FEASIBILITY STUDY REPORT
STUART-OLVER-HOLTZ SITE
HENRIETTA, NEW YORK

NYSDEC SITE NO. 8-28-079

PREPARED FOR:
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October 1996
File: 19078.2

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1.00 INTRODUCTION

This report presents the results of a Feasibility Study of alternatives for the environmental remediation of the Stuart-Olver-Holtz (SOH) site located in the Town of Henrietta, Monroe County, New York. A site locus plan is provided on Figure 1. The site is listed as a "Class 2" site on the New York State Department of Environmental Conservation (Department) Registry of Inactive Hazardous Waste Sites, site designation No. 8-28-079.

1.10 BACKGROUND

In response to apparent soil and groundwater contamination at the SOH site, the Department commissioned a Remedial Investigation/Feasibility Study (RI/FS) of the site. The RI and FS were completed on behalf of the Department under Superfund Standby Contract Work Assignment #D003060-7 to TAMS Consultants, Inc. (TAMS) of Clifton Park, New York. The RI and FS were completed by GZA GeoEnvironmental of New York (GZA) as a subconsultant to TAMS.

The objective of the RI was to characterize the nature and extent of contamination at the site and to provide data for use in the FS. The scope of work for the RI is described in workplan documents approved by the Department (see Section 1.30). The RI included a qualitative risk assessment to identify potential risks to human health and the environment due to contaminants present at the site. The results of the RI were summarized in a separate report prepared by GZA entitled "Remedial Investigation Report, Stuart-Olver-Holtz, Henrietta, New York".

1.20 PURPOSE

The purpose of the FS is to identify and evaluate technologies that are available to remediate the portions of the site identified in the RI as requiring remedial action. The technologies most appropriate for the site conditions are then developed into sitewide remedial alternatives that are evaluated based on their environmental benefits and cost. The information presented in the FS will be used by the Department to select remedial action(s) for the site. The remedial action(s) selected for the site will be summarized by the Department in a Proposed Remedial Action Plan (PRAP) which will be released for public comment. After receipt of public comments, Department will issue a Record of Decision (ROD).

1.30 SCOPE OF WORK

GZA completed the following scope of work for the FS:

- Identified Standards, Criteria and Guidelines (SCGs) that may apply to the specific conditions at the site. These generally include State and Federal requirements that are used as a basis for establishing cleanup goals for the site and other regulatory requirements that may apply to proposed remedial actions;

- Identified proposed cleanup goals and remedial objectives for contaminants of concern at the site;

- Completed preliminary screening of remedial technologies to develop a short-list of technologies that appear implementable and effective based on the site conditions and list of contaminants identified during the RI;

- Developed sitewide remedial alternatives for detailed screening that were evaluated on the basis of:

  - compliance with SCGs and cleanup goals established for the site;
  - reduction of toxicity, mobility and volume;
  - implementability;
  - protection of human health and the environment;
  - long-term effectiveness and permanence;
  - short-term impacts and effectiveness, and
  - cost.

- Provided recommendations for a sitewide remedy; and

- Prepared this report summarizing the findings of the FS.

The feasibility study and report were completed in general accordance with: (1) the scope of work described in the "Project Management Plan, Stuart-Olver-Holtz, Site No. 8-28-079" dated August 29, 1994, as amended; (2) procedures outlined in the Department's Technical and Administrative Guidance Memorandum (TAGM) 4025, "Guidelines for Remedial Investigation/Feasibility Studies" dated March 1989; and (3) the Department's TAGM 4030, "Selection of Remedial Actions at Inactive Hazardous Waste Sites" as revised May 1990.

The scope of work for the SOH site was prepared by TAMS with assistance from GZA and submitted to Department for review and approval. The scope of work was subsequently finalized and issued as part of the Project Management Plan dated

August 29, 1994. The Project Management Plan incorporates by reference the following additional work plan documents:

- "Field Activity Plan, Stuart-Olver-Holtz, Site No. 8-28-079" dated August 29, 1994;
- "Quality Assurance Project Plan, Stuart-Olver-Holtz, Site No. 8-28-079" dated August 29, 1994;
- "Health and Safety Plan, Stuart-Olver-Holtz, Site No. 8-28-079" dated August 29, 1994; and
- "Citizen Participation Plan, Stuart-Olver-Holtz, Site No. 8-28-079" dated August 29, 1994.

