05	3.6E+04	3.5E+05	6.4E+04	7.0E+05	1.3E+05
100425	Styrene		NC	5.0E+05	1.2E+05	1.0E+06	2.3E+05	1.4E+06	3.4E+05	2.5E+06	5.9E+05	5.0E+06	1.2E+06
98066	tert-Butylbenzene	X	NC	7.0E+04	1.3E+04	1.4E+05	2.6E+04	2.0E+05	3.6E+04	3.5E+05	6.4E+04	7.0E+05	1.3E+05
630206	1,1,1,2-Tetrachloroethane		C	1.6E+04	2.4E+03	3.3E+04	4.8E+03	4.7E+04	6.8E+03	8.2E+04	1.2E+04	1.6E+05	2.4E+04
79345	1,1,2,2-Tetrachloroethane		C	2.1E+03	3.1E+02	4.2E+03	6.1E+02	6.0E+03	8.7E+02	1.0E+04	1.5E+03	2.1E+04	3.1E+03
127184	Tetrachloroethylene		C	4.1E+04	6.0E+03	8.1E+04	1.2E+04	1.2E+05	1.7E+04	2.0E+05	3.0E+04	4.1E+05	6.0E+04
108883	Toluene		NC	2.0E+05	5.3E+04	4.0E+05	1.1E+05	5.7E+05	1.5E+05	1.0E+06	2.7E+05	2.0E+06	5.3E+05
156605	trans-1,2-Dichloroethylene	X	NC	3.5E+04	8.8E+03	7.0E+04	1.8E+04	1.0E+05	2.5E+04	1.8E+05	4.4E+04	3.5E+05	8.8E+04
76131	1,1,2-Trichloro-1,2,2-trifluoroethane		NC	1.5E+07	2.0E+06	3.0E+07	3.9E+06	4.3E+07	5.6E+06	7.5E+07	9.8E+06	1.5E+08	2.0E+07
120821	1,2,4-Trichlorobenzene		NC	1.0E+05	1.3E+04	2.0E+05	2.7E+04	2.9E+05	3.8E+04	5.0E+05	6.7E+04	1.0E+06	1.3E+05
79005	1,1,2-Trichloroethane		C	7.8E+03	1.4E+03	1.5E+04	2.8E+03	2.2E+04	4.0E+03	3.8E+04	7.0E+03	7.8E+04	1.4E+04
71556	1,1,1-Trichloroethane		NC	1.1E+06	2.0E+05	2.2E+06	4.0E+05	3.1E+06	5.8E+05	5.5E+06	1.0E+06	1.1E+07	2.0E+06
79016	Trichloroethylene ††	X	C	1.1E+03	2.1E+02	2.2E+03	4.1E+02	3.2E+03	5.9E+02	5.5E+03	1.0E+03	1.1E+04	2.1E+03
75694	Trichlorofluoromethane		NC	3.5E+05	6.2E+04	7.0E+05	1.2E+05	1.0E+06	1.8E+05	1.8E+06	3.1E+05	3.5E+06	6.2E+05
96184	1,2,3-Trichloropropane		NC	2.5E+03	4.1E+02	4.9E+03	8.1E+02	7.0E+03	1.2E+03	1.2E+04	2.0E+03	2.5E+04	4.1E+03
95636	1,2,4-Trimethylbenzene		NC	3.0E+03	6.1E+02	6.0E+03	1.2E+03	8.5E+03	1.7E+03	1.5E+04	3.0E+03	3.0E+04	6.1E+03
108678	1,3,5-Trimethylbenzene		NC	3.0E+03	6.1E+02	6.0E+03	1.2E+03	8.5E+03	1.7E+03	1.5E+04	3.0E+03	3.0E+04	6.1E+03
108054	Vinyl acetate		NC	1.0E+05	2.8E+04	2.0E+05	5.7E+04	2.9E+05	8.1E+04	5.0E+05	1.4E+05	1.0E+06	2.8E+05
75014	Vinyl chloride (chloroethene)		C	1.4E+04	5.4E+03	2.8E+04	1.1E+04	4.0E+04	1.5E+04	6.9E+04	2.7E+04	1.4E+05	5.4E+04

* Health-based target breathing concentration exceeds maximum possible chemical vapor concentration (pathway incomplete)
** Target soil gas concentration exceeds maximum possible vapor concentration at this soil gas to indoor air attenuation factor (pathway incomplete)
†† The target concentration for trichloroethylene is based on the upper bound cancer slope factor identified in EPA's draft risk assessment for trichloroethylene (US EPA, 2001). The slope factor is based on state-of-the-art methodology, however the TCE assessment is still undergoing review. As a result, the slope factor and the target concentration values for TCE may be revised further. (See Appendix D.)

Table 12
NYSDEC Recommended Soil Cleanup Levels[1]
for Contaminants of Concern
Related to the MacKenzie Chemical Works Site

Contaminant of Concern	Recommended Soil Cleanup Level (µg/kg)
VOCs	
1,2,3-Trichloropropane	400
SVOCs	
Benzo(a)anthracene	224 or MDL
Benzo(b)fluoranthene	224 or MDL
Benzo(k)fluoranthene	224 or MDL
Benzo(a)pyrene	61 or MDL
Indeno(1,2,3-cd)pyrene	3,200
Dibenzo(a,h)anthracene	14 or MDL
N-nitrosodiphenylamine	--------

(1) NYSDEC Recommended Soil Cleanup Objectives and Cleanup Levels Division of Hazardous Waste Remediation - Technical and Adminstrative Guidance Memorandum (NYSDEC TAGM No. 92-4046, revised 4/95).

TABLE 13

Chemical-Specific ARARs/TBCs for Groundwater Cleanup Criteria [1]
for Contaminants of Concern
Related to the MacKenzie Chemical Works Site

Contaminant of Concern	Federal Drinking Water (MCLs) Standards	Class GA Groundwater Quality Standards [2]	NYS Drinking Water (MCLs) Standards [3]	Groundwater Cleanup Criteria
Chloroform	--------	7	80[4]	7
1,2,3-Trichloropropane	--------	0.04	5	0.04
1,2-Dichloropropane	5	1	5	1
Trichloroethene	5	5	5	5
Benzene	5	1	5	1
1,4-Dichlorobenzene	75	5	5	5
bis(2-ethylhexyl)phthalate	--------	5	6	5
Aluminum	--------	100	--------	100
Antimony	6	3	6	3
Arsenic	50	25	50	25
Cadmium	5	5	5	5
Chromium	100	50	100	50
Iron	--------	300*	300*	300*
Manganese	--------	300*	300*	300*

(1) Units are in micrograms per liter (µg/l)
(2) 6 NYCRR 703.5
(3) 10 NYCRR 5-1.52.
(4) The sum of trihalomethanes is not to exceed 80 µg/l.
(*) The sum of these substances is not to exceed 500 µg/l.

Table 14
Order of Magnitude Cost Estimate
Soil Alternative 4 - Thermally Enhanced Soil Vapor Extraction
MacKenzie Chemical Site
Central Islip, Suffolk County, New York

I. Capital Costs	Unit Cost		Quantity	Cost
Pilot Test				
Workplan, HASP	$ 5,000	ea.	1	$ 5,000
Wells	$ 3,000	ea.	5	$ 15,000
Portable Steam Generator, GAC	$ 5,000	ea.	1	$ 5,000
Field Testing	$ 8,000	ea.	1	$ 8,000
Air Monitoring & Analysis	$ 5,000	ea.	1	$ 5,000
				$ 38,000
Extraction				
Extraction Wells	$ 3,000	ea.	8	$ 24,000
Trenching	$ 20	/LF	400 LF	$ 8,000
Piping	$ 10	/LF	600 LF	$ 6,000
Vaults	$ 2,000	ea.	7	$ 14,000
				$ 52,000
Treatment System				
Treatment Building & Slab	$ 25,000	ea.	1	$ 25,000
Process Equipment	$ 35,000	ea.	1	$ 35,000
Vapor Phase Carbon	$ 10,000	ea.	2	$ 20,000
Power Source	$ 15,000	ea.	1	$ 15,000
Process Piping & Valves	$ 10,000	ea.	1	$ 10,000
System Control	$ 20,000	ea.	1	$ 20,000
Air Cooler	$ 20,000	ea.	1	$ 20,000
Electrical	$ 8,000	ea.	1	$ 8,000
				$ 153,000
Thermal Enhancement System				
Wells	$ 6,000	ea.	16	$ 96,000
Trenching	$ 40	/LF	400 LF	$ 16,000
Piping (Steam)	$ 30	/LF	600 LF	$ 18,000
Water Supply	$ 20	/LF	300 LF	$ 6,000
Steam Boiler including Manifolds	$ 25,000	ea.	1 unit	$ 25,000
Heat Exchanger	$ 7,000	ea.	1 unit	$ 7,000
				$ 168,000
Excavation and Disposal				
Soil Excavation	$ 1,500	/day	7 days	$ 10,500
Drainage Structure Excavation	$ 1,500	/day	25 days	$ 37,500
Backfilling and Grading	$ 30	/ cy	100 cy	$ 3,000
Disposal (non-Haz., 55 cy)	$ 70	/cy	220 tons	$ 15,400
				$ 66,400
Building Demolition				
Building Demolition	$ 1,500	/day	27 days	$ 40,500
Confirmation Sampling				
Soil Sampling	$ 4,000	/event	2 events	$ 8,000
			Subtotal for SVE System Capital	$ 525,900
			Admin./Constr. Mgmt. (20%):	$ 105,180
			Engineering (10%):	$ 52,590
			Contingency (20%):	$ 105,180
			Subtotal Estimated Capital Cost :	**$ 788,850**

II. Annual Operating Costs	Unit Cost		Quantity	Cost
a. General O & M	$ 2,000	/month	12 months/yr	$ 24,000
b. Electricity ($0.15 KW HR)	$ 4,500	/month	12 months/yr	$ 54,000
c. GAC Replacement	$ 800	/month	12 months/yr	$ 9,600
d. Air Monitoring	$ 900	/month	12 months/yr	$ 10,800
	Subtotal Estimated Annual Operating Cost:			**$ 98,400**

III. Present Worth Capital Costs and Annual Operating Costs	
Total Estimated Capital Cost	$ 788,850
Total Estimated Annual Operating Cost	$ 98,400
Present Worth (5 yrs., 7%)	$ 403,440
Present Worth (Total Capital & Operating)	**$ 1,192,290**

Notes:

1 These Cost Estimates represent our opinion as design professionals of probable order of magnitude construction and operating costs and are provided for general guidance in the evaluation of alternatives. Actual contractor bids or cost to the client are a function of final design, competitive bidding and market conditions.

2 Operating (monitoring) costs are assumed for 5 years.

Table 15
Order of Magnitude Cost Estimate
Groundwater Alternative No. 2 - In-Situ Air Sparge with Ozone Injection
MacKenzie Chemical Site
Central Islip, Suffolk County, New York

I. **Capital & Installation Costs:**	Unit Cost		Quantity	Cost
Brightside Avenue and South Road				
Installation of Wells	$ 6,000	ea.	8 wells	$ 48,000
Installation of Sparge Points	$ 5,000	ea.	6 wells	$ 30,000
Palletized Sparge System (Brightside Ave)	$ 40,100	ea.	1 unit	$ 40,100
Wall Mount Sparge System (South Rd)	$ 16,700	ea.	1 unit	$ 16,700
In-well Unit	$ 2,875	ea.	8 units	$ 23,000
Below Well Unit	$ 575	ea.	8 units	$ 4,600
Spargepoints	$ 500	ea.	6 units	$ 3,000
Oxygen Source with Controller	$ 3,500	ea.	1 unit	$ 3,500
Well Head Assembly	$ 450	ea.	12 units	$ 5,400
Miscellaneous Parts	$ 10,000	ea.	1	$ 10,000
State License and Fees	$ 13,300	ea.	1	$ 13,300
Vapor Control Unit	$ 3,220	ea.	1 unit	$ 3,220
Vaccum Extraction Pump	$ 5,000	ea.	1 unit	$ 5,000
Piping (PVC)	$ 15	LF	300 LF	$ 4,500
Preconstruction Activities	$ 1,500	ea.	1	$ 1,500
Field Testing	$ 15,000	ea.	1 week	$ 15,000
Buildings	$ 15,000	ea.	2 ea.	$ 30,000
Rental of Field Analytical Equipment (startup)	$ 5,000	ea.	1	$ 5,000
Labor and Expense (System Start-up)	$ 15,000	ea.	1	$ 15,000
Electrical	$ 10,000	ea.	1	$ 10,000
				$ 286,820
Subtotal				$ 286,820
Contingency (20%)				$ 57,364
Engineering (15%)				$ 43,023
Admin./Constr. Mgmt. (20%)				$ 57,364
			Subtotal Estimated Capital Cost:	**$ 444,571**

II. **Annual Operating Costs**	Unit Cost		Quantity	Cost
Electricity	$ 400	Month	12 Months	$ 4,800
System Engineer	$ 80	/hr.	150 hours	$ 12,000
System Operator	$ 70	/hr.	400 hours	$ 28,000
Vapor Phase Carbon	$ 500	/drum	4 drums	$ 2,000
Maintenance Materials	$ 10,000	L.S.	1 Units	$ 10,000
System Performance Monitoring	$ 15,000		1 L.S.	$ 15,000
Semi-Annual Groundwater Monitoring	$ 9,000	/event	2 events/yr.	$ 18,000
			Subtotal Estimated Annual Operating Cost:	**$ 89,800**

III. **Present Worth Capital Costs and Annual Operating Costs**	
Total Estimated Capital Cost	$ 444,571
Total Estimated Annual Operating Cost	$ 89,800
Present Worth (15 yrs., 7%)	$ 817,180
Present Worth (Capital & Operating)	**$ 1,261,751**

Operating costs are assumed for 10 years.
NYSDEC may need to acquire land for installation/construction of treatment system.

These Cost Estimates represent our opinion as design professionals of probable order of magnitude construction and operating costs and are provided for general guidance in the evaluation of alternatives. Actual contractor bids or cost to the client are a function of final design, competitive bidding and market conditions.

MACKENZIE CHEMICAL WORKS SITE

ROD APPENDIX III

ADMINISTRATIVE RECORD INDEX

MACKENZIE CHEMICAL WORKS
ADMINISTRATIVE RECORD FILE
INDEX OF DOCUMENTS

1.0 SITE IDENTIFICATION

1.2 Notification/Site Inspection Reports

P. 100001 - 100283 Report: Engineering Investigations at Inactive Hazardous Waste Sites, Phase II Investigation, MacKenzie Chemical, Town of Islip, Suffolk County, Report, prepared for New York State Department of Environmental Conservation, prepared by Lawler, Matusky & Skelly Engineers, April, 1993.

P. 100284 - 100730 Report: Engineering Investigations at Inactive Hazardous Waste Sites, Phase II Investigation, MacKenzie Chemical, Town of Islip, Suffolk County, Supporting Documentation, Volume 1, prepared for New York State Department of Environmental Conservation, prepared by Lawler, Matusky & Skelly Engineers, April, 1993.

P. 100731 - 101031 Report: Hazardous Ranking System Prescore, Site Inspection Narrative Report, MacKenzie Chemical, Town of Islip, Suffolk County, prepared for New York State Department of Environmental Conservation, prepared by Lawler, Matusky & Skelly Engineers, December, 1993.

1.3 Preliminary Assessment Reports

P. 101032 - 101059 Report: Preliminary Assessment, MacKenzie Chemical Works, prepared for U. S. EPA, Region 2, prepared by NUS Corporation, April 22, 1983.

2.0 REMOVAL RESPONSE

2.2 Sampling and Analysis data/Chain of Custody Forms

P. 200001 - 200307 Memorandum to Mr. Mark Granger, Remedial Project Manager, New York Remediation Branch, U. S. EPA, Region 2, from Ms. Diane Salkie, Environmental Scientist, Hazardous Waste Support Branch, U. S. EPA, Region 2, re: Sampling Report for MacKenzie Chemical Site, October 31, 2002. (Attachment: Report: Superfund Contract Support Team, Sampling Report for the MacKenzie Chemical Site in Central Islip, Suffolk County, New York, prepared by Ms. Diane Salkie, Environmental Scientist, U. S. EPA, Region 2, October 28, 2002.)

2.7 Correspondence

P. 200308 - 200346 Memorandum to File from Mr. James S. Haklar, Ph.D., P.E., On-Scene Coordinator, Removal Action Branch, U. S. EPA, Region 2, re: Removal Site Evaluation (RSE) for the MacKenzie Chemical Works, Central Islip, Suffolk County, New York, October 12, 2000.

3.0 REMEDIAL INVESTIGATION

3.4 Remedial Investigation Reports

P. 300001 - 300409 Report: Engineering Investigations at Inactive Hazardous Waste Sites, Remedial Investigation/ Feasibility Study, MacKenzie Chemical Site, Town of Islip, New York, prepared for New York State Department of Environmental Conservation, Division of Environmental Remediation, Bureau of Eastern Remedial Action, prepared by H2M Group and Lawler, Matusky & Skelly Engineers, LLP, August 2000.

MACKENZIE CHEMICAL WORKS SITE

ROD APPENDIX IV

STATE LETTER OF CONCURRENCE

New York State Department of Environmental Conservation
Division of Environmental Remediation, 12th Floor
625 Broadway, Albany, New York 12233-7011
Phone: (518) 402-9706 • FAX: (518) 402-9020
Website: www.dec.state.ny.us

Erin M. Crotty
Commissioner

MAR 2 6 2003

Mr. George Pavlou
Director
Emergency & Remedial Response Division
U. S. Environmental Protection Agency
Region II
290 Broadway
New York, New York 10007-1866

Dear Mr. Pavlou:

Re: Record of Decision (ROD)
Mackenzie Chemical, Suffolk County
Site No. 152017

The New York State Department of Environmental Conservation (NYSDEC), in conjunction with the New York State Department of Health (NYSDOH) has reviewed the Record of Decision (ROD) for the Mackenzie Chemical site and finds it acceptable. The following are the key components of the remedy:

Site Soils:

In order to treat the contaminant of concern 1,2,3-trichloropropane (1,2,3-TCP), the selected soil treatment consists of soil vapor extraction (SVE) with thermal enhancement. A pilot test will be performed to determine the effectiveness of this soil treatment. Off-gases from the SVE system would be treated with vapor phase granular activated carbon (GAC) to meet NYSDEC Air Guide 1 discharge requirements.

Should the findings of the pilot test indicate that thermally enhanced SVE would not be successful in addressing the contaminated soils, then the soils would be excavated and disposed off-site. Potential excavation activities would be focused on the western portion of the property in an area where significant concentrations of 1,2,3-TCP were found. This area has an overall areal extent of approximately 3,000 square feet. There are four other isolated areas within the property where 1,2,3-TCP exceeded the soil cleanup criteria. These areas total 1,300 square feet.

The goal of soil remedy would be to achieve the soil cleanup objective (400 ug/kg) for 1,2,3-TCP.

Groundwater:

In order to treat the contaminant of concern (1,2,3-TCP) in the groundwater, the selected groundwater treatment will consist of in-situ air sparging with ozone injection. A pilot test will be performed to determine the effectiveness of this groundwater treatment.

If after a thorough pilot test, the in-situ air sparging with ozone injection is determined not to be effective, then a permeable reactive barrier would become the preferred groundwater treatment.

The goal of groundwater treatment will be to achieve the groundwater standard for 1,2,3-TCP.

If you have any questions or comments on this matter, please contact Mr. Chittibabu Vasudevan at (518) 402-9625.

Sincerely,

Dale A. Desnoyers
Director
Division of Environmental Remediation

cc: J. Peck
R. Fedigan, NYSDOH
B. Mitchell, NYSDOH
I. Ushe, NYSDOH
S. Robbins, SCDHS

MACKENZIE CHEMICAL WORKS SITE

ROD APPENDIX V

RESPONSIVENESS SUMMARY

RESPONSIVENESS SUMMARY
FOR THE
MACKENZIE CHEMICAL WORKS SUPERFUND SITE
CENTRAL ISLIP, SUFFOLK COUNTY, NEW YORK

INTRODUCTION

This Responsiveness Summary provides a summary of citizens' comments and concerns received during the public comment period related to the MacKenzie Chemical Works site (Site) remedial investigation and feasibility study (RI/FS), RI/FS Addendum, and the Proposed Plan, and provides the responses of the U.S. Environmental Protection Agency (EPA) to those comments and concerns. All comments summarized in this document have been considered in EPA's final decision in the selection of a remedy to address the contamination at the Site.

SUMMARY OF COMMUNITY RELATIONS ACTIVITIES

The RI/FS and RI/FS Addendum describe the nature and extent of the contamination at and emanating from the Site and evaluate remedial alternatives to address this contamination. The Proposed Plan identified EPA and the New York State Department of Environmental Conservation's (NYSDEC's) preferred remedy and the basis for that preference. These documents were made available to the public in both the Administrative Record and information repositories maintained at the EPA Docket Room in the Region II New York City office and at the Central Islip Public Library located at 33 Hawthorne Avenue, Central Islip, New York. A notice of the commencement of the public comment period, the public meeting date, the preferred remedy, contact information, and the availability of above-referenced documents was published in the *Islip Bulletin* on January 23, 2003. The public comment period opened on January 23, 2003. Due to inclement weather, EPA postponed the February 18, 2003 public meeting to present the findings of the RI/FS and to answer questions from the public about the Site and the remedial alternatives under consideration. The meeting was rescheduled and held on March 3, 2003, at 7:00 p.m. at the Central Islip Public Library. In addition, the closure of the public comment period was extended from February 21, 2003 to March 6, 2003. A second notice identifying the new public meeting date and the extension of the public comment period was published in the *Islip Bulletin* on February 27, 2003. Approximately 25 people, including residents, local business people, representatives of civic groups, and state and local government officials, attended the public meeting.

OVERVIEW

The public, generally, supports the preferred remedy, which includes:

- treatment of contaminated source area soils using thermally enhanced in-situ soil vapor extraction (ISVE) in combination with limited excavation and off-Site treatment/disposal of contaminated soils and certain piping and structures; and

- treatment of the contaminated groundwater using air sparging with ozone injection.

The effectiveness of thermally-enhanced ISVE will be confirmed based upon the results of treatability studies conducted during the design phase. Should the findings of these treatability studies indicate that thermally-enhanced ISVE would not be sufficiently effective in addressing the contaminated soils at the property, then the soils will be excavated and treated/disposed off-Site.

The effectiveness of air sparging with ozone injection will be confirmed based upon the results of bench- and pilot-scale treatability studies conducted during the design phase. Should the findings of the treatability studies indicate that this technology will not be sufficiently effective in addressing the contaminated groundwater at the Site, or if its implementation proves to be logistically impracticable, then the groundwater will be treated with a permeable reactive barrier.

SUMMARY OF COMMENTS AND RESPONSES

A summary of the comments provided at the public meeting and in writing, as well as EPA's responses to them, are provided below. The comments and responses have been organized into the following topics:

- Current Site Conditions
- Groundwater Plume
- Water Supply
- Soil-Vapor Intrusion Monitoring
- Public Awareness
- Residents' Health Problems
- Emergency Situations
- Remediation Costs
- Remediation Equipment
- Remedy Implementation

Current Site Conditions

Comment #1: A commenter expressed concern about the current occupant's piles of construction and demolition debris on the property. The commenter also asked whether the occupant is exacerbating the soil contamination problem on the property by its frequent moving of piles of dirt and cement around the property.

Response #1: Since EPA will need to access the areas under the debris to conduct design-related sampling and to implement the remedy, EPA has discussed the removal of the debris on the property with the current occupant. The occupant has committed to removing substantial portions of the debris this spring.

The surface soils are not significantly contaminated; the majority of the contaminated soils on the property are located at least four feet beneath the surface. Therefore, the occupant's dirt and cement moving activities, which would only impact surface soils, will not likely exacerbate the soil contamination problem.

Groundwater Plume

Comment #2: A commenter asked what the size of the groundwater contaminant plume is and whether it will continue to grow.