During the course of the work, several amendments to the scope of work for the RI and FS were made after review and approval by Department. The revisions to the scope of work are described in the following documents:

- Revised the drilling procedures for the top-of-bedrock monitoring wells by GZA letter dated October 25, 1994;
- Revised the Quality Assurance Project Plan by TAMS memorandum dated June 13, 1995;
- Revised the Field Activity Plan by GZA letter dated June 16, 1995;
- Revised the Health and Safety plan by GZA letter dated June 16, 1995;
- Made contract modifications for off-site investigation work as described in Contract Amendment No. 1 prepared by TAMS dated July 12, 1995; and
- Established sampling locations and analytical parameters for the second groundwater sample round by GZA letter dated September 20, 1995.

2.00 SITE INFORMATION

This section includes descriptions of the site and its history and an overview of the physical characteristics of the study area based on the findings of the RI.

2.10 SITE DESCRIPTION

The approximately 3.8 acre site is located at 39 Commerce Drive, in a mixed commercial-industrial area in the Town of Henrietta, Monroe County, New York. A single story building with a footprint of approximately 64,000 square feet is located along the eastern property line of the site. The remaining site area consists primarily of parking lots/driveways, grass covered areas, and weeds/scrub/brush covered areas. A vegetated drainage swale is located just beyond the west property boundary.

The SOH site is located in the Red Creek drainage basin, and Red Creek flows within ½-mile of the site to the north (see Figure 1). Red Creek ultimately drains to the north discharging into the Erie Canal located about 2 miles from the site. The northwestern corner of the SOH property is located within the 100-year floodplain of Red Creek.

As shown on the site plan on Figure 2, the site is bound to the east by Oregano's Restaurant, the Patton Professional Center, and Leichtner's Studios; to the south by Ruby-Gordon Furniture; to the west by a narrow strip of land owned by Mr. Dennis Petrisak that contains the drainage swale and a sewer easement with the Pullman Manufacturing property located farther to the west beyond the strip of land; and to the north by Commerce Drive and several commercial properties on the opposite (north) side of Commerce Drive, including a former Town of Henrietta Fire Station.

The water supply well inventory completed as part of the RI indicated that the area is served by municipal water supply and did not identify any water supply wells in use within a ½-mile radius of the SOH site. Two bedrock supply wells, that were reportedly used in the past to provide non-contact cooling water for manufacturing processes, are located within the SOH building. However, it is reported that these wells are currently not in use. The municipal water supply provides drinking water and process water to the facility.

2.20 SITE HISTORY

The site history was based on GZA's review of aerial photographs, site facility plans, Department documents, Monroe County Department of Health (MCDOH) documents, and available correspondence. The site and surrounding properties generally progressed from a rural farmland area (pre-1961) to a commercial area in the early 1960's. Development has further progressed to the current commercial/industrial setting.

The SOH site was vacant until the construction and operation of a metal finishing and plating facility around 1962. The site has been continually occupied by metal finishing and plating operations since that time. Several building additions and facility expansions have occurred over the years. Stuart-Olver-Holtz, Inc. operated the facility for the bulk of that period, until filing for bankruptcy protection in 1986. The facility is currently operated by Metalade, Inc.

In 1974 a fire occurred at the site, which resulted in a release of chromic acid, nickel chloride, nickel sulfate, paint strippers and alkali detergent. A quantity of tetrachloroethene (TCE) was also lost. Following the fire, the structures were repaired and the metal finishing and plating operations were resumed.

In addition to the releases during the fire, there were reports of leaking drums and spills on the site. These releases generally included metal-bearing acids, plating solutions, paint strippers, and solutions associated with the metal finishing processes.

The Ruby-Gordon facility located south of the site is a retail furniture store with warehouse storage facilities. The storage areas were constructed in 1972 when a building addition with a basement was added to the rear (west side) of the Ruby-Gordon building. The RI identifies previous reports by others that documented the presence of contaminated groundwater in the drainage system for the Ruby-Gordon basement. A report by a consultant to Ruby-Gordon indicated that samples of the basement air may have contained organic vapors, but this has not been confirmed by the Department, the New York State Department of Health (NYSDOH), or the MCDOH.

The Ruby-Gordon facility is currently operating an air stripper for pretreatment of water collected from the basement drainage system. The water is pretreated to remove Volatile Organic Compounds (VOCs) prior to discharge to the municipal sanitary sewer system. A permit for the sewer discharge was issued to Ruby-Gordon by the Monroe County Pure Waters District (Permit No. 748, District No. 8535 expires August 31, 1996). The permit requires: (1) that the total concentration of purgeable halocarbons in the sewer discharge not exceed 2.13 parts per million (ppm); (2) that self-monitoring be completed which is to include monthly sampling and analysis of water samples for EPA Method 601; and (3) that quarterly flow summaries be submitted for billing purposes.

2.30 STANDARDS, CRITERIA AND GUIDELINES

Standards, Criteria and Guidelines (SCGs) are used at inactive hazardous waste sites such as the SOH site to establish the locations where remedial actions are warranted and to establish cleanup goals. SCGs include State and Federal requirements, including Applicable or Relevant and Appropriate Requirements (ARARs).

Applicable Requirements are legally enforceable standards or regulations which have been promulgated under Federal and state law such as groundwater standards for drinking water, surface water standards, etc. *Relevant and Appropriate Requirements* include those requirements which have been promulgated under state and Federal law which may not be "applicable" to the specific contaminant released or the remedial action contemplated, but are sufficiently similar to the site conditions to be considered relevant and appropriate. If a Relevant and Appropriate Requirement is well-suited to a site, it carries the same weight as an Applicable Requirement during the evaluation of remedial alternatives. *To Be Considered Criteria* are non-promulgated advisories or guidance issued by state or Federal agencies that may be used to evaluate whether a remedial alternative is protective of human health and the environment in cases where there are no standards or regulations for a particular contaminant or site condition. These criteria may be considered with SCGs in establishing cleanup goals for protection of human health and the environment.

The following subsections present the three categories of SCGs; chemical-specific, location-specific, and action-specific.

2.31 Chemical-Specific SCGs

Chemical-specific SCGs are typically technology or health risk based numerical limitations on the contaminant concentrations in the ambient environment. They are used to assess the extent of remedial action required and to establish cleanup goals for the site. Chemical-specific SCGs may be directly used as actual cleanup goals, or as a basis for establishing appropriate cleanup goals for the contaminants of concern at the site. Chemical-specific SCGs for the SOH site are identified in Table 1.

It should be noted that the list of chemical-specific SCGs presented herein is generally consistent with the SCGs presented as part of the qualitative risk assessment for the RI, except that for the purposes of the FS, the United States Environmental Protection Agency (USEPA) Draft Residential Generic Soil Screening Levels were not used to develop cleanup goals for the site. These requirements were presented in the risk assessment for information and completeness. However, the USEPA indicates that the document is draft, subject to change and, at this time, is not to be cited. For these reasons and the fact that the intended use of the site and surrounding area is for commercial purposes (not residential), these requirements were not used in developing site cleanup goals.

It is also noted that supplemental SCGs have also been identified during the preparation of this FS. These additional SCGs include:

- "Region IX Preliminary Remediation Goals (PRGs) - Second Quarter 1993" prepared by Region IX United States Environmental Protection Agency, and

- New York State Agencies (Department and NYSDOH) - Soil SCG Goals.

These SCGs were considered during the development and selection of the site specific cleanup goals.

2.32 Location-Specific SCGs

Location-specific SCGs apply to sites that contain features such as wetlands, floodplains, sensitive ecosystems or historic buildings that are located on, or in close proximity to the site. The RI fish and wildlife assessment indicates that the site contains no threatened or endangered species of flora or fauna. However, a portion of the site is apparently located within the 100-year floodplain for Red Creek. In addition, the swale along the west SOH property boundary is a tributary to a New York State Class "C" stream and a portion of the swale near Ruby-Gordon may be a Federally regulated wetland. Depending on the selected remedial alternative, these features could trigger a location-specific SCG, if an alternative has the potential to affect a stream, wetland or floodplain. Location-specific SCGs for the SOH site are identified in Table 2.