Response #2: Based upon the sampling results, it has been determined that a groundwater plume, approximately 1,500-foot long, 300-foot wide, and 140-foot deep, contaminated with volatile organic compounds (VOCs) extends in a southeasterly direction from the western portion of the property. Concentrations of 1,2,3-trichloropropane (1,2,3-TCP), the primary contaminant, tend to be significantly lower downgradient from South Road (approximately 800 feet from the property) than under the property. Further, based upon sample results of several years, it appears that the groundwater contaminant plume is no longer expanding.

Water Supply

Comment #3: A commenter asked whether any private or public water supply wells in the area are threatened by the groundwater contamination.

Response #3: Potable water for the property and downgradient areas is obtained from public-supply sources. The only known private well near or downgradient of the Site is located on a residential property that is located parallel to the groundwater contaminant plume (hydrologically sidegradient). Sampling of this well has shown that it is not impacted by Site-related contaminants. The nearest municipal drinking water supply well is not impacted by the plume. It is located approximately 3,500 feet southeast of the property (well beyond the contaminant plume) and is screened (draws in water from the aquifer) significantly below the depth of the plume.

Soil-Vapor Intrusion Monitoring

Comment #4: Several commenters expressed concern about soil-vapor intrusion into residences.

Response #4: As part of the RI, soil gas samples were analyzed for VOCs in order to evaluate the potential for subsurface gas migration. Samples were collected from twelve off-property locations. Based upon the sample results and a risk evaluation, it was determined that soil vapors do not pose a risk to off-property residents. However, because of the concerns that have been expressed, in the near future, EPA will conduct vapor intrusion monitoring in homes where it is requested.

Public Awareness

Comment #5: A commenter expressed concern that there may be illegal wells in the neighborhood, suggesting that EPA conduct a public-information mailing to all homeowners and tenants in the area cautioning them not to use well water. The commenter also suggested that area residents be cautioned about undertaking excavation work in the area (*e.g.*, cesspool work, excavations for swimming pools, foundations) because of the potential to come into contact with contaminated groundwater or exposure to vapors.

Response #5: Recognizing the possibility that there could be illegal wells and the fact that utilization of the contaminated groundwater would pose an unacceptable risk to human health, EPA will issue an informational mailing cautioning the public not to use well water in the area.

Since the depth to the surface of the groundwater is approximately 50 feet below ground surface, it is unlikely that excavation work in areas overlying the groundwater plume would pose a threat to public health. As was noted in Response #4, above, soil vapors do not pose a risk in off-property areas.

Residents' Health Problems

Comment #6: Several commenters expressed concern that the health problems of several residents located in the area might be attributable to Site-related contaminants.

Response #6: No current exposures to Site-related contaminants have been identified either on- or off-property. Therefore, no health effects from such exposures would be expected. Because data on possible historical exposures are not available, past exposures, if any, cannot be evaluated. Individuals with questions about possible exposures to Site-related contaminants may contact Ian Ushe, project manager for the New York State Department of Health, at (800) 458-1158, extension 27880.

Emergency Situations

Comment #7: A commenter asked whether special precautions would need to be taken by emergency workers in the event of an on-property fire or explosion.

Response #7: Since the on-property buildings and surface soils are not contaminated, no precautions other than those that are typically employed by emergency workers would be necessary.

Remediation Costs

Comment #8: A commenter asked who will pay for the cleanup of the Site.

Response #8: EPA has identified four potentially responsible parties (PRPs) for the Site, but has not been able to determine their financial viability. If any or all of the PRPs are determined to be financially viable, after a remedy is selected for the Site, such parties will be offered the opportunity to either fund or conduct the necessary design and construction work. If the PRPs are unable or unwilling to perform the necessary work, EPA would opt to use federal monies available under the Superfund statute for the remedial work, and pursue recovery of those monies from the PRPs as allowed under the Superfund law.

Remediation Equipment

Comment #9: A commenter asked whether the proposed on- and off-property remediation equipment will be noisy. Another commenter asked whether the off-property components of the remedy will adversely affect residents.

Response #9: The on- and off-property treatment units will generate some noise. On-property noise from the soils and groundwater treatment systems can be controlled by placing the treatment units inside buildings or applying other engineered solutions to reduce or minimize noise. For the off-property groundwater treatment system, it is not anticipated that the ozone generator will produce significant noise. However, should noise be a problem, mitigating measures (such as muffling or baffling) can be used.

All off-property air sparging wells and piping are expected to be installed in road rights-of-way to minimize the impacts on area residents.

Comment #10: A commenter asked about the method of treating the vapors that would be generated by the low temperature thermal desorption (LTTD) unit[1] and those that would be collected by the ISVE system[2].

Response #10: For the LTTD unit (which is not the selected remedy for the Site), the organic vapors that would be extracted from the soil would be either condensed, transferred to another medium (such as granular activated carbon), or thermally treated in an afterburner operated to ensure complete destruction of the VOCs. The off-gases would be filtered through a carbon vessel. The organic vapors extracted by the ISVE system (the selected remedy) would be fully treated by granular activated carbon and/or other appropriate technologies.

Remedy Implementation

Comment #11: A commenter asked when the implementation of the remedy will commence and how long will it take.

Response #11: If financially viable PRPs are identified and they indicate a willingness to undertake the necessary work, it is anticipated that it would require a number of months to negotiate an agreement with these parties. If the PRPs are unable or unwilling to perform the necessary work, then EPA would use the Superfund to finance the effort. The design would commence following the execution of an agreement or the funding of the work. It is estimated that the design of the soils and groundwater remediation systems (which includes sampling and treatability studies) would take a year to complete. Based upon these time frames, it is estimated that construction might start in Spring 2005.

It is estimated that it would require three months to install the ISVE system and five years to achieve soil cleanup levels. It is further estimated that the groundwater remediation system would be constructed in four months and would require fifteen years to remediate the contaminated groundwater. The actual time for the groundwater to be remediated, however, would need to be refined based on the results of groundwater monitoring and, as appropriate, groundwater modeling.

Attached to this Responsiveness Summary are the following Appendices:

Appendix V-a Proposed Plan (January 2003)

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[1] The LTTD unit is part of Alternative S-3 (excavation of contaminated soils, on-property treatment via low temperature thermal desorption, and redeposition).

[2] The ISVE system is part of Alternative S-4 (treatment of VOC-contaminated soils using thermally-enhanced ISVE).

Appendix V-b	Public Notices published in the *Islip Bulletin* on January 23, 2003 and February 27, 2003
Appendix V-c	March 3, 2003 Public Meeting Sign-In Sheet
Appendix V-d	March 3, 2003 Public Meeting Transcript
Appendix V-e	Letter submitted during the public comment period

RESPONSIVENESS SUMMARY

APPENDIX V-a

PROPOSED PLAN (JANUARY 2003)

MacKenzie Chemical Works Site

Town of Islip, New York

EPA

Region 2

January 2003

PURPOSE OF PROPOSED PLAN

This Proposed Plan describes the remedial alternatives considered for the contaminated soil and groundwater at the MacKenzie Chemical Works Superfund site, and identifies the preferred remedy with the rationale for this preference. The Proposed Plan was developed by the U.S. Environmental Protection Agency (EPA) in consultation with the New York State Department of Environmental Conservation (NYSDEC). EPA is issuing this Proposed Plan as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended, and Sections 300.430(f) and 300.435(c) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The alternatives summarized here are described in the August 2000 Remedial Investigation/Feasibility Study (RI/FS)[1] Report and the January 2003 RI/FS Report Addendum. EPA and the NYSDEC encourage the public to review these documents to gain a more comprehensive understanding of the site and Superfund activities that have been conducted at the site.

This Proposed Plan is being provided as a supplement to the RI/FS report and the RI/FS report addendum to inform the public of EPA's and NYSDEC's preferred remedy and to solicit public comments pertaining to all of the remedial alternatives evaluated, including the preferred soil and groundwater alternatives. EPA's preferred soil remedy consists of thermally-enhanced in-situ soil vapor extraction (ISVE)[2] for soils contaminated with volatile organic compounds (VOCs) and some limited excavation and off-site disposal for soils contaminated with semi-volatile organic compounds (SVOCs). EPA's preferred groundwater remedy involves treatment using in-situ air sparging with ozone injection[3].

Should the findings of design-phase studies indicate that thermally-enhanced ISVE would not be sufficiently effective in addressing the soils contaminated with volatile organics, then these soils would also be excavated and treated/disposed off-site. Similarly, should design-phase studies conclude that in-situ air sparging with ozone injection would not adequately address the contaminated groundwater, or if its implementation proves logistically impracticable, then the groundwater would be treated with a permeable reactive barrier[4].

The remedy described in this Proposed Plan is the preferred remedy for the site. Changes to the preferred remedy, or a change from the preferred remedy to another remedy, may be made if public comments or additional data indicate that such a change will result in a more appropriate remedial action. The final decision regarding the selected remedy will be made after EPA has taken into consideration all public comments. EPA is soliciting public comment on all of the alternatives considered in the Proposed Plan and in the detailed analysis sections of the RI/FS report and RI/FS report addendum because EPA and NYSDEC may select a remedy other than the preferred remedy.

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1 An RI/FS determines the nature and extent of the contamination at and emanating from a site and identifies and evaluates remedial alternatives.

2 Thermally-enhanced ISVE involves drawing heated air through a series of wells to volatilize the solvents in the soils. The extracted vapors are then treated.

3 In-situ air sparging with ozone injection involves injecting a mixture of air and ozone under pressure into the groundwater via wells to strip and treat the contaminants .

4 A permeable reactive barrier is a subsurface structure which allows groundwater to naturally flow through a permeable media which is capable of removing contaminants from the groundwater.

MARK YOUR CALENDAR

January 23, 2003 - February 21, 2003: Public comment period on the Proposed Plan.

February 18, 2003 at 7:00 p.m.: Public meeting at the Central Islip Public Library, 33 Hawthorne Avenue, Central Islip, New York 11722, (631) 234-9333.

COMMUNITY ROLE IN SELECTION PROCESS

EPA and NYSDEC rely on public input to ensure that the concerns of the community are considered in selecting an effective remedy for each Superfund site. To this end, the RI/FS report, RI/FS report addendum, and this Proposed Plan have been made available to the public for a public comment period which begins on January 23, 2003 and concludes on February 21, 2003.

A public meeting will be held during the public comment period at the Central Islip Public Library on February 18, 2003 at 7:00 p.m. to present the conclusions of the RI/FS, to elaborate further on the reasons for recommending the preferred remedy, and to receive public comments.

Comments received at the public meeting, as well as written comments, will be documented in the Responsiveness Summary Section of the Record of Decision (ROD), the document which formalizes the selection of the remedy.

Copies of the Proposed Plan and supporting documentation are available at the following information repositories:

Central Islip Public Library
33 Hawthorne Avenue
Central Islip, New York 11722
(631) 234-9333

Contact: Ms. Anne Pavlak, Director

Hours: Monday - Friday, 10:00-9:00
Saturday, 10:00-5:00
Sunday, 1:00-5:00

USEPA-Region II
Superfund Records Center
290 Broadway, 18th Floor
New York, New York 10007-1866
(212) 637-4308

Hours: Monday-Friday, 9:00-5:00

Written comments on this Proposed Plan should be addressed to:

Mark Granger, Project Manager
Central New York Remediation Section
U.S. Environmental Protection Agency
290 Broadway, 20th Floor
New York, New York 10007-1866
Telephone: (212) 637-3351
Telefax: (212) 637-4284
Internet: granger.mark@epa.gov

SCOPE AND ROLE OF ACTION

The primary objectives of this action are to remediate the source of contamination at the site, to reduce and minimize the downward migration of contaminants to the aquifer, and to minimize any potential future health and environmental impacts.

SITE BACKGROUND

Site Description

The site includes a parcel of property located at One Cordello Avenue, Central Islip, Suffolk County, New York in a residential/light commercial area. (See Figure 1 for a site location map.) The property, which contains three one-story block buildings (a former manufacturing building and two warehouses) and a two-story (structurally-unsound) block building (a former laboratory) encompasses approximately 1.4 acres and is currently occupied by a paving and excavation firm. The property is bounded to the north by the Long Island Rail Road and commercial properties, to the east by a residential property and an abandoned parking lot, to the south by Railroad Avenue and residential properties, and to the west by Cordello Avenue and vacant land. (See Figure 2 for a property layout map.)

The local topography surrounding the site consists of relatively flat terrain with a very slight southerly downward slope (*i.e.*, a difference in elevation of approximately seventy feet over several miles). The Long Island Rail Road tracks immediately to the north produce a berm approximately two feet above the general ground surface of the property. The eastern half of the property is currently used for storage of construction materials, such as sand and fill. As these materials are stored on the property on a temporary basis, surface features of this nature change regularly. Subsurface features include two former concrete-lined waste lagoons backfilled with clean soils, at least one cesspool, and at least nine storm-water drywells.

The property, which has been used for industrial/commercial purposes since 1948, is presently zoned industrial; according to the Town of Islip Department of Planning and Development, it is not anticipated that the land use will change in the future.

Site Geology/Hydrogeology

The depth to groundwater is approximately fifty feet below ground surface (bgs). The only known private well near or downgradient of the property is located on a residential property that is hydrologically sidegradient. Sampling of this well has shown that it is not impacted by-related contaminants. The nearest municipal drinking water supply well is located approximately 3,500 feet southeast of the property (well beyond the contaminant plume) and is screened at a depth of 710 feet bgs.

There are three primary water-bearing aquifers underlying Suffolk County, comprising a federally-designated sole source of drinking water for Long Island. Therefore, groundwater in the vicinity of the site is a potential source of drinking water. Surficial geology is comprised of one to two feet of topsoil/fill underlain by the sand and gravel of the upper geologic unit. Typically, fill materials are encountered to a maximum depth of two feet bgs. Local groundwater flow at the site moves south to southeast. No surface water bodies exist at or near the site. There are no streams or stream-cut channels at or near the property. The nearest surface water bodies are Champlin Creek, which is located over a mile south of the property and the Connetquot River, which is located approximately two miles east of the property.

Property History

The property was used from approximately 1948 to 1987 for the manufacture of various chemical products by MacKenzie Chemical Works, Inc. (MCW), including fuel additives and metal acetylacetonates. Over the years of operation, the Suffolk County Department of Health Services (SCDHS)

and the Suffolk County Fire Department documented poor housekeeping and operational procedures. According to SCDHS, MCW stored 1,2,3-trichloropropane (1,2,3-TCP) in three 10,000-gallon tanks on the property. Other potential historical waste sources include other storage tanks[5], leaking drums, two waste lagoons, a cesspool, and storm-water drywells. Spills, explosions, and fires have occurred at the facility, including a methyl ethyl ketone (MEK) spill in 1977, a nitrous oxide release in 1978, and an MEK fire in 1979. SCDHS fined MCW for the nitrous oxide release and ordered it to perform a general property cleanup, including the excavation and drumming of stained surface soils. This effort was completed in 1979.

An assessment was conducted in 1983 by EPA, which recommended that action be taken at the property. Subsequently, MCW arranged for the disposal of thirty-three drums of stained surface soils (from the 1979 cleanup effort) and twenty-two drums of liquid wastes. MCW operations at the property ceased in 1987. In 1993, SCDHS installed nine downgradient temporary well points in order to assess the horizontal and vertical extent of groundwater contamination. The results of the SCDHS effort indicated the presence of elevated levels of 1,2,3-TCP, tetrachloroethylene (PCE), and trichloroethylene (TCE) in downgradient groundwater. In 1993, NYSDEC completed an investigation of the property. The results of the NYSDEC effort indicated the presence of elevated levels of 1,2,3-TCP, PCE, and TCE in on-property soils and on-property groundwater. Metals and SVOCs were detected in on-property soils. In January 1998, NYSDEC commenced an RI/FS to determine the nature and extent of contamination at and emanating from the property and to identify and evaluate remedial alternatives. During this investigation, NYSDEC emptied the two concrete-lined and intact waste lagoons of all soil and sludge materials and backfilled them with clean soils. The excavated material was disposed of at an appropriate waste-receiving facility. In June 1999, based on the preliminary findings of the RI, NYSDEC requested that EPA take a response action at the property. In response to NYSDEC's request, EPA collected groundwater samples from off-property monitoring wells, two municipal supply wells, and one private well in April 2000. Based upon the results of this investigation, EPA concluded that immediate actions were not required, but that remedial actions should be considered to address potential long-term threats. NYSDEC completed the RI/FS in August 2000.

The property was proposed for inclusion on the National Priorities List (NPL) in June 2001; it was listed on the NPL in September 2001.

Because a number of subsequent occupants have completely reworked the surface of the property several times since MCW's operations ceased, EPA undertook sampling in July 2002 in order to assess current conditions related to on-property surface soil. Based in part upon these sample results, an RI/FS report addendum was completed by EPA in January 2003.

A search for potential responsible parties (PRPs) is ongoing.

RESULTS OF THE REMEDIAL INVESTIGATION

The results of the RI are summarized below.

Groundwater

Groundwater samples were collected from four on-property monitoring wells, eleven temporary vertical profile wells, four temporary wells, eight downgradient monitoring wells, and two upgradient background monitoring wells. The samples were analyzed for VOCs, SVOCs, pesticides/PCBs, and metals.

The primary VOC of concern in the groundwater beneath and downgradient of the property is 1,2,3-TCP. 1,2,3-TCP was detected in two on-property monitoring wells at concentrations of 40 micrograms per liter (µg/l) and 250 µg/l. Downgradient groundwater detections for 1,2,3-TCP included a concentration as high as 34,000 µg/l in a shallow (sixty feet bgs) temporary well point located approximately one- hundred feet downgradient of the property and 9,300 µg/l in an intermediate (eighty feet bgs) temporary well point located five-hundred feet downgradient. Much lower concentrations of 1,2,3-TCP (220 µg/l) were found in a deep (140 feet bgs) monitoring well located approximately fifteen hundred feet downgradient from the source area. No contamination was detected in the most recent sample collected from this well. (Figure 3 delineates the 1,2,3-TCP plume.)

PCE was detected in three on-property monitoring wells at concentrations ranging from 13 to 54 µg/l. PCE was detected at 5,600 µg/l in a shallow (sixty feet bgs) downgradient temporary well point; PCE was not detected in deeper samples at this location or in any of the sampling points located downgradient. Additionally, low concentrations of TCE were detected in some groundwater samples.

For SVOCs, bis-(2-ethylhexyl)phthalate and 2-nitroanaline were detected at 35 µg/l and 14 µg/l, respectively, in on-property monitoring wells. Bis-(2-ethylhexyl)phthalate was detected at 40 µg/l in a downgradient monitoring well.

For metals, manganese was detected in three on-property monitoring wells at concentrations ranging from 388 µg/l to 5,110 µg/l. Arsenic, cadmium, and lead were detected at 30 µg/l, 19 µg/l, and 74 µg/l, respectively.

Based upon the sampling results, it has been determined that an approximately 1,500-foot long, 300-foot wide, and 140-foot deep groundwater VOC plume extends in a southeasterly direction from the western portion of the property. Concentrations of 1,2,3-TCP tend to be significantly lower downgradient from South Road

[5] All tanks associated with MCW operations were decommisioned. Most were scrapped in the 1990s.

(approximately eight-hundred feet from the property). Further, although 1,2,3-TCP is resistant to biological and chemical degradation, it appears that the groundwater contaminant plume is no longer expanding.

Subsurface Soil

Subsurface soil sampling locations were selected on the basis of soil-gas sampling results and by screening the sampling results of numerous shallow soil borings using a mobile laboratory. In addition, all nine on-property storm-water drywells were sampled. (Figure 4 shows subsurface soil sampling locations and sampling results for 1,2,3-TCP.)

Significant concentrations of 1,2,3-TCP were detected in the unsaturated (above the water table), subsurface soils at five of the eighteen on-property soil-boring locations; the maximum concentration detected was 680 milligrams per kilogram (mg/kg). The 1,2,3-TCP-contaminated soils are located predominantly immediately east of the laboratory building, to a maximum depth of approximately forty feet. 1,2,3-TCP was also detected southeast of the laboratory building and east of the warehouse buildings. PCE was detected at 2.3 mg/kg toward the north of the warehouse buildings. Several other VOCs, including TCE, were detected in subsurface soils, generally at low concentrations.

Soil borings were collected from the nine on-property storm-water drywells. 1,2,3-TCP was detected in a number of the drywells that were located east of the laboratory building, with the highest concentration being 87 mg/kg. The SVOCs benzo(b)fluoranthene (28 mg/kg), benzo(a)pyrene (23 mg/kg), benzo(a)anthracene (17 mg/kg), and benzo(k)fluoranthene (11 mg/kg) were detected in a drywell located east of the warehouse buildings.

Mercury at 1 mg/kg was detected in a subsurface soil sample collected southeast of the warehouse buildings. Zinc at 224 mg/kg was detected in a soil sample collected from east of the warehouse buildings.

A sample from the bottom of a manhole located at the entrance to 1 Cordello Drive had arsenic at 2,180 mg/kg and zinc at 67 mg/kg.

Surface Soil

Twenty on-property surface soil samples were collected from ten locations. Because a number of subsequent occupants have completely reworked the surface of the property several times since MCW's operations ceased, surface soil sampling locations were randomly selected to assess current property conditions. SVOCs were detected in all sample locations. The detected compounds and their maximum concentrations included benzo(a)pyrene (8 mg/kg), dibenzo(a,h)anthracene (1.5 mg/kg), and benzo(a)anthracene (10 mg/kg). It is likely that the nature of several businesses that have occupied the property since MCW ceased operations have contributed to SVOC contamination of surface soils.

Aqueous Samples

An aqueous sample collected from an excavated subsurface drain pipe had a 1,2,3-TCP concentration of 11,000,000 µg/l.

Soil Gas

Soil gas samples were analyzed for VOCs in order to evaluate the potential for subsurface gas migration. Samples were collected from four on-property locations southeast of the laboratory building and at twelve downgradient locations immediately to the south of this area (*i.e.*, in the direction of groundwater flow and toward the residential area). Samples were collected from five feet, ten feet, and fifteen feet bgs at each of the locations. In general, the concentrations of VOCs in soil gas tended to increase with depth.

The VOCs 1,2,3-TCP, PCE, and TCE were found at elevated concentrations throughout the soil column in each of the four on-property locations. Most notably, the maximum concentration of 1,2,3-TCP was 2,200 micrograms per cubic meter (µg/m^3). PCE was detected up to a concentration of 600 µg/m^3 and TCE was detected up to a concentration of 300 µg/m^3. The high soil gas concentrations were generally associated with soil source areas.

1,2,3-TCP was not found in any of the twelve off-property locations. PCE levels were approximately half of those found on-property, with a maximum detection of 330 µg/m^3; TCE was found at levels ten times lower than those on-property, with a maximum detection of 19 µg/m^3.

SUMMARY OF SITE RISKS

Based upon the results of the RI, a baseline risk assessment was conducted to estimate the risks associated with current and future property conditions. A baseline risk assessment is an analysis of the potential adverse human health effects caused by hazardous-substance exposure in the absence of any actions to control or mitigate these under current and future land uses.

The human-health estimates summarized below are based on current reasonable maximum exposure scenarios and were developed by taking into account various conservative estimates about the frequency and duration of an individual's exposure to the contaminants of concern (COCs), as well as the toxicity of these contaminants.

While a screening of ecological considerations lead to the conclusion that property conditions do not necessitate a quantitative ecological risk assessment, a qualitative discussion is included below.

WHAT IS RISK AND HOW IS IT CALCULATED?

A Superfund baseline human health risk assessment is an analysis of the potential adverse health effects caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these under current- and future-land uses. A four-step process is utilized for assessing site-related human health risks for reasonable maximum exposure scenarios.

Hazard Identification: In this step, the COCs at the site in various media (*i.e.*, soil, groundwater, surface water, and air) are identified based on such factors as toxicity, frequency of occurrence, and fate and transport of the contaminants in the environment, concentrations of the contaminants in specific media, mobility, persistence, and bioaccumulation.

Exposure Assessment: In this step, the different exposure pathways through which people might be exposed to the contaminants identified in the previous step are evaluated. Examples of exposure pathways include incidental ingestion of and dermal contact with contaminated soil. Factors relating to the exposure assessment include, but are not limited to, the concentrations that people might be exposed to and the potential frequency and duration of exposure. Using these factors, a "reasonable maximum exposure" scenario, which portrays the highest level of human exposure that could reasonably be expected to occur, is calculated.

Toxicity Assessment: In this step, the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure and severity of adverse effects are determined. Potential health effects are chemical-specific and may include the risk of developing cancer over a lifetime or other non-cancer health effects, such as changes in the normal functions of organs within the body (*e.g.*, changes in the effectiveness of the immune system). Some chemicals are capable of causing both cancer and non-cancer health effects.

Risk Characterization: This step summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site risks. Exposures are evaluated based on the potential risk of developing cancer and the potential for non-cancer health hazards. The likelihood of an individual developing cancer is expressed as a probability. For example, a 10^{-4} cancer risk means a "one-in-ten-thousand excess cancer risk"; or one additional cancer may be seen in a population of 10,000 people as a result of exposure to site contaminants under the conditions explained in the Exposure Assessment. Current Superfund guidelines for acceptable exposures are an individual lifetime excess cancer risk in the range of 10^{-4} to 10^{-6} (corresponding to a one-in-ten-thousand to a one-in-a-million excess cancer risk) with 10^{-6} being the point of departure. For non-cancer health effects, a "hazard index" (HI) is calculated. An HI represents the sum of the individual exposure levels compared to their corresponding reference doses. The key concept for a non-cancer HI is that a "threshold level" (measured as an HI of less than 1) exists below which non-cancer health effects are not expected to occur.

Human Health Risk Assessment

As was noted above, the current land use of the property is industrial/commercial, and it is anticipated that the land use will not change in the future.

The baseline risk assessment began with selecting COCs in the various media that would be representative of property risks. Since the area is served by municipal water, it is not likely that the groundwater underlying the property will be used for potable purposes in the foreseeable future; however, since regional groundwater is designated as a drinking water source, hypothetical exposure to groundwater was evaluated. The other media that were evaluated included surface and subsurface soil. The primary COCs in groundwater are 1,2,3-TCP and other VOCs and metals, in surface soil are SVOCs and metals, and in subsurface soil are 1,2,3-TCP and SVOCs.

The baseline risk assessment evaluated the health effects which could result from exposure to contaminated property media through ingestion, dermal contact, or inhalation. The assessment evaluated hazards and risks to on-property trespassers and future on-property workers exposed to surface soils; future on-property construction and utility workers exposed to subsurface soils; and hypothetical on-property workers and hypothetical off-property adult and child residents exposed to potable groundwater. In addition, a qualitative risk evaluation was performed to assess potential risks for current off-property residents and future on-property workers exposed to soil gas.

The results of the baseline risk assessment indicate that the contaminated subsurface soils at the property and groundwater at the site pose an unacceptable risk to human health due, primarily, to the presence of VOCs, SVOCs, and metals. The estimated excess cancer risks related to the ingestion of and dermal contact with subsurface soils at the property for future on-property construction and utility workers exceed the acceptable risk range at 9.4×10^{-3}. For potable groundwater ingestion and inhalation by hypothetical on-property workers and hypothetical off-property adult and child residents, the risks were 2.8×10^{-2}, 3.8×10^{-2}, and 2.2×10^{-2}, respectively, which exceed the acceptable risk range for each receptor population. Risks are driven by 1,2,3-TCP. To determine potential downgradient risks, a separate calculation was performed using data from the downgradient monitoring wells to estimate the risks to hypothetical off-property residents from ingestion and inhalation of groundwater contaminated with 1,2,3-TCP. The resulting risk estimate was 4.1×10^{-4}, which is above the acceptable risk range. The estimated excess cancer risks for future on-property workers and trespassers exposed to surface soil were within the acceptable risk range.

The total estimated HI value for individual chemicals and combinations of chemicals for ingestion of and dermal contact with subsurface soils at the property for future on-property construction and utility workers was 4, which is above the acceptable level of 1, driven by 1,2,3-TCP. Total

estimated HI values for future on-property workers and trespassers exposed to surface soil did not exceed 1. For potable groundwater ingestion and inhalation by hypothetical on-property workers and hypothetical off-property adult and child residents, the HIs were 37, 52, and 120, respectively, which are all above the acceptable level of 1. These HIs are primarily driven by 1,2,3-TCP and iron.

In assessing potential inhalation risk for the soil-gas medium, the sampling results for soil gas were compared against the target values in EPA's Subsurface Vapor Intrusion Guidance (SVIG). For site-related VOCs, the SVIG values used correspond with the 10^{-4} cancer risk threshold value for vapor concentrations in shallow soil. The comparison suggests there may be an unacceptable risk to a future on-property worker performing tasks in a basement, driven almost exclusively by 1,2,3-TCP. The maximum on-property soil-gas concentration for 1,2,3-TCP was 2,200 $\mu g/m^3$. The SVIG value for 1,2,3-TCP is 49 $\mu g/m^3$.

Based on the SVIG values, there is no apparent qualitative risk to a current off-property resident. 1,2,3-TCP was not found in any of the thirty-six soil-gas samples collected from twelve off-property locations. With a high concentration of 330 $\mu g/m^3$, the 810 $\mu g/m^3$ SVIG value for PCE was not exceeded. All PCE levels were approximately half of those found on the property. TCE was found at levels ten times lower than those on-property, with all reported values being below the SVIG value for TCE of 22 $\mu g/m^3$.

Ecological Risk Assessment

Information from the NYSDEC Bureau of Wildlife indicates that there are no endangered or threatened plant or animal species at or in the vicinity of the site. Therefore, EPA evaluated potential exposure pathways for non-endangered and non-threatened animal and plant species. Since the property includes an industrial/commercial facility, there is minimal habitat available for ecological receptors on the property. Due to the suburban/commercial setting, the potential for exposure to receptors and ecological risk is minimal in the area surrounding the property as well.

Because the main medium of concern is groundwater, and the depth to the surface of the groundwater is approximately fifty feet bgs, direct contact with groundwater by ecological receptors is unlikely. Because there are no wetlands or surface water bodies on or in the immediate vicinity of the site, there is no potential for contaminated groundwater to discharge into surface water. Therefore, groundwater is not considered to be an exposure pathway for ecological receptors.

Soil samples did contain VOCs, some of which (*e.g.*, 1,2,3-TCP) are present in concentrations greater than conservative screening criteria considered protective of soil invertebrate species. Therefore, there is a potential for an unacceptable risk to burrowing animals that may come into contact with these contaminated surface soils (zero to two-foot depth).

Summary of Human Health and Ecological Risks

The results of the risk assessment indicate that ingestion of and dermal contact with on-property subsurface soils by future on-property construction and utility workers, ingestion and inhalation of groundwater by hypothetical on-property workers and hypothetical off-property adult and child residents, and inhalation of on-property soil gas by future on-property workers pose unacceptable excess cancer risks.

The total estimated HI values for future on-property construction and utility workers exposed to subsurface soil and ingestion and inhalation of groundwater by hypothetical on-property workers and hypothetical off-property adult and child residents pose a chronic adverse non-cancer health effect to such receptors.

Contamination in the surface soil poses a potential unacceptable risk to burrowing animals that may come into contact with these soils.

Based upon the results of the RI and the risk assessment, EPA has determined that actual or threatened releases of hazardous substances from the property, if not addressed by the preferred remedy or one of the other active measures considered, may present a current or potential threat to human health and the environment.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives are specific goals to protect human health and the environment. These objectives are based on available information and standards, such as applicable or relevant and appropriate requirements (ARARs), to-be-considered guidance, and site-specific risk-based levels.

The following remedial action objectives were established for the site:

- Restore groundwater to levels which meet state and federal standards within a reasonable time frame;
- Mitigate the potential for chemicals to migrate from soils and drainage structures on the property into groundwater;
- Mitigate the migration of the affected groundwater; and
- Reduce or eliminate any direct contact, ingestion, or inhalation threat associated with contaminated soil on the property.

Soil cleanup levels will be those established pursuant to the New York State Technical and Administrative Guidance Memorandum No. 94-HWR-4046 (TAGM). These levels are the more stringent cleanup level between a human-health protection value and a value based on protection of

groundwater as specified in the TAGM. All of these levels fall within EPA's acceptable risk range.

Groundwater cleanup goals will be the more stringent of the state or federal promulgated standards.

SUMMARY OF REMEDIAL ALTERNATIVES

CERCLA §121(b)(1), 42 U.S.C. §9621(b)(1), mandates that remedial actions must be protective of human health and the environment, cost-effective, comply with ARARS, and utilize permanent solutions and alternative treatment technologies and resource recovery alternatives to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ, as a principal element, treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants and contaminants at a site. CERCLA §121(d), 42 U.S.C. §9621(d), further specifies that a remedial action must attain a level or standard of control of the hazardous substances, pollutants, and contaminants, which at least attains ARARs under federal and state laws, unless a waiver can be justified pursuant to CERCLA §121(d)(4), 42 U.S.C. §9621(d)(4).

Detailed descriptions of the remedial alternatives for addressing the contamination associated with the site can be found in the RI/FS report and the RI/FS report addendum. These documents present five soil remediation alternatives and five groundwater remediation alternatives. To facilitate the presentation and evaluation of these alternatives, the RI/FS report and RI/FS report addendum's ten alternatives were reorganized in formulating the remedial alternatives discussed below.

The construction time for each alternative reflects only the time required to construct or implement the remedy and does not include the time required to design the remedy, negotiate the performance of the remedy with any PRPs, or procure contracts for design and construction. The present-worth costs associated with the soil remedies are calculated using a discount rate of seven percent and a five-year time interval. The present-worth costs associated with the groundwater remedies are calculated using a discount rate of seven percent and a fifteen-year time interval.

The remedial alternatives are:

Soil Alternatives

Alternative S-1: No Action

Capital Cost:	$0
Annual Operation and Maintenance Cost:	$0
Present-Worth Cost:	$0
Construction Time:	0 months

The Superfund program requires that the "no-action" alternative be considered as a baseline for comparison with the other alternatives. The no-action remedial alternative for soil does not include any physical remedial measures that address the problem of soil contamination at the property.

Because this alternative would result in contaminants remaining on-property above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the site be reviewed at least once every five years. If justified by the review, remedial actions may be implemented to remove, treat, or contain the wastes.

Alternative S-2: Excavation of Contaminated Soils and Off-Site Treatment/Disposal

Capital Cost:	$1,542,000
Annual Operation and Maintenance Cost:	$0
Present-Worth Cost:	$1,542,000
Construction Time:	6 months

This remedial alternative includes the excavation of all source-area soils which exceed the TAGM cleanup levels , along with any contaminated drywell structures, cesspools, and associated piping.

To obtain access to all of the contaminated soils, this alternative also includes the demolition of the laboratory building. The building debris, after decontamination, if necessary, would be disposed of off-site.

The estimated volume of contaminated soil to be excavated is 5,000 cubic yards (contamination is as deep as forty-one feet). The actual extent of the excavation and the volume of the excavated material would be based on post-excavation confirmatory sampling. Shoring of the excavation and extraction and treatment of any water that enters the trench would be necessary.

The excavated areas would be backfilled with clean fill and revegetated. All excavated material would be characterized and transported for treatment/disposal at an off-site Resource Conservation and Recovery Act (RCRA)-compliant facility.

Alternative S-3: Excavation of Contaminated Soils, On-Property Treatment via Low Temperature Thermal Desorption, and Redeposition

Capital Cost:	$2,502,000
Annual Operation and Maintenance Cost:	$0
Present-Worth Cost:	$2,502,000
Construction Time:	1 year

This alternative is the same as Alternative S-2, except that instead of off-site treatment/disposal, the excavated soils would be fed to a mobile Low-Temperature Thermal Desorption (LTTD) unit brought to the property, where hot air injected at a temperature above the boiling points of the organic contaminants of concern would allow them to be volatilized into gases and escape from the soil. The organic vapors extracted from the soil would then be either condensed, transferred to another medium (such as granular activated carbon), or thermally treated in an afterburner operated to ensure complete destruction of the VOCs. The off-gases would be filtered through a carbon vessel. Once the treated soil achieved the TAGM levels , it would be tested in accordance with the Toxicity Characteristic Leaching Procedure (TCLP) to determine whether it constitutes a RCRA hazardous waste for metals and, provided that it passes the test, it would be used as backfill material for the excavated area. Soil above TCLP metals levels would be either re-treated or disposed of at an approved off-site facility, as appropriate.

To obtain access to all of the contaminated soils, this alternative also includes the demolition of the laboratory building. The building debris, after decontamination, if necessary, would be disposed of off-site.

The excavated drywell structures, cesspools, and associated piping would be disposed of off-site at a RCRA-compliant facility.

Alternative S-4: Treatment of VOC-Contaminated Soils Using Thermally-Enhanced ISVE; Excavation of SVOC-Contaminated Soils with Off-Site Treatment/Disposal

Capital Cost:	$789,000
Annual Operation and Maintenance Cost:	$ 98,000
Present-Worth Cost:	$1,191,000
Construction Time:	3 months

Under this alternative, the VOC-contaminated soils (approximately 5,000 cubic yards) would be remediated by thermally-enhanced ISVE[6]. Under this treatment process, either steam or heated air would be forced through a series of wells to volatilize the solvents contaminating the soils in the unsaturated zone (above the water table). The extracted vapors would be treated by granular activated carbon and/or other appropriate technologies before being vented to the atmosphere. The exact configuration and number of vacuum extraction wells and heat-injection points would be determined based on the results of a pilot-scale treatability study.

While the actual period of operation of the ISVE system would be based upon soil sampling results which demonstrate that the affected soils have been treated to soil TAGM levels, it is estimated that the system would operate for a period of five years.

Since thermally-enhanced ISVE would not be effective at remediating the SVOC-contaminated soils located, primarily, east of the warehouse buildings, these soils (approximately 100 cubic yards in total) would be excavated and disposed of off-site. In addition, contaminated drywell structures, cesspools, and associated piping would be excavated and removed.

To obtain access to all of the contaminated soils, this alternative also includes the demolition of the laboratory building. The building debris, after decontamination, if necessary, would be disposed of off-site.

The excavated areas would be backfilled with clean fill and revegetated. All excavated materials would be characterized and transported for treatment/disposal at an off-site RCRA-compliant facility.

This alternative also includes engineering controls, such as fencing and signs, to protect the integrity of the soil treatment system and to limit access until the soil remediation effort has been completed.

Groundwater Remedial Alternatives

Alternative GW-1: No Action

Capital Cost:	$0
Annual Monitoring Cost:	$0
Present-Worth Cost:	$0
Construction Time:	0 months

The Superfund program requires that the "no-action" alternative be considered as a baseline for comparison with the other alternatives. The no-action remedial alternative would not include any physical remedial measures to address the groundwater contamination at the site.

Because this alternative would result in contaminants remaining on-site above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the site be reviewed at least once every five years. If justified by the review, remedial actions may be implemented to remove or treat the wastes.

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6 Factors that contribute to the effectiveness of a conventional ISVE system are the chemical and physical properties of the contaminants and the soil characteristics. Based on the results of the RI, the property's soils should be conducive to vapor extraction. The chemical and physical properties of 1,2,3-TCP suggest that thermal enhancement would be necessary for ISVE to be effective in the contaminant's removal (*i.e.*, heating would make 1,2,3-TCP more volatile).

Alternative GW-2: Groundwater In-Situ Air Sparging with Ozone Injection

Capital Cost:	$ 445,000
Annual Operation, Maintenance and Monitoring Cost:	$90,000
Present-Worth Cost:	$1,265,000
Construction Time:	4 months

Under this alternative, a mixture of ozone and air would be injected under pressure into the aquifer through injection-well points installed into the plume along the southern boundary of the property or at the source areas (immediately east of the laboratory building, southeast of the laboratory building, and east of the warehouse buildings) and within the downgradient plume (see Figure 3). It is anticipated that six injection-well points with a pallet-mounted injection system would be required to treat the source area contamination and eight injection-well points with a street curb-mounted injection system would be required in downgradient areas to address the existing plume. The injection-well points would be installed to depths of up to 140 feet bgs. Because the area downgradient from the source areas is highly-developed and densely-populated, the injection-well points and the associated piping installed downgradient of the source areas would be placed beneath roadways or in road right-of-ways so as to avoid having to install them on residential properties.

Under this process, bubbles are formed from the injected ozone and air, which strip and oxidize[7] the VOCs from the groundwater, a reaction that breaks down VOCs (including 1,2,3-TCP) into carbon dioxide and chlorides. Ozone is required to enhance air sparging both because of the depth to which 1,2,3-TCP is present and due to its solubility in groundwater.

Bench- and pilot-scale treatability studies would be performed to optimize the effectiveness of the injection system and to determine optimum installation locations for the injection-well points.

As part of a long-term groundwater monitoring program, groundwater samples would be collected and analyzed regularly in order to verify that the concentrations and the extent of groundwater contaminants are declining. The exact frequency and parameters of sampling and location of any additional monitoring wells would be determined during the design phase. Soil-vapor monitoring in the treatment areas would also be conducted, as necessary.

It has been estimated that it would take fifteen years to remediate the contaminated groundwater through air sparging and ozone injection.

This alternative also includes institutional controls restricting the installation and use of groundwater wells at and downgradient of the property until groundwater quality has been restored. Institutional controls would be in the form of existing use and development restrictions limiting the use of groundwater as a potable or process water without treatment, as determined by SCDHS. Engineering controls, such as fencing and signs, would be used to protect the integrity of all above-surface installations.

Because this alternative would result in contaminants remaining on-site above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the site be reviewed at least once every five years.

Alternative GW-3: Groundwater Extraction and Treatment

Capital Cost:	$1,149,000
Annual Operation, Maintenance and Monitoring Cost:	$155,000
Present-Worth Cost:	$2,561,000
Construction Time:	6 months

Under this alternative, a network of wells installed into the plume along the southern boundary of the property or within the source areas (immediately east of the laboratory building, southeast of the laboratory building, and east of the warehouse buildings) and within the downgradient plume would extract contaminated groundwater. The extracted groundwater would be piped to an on-property facility where it would be treated by air stripping and/or other appropriate technologies, and would be reinjected to the aquifer. It is anticipated that three wells would be required to extract contaminated groundwater from the source areas and three wells would be required in downgradient areas. Because the area downgradient from the source areas is highly-developed and densely-populated, the extraction wells and the associated piping installed downgradient of the source areas would be placed beneath roadways or in road right-of-ways so as to avoid having to install them on residential properties.

Air stripping involves pumping untreated groundwater to the top of a "packed" column, which contains a specified amount of inert packing material. The column receives ambient air under pressure in an upward direction from the bottom of the column as the water flows downward, transferring VOCs to the air phase. The air-stripping process would be followed by a groundwater polishing system using granular activated carbon and/or other appropriate technologies. To comply with New York State air guidelines, granular activated carbon treatment of the air strippers' air exhaust streams may be necessary.

As part of a long-term groundwater monitoring program, groundwater samples would be collected and analyzed regularly in order to verify that the concentrations and the

[7] An oxidizing agent uses oxygen to degrade VOCs.

extent of groundwater contaminants are declining. The exact frequency and parameters of sampling and the location of any additional monitoring wells would be determined during the design phase.

It has been estimated that it would take approximately fifteen years of groundwater extraction and treatment to remediate the entire groundwater plume.

This alternative also includes institutional controls restricting the installation and use of groundwater wells at and downgradient of the property until groundwater quality has been restored. Institutional controls would be in the form of existing use and development restrictions limiting the use of groundwater as a potable or process water without treatment, as determined by SCDHS. Engineering controls, such as fencing and signs, would be used to protect the integrity of all above-surface installations.

Because this alternative would result in contaminants remaining on-site above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the site be reviewed at least once every five years.

Alternative GW-4: In-Situ Permeable Reactive Barrier

Capital Cost:	$ 2,400,000
Annual Operation, Maintenance and Monitoring Cost:	$18,000
Present-Worth Cost:	$2,564,000
Construction Time:	6 months

Under this alternative, subsurface permeable reactive barriers would be installed across the width and depth of the groundwater plume along the southern boundary of the property (immediately east of the laboratory building, southeast of the laboratory building, and east of the warehouse buildings) and within the downgradient plume to catalytically break down VOCs into carbon dioxide and chlorides as the groundwater passes through the barrier.

Installation of a permeable reactive barrier involves the fracturing of the subsurface using standard drilling technologies and immediately filling the fracture with a soluble slurry containing catalytic iron, a substance proven to break down VOCs (including 1,2,3-TCP). The controlled fracturing and filling are accomplished in up to thirty-foot wide reactive panels, requiring the installation of a number of panels into the water table with a drill rig to approximately 140 feet bgs. The thickness of the reactive panel can also be controlled and is determined as a function of contaminant concentration and groundwater velocity. With a panel porosity higher than the surrounding formation, VOCs are degraded to harmless compounds as they pass through the barrier.

As part of a long-term groundwater monitoring program, groundwater samples would be collected and analyzed regularly in order to verify that the concentrations and the extent of groundwater contaminants are declining. The exact frequency and parameters of sampling and the location of any additional monitoring wells would be determined during the design phase.

It has been estimated that it would take approximately fifteen years to remediate the groundwater plume using permeable reactive barriers.

This alternative also includes institutional controls restricting the installation and use of groundwater wells at and downgradient of the property until groundwater quality has been restored. Institutional controls would be in the form of existing use and development restrictions limiting the use of groundwater as a potable or process water without treatment, as determined by SCDHS. Engineering controls, such as fencing and signs, would be used to protect the integrity of all above-surface installations.

Because this alternative would result in contaminants remaining on-site above levels that allow for unrestricted use and unlimited exposure until MCLs are achieved, CERCLA requires that the site be reviewed at least once every five years.

COMPARATIVE ANALYSIS OF ALTERNATIVES

During the detailed evaluation of remedial alternatives, each alternative is assessed against nine evaluation criteria, namely, overall protection of human health and the environment, compliance with applicable or relevant and appropriate requirements, long-term effectiveness and permanence, reduction of toxicity, mobility, or volume through treatment, short-term effectiveness, implementability, cost, and state and community acceptance.

The evaluation criteria are described below.

- Overall protection of human health and the environment addresses whether or not a remedy provides adequate protection and describes how risks posed through each exposure pathway (based on a reasonable maximum exposure scenario) are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

- Compliance with ARARs addresses whether or not a remedy would meet all of the applicable or relevant and appropriate requirements of other federal and state environmental statutes and requirements or provide grounds for invoking a waiver.

- Long-term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met. It also addresses the magnitude and effectiveness of the measures that may be required to manage the risk

posed by treatment residuals and/or untreated wastes.

- Reduction of toxicity, mobility, or volume through treatment is the anticipated performance of the treatment technologies, with respect to these parameters, a remedy may employ.
- Short-term effectiveness addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.
- Implementability is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.
- Cost includes estimated capital and operation and maintenance costs, and net present-worth costs.
- State acceptance indicates if, based on its review of the RI/FS and Proposed Plan, the state concurs with the preferred remedy at the present time.
- Community acceptance will be assessed in the ROD and refers to the public's general response to the alternatives described in the Proposed Plan and the RI/FS reports.

A comparative analysis of these alternatives based upon the evaluation criteria noted above follows.

Overall Protection of Human Health and the Environment

Alternative S-1 (no action) would not be protective of human health and the environment, since it would not actively address the contaminated soils, which present unacceptable risks of exposure and are a source of groundwater contamination. Alternative S-2 (excavation of contaminated soils and off-site treatment/disposal), Alternative S-3 (excavation of contaminated soils and on-property treatment via LTTD), and Alternative S-4 (thermally-enhanced ISVE) would be protective of human health and the environment, since each alternative relies upon a remedial strategy and/or treatment technology capable of eliminating human exposure and removing the source of groundwater contamination in the unsaturated zone. Under these alternatives, the contaminants would either be treated on-property or treated/disposed of off-site.