2.33 Action-Specific SCGs

Action-specific SCGs are usually administrative or activity-based limitations that guide how remedial actions are conducted. These may include record keeping and reporting requirements, permitting requirements, design and performance standards for remedial actions, and treatment, storage and disposal practices. Action-specific SCGs for the SOH site are identified in Table 3.

2.40 SUMMARY OF REMEDIAL INVESTIGATION

This subsection summarizes the major field investigation tasks, the descriptions of the site geology and hydrogeology, and the qualitative risk assessment that were reported as part of the RI. This information will be used to develop the proposed remedial actions described later in this report.

2.41 Field Investigation Tasks

The major field tasks completed as part of the RI included:

- A geophysical survey of the SOH site to assess the presence or absence of shallow subsurface metallic objects;
- Excavation of test pits at the SOH site to assess anomalies identified in the geophysical survey;

- A soil vapor survey of the SOH site to identify areas with potential for elevated levels of VOCs;

- Subsurface explorations that included drilling of soil test borings and installation of monitoring wells at the SOH site and selected off-site locations. The borings and wells were used to assess the physical properties of the site soils and hydrogeologic conditions and to obtain samples for laboratory analyses;

- Water level measurements in monitoring wells to assess groundwater flow patterns and hydraulic gradients;

- Collection and analyses of soil and sediment samples from the SOH site and selected off-site areas; and

- Two rounds of groundwater sampling and laboratory analyses at on-site and off-site well locations.

2.42 Subsurface Conditions

The following is a brief description of the subsurface conditions encountered in the test borings and test pits as reported in the RI. The general stratigraphy encountered during explorations in the overburden soils and bedrock is described below beginning at the ground surface and proceeding downward:

Fill: The surface is covered with fill material consisting of a loose to medium dense mixture of sand, silt, gravel and occasional pieces of wood and metal debris. The fill material, where encountered, is approximately 1.0 to 15.3 feet thick with an average thickness of about 5 feet at the exploration locations.

Lacustrine Deposit: The lacustrine deposit generally consists of stiff silty clay with variable amounts of fine to medium sand. The lacustrine deposit, where encountered, is approximately 1.5 to 17.4 feet thick with an average thickness of about 7 feet at the exploration locations. This deposit is generally thickest in the northwest portion of the site.

Upper Glacial Till: The upper glacial till typically consists of a matrix of dense sand, gravel and clayey silt, but with distinct strata of fine to medium sand approximately 2.0 feet to greater than 10.0 feet thick. The sand strata occur at various depths in the upper till and appear to be discontinuous across the site. The RI data indicate that the sand strata are more permeable than the surrounding upper till matrix, and as such, the sand strata may be the preferred flow pathway for groundwater in this unit. The upper till, where encountered, ranges from 4.0 to 28.0 feet thick with an average thickness of about 14 feet at the exploration locations. The upper till unit is present at depths between 3.0 and 22.1 feet below the ground surface.

Lower Glacial Till: The lower glacial till consists of a very dense matrix of sand, clayey silt and gravel. The RI data indicate that this unit may act as an aquitard between the overlying upper till and the underlying weathered bedrock. This unit appears to be continuous across the site based on explorations advanced to date. Standard penetration test N-values typically exceed 100 blows for 6 inches and sand strata that may act as preferential pathways are generally absent. The lower glacial till, where fully penetrated, ranges from approximately 4.0 to 21.2 feet thick with an average thickness of approximately 13.8 feet. Where explorations were advanced to sufficient depth on the SOH property to encounter the top of the lower glacial till, the depth to the top of the lower till ranges from 14.6 to 38.0 feet below the ground surface with an average depth of about 25 feet.

Top of Bedrock: The top of the bedrock below the lower till consists of severely weathered shale of the Vernon formation. The degree of weathering is such that the upper portions of the bedrock have a soil-like appearance in some zones. In many instances, it was possible to obtain samples of the weathered bedrock with conventional split-spoon sampling methods that are typically used for overburden soil. Based on explorations advanced to the top of the bedrock, the depth to the top of the bedrock formation ranges from 30.0 to 44.7 feet with an average of about 39 feet at the exploration locations.