Alternative GW-1 (no action) would be the least protective groundwater alternative in that it would result in no affirmative steps to restore groundwater quality to drinking water standards. Therefore, under this alternative, the restoration of the groundwater would take a significantly longer time (estimated to be at least thirty years) in comparison to the other alternatives. All three of the active groundwater alternatives are estimated to restore groundwater quality significantly faster (approximately fifteen years) and, therefore, would be protective of human health and the environment.

Compliance with ARARs

There are currently no federal or state promulgated standards for contaminant levels in soils, only New York State soil cleanup levels as specified in the soil TAGM (which are used as "To-Be-Considered" criteria).

Since the contaminated soils would not be addressed under Alternative S-1 (no action), this alternative would not comply with the soil cleanup levels , Alternative S-2 (excavation of contaminated soils and off-site treatment/disposal), Alternative S-3 (excavation of contaminated soils and on-property treatment via LTTD), and Alternative S-4 (thermally-enhanced ISVE), would attain the soil cleanup levels specified in the TAGM.

Under Alternative S-4, spent granular activated carbon from the ISVE units would need to be managed in compliance with RCRA treatment/disposal requirements.

Alternative S-2 and Alternative S-4, and, to a lesser extent, Alternative S-3 (for the SVOC-contaminated soils and any contaminated drywell structures, cesspools, and piping), would be subject to New York State and federal regulations related to the transportation and off-site treatment/disposal of wastes. Alternatives S-2 and S-3 would involve the excavation of contaminated soils and would, therefore, require compliance with fugitive dust and VOC emission regulations. In the case of Alternative S-3, compliance with air emission standards would be required at the LTTD unit, as well. Any emissions from the ISVE system for Alternative S-4 would require similar compliance. Specifically, treatment of off-gases would have to meet the substantive requirements of New York State Regulations for Prevention and Control of Air Contamination and Air Pollution (6 NYCRR Part 200 *et.seq.*) and comply with the substantive requirements of other state and federal air emission standards.

EPA and NYSDOH have promulgated health-based protective Maximum Contaminant Levels (MCLs)(40 CFR Part 141), which are enforceable standards for various drinking water contaminants (chemical-specific ARARs). Although the groundwater at the site is not presently being utilized as a potable water source, achieving MCLs in the groundwater is an applicable standard, because the groundwater at the site is a potential source of drinking water. The aquifer is classified as Class GA (6 NYCRR 701.18), meaning that it is designated as a potable water supply.

Alternative GW-1 (no action) does not provide for any direct remediation of the groundwater and would, therefore, involve no actions to achieve chemical-specific ARARs. All three of the active groundwater alternatives would be effective in reducing groundwater contaminant concentrations below MCLs.

Any emissions from the air stripper under Alternative GW-3 would be required to comply with the substantive requirements of state and federal air emission standards.

Long-Term Effectiveness and Permanence

Alternative S-1 (no action) would involve no active remedial measures and, therefore, would not be effective in eliminating the potential exposure to contaminants in soil and would allow the migration of contaminants in soil and groundwater. Alternative S-2 (excavation of contaminated soils and off-site treatment/disposal), Alternative S-3 (excavation of contaminated soils and on-property treatment via LTTD), and Alternative S-4 (thermally-enhanced ISVE) would all be effective in the long term and would provide permanent remediation by either removing the wastes from the property or treating them on-site.

Alternatives S-3 and S-4 would generate treatment residuals which would have to be appropriately handled; Alternative S-2 would not generate such residuals.

Alternative GW-1 (no action) would be far less effective in the long term in restoring groundwater quality, since it would take at least twice as long to restore groundwater than Alternative GW-2 (in-situ air sparging with ozone injection), Alternative GW-3 (groundwater extraction and treatment), and Alternative GW-4 (permeable reactive barrier). All of the active groundwater alternatives would effectively restore groundwater quality within approximately fifteen years.

Alternative GW-3 may generate treatment residuals which would have to be appropriately handled; Alternatives GW-1, GW-2, and GW-4 would not generate such residuals.

Reduction in Toxicity, Mobility, or Volume Through Treatment

Alternative S-1 (no action) would provide no reduction in toxicity, mobility or volume. Under Alternative S-3 (excavation of contaminated soils and on-property treatment via LTTD) and Alternative S-4 (thermally-enhanced ISVE), the toxicity, mobility, and volume of contaminants would be reduced or eliminated through on-property treatment. Under Alternative S-2 (excavation of contaminated soils and off-site treatment/disposal), the toxicity, mobility, and volume of the contaminants would be eliminated by removing the contaminated soil from the property for treatment/disposal.

Alternative GW-1 (no action) would not effectively reduce the toxicity, mobility, or volume of contaminants in the groundwater, as this alternative involves no active remedial measures. Alternative GW-2 (in-situ air sparging with ozone injection), Alternative GW-3 (groundwater extraction and treatment), and Alternative GW-4 (permeable reactive barrier) would reduce the toxicity, mobility, or volume of contaminants in the groundwater through treatment at (or adjacent to) the source and in downgradient areas, thereby satisfying CERCLA's preference for treatment. Alternatives GW-2 and GW-3 possess the added flexibility of being constructed within the source areas, thus, potentially reducing the toxicity, mobility, or volume of contaminants in the source areas in a shorter time period.

Short-Term Effectiveness

Alternative S-1 (no action) does not include any physical construction measures in any areas of contamination and, therefore, would not present any potential adverse impacts to on-property workers or the community as a result of its implementation. Alternatives S-2 (excavation of contaminated soils and off-site treatment/disposal) and S-3 (excavation of contaminated soils and on-property treatment via LTTD) could present some limited adverse impact to on-property workers through dermal contact and inhalation related to post-excavation sampling activities. Similarly, Alternative S-4 (thermally-enhanced ISVE) could result in some adverse impacts to on-property workers through dermal contact and inhalation related to the installation of ISVE wells through contaminated soils. Noise from the treatment units associated with Alternatives S-3 and S-4 could present some limited adverse impacts to on-property workers and nearby residents. In addition, interim and post-remediation soil sampling activities would pose some risk. The risks to on-property workers and nearby residents under all of the alternatives could, however, be mitigated by following appropriate health and safety protocols, by exercising sound engineering practices, and by utilizing proper protective equipment.

Alternative S-2 would require the off-site transport of contaminated waste material, which may pose the potential for traffic accidents, which could result in releases of hazardous substances. Alternatives S-3 and S-4 would also require the off-site transport of contaminated wastes, but at a volume substantially less than the other active alternatives.

Under Alternatives S-2 and S-3, substantial disturbance of the land during excavation activities could affect the surface water hydrology of the property. There is a potential for increased stormwater runoff and erosion during excavation and construction activities that would have to be properly managed to prevent or minimize any adverse impacts. For these alternatives, appropriate measures would have to be taken during excavation activities to prevent transport of fugitive dust and exposure of workers and downgradient receptors to VOCs.

Since no actions would be performed under Alternative S-1, there would be no implementation time. It is estimated that it would take six months to excavate and transport the contaminated soils to an EPA-approved treatment/disposal facility under Alternative S-2 and one year to excavate and treat the contaminated soils using LTTD under Alternative S-3. It is estimated that Alternative S-4 would require three months to install the ISVE system and five years to achieve soil cleanup levels.

All of the groundwater alternatives could present some limited adverse short-term impacts to on-property workers through dermal contact and inhalation related to groundwater sampling activities. Alternative GW-2 (in-situ

air sparging with ozone injection), Alternative GW-3 (groundwater extraction and treatment), and Alternative GW-4 (permeable reactive barrier) could present adverse impacts to on-property workers, since these alternatives would involve the installation of either injection wells, extraction wells, or reactive panels through potentially contaminated soils and groundwater. Alternative GW-2 could pose more adverse impacts than Alternatives GW-3 and GW-4, since it would require the installation of significantly more well points than Alternatives GW-3 and GW-4. On the other hand, both Alternatives GW-2 and GW-3 require the installation of piping and other components in the street right-of-way, thus, potentially increasing the potential for adverse impacts. Noise from the treatment units associated with Alternatives GW-2 and GW-3 could present some limited adverse impacts to on-property workers and nearby residents. The risks to on-property workers and nearby residents under all of the alternatives could, however, be minimized by following appropriate health and safety protocols, by exercising sound engineering practices, and by utilizing proper protective equipment.

Since no activities would be performed under Alternative GW-1, no time would be required to implement this alternative. It is estimated that the groundwater remediation systems under Alternative GW-2, Alternative GW-3, and Alternative GW-4 would be constructed in four, six, and six months, respectively.

It is estimated that Alternative GW-1 would require at least thirty years to remediate the source areas and the contaminant plume. Alternatives GW-2, GW-3, and GW-4, with similar configurations with respect to the source areas and the plume, but with varying technologies, would require approximately fifteen years to remediate the contaminated groundwater. The actual time for the groundwater to be remediated under all of the alternatives may vary and may need to be refined based on the results of groundwater monitoring and, as appropriate, groundwater modeling.

Implementability

Alternative S-1 (no action) would be the easiest to implement, as there are no activities to undertake. Potentially difficult factors related to the excavation of soils down to fifty feet bgs adjacent to on-property buildings and on a property that is so small may need to be resolved for Alternative S-2 (excavation of contaminated soils and off-site treatment) and Alternative S-3 (excavation of contaminated soils and on-property treatment via LTTD). Additional measures, such as building demolition (in addition to the laboratory building), may be required to make space. In addition, finding sufficient space for the placement of an LTTD unit on-property could be problematic. Alternative S-4 (thermally-enhanced ISVE) would be much easier to implement than Alternative S-2 and Alternative S-3 since large-scale soil excavation and handling would not be required. All three active soil alternatives would require the demolition of the laboratory building in order to facilitate the goal of attaining cleanup levels. Staging the building debris for off-site disposal may be difficult for all of these alternatives because of the small size of the property. Under Alternatives S-2 and S-3, the excavation of soils down to fifty feet bgs adjacent to on-property buildings and on a property that is so small may necessitate additional building demolition, further complicating the building debris staging requirements. Also, because of space limitations, staging the excavated soil for off-site treatment/disposal and on-property treatment, under Alternatives S-2 and S-3, respectively, may prove difficult.

All three soil action alternatives would employ technologies known to be reliable and that can be readily implemented. In addition, equipment, services, and materials needed for these alternatives are readily available, and the actions under these alternatives would be administratively feasible. Sufficient facilities are available for the treatment/disposal of the excavated soils under Alternative S-2. Thermally-enhanced ISVE (Alternative S-4) is an effective technology for removing VOCs, although pilot-scale treatability studies would need to be performed to ensure that it can successfully treat 1,2,3-TCP.

Under Alternative S-2 and Alternative S-3, monitoring the effectiveness of the excavation could be easily accomplished through post-excavation soil sampling and analysis. Monitoring the effectiveness of the LTTD system under Alternative S-3 could be easily accomplished through post-treatment soil sampling and analysis, although, based on EPA's experience at other Superfund sites, there may be implementation issues related to public acceptance with respect to locating an LTTD unit in a densely-populated area. Monitoring the effectiveness of the ISVE system under Alternative S-4 would be easily accomplished through soil and soil-vapor sampling and analysis.

Alternative GW-1 (no action) would be the easiest to implement, since it would not entail the performance of any activities. While the air sparging/ozone injection system related to Alternative GW-2 and the groundwater extraction and treatment system related to Alternative GW-3 would be relatively easy to implement, the implementation of Alternative GW-4 (permeable reactive barrier) would be the easiest to implement as there are no piping or facilities to construct or maintain. While there is sufficient space on the property for most of the constructed components of each of the active groundwater alternatives, Alternative GW-4 would be substantially easier to implement than either Alternatives GW-2 or GW-3 in the highly-developed and densely-populated downgradient plume area; both Alternatives GW-2 and GW-3 would require the installation of piping and other components in the street right-of-way potentially complicated by the presence of gas and water lines, utility poles, and large trees. Alternative GW-3 would be the most difficult to implement due to the size and quantity of the water piping that would be required to be installed along the street right-of-way back to the on-property treatment system and due to the limited options related to the discharge of a relatively high volume of treated groundwater. Both Alternative GW-2 and Alternative GW-3 would use conventional well and piping installation techniques and equipment. Alternative GW-4 would use conventional installation techniques, but would require the use of

sophisticated control technology in the placement of the reactive panels.

Air sparging, as a general rule, is only effective to a depth of fifty feet below the water table. At the site, the saturated thickness of the plume is over seventy feet. A recently developed air sparging technology appears to be viable. This system injects an air/ozone mixture into the aquifer up to 150 feet below the water surface using an injection-well point system. Because 1,2,3-TCP is not a typical contaminant, there has been no experience using this technology for this particular contaminant. However, given the chemical nature of 1,2,3-TCP, it appears likely that it would be amenable to treatment with this technology. Consequently, bench- and pilot-scale treatability studies would be required to verify its effectiveness.

The groundwater extraction and treatment system that would be used under Alternative GW-3 has been implemented successfully at numerous sites to extract, treat, and hydraulically control contaminated groundwater. Though relatively new compared to Alternative GW-3, the groundwater treatment system that would be used under Alternative GW-4 has also been implemented successfully at numerous sites in treating contaminated groundwater.

The air stripping and granular activated carbon technologies that might be used for Alternative GW-3 are proven and reliable in achieving the specified performance goals and are readily available, as is the catalytic iron technology associated with Alternative GW-4.

Cost

The present-worth costs associated with the soil remedies are calculated using a discount rate of seven percent and a five-year time interval. The present-worth costs associated with the groundwater remedies are calculated using a discount rate of seven percent and a fifteen-year time interval.

The estimated capital, operation, maintenance, and monitoring (OM&M), and present-worth costs for each of the alternatives are presented below.

Alternative	Capital	OM&M	Present-Worth
S-1	$0	$0	$0
S-2	$1,542,000	$0	$1,542,000
S-3	$2,502,000	$0	$2,502,000
S-4	$789,000	$98,000	$1,191,000
GW-1	$0	$0	$0
GW-2	$445,000	$90,000	$1,265,000
GW-3	$1,149,000	$155,000	$2,561,000
GW-4	$2,400,000	$18,000	$2,564,000

As can be seen by the cost estimates, Alternative S-1 (no action) is the least costly soil alternative at $0. Alternative S-3 (excavation of contaminated soils and on-property treatment via LTTD) is the most costly soil alternative at $2,502,000. The least costly groundwater remedy is Alternative GW-1 (no action) at $0. Alternative GW-3 and GW-4 are the most costly groundwater alternatives, each estimated at an approximate cost of $2,560,000.

State Acceptance

NYSDEC concurs with the preferred alternative.

Community Acceptance

Community acceptance of the preferred alternative will be assessed in the ROD following review of the public comments received on the Proposed Plan.

PROPOSED REMEDY

Based upon an evaluation of the various alternatives, EPA and NYSDEC recommend Alternative S-4 (thermally-enhanced ISVE) and Alternative GW-2 (in-situ air sparging with ozone injection) as the preferred remedy for soil and groundwater, respectively (see Figures 5 and 6 for conceptual illustrations of the preferred remedial alternatives). The total capital cost for Alternatives S-4 and GW-2 together is $1,234,000 and the total present worth cost is $2,456,000. Specifically, this would involve the following:

- Treatment of the unsaturated soils using thermally-enhanced ISVE in on-property source areas which exceed NYSDEC's soil TAGM levels for VOCs. Post-treatment confirmatory samples would be collected to ensure that the entire source areas have been effectively treated to the cleanup levels. Off-gases from the ISVE system may need to be treated to meet air-discharge requirements. Soil-vapor monitoring in the treatment areas and in adjacent residential areas would also be conducted, as necessary. Should this monitoring indicate a problem with respect to residences, appropriate actions will be taken.

- Excavation and off-site disposal of approximately 100 cubic yards of SVOC-contaminated soils which exceed NYSDEC's soil TAGM levels for SVOCs. In addition, any contaminated drywell structures, cesspools, and associated piping would also be excavated. Confirmatory sampling would be conducted to ensure that all soils above the cleanup goals have been removed. The excavation would be backfilled with certified clean fill.

- Demolition of the laboratory building. The building debris, after decontamination, if necessary, would be disposed of off-site.

- Treatment of the contaminated groundwater using air sparging with ozone injection. The exact configuration and number of injection wells would be determined during the remedial design. The system would be operated until MCLs are attained in the groundwater.

- Long-term groundwater monitoring in order to verify that the concentrations and the extent of groundwater contaminants are declining, that the remedies remain effective, and that public water supplies are protected. The exact frequency and parameters of sampling and the location of any additional monitoring wells would be determined during the design phase.

- Institutional controls restricting the installation and use of groundwater wells at and downgradient of the property until groundwater quality has been restored. Institutional controls would be in the form of existing use and development restrictions limiting the use of groundwater as a potable or process water without necessary water treatment as determined by SCDHS. Engineering controls, such as fencing and signs, would also be considered in order to protect the integrity of the remedies and to limit facility access until cleanup goals have been attained.

The effectiveness of thermally-enhanced ISVE (and, if appropriate, the configuration and number of ISVE wells) would be determined based upon the results of pilot-scale treatability studies conducted during the design phase. Should the findings of these treatability studies indicate that thermally-enhanced ISVE would not be sufficiently effective in addressing the contaminated soils at the property, then the soils would be excavated and treated/disposed off-site (Alternative S-2).

The effectiveness of air sparging with ozone injection (and, if appropriate, the configuration and number of injection wells) would be determined based upon the results of bench- and pilot-scale treatability studies conducted during the design phase. Should the findings of the treatability studies indicate that this technology is not sufficiently effective in addressing the contaminated groundwater at the site, or if its implementation proves logistically impracticable (it would require the installation of piping and other components in the street right-of-way, potentially complicated by the presence of gas and water lines, utility poles, and large trees), then the groundwater would be treated with a permeable reactive barrier (Alternative GW-4).

Because the preferred remedy would result in contaminants remaining on-site above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the site be reviewed at least once every five years. If justified by the review, additional remedial actions may be implemented.

Basis for the Remedy Preference

While Alternative S-2 (excavation of contaminated soils and off-site treatment/disposal), Alternative S-3 (excavation of contaminated soils and on-property treatment via LTTD), and Alternative S-4 (thermally-enhanced ISVE) would all effectively achieve the soil cleanup levels, Alternative S-2 and Alternative S-3 would be more expensive than Alternative S-4. Potentially difficult factors related to the excavation of soils down to fifty feet bgs adjacent to on-property buildings and on a property that is so small may need to be resolved for Alternative S-2 and Alternative S-3. Additional measures, such as building demolition (in addition to the laboratory building), may be required. Also, because of space limitations, staging the excavated soil for off-site treatment/disposal and on-property treatment, under Alternatives S-2 and S-3, respectively, as well as staging any additional building demolition debris, may prove difficult. While Alternative S-4 would require the performance of pilot-scale treatability studies and would take significantly longer to achieve the soil cleanup levels than the other action alternatives (five years for thermally-enhanced ISVE, as compared to six months to excavate and transport the contaminated soils to an EPA-approved treatment/disposal facility and one year to excavate and treat the contaminated soils using LTTD), considering that the groundwater component of the preferred remedy would address the contaminated groundwater in an estimated fifteen years, the increase in the time needed to clean up the soil would not be a significant concern. Therefore, EPA believes that Alternative S-4 would effectuate the soil cleanup while providing the best balance of tradeoffs with respect to the evaluating criteria.

Alternative S-2 is the preferable contingency alternative because, while Alternative S-3 (LTTD) is as effective as Alternative S-2, it would take more time to implement, require on-property space for the placement of an LTTD unit (which may be problematic), and is estimated to be more than twice as costly, as is noted above.

All three of the active groundwater alternatives are estimated to take approximately fifteen years to restore groundwater quality. Because there are no piping or facilities to construct or maintain, Alternative GW-4 (permeable reactive barrier) would be easier to implement than the two other action alternatives (especially in the highly-developed and densely-populated downgradient plume area, where implementation would be complicated by the presence of gas and water lines, utility poles, and large trees); however, Alternative GW-4 is approximately twice the cost of Alternative GW-2 (in-situ air sparging with ozone injection). Alternative GW-3 (groundwater extraction and treatment) would require the installation of considerably more piping and other components in the street right-of-way than Alternative GW-2, In addition, there are limited options related to the discharge of a relatively high volume of treated groundwater. Therefore, EPA has identified Alternative GW-2 as its preferred groundwater alternative since it would effectuate the groundwater cleanup while providing the best balance of tradeoffs among the alternatives with respect to the evaluating criteria.

With regard to the groundwater contingency alternative (Alternative GW-4), while Alternative GW-4 is as effective as Alternative GW-3 and would take about the same time to implement, it is considerably easier to implement, as is noted above.

The preferred remedy is believed to provide the greatest protection of human health and the environment, provide the greatest long-term effectiveness, be able to achieve the ARARs more quickly, or as quickly, as the other alternatives, and is cost effective. Therefore, the preferred remedy will provide the best balance of tradeoffs among alternatives with respect to the evaluating criteria. EPA and NYSDEC believe that the preferred remedy will treat principal threats, be protective of human health and the environment, comply with ARARs, be cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. The preferred remedy also will meet the statutory preference for the use of treatment as a principal element.