2.43 Site Hydrogeology

The data from the RI indicate that two water bearing zones may be present in the study area; an overburden groundwater zone in the soils above the lower glacial till unit, and a bedrock groundwater zone in the top-of-bedrock below the lower glacial till. The hydraulic connection between the overburden groundwater and the top-of-bedrock groundwater appears to be poor due to the lower glacial till which apparently acts as an aquitard between the two water bearing zones. This is supported by different piezometric levels and different hydraulic gradient conditions in the two water bearing zones. The overburden groundwater has been the focus of the RI/FS since the well survey indicates that no bedrock wells are currently in use within ½-mile of the site and that the area is served by municipal water, and because the overburden groundwater currently presents a higher potential for exposure, and therefore, higher risk to human health and the environment. Additional information regarding the bedrock groundwater is provided in the RI.

Depths to overburden groundwater on the SOH property ranged from 2.6 to 11.7 feet below the ground surface between November 1994 and October 1995 with an average depth of about 7 feet over that time period based on water level measurements made in the overburden monitoring wells. Groundwater contour maps are provided with the

RI report that illustrate groundwater elevations and apparent flow directions in the soil overburden based on water level measurements made in August and October 1995. The average saturated thickness of the overburden is approximately 18 feet based on depths to the top of the lower till at the subsurface explorations and water level measurements obtained from overburden groundwater monitoring wells.

The RI indicates that overburden groundwater from the SOH site generally flows in a north-northwesterly direction towards Commerce Drive. However, during wet periods of the year, it was observed that water levels generally rise and the groundwater flow directions appear to be influenced by the sump pumps and foundation drains for the Ruby-Gordon basement. It appears that when groundwater elevations rise above the basement slab elevation of approximately 521 feet, pumping begins and localized changes in groundwater flow direction occur. During pumping, groundwater from the southern portion of the SOH site appears to flow in a south and southwesterly direction toward the Ruby-Gordon basement. Overburden groundwater from the central and northern areas of the SOH site appears to flow north-northwesterly independent of pumping within the Ruby-Gordon basement.

The RI data indicate that contaminated groundwater is present in the saturated portion of the upper glacial till. The RI report indicates that the hydraulic conductivity of the upper till ranges from 8.4×10^{-3} to 8.8×10^{-5} centimeters per second (cm/s) with an average of 2.2×10^{-3} cm/s based on field testing in monitoring wells installed within the upper till. The effective porosity of the upper till was reported to be on the order of 0.2 based on laboratory water content test results on samples of the saturated upper till soils and estimated specific gravity and unit weight values for similar soil types.

Calculated horizontal hydraulic gradients for the overburden groundwater on the SOH site and beyond the influence of the Ruby-Gordon basement pumps remained relatively unchanged at approximately 0.035 ft/ft during 1995 and do not appear to be significantly affected by seasonal variations in overburden groundwater levels. The RI reported estimates of flow velocity for overburden groundwater flowing from the SOH site toward the north-northwest and Commerce Drive that ranged from approximately 390 to 400 feet per year based on the average of the hydraulic conductivity measurements and the August and October 1995 groundwater elevations.

In the vicinity of the Ruby-Gordon basement, horizontal hydraulic gradients calculated for the overburden groundwater vary depending on the extent of pumping from the basement sumps. The RI report indicates that horizontal hydraulic gradients from the southern portion of the SOH site toward the Ruby-Gordon basement ranged from 0.026 to 0.068 ft/ft on August and October 1995 which correspond to overburden groundwater flow velocities in the range of 300 to 765 feet per year. These estimates were based on the average of the overburden hydraulic conductivity measurements.

2.44 Nature and Extent of Contamination

The laboratory analytical results reported in the RI indicate the presence of elevated concentrations of VOCs, semi-volatile organic compounds (SVOCs), metals and cyanide in several environmental media in and around the SOH site. Polychlorinated biphenyls (PCBs) were not detected during the RI. One pesticide compound was detected at low levels in one test pit soil sample. A summary of the compounds and the media in which they were encountered is provided below. Additional details are provided in the RI report.