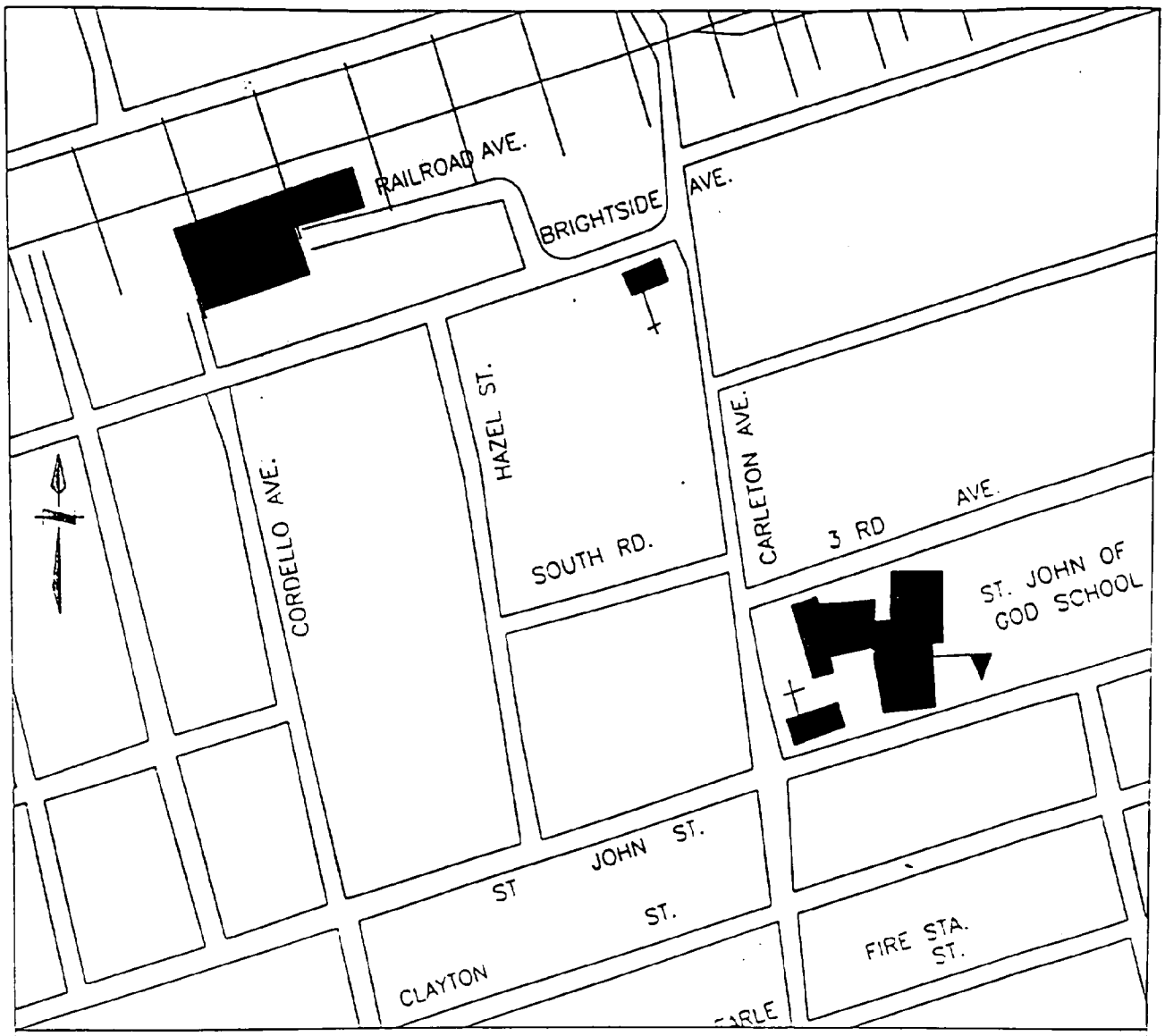

FIGURE 1

MACKENZIE CHEMICAL

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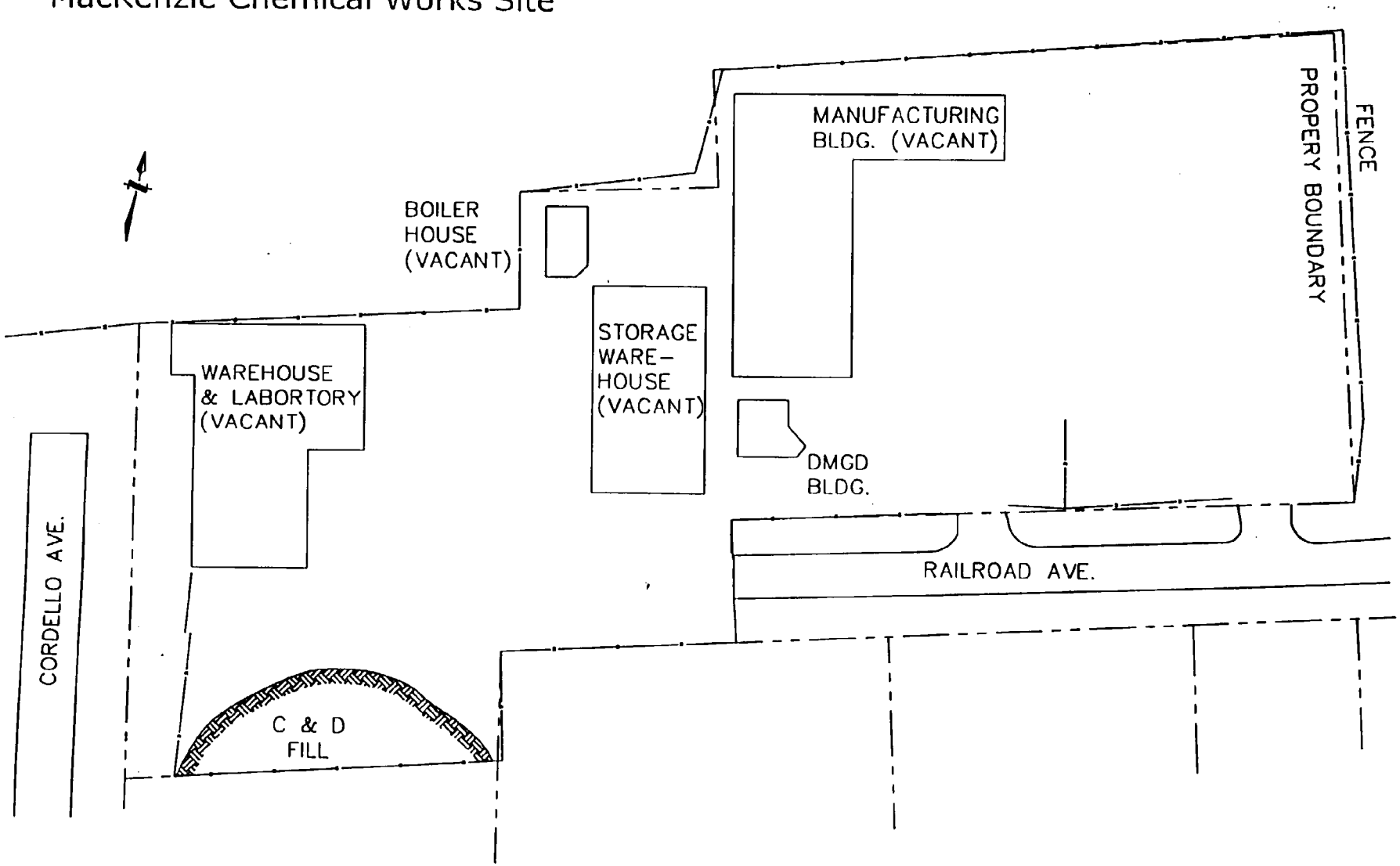
Figure 2: Site Layout
MacKenzie Chemical Works Site



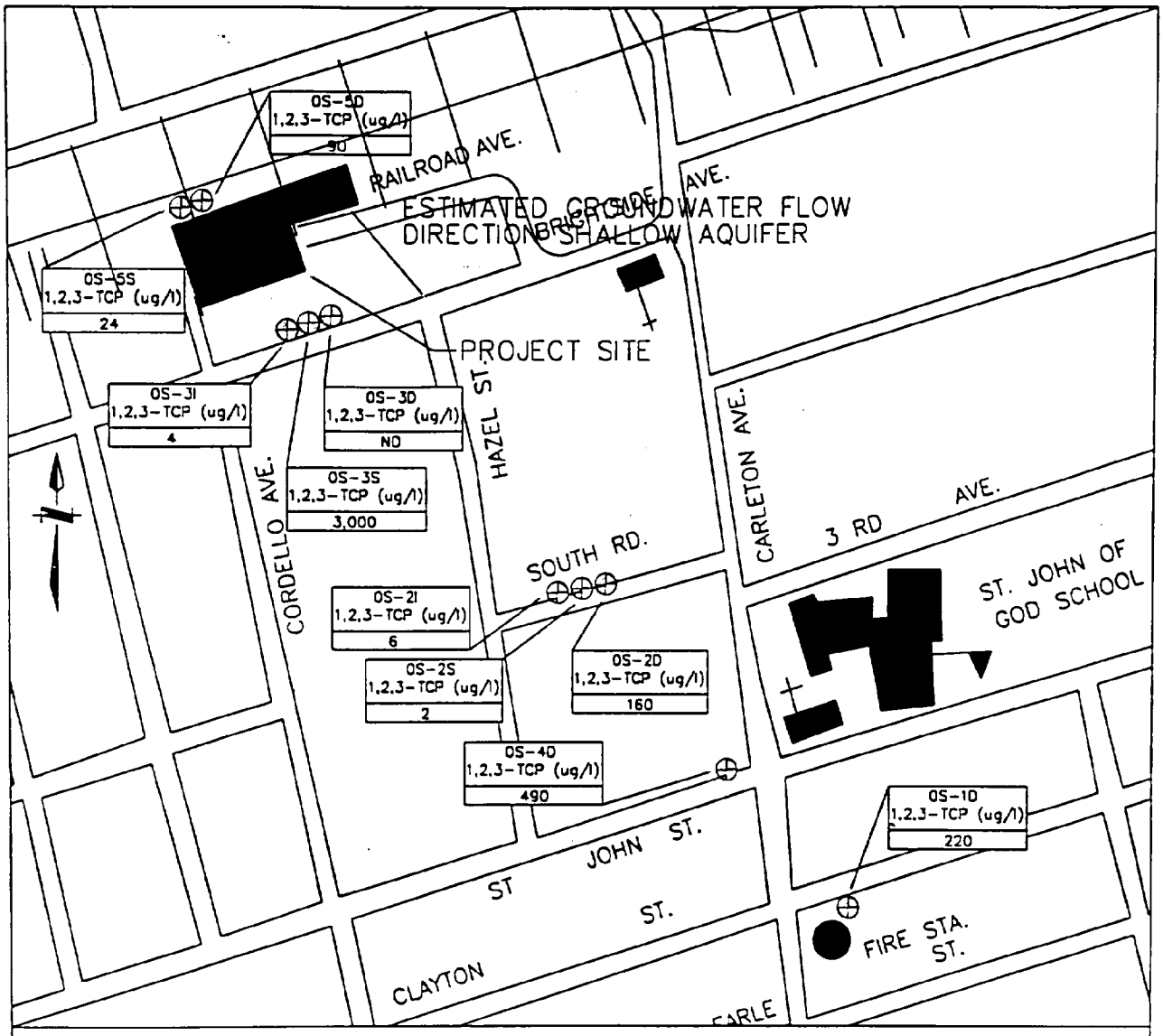


FIGURE 3
OFF-SITE MONITORING WELLS
AUGUST 1999
CONCENTRATIONS OF
1,2,3-TRICHLOROPROPANE
MACKENZIE CHEMICAL

OFF-SITE WELLS LEGEND:

S 60' BGS
I 120'-130' BGS
D 130'-160' BGS
ND NON DETECT
SAMPLE DATA IS FROM ANALYTICAL LABORATORY
⊕ MONITORING WELL

SCALE: 1"=300'

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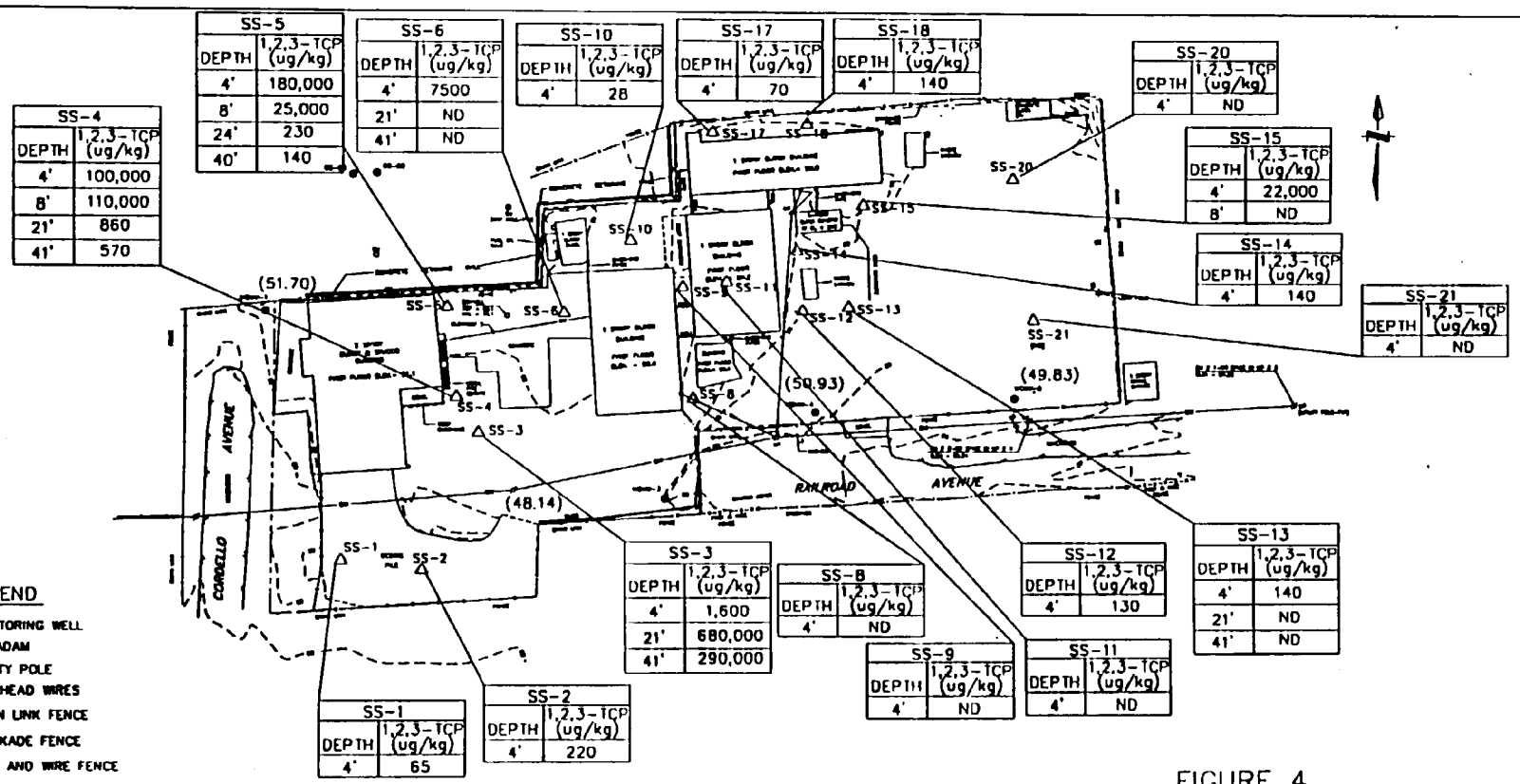

FIGURE 4
SOIL SAMPLES LOCATIONS WITH CONCENTRATIONS OF 1,2,3-TRICHLOROPROPANE MACKENZIE CHEMICAL

SCALE: 1"= 50'

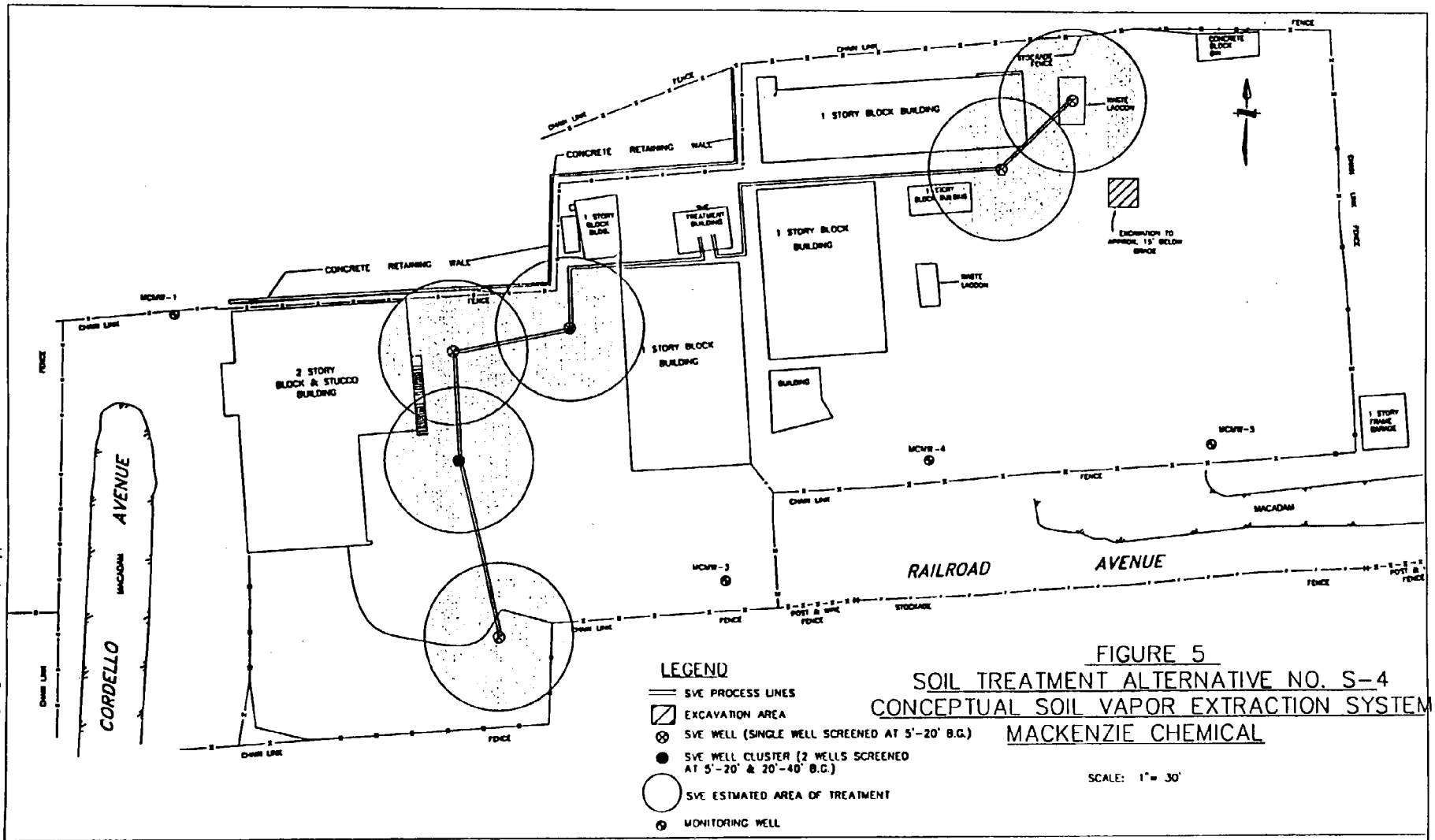

FIGURE 5
SOIL TREATMENT ALTERNATIVE NO. S-4
CONCEPTUAL SOIL VAPOR EXTRACTION SYSTEM
MACKENZIE CHEMICAL

SCALE: 1"= 30'

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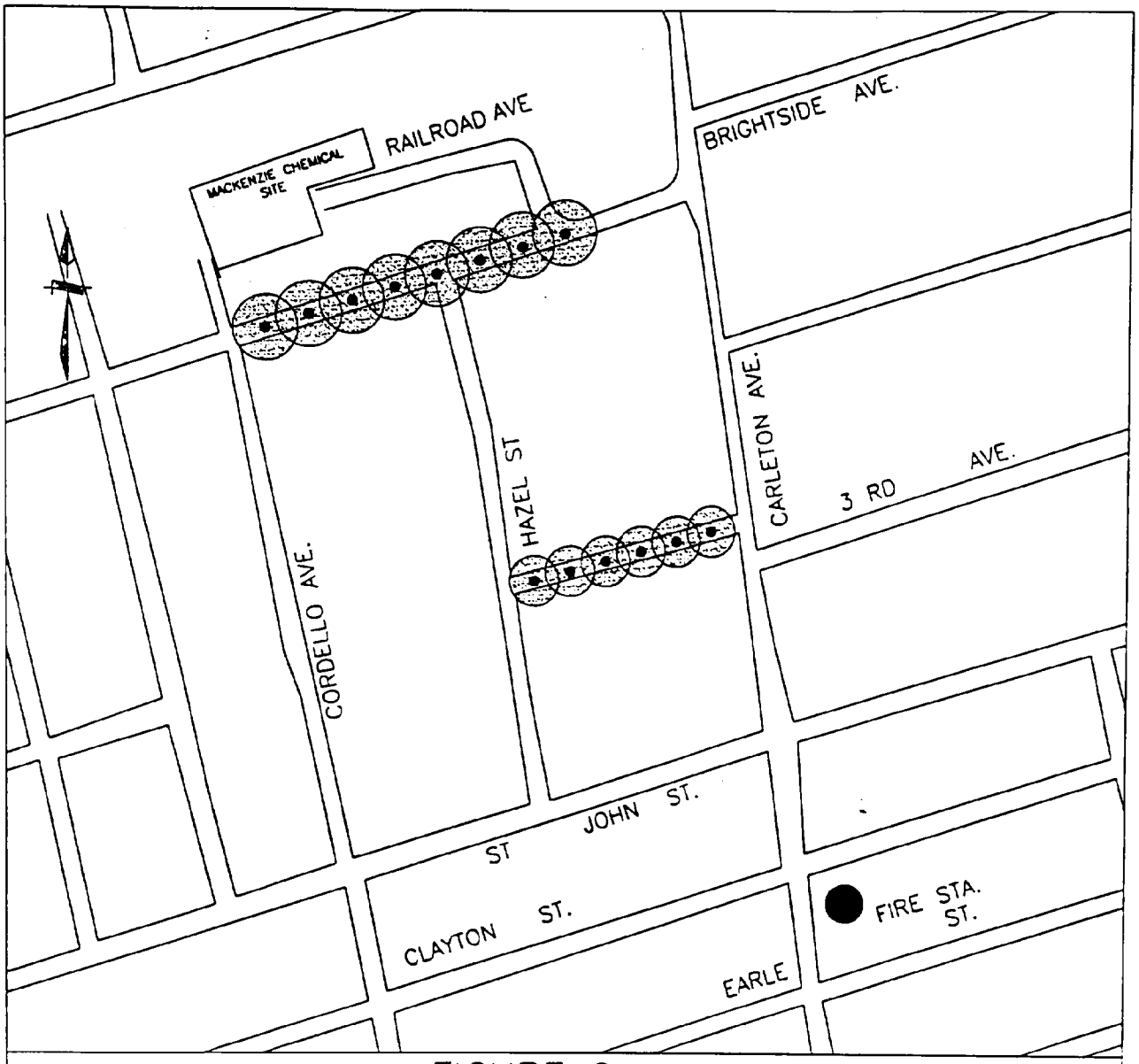

FIGURE 6
CONCEPTUAL GROUNDWATER ALTERNATIVE NO. GW-2
AIR SPARGE/ OZONE INJECTION SYSTEM
MACKENZIE CHEMICAL

LEGEND:

● TREATMENT WELL

◯ – C-SPARGER BUBBLE FENCE ESTIMATED ZONE OF INFLUENCE

SCALE: 1"=300'

NOTE: HIGHEST 1,2,3 – TCP CONC. USED FOR G.W. SAMPLES COLLECTED AT MULTIPLE DEPTHS

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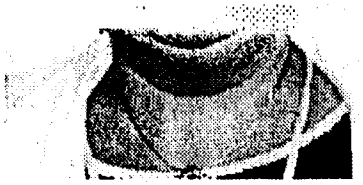
RESPONSIVENESS SUMMARY

APPENDIX V-b

PUBLIC NOTICES PUBLISHED IN THE *ISLIP BULLETIN* ON JANUARY 23, 2003 AND FEBRUARY 27, 2003

Back Copies of Islip Bulletin are charged at a cost of 50¢ per copy for the current month plus an additional 50¢ for each preceding month. Entered as a periodical matter at the post office at Sayville, N.Y. 11782 under the act of March 3, 1879.

cation to the nursing profession, she was promoted to infection control coordinator in 2000 and, most recently, to director of infection control. Ms. Terruso resides in Bay Shore with her two children, Michael and Britney.



News" items. However, please keep in mind that due to space limitations photos may or may not be used. The editorial staff will edit the copy to suit the paper's format. We will not "guarantee" placement of any community news items in any given week, items run on an "as received" basis.

The United States Environmental Protection Agency Invites Public Comment on the Proposed Remedial Alternatives for the MACKENZIE CHEMICAL WORKS SUPERFUND SITE Central Islip, New York

The Mackenzie Chemical Works Superfund Site is an abandoned industrial facility comprising approximately 1.4 acres, located in the Central Islip, Suffolk County, New York, on Railroad Avenue, in a mixed industrial and residential area. The United States Environmental Protection Agency (EPA), in consultation with the New York State Department of Environmental Conservation, recently completed an investigation to determine the nature and extent of the contamination at and emanating from the site and to identify and evaluate remedial alternatives. Based on the results of this investigation, EPA has proposed a remedy for the site. EPA's preferred soil alternative is thermally-enhanced in-situ soil vapor extraction and limited excavation and off-site disposal. EPA's preferred groundwater alternative is treatment using in-situ air sparging with ozone injection.