Chlorinated VOCs were detected at concentrations above chemical-specific SCGs in samples of the overburden groundwater (including water samples obtained from the basement sumps for the Ruby-Gordon building), top-of-bedrock groundwater (including the samples from the SOH interior bedrock wells), subsurface soils, and in aqueous and sediment samples from on-site sumps and catch basins. The overburden groundwater appears to be the environmental media with the most elevated concentrations of chlorinated VOCs. During the RI, the total concentration of chlorinated VOCs in the overburden groundwater in on-site monitoring well OW-7S was reported to be 151,500 and 150,300 ppb in the first and second groundwater sampling rounds, respectively. Monitoring well OW-7S is located in the central portion of the SOH site just southwest of the SOH building (see Figure 3) and may be within or near a suspected source area. For the downgradient overburden groundwater monitoring wells near the north and west SOH property lines (OW-3S, OW-4S, OW-5S and MW-5), the total concentration of chlorinated VOCs ranged from 58,000 to 29,600 ppb in the first groundwater sampling round and from 179 to 11,300 ppb in the second groundwater sampling round.

SVOCs were detected at concentrations above chemical-specific SCGs in samples of the overburden groundwater, surface soils, subsurface soils, sediment samples obtained from the nearby surface water swale, and in aqueous and sediment samples obtained from the on-site sumps and catch basins. The elevated concentrations of SVOCs were detected in samples of the surface soils collected from non-paved areas where vegetative cover is present.

Metals were detected at concentrations above chemical-specific SCGs in samples obtained from the overburden groundwater, top-of-bedrock groundwater, surface soils, subsurface soils, surface water, surface water sediments, and in aqueous and sediment samples from the on-site sumps and catch basins. The more frequently encountered metals with moderate to high toxicity include arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc.

Cyanide was detected at concentrations above chemical-specific SCGs in samples of overburden groundwater and in aqueous samples from the on-site sumps and catch basins. The analytical results indicate one pesticide compound was detected in one test pit sample at a concentration slightly above the method detection limit. No PCBs were detected in the soil or sediment samples, or in the first round of groundwater sampling. Thus, analyses were not completed for PCBs as part of the second groundwater sampling round as per the amended Project Management Plan.

2.45 Qualitative Risk Assessment

A qualitative risk assessment was completed to identify potential risks to human health and the environment due to contaminants present at the site. This was completed by making an assessment of the toxicological properties of the contaminants detected at the site and potential exposure pathways. The concentrations of contaminants at the point of exposure were then compared to chemical-specific SCGs such as drinking water standards, soil guidance values, and aquatic sediment guidance values which are risk-based limits for exposure to contaminants.

The risk assessment indicated that chemical-specific SCGs (risk-based limits on contaminants concentrations) were exceeded for VOCs, SVOCs, and metals. For several contaminated media and potential exposure pathways, the observed exceedances pose a potential risk to human health and the environment. The contaminated media and potential exposure pathways are summarized in subsection 3.10 and were used to develop remedial action objectives for the site.

3.00 REMEDIAL ACTION OBJECTIVES

This section presents the objectives for remedial actions that may be taken at the site to protect human health and the environment. To develop the remedial action objectives, GZA completed the following as part of the RI and FS:

- Identified the contaminants present in the environmental media in the study area;
- Evaluated the existing or potential exposure pathways in which the contaminants may effect human health and the environment;
- Identified those pathways where there is a moderate to high likelihood for exposure;
- Identified the chemical-specific SCGs that apply to the likely exposure routes to establish the contaminants of concern and proposed cleanup goals for purposes of remediation; and
- Established remedial action objectives for the contaminants of concern to reduce the potential for future exposure.

Remedial action objectives are presented for the environmental media in the study area. The sitewide remedial action objectives are summarized at the end of this section.

3.10 CONTAMINANTS OF CONCERN AND SCG GOALS

Table Nos. 4a through 4h list the contaminants detected in samples collected from the site and the chemical-specific SCGs (risk-based exposure limits) that apply to the likely exposure routes for the environmental media of interest. Potential exposure pathways are discussed in subsection 3.20. Proposed cleanup goals for each contaminant were developed in accordance with the procedures described below.