EPA's Proposed Plan, the document that describes the basis for EPA's preference, and other site-related documents are contained in the information repositories established for the site, which are available for public review at the following locations:

Central Islip Public Library
33 Hawthorne Avenue
Central Islip, New York 11722
(631) 234-9333
Hours: Mon. - Fri., 10:00 - 9:00
Saturday, 10:00-5:00
Sunday, 1:00-5:00

EPA Region II
Superfund Records Center
290 Broadway, 18th Floor
(212) 637-4308
Hours: Mon. - Fri., 9:00 - 5:00

EPA relies on public input to ensure that the selected remedy for each Superfund site meets the needs and concerns of the local community. A 30-day period for public comment runs from January 23, 2003 through February 21, 2003. EPA will hold a public meeting to discuss the Proposed Plan for the site on February 18, 2003 at 7:00 p.m. at the Central Islip Public Library Building, 33 Hawthorne Avenue, Central Islip, New York. During this meeting, public comments will be received.

Written comments and questions regarding the MACKENZIE CHEMICAL WORKS SITE, postmarked no later than February 21, 2003, may be sent to:

Mark Granger, Project Manager
U.S. Environmental Protection Agency
290 Broadway, 20th Floor
New York, New York 10007-1866
Telephone: (212) 637-3351 Fax: (212) 637-4284

It is important to note that although EPA has identified a preferred remedy for the site, a final decision will not be made until EPA has considered all public comments received during the public comment period. EPA will summarize these comments along with EPA's responses in a Responsiveness Summary, which will be included in the Record of Decision, the document which formalizes the selection of the remedy.

- LE COYOTE'S PROGRAM, AGES 3 TO 5.

Please turn to page 18

Knowing self defense is the same as money in the bank; good to have when you need it!

RESCHEDULED PUBLIC MEETING DATE

The United States Environmental Protection Agency
Invites Public Comment on the
Proposed Remedial Alternatives for the
MACKENZIE CHEMICAL WORKS SUPERFUND SITE
Central Islip, New York

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EPA relies on public input to ensure that the selected remedy for each Superfund Site meets the needs and concerns of the local community. Due to inclement weather, the public meeting to discuss the Proposed Plan for the site that was scheduled for February 18, 2003 was cancelled, and has been rescheduled for Monday, March 3, 2003, at 7:00 p.m. at the Central Islip Public Library Building, 33 Hawthorne Avenue, Central Islip, New York. During this meeting, public comments will be received. The closure of the public comment period has been extended to March 6, 2003.

Written comments and questions regarding the Mackenzie Chemical Works Site, postmarked no later than March 6, 2003, may be sent to:

Mark Granger, Project Manager
U.S. Environmental Protection Agency
290 Broadway, 20th Floor
New York, New York 10007-1866
Telephone: (212) 637-3351
Fax: (212) 637-4284

It is important to note that although EPA has identified a preferred remedy for the site, a final decision will not be made until EPA has considered all public comments received during the public comment period. EPA will summarize these comments along with EPA's responses in a Responsiveness Summary, which will be included in the Record of Decision, the document which formalizes the selection of the remedy.

RESPONSIVENESS SUMMARY

APPENDIX V-c

MARCH 3, 2003 PUBLIC MEETING SIGN-IN SHEET

EPA
Region II

MACKENZIE CHEMICAL WORKS SUPERFUND SITE
PUBLIC MEETING

Monday, March 3, 2003 @ 7:00PM - 9:00PM

ATTENDEES
(Please Print Clearly)

NAME	STREET	CITY	ZIP	PHONE	REPRESENTING	Are you currently on the list?	check list & add if necessary
TED O'BRIEN	7 CHURCH	CI	11722 11720	234 4184	CI IND CCC	YES	✓
Joe Reck	Albany	NY	12237	518 402 9622	NYSDEC	Y	✓
Everett Lackenbauer	38 Maplewood DR Central Islip	NY	11722	234 7443	Self	No	✓
Ralph Vunn	1022 Wilson Blvd Central Islip	N.Y.	11722-2801	(631) 234-4818	Self	yes	✓
Yvette Camacho	99 Juniper St. Central Islip	NY	11722	631-234-9027.	Self/ Town of Islip DEC	yes.	✓
Chris Gugliard	5 Church St	C I		631-234-4128		NO	✓
Anthony Gugliardi	5 church st	CI		631 234 6128		NO	✓

EPA
Region II

MACKENZIE CHEMICAL WORKS SUPERFUND SITE
PUBLIC MEETING

Monday, March 3, 2003 @ 7:00PM - 9:00PM

ATTENDEES
(Please Print Clearly)

NAME	STREET	CITY	ZIP	PHONE	REPRESENTING	Are you currently on the list?	
Sy Robbins					SCDHS	Yes	✓
Ed Delaney	4 Rosstown Ave	CI	11722	2346657			✓
Donna Guzman	16 Woodlawn Ave	CI	11722	232-2602		Yes	✓
Joe Saenz de Viteri Jr.	PO Box 284	CI	11722			No	✓
Nancy + Pete Manfredonia	23 Deerpath	CI	11722	348-0669	C.I. Civic Council	Yes	✓
KAY THONGBASEITH	195 St Johns Pl	CI	11722	631-234-4802		No	✓

EPA
Region II

MACKENZIE CHEMICAL WORKS SUPERFUND SITE
PUBLIC MEETING

Monday, March 3, 2003 @ 7:00PM - 9:00PM

ATTENDEES
(Please Print Clearly)

NAME	STREET	CITY	ZIP	PHONE	REPRESENTING	Are you currently on the list?
Barbara Loy	1127 Connetquot Ave	C. Islip			No. Great River Civic Assoc.	✓
CAROL CORCORAN	5 HAZEL ST.	Central Islip,	11722-2909	631 234-9453		No ✓
Julio PENA	73 BEECH St.	Central Islip,	11722-4951	631 234-8485		NO ✓
Amparo Walsh	15 Snowberry Ln.	Islandia,	NY. 11749	631-348-7265		✓

EPA
Region II

MACKENZIE CHEMICAL WORKS SUPERFUND SITE
PUBLIC MEETING

Monday, March 3, 2003 @ 7:00PM - 9:00PM

ATTENDEES
(Please Print Clearly)

NAME	STREET	CITY	ZIP	PHONE	REPRESENTING	Are you currently on the list?
Tom Westerfeld	1229 Connecticut Ave	CI	11772	342 0610		✓
Gwen Rivera	131 Alkwood Ave	CI	11772	NGR Civic Club	732 1046 apparently NOT.	✓
Thomas A D'Atro	1 Condello Ct	CE	11722.			✓

EPA
Region II

MACKENZIE CHEMICAL WORKS SUPERFUND SITE
PUBLIC MEETING

Monday, March 3, 2003 @ 7:00PM - 9:00PM

ATTENDEES
(Please Print Clearly)

NAME	STREET	CITY	ZIP	PHONE	REPRESENTING	Are you currently on the list?	
Joe Saenz de Vitsi SR.	68 Dietz st.	Central Isl.	N.Y 11722			NO	✓
Rick Johnson	66 2nd PL	Central Islip	NY 11722		Central Islip School Dist.		✓
Cheryl Westerfield	1235, Connetquot Ave	Central Islip	NY 11722		North Great River Civic Assoc.	No	✓
Jose R. Saenz de Vitsi	68 Dietz st	C.I	N.Y	11722		No	✓
Janice Smith	42 Cherry St.	C.I	11722	631-234-4581		NO	✓

RESPONSIVENESS SUMMARY

APPENDIX V-d

MARCH 3, 2003 PUBLIC MEETING TRANSCRIPT

In The Matter Of:

MACKENZIE CHEMICAL WORKS

Hearing
March 3, 2003

FINK & CARNEY
REPORTING AND VIDEO SERVICES
39 WEST 37TH STREET
NEW YORK, NY USA 10018
(212) 869-1500 or (800) 692-3465

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PAGE 1

TOWN OF ISLIP
COUNTY OF SUFFOLK: STATE OF NEW YORK

———————————————X

PUBLIC MEETING

MacKENZIE CHEMICAL WORKS SUPERFUND SITE
PROPOSED PLAN
CENTRAL ISLIP, NEW YORK

———————————————X

March 3, 2003
7:00 p.m.

33 Hawthorne Avenue
Central Islip, New York

APPEARANCES:
JOEL SINGERMAN, Chief, Central New York Section, Superfund Remedial Branch

MARK GRANGER, Project Manager, Superfund Remedial Branch
SY F. ROBBINS, CPG, Suffolk County Department of Health Services

CECILIA R. ECHOLS, Community Involvement Coordinator
JOE PECK, Department of Environmental Conservation

Sheryl Schultz
Court Reporter

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MS. ECHOLS: Good evening. We're ready to start. Hello. I am Cecilia Echols, and I'm the Community Involvement Coordinator for the MacKenzie Chemical Works Superfund Site.

Thank you all for coming out tonight. We're going to be here up until 9:00. The library closes at that time, so we'll have to scatter around that time.

We're here to discuss the cleanup at the site, the soil and the groundwater; and we're here to get community input, which is part of the decision-making process for cleaning up Superfund sites for the federal government.

There is a few ground rules. We will just wait for questions to be asked by you all after all of the presentations are made. There is an information repository here in the library. If there are any documents

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you are interested in reviewing, you can always come here and get them. We also have an information repository in Manhattan at our offices.

All of the comments and questions taken tonight will be part of the Record of Decision, which will be signed by the Regional Administrator, once we go through the entire process of how we're going to resolve in coming up with the cleanup.

I also wanted to make mention that there is a Technical Assistance Grant Program. It's a $50,000 grant that each community can apply for who lives around a Superfund site. If you want any more information about that, you can speak to me afterwards.

We do have a translator here, if there is anyone who needs — we have a Spanish-speaking translator here, if anyone needs any assistance with that; and it is Amparo, she is sitting right there in the front.

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There were sign-in sheets. I hope everyone signed in, so you can receive future mailings. I hope you took all of the handouts.

There is a stenographer. Everything is for the record. She's right here in the front. She's right here.

If you have to leave early and would like to make a comment or if you have questions, you can come up to me and I can give you this card. You can fill it out with your question or comment.

So let me go through the agenda. On the agenda we have Joel Singerman, who is to the far left of me. He is the Chief of the Central New York Section for the Superfund Remedial Branch; and we have Mark Granger, who is the Project Manager. He's going to give an overview of the results of the Remedial Investigation, Feasibility Study, and the Remedial Alternatives;

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and Joel will speak about the overview of Superfund. Then Mark is going to give our Proposed Plan of Cleanup, and then we'll open it up for questions and answers.

In addition, we have Joe Peck. He is with the New York State DEC. He is to your far here; and Sy Robbins, he is with the Suffolk County Department of Health.

The public comment period is March 6th. It ends March 6th. It was extended about fifteen, twenty days. A meeting was supposed to take place on February 18th. Due to the snow, we had to have it cancelled, but we didn't really have to have it cancelled because the library was closed anyway; but we're here tonight to give that same presentation. So by March 6th we should receive all of the written comments, which will be part of the Record of Decision.

Now I'll give it to Joel.

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MR. SINGERMAN: Several well-publicized sites of toxic waste disposal disasters in the late 1970's, one of them, the Love Canal, shocked the nation and highlighted the fact that past waste disposal practices were not safe. In 1980, Congress responded with the creation of the Comprehensive Environmental Response, Compensation and Liability Act, more commonly known as Superfund. The Superfund Law provided federal funds to be used in the cleanup of uncontrolled and abandoned hazardous waste sites and for responding to emergencies involving hazardous substances. In addition, the law empowered EPA to compel those parties that were responsible to pay for the cleanup or to conduct the necessary response actions.

The work to remediate the Superfund site is very complex and takes place in many different stages.

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Once a site is discovered and inspection further identifies the hazards and contaminants, the determination is then made to include it on the Superfund National Priorities List, which is a list of hazardous waste sites that EPA can address. These are the nation's worst hazardous waste sites. The sites are placed on the National Priorities List based upon the ranking system, based upon the threat to public health and the environment. All of these sites on the National Priorities List can clean up from the Superfund.

The selection remedy for a Superfund site is based upon two investigations, a Remedial Investigation and a Feasibility Study. The purpose of a Remedial Investigation is to determine the nature and extent of the contamination at the emanating site and to evaluate the threat posed to public health and

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the environment. The purpose of the Feasibility Study is to identify and evaluate remedial alternatives to address that contamination.

Public participation is the key feature in a Superfund process. The public is invited to participate in all decisions that will be made throughout the program, through the Community Relations Program. Public meetings, such as this one, are held as necessary to keep the public informed and to solicit their input. The public is given the opportunity to comment on the results of the investigation and these studies conducted at the site and the proposed remedy.

After considering public comments on the proposed remedy, a Record of Decision is signed. The Record of Decision is a document which indicates the basis for the particular remedy that is chosen. The site then proceeds to the design phase for the plans and

Page 9

specifications related to the selected remedies that are developed.

Following that is the remedial action, which takes the design plans and actually implements the remedy that's been designed. Following that, operation and maintenance of the remedy of monitoring whatever is necessary is undertaken; and then once the site has achieved cleanup levels, the site will be deleted from the National Priorities List.

Now Mark will talk about the history of the site.

MR. GRANGER: Thank you, Joel. I would like to start by thanking everyone for coming this evening and to point out that the slides are available in the back of the room for anyone who doesn't have them as well as the Proposed Plan which discusses in more detail what I'm going to be discussing this evening.

The purpose of my talk is to

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discuss the history of the MacKenzie Chemical Works Site, to summarize the findings of the Remedial Investigation and the Risk Assessment, to explain the alternatives that EPA has developed to address contamination that was found at the site, and to present EPA's preferred remedial alternative.

MacKenzie Chemical Works Site is located in Central Islip on Railroad Avenue. The plant was built on previously undeveloped property, operating continuously from the 50's through the mid-1980's. MacKenzie operations included the manufacturer of various chemical products, including fuel additives; one of which is a product called Pyrocat, which uses the chemical name 1,2,3-trichloropropane.

Spills and poor housekeeping were documented from the late 1970's through the early 1980's. Poor housekeeping also included several fires.

MacKenzie Chemical Works sold

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the property in the mid-1980's, consolidating operations in Louisiana. A series of several small businesses have occupied the property since that time, more or less continuously.

Here we have the MacKenzie Chemical Site on Railroad Avenue. To the north you will see railroad tracks. To the west is commercial properties and to the south and to the east are residential properties.

The MacKenzie Chemical site itself, you will hear me refer to this as the lab building and these two buildings as the warehouse buildings. (Indicating) When I say east of the lab building, I am talking about this area, and when I say east of the warehouse buildings, I'm talking about this area and up a little further, which I can't really reach.

New York State and Suffolk County studies of the site in 1993 found

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significant levels of contaminants in the soil and groundwater. New York State and Suffolk County completed comprehensive studies in 2000. Assessment of this data led to a comprehensive study known as Remedial Investigation or RI. This study was completed in August 2000. Based in large part on the findings of the Remedial Investigation, the site was added to the Superfund National Priorities List in September 2001.

New York State and EPA studies conducted between 1998 and 2002 included sampling of groundwater. Five grounds of groundwater sampling were conducted in that time period. Sampling of subsurface soils and drainage structures. Numerous samples were collected in order to, among other things, discern the presence of any source areas that may be a cause of groundwater contamination

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and sampling of the surface soil and soil vapor.

The results of the data collection efforts show that groundwater flows generally to the southeast. Contaminants were detected above the state and federal standards in groundwater beneath and downgradient of the site, including 1,2,3-trichloropropane; and public drinking water supply wells are located far downgradient of the site and outside the influence of site-related contaminants.

To continue with the results of the Remedial Investigation, many subsurface soils were found to contain contaminants above state guidance values. Off-site soil gas and site-related surface soils were not found to be significantly impacted by site-related contaminants; and there is a significant source of VOC contamination to groundwater

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from subsurface soils and drainage structures in the lab and warehouse areas, primarily 1,2,3-trichloropropane.

Again, when I'm talking about the lab and warehouse areas, I'm referring to this area here and the area to the east of the warehouse buildings. (Indicating)

To continue on the results of the RI still further, there are low to moderate levels of contaminants in subsurface soils throughout the site; and while relatively high immediately downgradient, VOC levels in groundwater tend to be significantly lower beyond South Road.

To illustrate this, groundwater monitoring results indicate that this area and this area have not been impacted by the site. The area immediately downgradient of the property is substantially impacted; but when you get down below South Road,

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the data indicates that the levels drop off rather significantly.

Sampling results from the RI were compiled and analyzed in what is known as a Risk Assessment. The purpose of risk analysis is to determine if a site poses a threat to human health and the environment. While generally the area is served by public water, because the aquifer beneath the site is a supply of public drinking water and is designated as a sole source aquifer, EPA ran that particular remedial through the risk assessment process under a hypothetical scenario.

Further, subsurface soils were addressed. While there is not an imminent threat due to contamination in surface soils — in subsurface soils rather — due to the fact that utility workers or construction workers could conduct excavation activities in this area, again, a hypothetical scenario was run through the risk analysis.

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The Risk Assessment concluded that there were unacceptable risks under hypothetical scenarios for both of those remedial subsurface soils and groundwater, primarily due to 1,2,3-trichloropropane.

Having shown the presence of contamination in soil and groundwater and having concluded that there is unacceptable risk due to hypothetical scenarios, EPA evaluated options for addressing both contaminated soil and contaminated groundwater.

The alternatives that were developed to address subsurface soil contamination were no action. The no action alternative is always done. It's part of a federal regulation. This alternative is required to provide a baseline of comparison for all of the other alternatives.

Alternative S-2: Excavation and Off-Site Treatment/Disposal. More or less self-explanatory. The soils in

Page 17

the source areas are excavated and trucked to a permanent facility where they are treated and/or disposed. Then the holes are backfilled with clean fill.

A variation of this is Alternative S-3: Soil Excavation, Treatment via LTTD, and Redeposition. The variation being that in LTTD, a Low-Temperature Thermal Desorption unit is a unit that treats soil. That unit is physically brought to the site, the soils are excavated from the source areas; and instead of being sent to a permanent facility, they are treated in this unit called a low-temperature thermal desorption unit; and provided that they meet guidance values can be redeposited into the excavations.

And, finally, Alternative S-4: Treatment of VOC-Contaminated Soils Using Thermally-Enhanced In-Situ Soil Vapor Extraction, with Limited Excavation of SVOC-Contaminated

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Soils with Off-Site Treatment and Disposal. Basically, to explain thermally-enhanced in-situ soil vapor extraction, the soil vapor extraction system involves the installation of extraction wells in the source areas and the application of a vacuum to each one of those points, whereby the vapor from the soil is continuously drawn off for an extended period of time until those vapors are beneath guidance values; thereby, eliminating the source in the subsurface soils to the groundwater. Those vapors are then treated and vented to the atmosphere after treatment.

In terms of cost, since no action is being taken for Alternative S-1, there is no cost incurred. S-2, Excavation and Off-Site Disposal, the costs are estimated to be 1.5 million dollars. For S-3, the Low-Temperature Thermal Desorption option, the costs are estimated to be 2.5 million

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dollars; and for the Soil Vapor Extraction Alternative, the costs are estimated to be 1.2 million dollars.

In terms of addressing groundwater, again, the no action alternative is required as a baseline of comparison.

Alternative GW-2: Groundwater In-Situ Air Sparging with Ozone Injection. Again, the concept is to install a series of points perpendicular to groundwater flow. If you recall, I said groundwater flows to the southeast. The idea being you basically construct a fence or some kind of barrier or some kind of curtain, just to apply a metaphor. You would install points perpendicular to groundwater flow for the width of the plume, and in this case you would inject a mixture of air and ozone.

Now, the contamination has been determined to be from the surface of

Page 20

the groundwater down to approximately 120 feet. So these points would go at least to 120 feet, maybe a little bit beyond. The ozone and air is injected, and as it bubbles up through the aquifer through this series of points, not just one point — it could be six; it could be eight; it could be ten; depending on the remedial design — as the ozone and air mixture bubbles up through the aquifer, it treats the contaminants before it reaches up to the surface.

Using the same metaphor of a curtain or a fence, as groundwater flows — I probably should have said that a little earlier — as groundwater flows towards these points — groundwater has a particular direction that it's flowing, and in this case it's to the southeast — as it flows, it passes through this series of injection points, and the contaminants are treated as the water passes

Page 21

through; and the water that comes out through the other side is generally below, or, you know, the design will be directed such that those contaminants are below guidance values when it comes out the other side.

Same can be said for groundwater extraction and treatment. The groundwater is flowing, it goes towards a series of, in this case, extraction wells, not injection wells; and the groundwater is extracted, pumped to a central facility, most likely to be located on the property. The groundwater is treated, and in this case there is no receiving bodies really, so the groundwater would — it would be required that the groundwater was reinjected into the aquifer, this treated groundwater that was below guidance values.

The final alternative for groundwater, Alternative GW-4: In-Situ Permeable Reactive Barrier. Basically,

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you're constructing your barrier or your porous media or — you know, in the first case, it was bubbles, for lack of a better word; in the second case, it was a groundwater extraction, a suction; and in this case, it's a physical, permeable barrier.

The groundwater comes toward the barrier. The barrier is installed down 120 feet for the width of the plume. It's basically like a permeable wall. Depending on the thickness is depending on how clean the groundwater is going to get. So when you install these — this particular alternative technology is installed in panels. So you install a series of panels that are connected; and as the groundwater goes through the wall, it's treated, and the groundwater on the other side — and, again, this is down 120 feet for the width of the plume — the groundwater comes out below guidance values.

Costs in terms of the groundwater

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remedies; again, no action is being taken for GW-1, so no costs are incurred. GW-2, Air Sparging with Ozone Injection, estimated at 1.3 million. The Groundwater Pumping and Treatment Alternative is estimated at 2.6 million dollars; and GW-4, Permeable Reactive Barrier Alternative is estimated at 2.6 million dollars.

EPA evaluates, as a matter of policy, all alternatives considered against nine criteria, and I will just go over these briefly. These include overall protection of human health and the environment; compliance with environmental regulations; long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; cost; state acceptance; and community acceptance. The last two criteria, state acceptance and community acceptance, are considered as part

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of EPA's final decision.
After careful consideration against the nine criteria, EPA's proposed remedy for the site includes: For the soils, Alternative S-4, Treatment of VOC-Contaminated Soils Using Thermally-Enhanced In-Situ Soil Vapor Extraction with Limited Excavation of SVOC-Contaminated Soils with Off-Site Treatment and Disposal. Essentially, the SVOC system is going to set up in the source areas that I had referred to a little earlier. That's east of the lab building and east of the warehouse buildings.
The other part of EPA's proposed remedy for the site is Alternative GW-2 to address the groundwater, Groundwater In-Situ Air Sparging with Ozone Injection. In this case, either on the property or immediately downgradient of the property, a series of injection wells will be installed that inject the ozone and air; and as

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the groundwater passes through it — there is a southeasterly flow to the groundwater — the groundwater is treated. But since this groundwater is already contaminated, based on design considerations and further studies of the aquifer, somewhere within the plume would be another series of injection points across the width of the plume, perpendicular to groundwater flow. So if groundwater flow is this way, perpendicular to groundwater flow the width of the plume, another series of injection points would be installed to address that groundwater.
EPA feels that this remedy provides the best balance of EPA's criteria; that it protects human health and the environment; that it reduces toxicity, mobility, and volume through treatment; that it is readily implementable and cost effective.
In conclusion, all of what I have

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discussed this evening is elaborated upon in detail in the Proposed Plan; and if you'd like more detail, you can either talk to me or you can read in more detail in the Proposed Plan. Thank you.
MR. SINGERMAN: The preferred remedy that Mark just described is just that, EPA's preferred remedy. We won't make a final decision until we have heard all the public's comments and concerns; and with that in mind, we are here tonight to hear your comments and concerns; and as we said earlier, you know, you can submit your comments. If you don't do it tonight, you can submit them in writing, either by fax, by e-mail, or by telephone; and all the information is right on page 2 of this document.
MS. ECHOLS: Okay. We are going to open up for questions and answers — questions. I'm sorry. One person at a time. Please state your name, so the

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stenographer can get that accurate.
Sir, would you stand please and state your name.
MR. NUNN: Yes. Ralph Nunn, N-U-N-N. Just two short questions. One of them has to do with the map that's currently on the wall right now. Looking at the direction indicator where the letter "N" is on that arrow, I live in that area right there. Is that area affected by the spreading plume or is that outside the plume area?
MR. GRANGER: Long Island plumes — and Sy could probably provide a little bit more clarification on this — but my understanding is that plumes on Long Island tend to be rather narrow and dagger-shaped. Plumes in other areas can spread out and move very, very far. On Long Island, they move very far or they can move very far, but they tend to stay very narrow, based on topography and groundwater

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flow.
The data that we've collected has shown that that area is not affected by the groundwater contamination.
MR. NUNN: And the related question is talking about the GW-4 process that you had mentioned. I understand it's more or less a filter process, and the question is: At which point does this filter device become saturated with contaminants and require replacement?
MR. GRANGER: Well, it's a good question; and if it was a filter device, then you're absolutely right. It would require replacement of the media.
In this case, it's more of a catalytic process. It's a material that's injected into the ground that is porous, and it catalytically breaks down, cleaning 1,2,3-trichloropropane as it passes through. Sort of like a catalytic

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converter on a car. As the gases pass the catalytic converter, the catalyst doesn't change, but what's passing past the catalyst does change.
MR. NUNN: Thank you.
MS. ECHOLS: Yes, sir. You have a question?
MR. WESTERFELD: Yes. Dave Westerfeld. I wanted to say a couple of words about the low-temperature thermal desorption unit versus the ISVE. In both cases, is the vapor treated, or how do you choose between those two?
MR. GRANGER: Well, they're actually two different, completely different, technologies; but, you know, in terms of off-gases, yes, that's probably the closest similarity between the two. Off-gases, there's a lot of different configurations of low-temperature thermal desorption units. For the most part, the off-gases from a low-temperature

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thermal desorption unit would either be what they call distilled, they would be driven off and collected and put back into liquid form and then brought somewhere else for treatment; or they would be collected and burned; or they can be sent through a carbon unit, for instance, a carbon, which has four openings to receive contaminants and can actually be used in that instance as well.