Proposed cleanup SCGs for organic compounds were selected by comparing the chemical-specific SCGs appropriate to the likely exposure pathways. The cleanup SCG was then selected based on the potential exposure scenarios and contaminated media encountered at the site.

Proposed cleanup SCGs for metals were selected in a similar manner except that the chemical-specific SCGs were first compared to the site background information. The cleanup SCG selected was the chemical-specific SCG value unless the SCG value was below the site background level. In these cases, the greater of the background level or the SCG was selected as the cleanup SCG.

Table Nos. 4a through 4h identifies the chemical-specific SCG values for each contaminant, and in the case of metals, the site background data that were used to develop the proposed cleanup SCGs for the contaminants in the environmental media at the site (ie., groundwater, soils, sediments, etc.).

Contaminants of concern were identified for the environmental media in the study area by identifying the contaminants that exceeded the proposed cleanup SCGs and then evaluating the frequency that cleanup goals were exceeded and the relative toxicity of the contaminant. In general, contaminants of concern were established based on the following criteria:

- Those contaminants that exceeded the proposed cleanup SCGs in greater than 5 percent of the samples tested within the medium; but

- Excluding compounds considered to be essential human nutrients that are present at slightly elevated levels above natural background (ie., iron, magnesium, calcium, potassium and sodium).

Table Nos. 5a through 5h identify the contaminants of concern for the purposes of remediation in the environmental media (ie., groundwater, soil, sediments, etc.), the range of concentrations detected, the proposed cleanup SCG, the number of samples that exceed the cleanup SCG, and the number of samples analyzed.

3.20 CONTAMINATED MEDIA AND EXPOSURE PATHWAYS

This subsection addresses the environmental media in the study area and describes the types of contaminants present, the potential exposure pathways, and the proposed remedial action objectives to reduce the potential for future exposure.

3.21 Overburden Groundwater

Two rounds of overburden groundwater sampling and laboratory analyses were completed as part of the RI. Table 5a identifies the contaminants of concern detected in the overburden groundwater samples. The contaminants of concern include chlorinated VOCs, metals and cyanide.

The primary exposure pathway for the overburden groundwater appears to be via contact with contaminated groundwater at points of possible groundwater discharge such as basement structures or temporary or future excavations near or below the overburden water table. Potential exposure may include ingestion, inhalation of vapors, or dermal contact. The potential for exposure via these pathways appears to be low to moderate and, therefore, remediation is warranted.

The remedial action objectives for the overburden groundwater are: (1) reduce to the extent practical, further off-site migration of contaminated overburden groundwater; (2) reduce to the extent practical, the levels of contamination in the overburden groundwater at the site; (3) attain to the extent practical the proposed cleanup goals for overburden groundwater quality at the SOH site boundary; and (4) reduce the risk of exposure to overburden groundwater by reducing the potential for inhalation of organic vapors, ingestion of contaminated groundwater and dermal contact with contaminated groundwater.

3.22 Bedrock Groundwater

As part of the RI, samples of the bedrock groundwater were collected for laboratory analyses. Table 5b identifies the contaminants of concern detected in the bedrock groundwater samples. The results indicate that chlorinated VOCs, SVOCs, and metals are present in the bedrock groundwater at concentrations above chemical-specific SCGs, particularly in the two interior wells within the SOH building.

The potential exposure pathway for the bedrock groundwater is through the use of bedrock groundwater as a water supply, either as a drinking water source, or a source of industrial process or irrigation water. The well survey completed as part of the RI did not identify any bedrock wells that are currently in use within a ½-mile radius of the SOH site. It should be noted that two bedrock supply wells are present on the SOH site which are reportedly not used. Furthermore, the RI indicates that a relatively low hydraulic gradient exists in the water bearing zones of the bedrock. The low gradient reduces the potential for off-site contaminant migration. The RI risk assessment indicates that the potential for adverse health effects due to exposure to bedrock groundwater is low provided bedrock wells are not used for potable water in the immediate area.

As such, the remedial action objective for the bedrock groundwater is to reduce the potential for exposure to contaminated groundwater in the bedrock that may occur via exposure to groundwater from bedrock supply wells. The intent of the initial remediation efforts will be to focus on the other contaminated media that appear to present a greater risk to human health and the environment at this time.