The low-temperature thermal desorption unit works by feeding the soil sequentially into this unit and driving off the contaminants. So, for instance, soil, on average, from your backyard, you're not going to be driving off contaminants from that; but something from a gas station or a chemical manufacturing facility or the like is going to have contaminants that tend to want to be driven off, if given a chance. So heat is applied and the vapors are driven off and then

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collected, and when the soil comes out the other side, it's not contaminated anymore, at least not with volatiles. It could be — there could be some other contaminants. They have metals that don't lend themselves to burning, but in this case we're looking at a volatile contamination.

MR. WESTERFELD: So what's the — how do you choose between those two? Is there a difference in pressure for treating volatiles?

MR. GRANGER: Well, the difference is that, in one case, you're actually digging the soils up; and in this case the soils are contaminated to quite a substantial depth. Contamination has been found down to 41 feet, and when you're digging down to 41 feet and feeding things into a unit, it gets a little impracticable just from a space constraint standpoint. I mean, you tend to want to open your holes up

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and lay them back through the one or whatever your layback is; and when you're going down 41 feet, when you have residences nearby and railroad tracks, even if you bring the buildings down — it can be done. You can shore them up, you can apply a lot of different engineering techniques to do that, but for the most part, that drives up your costs and that is reflected in the Proposed Plan.

The ISVE remedy, on the other hand, is an in-situ remedy where instead of digging soils up to drive the contaminants out, you're installing small pipes in clusters in the contaminated areas and drawing with a vacuum the volatile contamination from beneath the ground. And all you're doing, the only part that's similar between the low-temperature thermal desorption unit at that point and the in-situ soil vapor extraction is the collection of the vapors.

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MS. ECHOLS: Sir, in the far back?

MR. JOHNSON: Yes. My name is Rick Johnson and I'm representing part of the School District of Central Islip. I was just wondering if there is any hazards that we have to worry about with our schools that are so close to that, especially with the plume that goes that way, with the school on Clayton Street and Cordello Avenue.

MR. GRANGER: Basically, this is a concern that's come up over the last couple of years, or I should say it's been heightened over the last couple of years. The one thing that works to the advantage in terms of MacKenzie Chemical's influence to vapor would be, I think, what you are talking about?

MR. JOHNSON: Well, it's the water underneath the school I'm talking about, the plume that, you know, is underneath the way. Underneath the

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school pretty much, it is a waterway. We know all the water that runs off that area heads into the bay, and that's the way that it runs is down that area —

MR. GRANGER: All right.

MR. JOHNSON: — and I was wondering we have any problems with underneath our schools or with the ground that's around the school because of the contaminants.

MR. GRANGER: All right. So we usually evaluate that in terms of exposure pathways and completed exposure pathways. In the case of groundwater, there is no completed exposure pathway. The groundwater is 50 feet beneath the ground surface, basically, you know, 45 or 50 feet, give or take a couple of feet.

In that case, what you would be looking at is, is there a soil vapor problem? That is something that we're taking seriously and that we need to

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evaluate further, but just off the cuff, it would seem that it's rather remote —

MR. JOHNSON: Okay.

MR. GRANGER: — that a lesser volatile contaminant, such as 1,2,3-TCP, which is not as volatile as the perchloroethylenes that you get from dry cleaners and the trichloroethylenes that you get from metal fabrication plants; that that would be a large concern just because the groundwater and any volatiles that would come off the groundwater are so deep in the ground.

MR. JOHNSON: Okay. Thank you. The other question I have, if we have any sort of emergency in that area — I'm talking for our emergency workers in our town, the EFD, the fire department, which I happen to be a member of — is there any precautions that we have to take when we head into this area if there is some sort of

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an emergency in that area, like a fire, explosion, or anybody trapped underneath the ground and that type of thing? Is there any — are there any precautions that we have to take when we enter this area?

MR. GRANGER: I'm sorry. Are you saying trapped beneath the ground?

MR. JOHNSON: Well, if we have people who are working underneath the ground, digging up this soil, which means we're going to have a hole, people do have a tendency to fall in and get trapped and some sort of a rescue operation that we're going to have to go in and take this person out or these people out or anything like that.

MR. GRANGER: Right.

MR. JOHNSON: I was wondering if there's any type of precautions that we have to take as emergency workers in this area because of what's going on there and what the problems is with the

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toxic material that is in the ground and stuff and in the building.

MR. GRANGER: All right.

You'll see in the discussion of the alternatives in the Proposed Plan that part of these — well, let me — all right.

First, let me say this, that is discussed in the Proposed Plan, and that is something that the Proposed Plan addresses directly by saying, "This alternative is implementable, but it does require that health and safety protocols be followed directly."

Let me follow that up by saying that the alternative that you're talking about that involves digging is not being proposed by EPA tonight. So if it was, then that would be something that we probably would need to discuss further; but as it is, unless public comment indicates or some other force comes into play that changes the selection to that remedy.

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it won't be a — it won't be a factor to consider.

MR. JOHNSON: Right, but what I'm asking you right now, if we have an emergency in that area right now, okay, we have the building and there is a fire in there, should we treat that area as a hot area, as a HAZMAT area, or should we just treat it as just a regular building that's on fire?

MR. GRANGER: All right. Now, that's a good question. I think that I'm going to have to discuss that with my supervisor a little further, but my off-the-cuff answer is that we haven't found the buildings themselves to be contaminated and we haven't found the surface of the site to be substantially contaminated, such that if there was a fire on the property, you would be able to handle that as just an ordinary — well, I guess no fire is ordinary — but as a nonhazardous situation. Let's

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put it that way.

MR. JOHNSON: Okay. Thank you.

MS. CAMACHO: I have a question. My name is Yvette Camacho. I work for the Town of Islip and I'm a sanitation inspector.

The property, based on this information, states that a construction company is right now using this property temporarily, but this paving company has been there three years and with them constantly moving the ground and the cement back and forth, aren't they exacerbating this whole problem back and forth and contaminating that whole entire area? Because they keep on recycling their construction material.

UNIDENTIFIED PERSON: They've got trucks in there constantly.

MR. GRANGER: Well, the fact of the matter is that in terms of contamination, the contamination was found basically four feet and down —

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MS. CAMACHO: Um-hmm. Yeah.

MR. GRANGER: — not necessarily four feet and up; and to my knowledge, I haven't seen any excavation being performed on the property except by governmental agencies such as EPA and DEC and Suffolk County.

MS. CAMACHO: They have been there for three years and they're still using that property.

MR. GRANGER: They're using the property, but are they digging?

MS. CAMACHO: No. They keep on storing and moving stuff around.

MR. GRANGER: These are the kind of things where governmental agencies tend to crisscross, and my answer to problems like that that I have encountered at other properties — yes, other properties, other sites, is that, typically, unless requested by the Town or by the County, EPA doesn't typically get involved in issues that should be handled locally.

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MS. CAMACHO: So then I have another question.

MR. GRANGER: Well, I'm sorry.

MS. CAMACHO: Okay.

MR. GRANGER: I would anticipate that a certain amount of reworking of the property is going to be necessary in order to implement the remedy, such that the areas that I discussed east of the lab building, there's going to be a certain reservation on EPA's part or of EPA reserving a part of that property to implement the remedy. Same as east of the warehouse where I think most of the piles that you're talking about are.

MS. CAMACHO: Right, because —

MR. GRANGER: We're going to need some of that, and some things are going to have to happen in order for us to implement the remedies that we want.

In the meantime, if you want to discuss things locally and try to

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bump it up to the County, if it comes to EPA's desk, then we would do that. But, to tell you the truth, my experience has been that most citizens of towns don't want federal government interference in local affairs.

MS. CAMACHO: But my question is, it's twofold, because in order for you to clean the property and the ground, they're going to have to move all the stuff out of there because you can't clean it without them.

MR. GRANGER: That's true.

MS. CAMACHO: So then what happens? This stuff has been sitting there three years.

MR. GRANGER: At that point we need to effect the actions that help us to implement the remedy.

MR. SINGERMAN: So we may have to move the stuff.

MR. WESTERFELD: So there's no concern about contamination being

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spread when they're moving the stuff; it's about the contamination that's in the subsurface?

MR. GRANGER: We specifically sampled the surface last year in order to assess whether there was a threat of contamination to human health or the environment from surface conditions; and the risk assessment, which is very rigorous and very conservative, turned up that there wasn't a threat based on that remedial. Okay?

MS. ECHOLS: Ma'am?

MS. MANFREDONIA: Nancy Manfredonia. I'm Director of the Central Islip Civic Council. I have some practical questions, if you'll bear with me.

I just — let's talk about the soil. If they — last year, as Ms. Camacho said, how did they test the soil in that area where there's, like, 20 feet of rubble? Did you go under that already? How did you test

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that?

MR. GRANGER: There are some samples that were collected from that area before there were piles there; but, no, basically, you're looking for a threat to human health or the environment. The piles are not related to, historically, what went on at the site and why we're interested in the site from a contaminant standpoint. So, no, we didn't sample underneath the piles. Then, again, nobody can get to those soils in order for there to be a threat.

MS. MANFREDONIA: Okay. But I guess I'm still following up on Ms. Comacho's question. Does the person there — who — who is paying for this? Is this his responsibility? Who makes him move this stuff? What's going on there in the first place? Because there are trucks constantly going in and out, and I can't seem to find out who is giving this guy

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permission to do this work or to be there.

MR. GRANGER: I don't know what arrangements the operator at the site has with the owner of the property.

MS. MANFREDONIA: Do we know actually who owns the property?

MR. GRANGER: We know who's basically ended up holding the bag, so to speak. I mean, the property is essentially abandoned.

MS. MANFREDONIA: All right. I mean, I don't — I don't understand. Because from what I — when I look it up, it says that they owe, like, three-quarters of a million dollars in taxes that haven't been paid and it's some private owner, and I don't understand the implications.

But let's talk about the people who are living there. If you're talking about soil and the soil vapors, I'm concerned about — and I don't know how — do you have any idea how wide

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this plume is?

MR. GRANGER: We estimated it to be 100 feet pretty close to the site and 200 feet downgradient of the site.

MS. MANFREDONIA: Okay. Then if we're talking about this, there is homes right on Brightside Avenue that back up to the site. There's homes on Hazel and South Road and so forth. Is there any possibility that people's basements could have vapor in them, or that people who might be excavating for a cesspool or something might be in jeopardy?

MR. GRANGER: We sampled soil vapor in neighboring properties immediately downgradient of the site and found the levels to be reasonably acceptable. In other words, EPA's Removal Program actually went in to see if there was an imminent threat to people who live immediately downgradient of the site and concluded that there was not an imminent threat.

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I think that Sy wanted to say something.

MR. ROBBINS: Yes. The State Health Department's looked at that data too, and their conclusion was that the soil vapor issue south of the site underneath — above where this groundwater plume is traveling is not a problem. There was some — I think it was perchloroethylene, which is one of the solvents they found in one of the monitoring wells off site on the residential properties, which just barely exceeded what they would normally allow in a basement space. So, presumably, if any of this ever found its way into somebody's basement, it would be even less than that concentration.

Certainly, what the EPA is proposing to do will eliminate that pathway, but they didn't find any trichloropropane in those soil vapor samples off site, and that would be

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the major concern from that groundwater plume.
MS. MANFREDONIA: Okay.
MR. ROBBINS: Also, as the groundwater plume moves southward and goes deeper and deeper, there's fresh water that falls on top of it, so it's really only the houses directly opposite the facility on the south side.
MS. MANFREDONIA: Like the ones on Brightside Avenue?
MR. ROBBINS: Yeah, and that's where the State Health Department tested, and they were satisfied that there was no health threat found there.
MS. MANFREDONIA: Thank you. Does that mean though that if — the other question is, I'm very unclear with the water, your remedy for the water. If you have to go down as deep as 120 feet and you're talking about going, you know, off site, what happens to the property owners where you may

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want to do this? This is — are you putting this in their backyards? I mean, where — where is this going?
MR. GRANGER: Part of the selection process is to take into consideration, like, the impact of technologies on the community in general. Essentially, two of the technologies that were viewed as — I should say the three that were evaluated — two of them were less intrusive than the third.
In other words, groundwater pump and treat would require piping right down the middle of the street and putting in extraction wells with pumps in them that are running 24 hours a day or 12 hours a day or some variation of that.
The air sparging with ozone injection requires much smaller injection points with little curb-mounted boxes that almost look like little telephone switching

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boxes. They're not really noisy and they shouldn't intrude on the neighborhood at all.
The permeable reactive barrier is a passive remedy. The thing that's not good about the permeable reactive barrier is that it's almost twice the price.
Although if things got really complicated, if you look, you will see in the Proposed Plan that we have a backup remedy. For instance, if case treatability studies indicate that the ozone and air mixture is not effectively treating the contaminated groundwater, then we would apply this more expensive technology, the passive barrier, which would require probably two weeks of disruption in the street and then you wouldn't see it again.
MS. MANFREDONIA: So these wells that you — how many are you planning and would any of them be on private property?

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MR. GRANGER: I would say they would be along the street, and we've noticed that there aren't really sidewalks. So you can't really say that you're going to put it between the sidewalk and the curb; but, you know, they'd be probably right along the street somewhere.
MS. MANFREDONIA: In the street right-of-way?
MR. GRANGER: Yeah. They're not real intrusive. It would require a little bit of piping. We are estimating at the time being that there's eight points, stretched a little, you know, perpendicular to the plume. Could be a little more; could be a little less.
MR. ROBBINS: They are piped together though?
MR. GRANGER: Yes, they are.
MR. ROBBINS: They're connected to an ozone too.
MR. GRANGER: It could be two

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sets of four or one set of eight, you know. The ones on the site or immediately downgradient of the site shouldn't be intrusive to neighbors at all. It would be the one that was addressing the downgradient groundwater that may be somewhat intrusive; but with respect to property values and nuisance, I think any time that you're addressing a Superfund site, it's a positive impact on any neighborhood.
MS. MANFREDONIA: So is this — you're saying these won't be noisy?
MR. GRANGER: They may buzz a little bit, and they're also — I confirmed with the installer that if it turns out that there was something that was deemed a nuisance, they can be put on timers, such that — you know, groundwater doesn't move that fast. They don't necessarily have to run 24 hours a day. I mean, groundwater is moving — you know, a foot a day is pretty speedy. So

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they could be run, you know, from 8 to 4 or 9:30 to 6:30 or something along those lines. They're scalable, in other words.
MS. MANFREDONIA: And I guess the question is: Is this a month, a year, five years, two weeks? What is this?
MR. GRANGER: Oh, for this remedy proposal?
MS. MANFREDONIA: Yes.
MR. GRANGER: Oh, no. Probably about 15 years.
MS. MANFREDONIA: Fifteen years?
MR. GRANGER: Groundwater takes a long time to clean up.
MS. MANFREDONIA: Oh, boy. Okay.
MR. GRANGER: And that 15 years is an estimate. It could be 20 years; it could be 10 years; it could be 25 years; it could be 8 years.
MS. MANFREDONIA: Would the other alternative take less time, the permeable barrier?
MR. GRANGER: No. The

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groundwater is moving at a certain speed. It's going to take the same amount, no matter which technology you select.

MS. MANFREDONIA: Okay. Let's go back to the soils. What — how long does that take, the soil remedy?

MR. GRANGER: Well, we've estimated the in-situ soil vapor extraction to take approximately five years; but that's going to be on the property though, so that should be less of an intrusion in the neighborhood.

MS. MANFREDONIA: How about noise from that?

MR. GRANGER: I asked about the noise. There would be some noise, but the vendors that I spoke with confirmed that they can be housed and baffled and muffled in ways that you wouldn't even know it was there.

MS. MANFREDONIA: Okay. And the vapors on site, I mean, would any — would any of those vapors get off site

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from the — from what you're doing there? People who live there, let's say, the backyards.

MR. GRANGER: You're steadily drawing off relatively low levels of vapors and treating them. You're not just venting the vapors from the contaminated soils into the atmosphere and calling that treatment. That's disgenuous to the public, basically. The vapors are drawn off and treated, so you're basically getting things that are within permissible air standards.

MS. MANFREDONIA: Okay. But I'm just curious as to whether or not this kind of technology — would any of the vapors get off site, for instance, on windy days or something like that, and would they be of detriment to children who live in the area?

MR. GRANGER: The vapors are all within pipes until they get into the treatment unit and then they're treated and the cleaner — the cleaned air is

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vented. So the vapors really wouldn't be coming from anywhere unless there was some kind of breakdown in the system; and even at that point, I don't see this being like a situation that is going to be an imminent danger to the neighboring community.

MS. MANFREDONIA: And who supervises this whole cleanup?

MR. GRANGER: EPA, DEC and Suffolk County.

MS. MANFREDONIA: All three?

MR. GRANGER: EPA has the lead.

MS. MANFREDONIA: So there would be somebody on the site watching it all the time?

MR. GRANGER: I don't think somebody is going to be living there, but it will be maintained on a regular basis. EPA has a lot of experience with these systems, so we know how often —

MR. ROBBINS: And there would be a cut-off. So if the treatment system,

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for some reason, failed, it would stop —

MS. MANFREDONIA: It would stop it?

MR. ROBBINS: — the extraction wells from pulling vapors. So, you know, there's no chance — it's going to be designed so it doesn't spew untreated vapors into the air.

MS. MANFREDONIA: Okay.

MR. SINGERMAN: Going back to your first question about sampling underneath the piles of debris — and you also asked the question — during the design process, we will most likely be taking additional samples. So, you know, just because it wasn't sampled a year or so ago doesn't mean we won't be sampling it in the future. I mean, our objective is to try to clean up the site, so we're not going to ignore certain areas that have not been sampled. Really, this is the whole purpose here was to try

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to identify what contamination we know about, how we can address it, and then fine-tune the sampling during the design process. So, you know, we will likely be taking different samples on site to help define what the extent of contamination is and how we can address it.

MS. MANFREDONIA: Thank you.

MS. ECHOLS: Ma'am?

MS. RIVERA: Hi. My name is Gwen Rivera. I just want to understand, the groundwater flows at about a foot a day?

MR. GRANGER: Well, I'm just estimating that figure.

MR. ROBBINS: I think that is a good estimate.

MR. GRANGER: It's probably 0.9 feet per day.

MS. RIVERA: How fast is the plume itself moving?

MR. ROBBINS: Probably a lot less than that, otherwise it would be

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a lot longer than we happened to see. Contaminants tend to absorb on the soil particles and then it builds up to a certain point and then will ease off a little bit. So there's usually what's called a refibration factor. The contamination won't move as fast as the regional groundwater.

MS. RIVERA: So some of that plume is then attaching itself to part of the aquifer?

MR. ROBBINS: Yeah, the soil — the soil particles that are in the aquifer.

MS. RIVERA: That is not a danger afterwards, after the plume itself is evaporated?

MR. ROBBINS: Well, that's what the plume is. It's that contamination that attaches its particles to the soil and it dissolves back into the water.

MS. RIVERA: It will?

MR. ROBBINS: So when you take the samples, with the air sparging, it

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will remove —
MS. RIVERA: So as the water continues to flow through, it will continue to wash it down even further?
MR. ROBBINS: Yes.
MS. RIVERA: And you said it's about 100 feet wide near the site and about 200 feet wide further down, but how long is it?
MR. GRANGER: We have estimated it at 1500 feet, and we have data that supports that relatively. I mean, it could be a little longer; it could be a little shorter.
MS. RIVERA: And this —
MR. GRANGER: Do you know where the firehouse is?
MS. RIVERA: Yes.
MR. GRANGER: It probably goes just a little bit beyond that.
MS. RIVERA: Beyond the firehouse on Carleton Avenue?
MR. GRANGER: Yes.
MS. CAMACHO: Which is right by

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the school.
MS. RIVERA: Right.
MR. GRANGER: Well, the school is really not in play at this point unless there was a completed exposure pathway. That's what I was talking about before. Just because you have groundwater beneath your house — in some cases, where the groundwater is really shallow — I have a project where I can dig with a teaspoon and get groundwater. In that case, if the groundwater was moving underneath the school, there would be a problem.
In this case, in terms of a completed exposure pathway, your groundwater is 50 feet below the ground. So unless someone was actively pumping that groundwater and putting it into the public supply system or into their own house, you don't have a completed exposure pathway. That's why the EPA calculated risk and found a risk based on a hypothetical

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scenario, not a real one.
MR. ROBBINS: Not only is the water table 50 feet below grade, but as you go further downgradient where the school is, there's probably 50 feet of relatively clean water on the top before you get to any contamination. There is no way for trichloropropane, which is a terrible solvent, to come up in the soil, you know, into spaces up into the school or basement or that type of thing.
MS. CAMACHO: Well, what's to say it's not going to come up?
MR. ROBBINS: We've already monitored right close to the site and happened to come up with trichloropropane levels. Again, the further downgradient it's going, the less likely that would occur.
(Audience members speaking over one another.)
MR. GRANGER: I'm sorry? Yeah.
MR. ROBBINS: During the air

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sparging process, we're going to monitor to make sure that none of those fumes are coming up into the soil and essentially into the basements or the school.
MS. RIVERA: These contaminants have been — this has been happening since approximately 1948, 1950 to 1987. That's what the "Suffolk Life" article expresses, the person —
MR. ROBBINS: The site. The site has been there. We're not sure how long the trichloropropane has been on the site.
MS. RIVERA: Right. You're not sure if this site has any wells there and you don't really — nobody really knows. Right?
So this plume — you are assuming this plume is it. There would be no other — and I'll use the term "escaping plumes" that may have come through? Are you testing any further sites that are between this plume and

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the Town of Islip well? Have you tested periodic sites along the way just to make sure there are no other —
MR. ROBBINS: If the question is addressing the County, no, we have not done additional monitoring between — other than the trichloropropane plume, which was first delineated back in 1993. Whether something else may have escaped from MacKenzie Chemicals prior to —
MS. RIVERA: That is my question.
MR. ROBBINS: — during its early operations, it's entirely possible; but we monitor the well field at Carleton Avenue very carefully, and we just finished some groundwater modeling studies to see where the water that the Carleton Avenue well draws upon, where that's coming from, it's about a mile north of the MacKenzie Chemical site. So we're really not anticipating any other contamination out there, at least from MacKenzie Chemicals, and the

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Carleton Avenue well is 750 feet deep. So in terms of —
MS. RIVERA: So are you saying that this plume is not in a pathway towards the well?
MR. ROBBINS: That's correct.
MS. RIVERA: And just because it was touched on in one meeting — I believe it was at the 1999 meeting — at that time there was a survey done of the houses in that area. I believe there was about 53 surveys mailed out and only about 35 were returned. Has there been another effort to determine whether any of those people in that area are using their wells?
MR. ROBBINS: Yeah. We have sat down with the Water Authority and went through their records to identify every house or every property that had a connection, and we looked at the aerial photos to see if there were any houses or whether there was vacant lots or parcels that weren't being served by

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the Water Authority. We had it field checked and afterwards determined there were no other wells in the area of the plume that are being used at this point. So unless somebody went in and illegally put in a well for their purposes, we are not aware of anybody using a private well, other than that residence immediately to the east of the MacKenzie Chemicals Site which doesn't have access to public water and it's not directly in the plume's path.

MS. RIVERA: Well, am I understanding you to say that you can tell by sight whether there is — whether there are wells or there are records that would have —

MR. ROBBINS: No. We went through the Water Authority records to see which paths are being served by the Water Authority.

MS. RIVERA: Okay.

MR. ROBBINS: For the ones that

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we had no records of serving, we went out to see if there were any houses on those properties.

MS. RIVERA: Okay.

MR. ROBBINS: In every instance, it was a vacant lot.

MS. RIVERA: So you're assuming that if the Water Authority is serving a parcel, it means that that parcel does not have a well.

MR. ROBBINS: That's correct.

MS. RIVERA: I — I live over on Connetquot Avenue. I have both a well and public water.

MR. ROBBINS: We realize that those — but you're presumably not using your well for drinking water.

MS. RIVERA: But you haven't done another survey of the area?

MR. ROBBINS: What?

MS. RIVERA: But you have not done another survey of the area? You considered the initial survey of 53 to be adequate with a return rate of 35?

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MR. ROBBINS: No. That was just a mail survey, but we have done other investigations. We have sat down with the Water Authority to go through their records.

First of all, it's not a good situation to have a well and public water. If you're using a well for irrigation purposes, if you are in the area of the plume, we certainly recommend that you do not use that well. If there is any cross-connection control or cross connection between that well and your indoor plumbing, that is illegal, and the Water Authority would demand that you disconnect the well.

MS. RIVERA: But what — I understand what you're saying. I understand what you're saying; but what I'm saying is, do the people in that area, have they been made aware, do they know that? You have rentals in that area; you have maybe multi-family

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illegal rentals in that area.

MR. ROBBINS: We realize that also.

MS. RIVERA: They may be using the well. They may have been afraid to answer your survey saying that they use the well because they didn't know why you were asking it.

MR. ROBBINS: We did not rely strictly on that mail survey. We have sat down with the Water Authority records to make sure that there was no other houses that could possibly be using a well.

MS. RIVERA: I hear what you're saying. So there was not another survey put out, but were there letters put out to any of the area, either by yourself or by any other agencies, just to make them aware of this site; or are you depending on the public information, which may or may not be in Spanish, which many of those families might be? Were there any

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letters —

MR. ROBBINS: I don't know. I don't know the EPA's notification requirements.

MS. RIVERA: — telling them —

MR. GRANGER: — that they're residing over a plume?

MS. RIVERA: — that if you have — yeah — and that if you have a well, you shouldn't use it? Have you gone into these houses and tested the basement air of each of the houses in that area?

MR. GRANGER: You are asking a lot of questions.

MS. RIVERA: Yeah, I know.

MR. GRANGER: So I can only answer one at a time.

MS. RIVERA: Okay.

MR. GRANGER: The first one I'll say is we inherited the site in approximately 2000; but I did review the documentation, and I saw the results of the survey that was done

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between Suffolk County and DEC and it was just pages after pages after pages of addresses confirming that there was potable water supply connections throughout the area downgradient of the site. I was amazed and shocked at how thorough it was.

So if you're asking did we then follow up and send mailings, I mean, it almost seems like, you know, we are here to clean up contamination, we are here to protect public safety, and part of ensuring public safety is making sure that the potable water supply that people are provided with is not affected by the site. I am confident that that's true. I saw results going back to, I think it was '95, and then, again, more results a couple of years later where actually some wells were identified in the plume area of MacKenzie Chemical, and I think there was five of them and all five of them

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were hooked up to public water almost immediately thereafter.
MS. RIVERA: So you did follow up and you did go in and find —
MR. GRANGER: We inherited the site in 2000. Suffolk County followed up. Suffolk County identified five residences that were on well water, notified them, and in each instance, those residences went onto public supply.
MR. ROBBINS: I don't know if all five — I don't think any of them were directly in the plume.
MR. GRANGER: Maybe they weren't. I was just looking — I was looking at a map of the area.
MR. ROBBINS: All of these homes were downgradient, just to play it safe. So I would say from Carleton Avenue over to, I think, maybe North, South Street, everything in that area that the Water Authority —
MS. RIVERA: Is there any plan at

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all to do any other testing to see if there were any other areas where there is contamination?
MR. GRANGER: Can I — I'm just going to jump on that real quick, and I'm going to say that one of the things that has been heightened over the last — I'm going to say over the last year, that's really come to the forefront, is the soil vapor intrusion exposure pathway, which is basically getting to the question that I think you were meaning to ask in terms of basements.
The sampling, the preliminary sampling results, from the properties immediately downgradient of the site do not indicate that there is a threat based — an exposure pathway — a threat on this exposure pathway for soil vapor intrusion. However, it is something that EPA feels strongly needs to be followed up on. Our discussions with DEC and Suffolk County, I think

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we're all on the same page with that.
We probably will be doing some limited sampling of people's homes immediately downgradient of the site where you would expect the worst contamination to be. If you did a screen level of the houses that are closest to the site and you found that there wasn't a problem, it would be smart money to say that the people further away from the site wouldn't be affected, especially in an aquifer that is sand, like the Long Island aquifer, that doesn't tend to, like, to send things in funny directions, appreciably, at any rate. So, yes, further sampling is to be conducted.
MS. RIVERA: I also just want to say I am glad that you have a backup plan, that you're going to continue to test and see if the bubbling effect doesn't work, that you will do the backup plan. So you would be — but you would then be saying you would be

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paying twice?
MR. GRANGER: Twice as much.
MS. RIVERA: You wouldn't want to just put in the more expensive one first and not have to end up putting it in again if it doesn't work?
MR. SINGERMAN: We're doing it on a small scale. We're going to first —
MS. RIVERA: You're doing what?
MR. SINGERMAN: Basically, you take a small scale operation and test it to see how it works; and if it looks like it's going to work, then we would go with the air sparging; and if it doesn't look like it's going to work, we will go with the other remedy. So we are not going to install the remedy until we are sure and confident that that's permeable.
MS. RIVERA: Do you have a company that does that?
MR. GRANGER: Yes. Any number of companies could do that. You know, they haven't been selected.

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MS. RIVERA: And the company that originally did the testing, are they still involved in testing or did they leave?
MR. GRANGER: It was H2M? They are not involved at this point, but that's not to say that they wouldn't be in the future.
MS. RIVERA: Okay.
MS. ECHOLS: Ma'am?
MS. MANFREDONIA: Yes. I just had a follow-up question related to what you were just talking about. There is at least one house, the one directly east, that is not hooked up to water. I think it's not feasible because it's so far away. What can you do about that particular house? If somebody is on well water, do you test it for them or do something about that?
MR. GRANGER: Well, I will start out by saying that, you know, whenever you're residing next to a Superfund site, we definitely have things we need

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to be concerned about. But one of the things that Suffolk County, DEC, and EPA did was sample that well. The reason that well doesn't really come into play in terms of discussion is for the reasons that we had discussed before, that the plumes on Long Island tend to be narrow and longer than wider. That property is located to the side, so if the plume is coming down this way, that house isn't really affected by the plume, which is why it wasn't really brought into the discussion.
I would suggest that through whatever mechanisms that well continues to be monitored, however, and if that's by EPA, that's fine. If it's by some other mechanism, that's fine too.
MS. MANFREDONIA: And just to follow up, in terms of the houses on Brightside that are just downgradient, you are going to check their basements for vapors?

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MR. GRANGER: If there is basements. I mean, you know, you can put your sampling devices in any room in the house basically. So if there is no basement, you can put it upstairs. If there is a basement, you would probably locate it in the basement or a crawl space. Sure.

MS. MANFREDONIA: Right. And if there is a problem, what do you do for that homeowner?

MR. GRANGER: If there's a problem, then we make suggestions based upon when we find the problem; but I don't — my gut instinct is that there — not that it doesn't need to be checked. I think it does. That "T" does need to be crossed; that "I" does need to be dotted. My gut instinct is that there is not a problem.

One of the reasons I say that is that TCP is not — which is the predominant contaminant at the site — is not extremely volatile. It's one

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of the reasons why, when we talk about in-situ soil vapor extraction, many times in the instances of, like I had said before, TCE and PCE, you don't need to thermally enhance TCE and PCE. That stuff wants to come out and all you got to do is apply a vacuum and it just starts running up the pipe. With the situation of trichloropropane, which is one of the reasons why you don't really see it in soil vapor, it's not that volatile, and in order to drive it off, in order to stop it from being flushed into the groundwater, in order to eliminate that source of groundwater contamination from the subsurface soil, you need to apply heat to that in order to get it to come up the pipe.

MS. MANFREDONIA: All right. So I guess my question though is I don't understand the Superfund. You know, you have lots of money to do something about this. If there is an individual

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homeowner or more that are impacted in any way, you are going to make suggestions. Are you going to pay for whatever they need to be done to make their house safe?

MR. GRANGER: That is a bridge that will need to be crossed if we determine that there was a problem. I would say not in every case, but there are times when I think that it would be considered by the program.

MS. ECHOLS: Sir?

MR. PENA: My name is William Pena. I have two — two questions.

First is, I would like to know, those contaminants, are they going to affect the water supply lines, or will they ever go to the water supply lines or not?

MR. GRANGER: More sampling does need to be done and regular sampling needs to be done to make sure that the plume is exactly defined. Based on the data that we have now, it

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does not appear that the site-related contamination is anywhere near affecting public drinking water supply wells.

MR. ROBBINS: If you're talking about the water pipes under the ground —

MR. GRANGER: Oh, maybe I misunderstood. I'm sorry. I missed your question.

MR. ROBBINS: — as long as you're only varying five, six feet below the soil, the groundwater plume is 40 feet plus below. So there's — they're not in contact, so there will be no cross contamination into the water supply distribution system. As far as the public supply wells in this area, it's very deep, and the area that contributes water to that supply well is coming from further away, almost a mile north of the MacKenzie Chemical site. So we don't feel that MacKenzie Chemical is posing a threat to that

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well.

MS. ECHOLS: Sy, would you also mention how often the water is tested out here.

MR. ROBBINS: The federal and state requirements are testing public supply wells quarterly, I think, and we also take a sample annually for follow-up. The Water Authority probably doesn't monitor just that well, but they probably monitor the general area.

MR. PENA: The second question was —

MR. SINGERMAN: Well, I have one small thing to add. Even though you said the pipes are near the surface and the groundwater is down at a certain depth, even just hypothetically, let's say, that the pipes were in the contaminated water or the contaminated soil, the water supply lines are at a positive compression, meaning that if you had a leak, the water comes out

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the sides. So it's highly unlikely there would ever be contamination in the pipeline.

MR. GRANGER: They are under pressure.

MR. SINGERMAN: They're under pressure. So it's designed so that you don't have any — if you have water leaks, it goes out. It doesn't go in.

MR. PENA: The second part is, does anyone know the — if there is anyone available from MacKenzie? Are they still alive that they can always pay for it?

UNIDENTIFIED PERSON: That's what I was wondering. He has a responsibility in this.

MR. PENA: Exactly.

MR. SINGERMAN: We are looking into that. I mean, we definitely — we want to use private funds or have the responsible party clean up before we use the federal funds. So we're now in the process of trying to identify

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the parties or party that might be responsible.
MR. PENA: Because the thing is I — let's say, like, for instance, I miss a payment to Suffolk County Water Supply and they put a lien on my property. In the meanwhile, look at the disaster these people have created. I mean, it's only fair that someone goes out after them.
MR. GRANGER: That is true, but let me just say, Suffolk — there is no way Suffolk County — oh, yeah, I guess they would put a lien on the property if the property was valuable. All right. I was going in a different direction. There is no way they would condemn the property.
UNIDENTIFIED PERSON: They would put a tax lien on that property.
MR. GRANGER: Okay. All right. We are pursuing parties that are potentially liable for the contamination.

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UNIDENTIFIED PERSON: I thought we found out at the other meeting four years ago that MacKenzie was down south.
UNIDENTIFIED PERSON: He's in Louisiana.
(Audience members speaking over one another.)
MS. ECHOLS: Wait, wait, wait. One person at a time please. Ma'am, would you state your name please.
MS. COCHRAN: My name is Carol Cochran and I live at 5 Hazel Street, and this is a very sensitive subject to me; but I remember being at the meeting at Central Islip High School a few years ago, and we did locate MacKenzie then, four years ago, and he was operating, I think, a similar — a similar thing down south, doing the same thing.
And then also last Thursday I spent two hours with the pediatric rheumatologist, who was very interested

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in these papers, because my daughter is very ill, has a lot of medical problems, and they're looking into Chemical Spuroderma (phonetic); and you're saying it's not an imminent danger.
MR. GRANGER: I don't — I think we need to talk further about that. This is probably not the right venue.
MS. COCHRAN: Please. I brought this up four years ago too.
MR. GRANGER: I'm sorry?
MS. COCHRAN: I brought this up four years ago too. This is another mom also that has a sick child in the area. (Indicating) And I know right around the corner from me on Brightside, there is an 11-year-old girl, she is in a home now, but Chemical Spuroderma is something that is very serious and devastating, and they have looked at these chemicals.
MS. CAMACHO: Has anything been

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done to determine how many children have illnesses because of this?
MR. GRANGER: Well, this is the first time I am hearing of any child with health problems that are potentially associated with this site.
MS. COCHRAN: Well, I brought this up fours years ago right at the high school.
MS. CAMACHO: I was there. I remember that.
MS. COCHRAN: She's a Make-A-Wish child.
MR. GRANGER: There is people that I can put you in touch with that would probably be involved with that somewhat. So let's talk afterwards.
MS. COCHRAN: Thank you.
MS. ECHOLS: Sir, you had a question? Just state your name please.
MR. NUNN: Yes. Ralph Nunn. I have one more question I just thought of.
Given the state of New York

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State's budgetary problems and the overall economy and all that and the budget shortfalls and deficits, what kind of impact would this have on that Superfund that is made available for this cleanup? Would it be detrimentally affected by it or —
MR. GRANGER: Well, from the angle of your question, it would have absolutely no effect because there is a federal lead at this point.
MR. NUNN: A federal what?
MR. SINGERMAN: Well, as a federal Superfund site, EPA, if we can't identify the parties responsible or the parties identified don't step forward to take any action, one of the purposes of the Superfund is to pay for these cleanup actions; and if the EPA pays for the cleanup action, 90 percent comes from federal funds and 10 percent comes from New York State.
So since the federal Superfund is running out of money and the state

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Superfund is running out of money, yes, there is a possibility that, you know, there may be a funding shortfall; but at this point we're hoping that won't be the case and that in the future the funds will be available.
The first thing we have to fund, again, if we don't have the — if we don't find the parties that are willing to pay for the remedial action is to find a resolve; and after the design, then we have to fund the money necessary for the construction.
So we're not talking about doing construction in a few weeks. We're probably talking about, the design is something that will take six months to a year, perhaps, and that's just guessing. So, hopefully, in that time then maybe things will work themselves out and we will have more money, more federal money, for the Superfund; but we can't guarantee that we will have the money.

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MR. NUNN: In the meantime, until the money becomes available then, there will be a continuation of the pluming process as the water travels a foot a day or whatever the rate is, you know, during the six months to a year where nothing gets done. Would there be a growth or an increase in the amount of pollution, or what would be the environmental factor on that?

MR. SINGERMAN: Well, it appears that the plume does — I think Mark mentioned earlier that it's about 1500 feet, which is sort of the boundary on how far we believe it's gone, and just because it's not necessarily being addressed doesn't — I mean, there is various factors that control a plume. I mean, there is degradation; there is dispersion; there is natural processes that cause the plume to diminish.

So we believe that something is occurring that through a natural

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process is stopping the plume at about 1500 feet. So because, again, this plume has been around a long time and it was running unabated and nothing — if natural measures and means were not addressing it, the plume would be much longer.

So while not having sufficient funds in delaying the remedial action would be of concern, it probably will not influence the plume. The plume will probably not continue to migrate. It appears that it's pretty much stable; and, again, it's contaminated from the site to this location, but it doesn't really go beyond that point and probably will not go much beyond that point. Because, again, otherwise we would see a much larger plume in that case.

MS. ECHOLS: Sir?

MR. SANSATARRI: Joe Sansatarri. You're saying that it's traveling south as far as Clayton and you have marked

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off Cordello and Carleton. Has it gone further past west of Cordello and east of Carleton, the marks of the streets that you have or —

MR. GRANGER: I will reiterate somewhat that no contamination was found in this area. So that's west of Cordello that you're referring to; right?

MR. SANSATARRI: Right.

MR. GRANGER: No contamination was found in this area. When you start getting down here, extremely low levels of contamination may actually cross Carleton Avenue, although further testing would have to be done to confirm that; but as Sy had pointed out, by the time the groundwater gets here, the contamination tends to be deeper. There is clean water over the top of that. Does that answer your question?

(Mr. Sansatarri nodded head.)

MS. RIVERA: Hi. This is Gwen

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Rivera again. I just want to know exactly on Carleton, where is the town well?

MR. ROBBINS: I'm not sure really.

MR. GRANGER: Carleton is down by College Woods.

MS. RIVERA: By Smith Street?

MR. ROBBINS: Yeah. By Smith Street is the cross street. It's about where the condo's are.

MS. RIVERA: And how deep is the well?

MR. ROBBINS: It's 750 feet deep.

MS. RIVERA: So it's very low?

MR. ROBBINS: It's very low.

MS. ECHOLS: Any more questions?

MR. WESTERFELD: David Westerfeld again. You said that there were hypothetical scenarios where you were assessing these chemicals?

MR. GRANGER: Yes.

MR. WESTERFELD: What type of hypothetical situations are you looking

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at?

MR. GRANGER: The hypothetical situations — well, EPA evaluates any number of what is called exposure pathways. There were no completed exposure pathways associated with the site that were determined in the risk assessment. There were hypothetical exposure pathways.

One of those hypothetical exposure pathways — well, there was two that created a risk — was the installation of a groundwater extraction well in the plume and using that groundwater for potable purposes. That's not the case. It's a hypothetical scenario. The site did show a risk in a hypothetical sense from that particular exposure pathway. That allows EPA to take an action based on the fact that it could be considered a drinking water supply aquifer.

The other hypothetical situation is that substantial contamination was

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found in the subsurface soils between 4 and 41 feet that could be, number one, a further source of contamination to groundwater. That's not a completed exposure pathway. However, if someone takes a backhoe and digs down to put pipes in for public water supply or some other type of utility, a gas line or a sewer line, or if in the instance of construction of the actual remedy, soils were excavated with a backhoe or a trackhoe or some other type of device for excavating soils, construction workers could be exposed under that hypothetical scenario.

Those are the two that were found to create a risk, and that is basically the reason why we are here.

MR. WESTERFELD: So the first hypothetical of drinking the groundwater, that apparently has happened in the past? So is there —

MR. GRANGER: I don't know that it has happened in the past. I don't

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know that anyone has consumed — I don't where the wells were and how deep they were. I don't know —

MR. ROBBINS: Not in this instance. Certainly, not in this instance, not that I'm aware of, have wells gone in where they shouldn't have; or if everybody was doing their job and they had applied for a permit and they were issued a permit and they feel sure there was nothing in the area that was a problem. We have had many instances where plumes or Superfund sites have inadvertently passed wells; but, again, wells that the Health Department knows about, we would not have allowed them.

MR. GRANGER: I don't know that there has been — that there has been a historical completed exposure pathway associated with this site. I don't know that for a fact.

MS. ECHOLS: Any more questions? Sir?

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MR. PENA: Yes. When is the proposed — when are we planning to start this project, to get work on that?

MR. GRANGER: Essentially, once a proposed remedy becomes formalized and finalized in the form of a Record of Decision, a project kind of takes on a life of its own.

Under ordinary circumstances, we would sign the Record of Decision within the next month or so, finalize the decision; and then we would start negotiating with responsible parties, if we can bring them to the table; or we would pick up a site on our own and start a remedial design process that can take up to a year, sometimes two years.

In this case, I don't think the technologies that we're dealing with are extremely complicated. There is some treatability studies that need to be done, that need to be factored into

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the design. But, let's say, just as a rule of thumb, we would anticipate a year for a design and then procuring contracts and actually implementing construction. It could be as early as summer or fall of 2004. Realistically, it would probably begin 2005.

MS. ECHOLS: Any more questions?

(There was no response.)

MS. ECHOLS: Okay. I guess we're going to close here. The public comment period ends March 6th.

If you have any questions or comments you want to send in to EPA, our addresses are inside of the Proposed Plan, page 2 of the Proposed Plan.

If you have any — if you want to reach us by phone, I have an 800 number, if you would like to take it down. It's the Community Relations Hotline. It's 1-800-346-5009, and you can ask for me, Cecilia Echols, and I will be able to address any of your

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concerns.

We would like to thank you all for coming out tonight. Thank you.

(This proceeding was concluded at 8:30 p.m.)

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CERTIFICATION

I, SHERYL L. SCHULTZ, a Notary Public for and within the State of New York, do hereby certify:

THAT the foregoing is a true and correct transcript of the proceedings held March 3, 2003, at Central Islip, New York, in this matter.

IN WITNESS WHEREOF, I have hereunto set my hand this 7th day of March, 2003.

SHERYL L. SCHULTZ

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RESPONSIVENESS SUMMARY

APPENDIX V-e

LETTER SUBMITTED DURING THE PUBLIC COMMENT PERIOD

Central Islip Civic Council, Inc.

March 6, 2003

Mr. Mark Granger, Project Manager
Central New York Remediation Section U.S. EPA
290 Broadway, 20th Floor
New York, NY 10007-1866
Re: MacKenzie Chemical Works Superfund Site

Dear Mr. Granger,

The Central Islip Civic Council, Inc. has the following comments for your consideration:

1. We strongly suggest that the EPA conduct a public information mailing in English and in Spanish to all homeowners and renters in the Brightside neighborhood. The mailing should include basic information about your plans, but more importantly, a caution about well water in the area. Even though the Water Authority does not list any wells, except 5 Railroad Avenue, it is very possible that homeowners or tenants are using well water for gardens or for illegal tenants in garages, outbuildings, etc. There should also be a caution about cesspool work, excavations for swimming pools, foundations, etc.
2. We also strongly suggest monitoring of all homes adjacent to or within a reasonable distance of the site for possible soil vapor problems.
3. A survey should be done to see if there could be a cluster of medical problems among children who live nearby.
4. Your answer about clean up costs related to soil vapor or well water problems was unclear. We strongly believe that any potential cleanup costs to individual homeowners should come from the superfund.
5. We are very concerned about the current activities on the site. We believe it is the EPA's responsibility to make sure that the current owner is not using the area as a dump site at this time.

Sincerely,

Nancy Manfredonia, Exec Dir

PO Box 219 • Central Islip, NY 11722-0219 • (631) 348-0669 • Fax (631) 348-1562