3.23 SOH Sump and Catch Basin Contents

As part of the RI, two aqueous and two sediment samples were collected from four sumps or catch basins outside the SOH building (NSM-Series). Table Nos. 5c and 5d list the contaminants of concern detected in the sediment and water samples from the SOH sumps and catch basins. The contaminants of concern include VOCs, SVOCs, metals and cyanide.

The potential exposure pathways include ingestion, inhalation or dermal contact by maintenance workers. In addition, contamination in the catch basin structures could contribute to contamination of surface water, or surface water sediments. Furthermore, if any of the sump or catch basin structures are not water tight, they could be a contributing source of contamination of the overburden groundwater. The likelihood of exposure via these pathways appears to be low to moderate and therefore remedial action is warranted.

The remedial action objectives for the SOH sumps and catch basins are: (1) reduce to the extent practical, the source of existing contamination in the sumps and catch basins, and (2) reduce the potential for future introduction of contaminants into the SOH sumps and catch basins.

3.24 Surface Soils

The RI included analyses of surface soil samples collected from unpaved areas of the site. Table 5e list contaminants of concern detected in samples of the surface soils. The contaminants of concern include SVOCs and metals.

Potential exposure pathways for the contaminated surface soils include ingestion, inhalation and dermal contact by site personnel or local residents, contamination of surface water runoff that comes in contact with the contaminated surface soils, and erosion of surface soils which may contaminate sediments in surface waters. The likelihood of exposure via these pathways appears to be moderate and therefore remedial action is warranted.

The remedial action objectives for the surface soils are: (1) reduce the potential for direct human or animal contact with the contaminated surface soils; (2) reduce the risk to surface waters by reducing future contact of surface water runoff with the contaminated surface soils; and (3) reduce the risk to surface water sediments by reducing the potential for future erosion of the contaminated soils.

3.25 Subsurface Soils

The RI data indicate that contamination is present in the subsurface soils. Table 5f lists the contaminants of concern detected in samples of the subsurface soils. The contaminants of concern include SVOCs and metals. Elevated levels of chlorinated VOCs were detected in one soil sample (OW-7S, depth 28 to 30 feet). As such, the subsurface soils do not appear a significant source of the chlorinated VOCs detected in samples of the overburden groundwater, except near OW-7S which is a suspected source area.

Potential exposure pathways for the contaminated subsurface soils include ingestion, inhalation and dermal contact by maintenance personnel or earthwork construction workers. In addition, the contaminated subsurface soils have the potential to leach contaminants into the overburden groundwater. The likelihood of exposure via these pathways is low to moderate and remedial action is warranted.

The remedial action objectives for the subsurface soils are: (1) reduce the potential for direct human or animal contact with the contaminated subsurface soils; and (2) reduce the risk to groundwater by reducing the potential for infiltration of surface runoff and leaching of contaminants into the groundwater.

3.26 Sediments

Three sediment samples were collected from the surface water swale along the west property boundary as part of the RI. Table 5g identifies the contaminants of concern detected in samples of the surface water sediments. The contaminants of concern include SVOCs and metals.

Potential exposure pathways include ingestion, inhalation and dermal contact by local residents or wildlife. The likelihood of exposure via these pathways appears to be low to moderate and therefore remedial action is warranted.

The remedial action objectives for the surface water sediment are: (1) reduce the potential for direct contact with the existing contaminated sediments from the surface water swale; (2) reduce the potential for contact by surface water with the existing contaminated surface water sediments; and (3) reduce the risk of future contamination of surface water sediments by eliminating future contact by surface water runoff with contaminated soils and sediments on the site.

3.27 Surface Water

Surface water was sampled at three locations as part of the RI (SW-Series). Table 5h identifies the contaminants of concern detected in the surface water samples. The contaminants of concern include metals.

The potential pathway for exposure is ingestion or dermal contact by local residents or wildlife. The likelihood of exposure via these pathways appears to be moderate and, therefore, remedial action is warranted.

The remedial action objective for surface water is to reduce the risk to human health and the environment by eliminating future contact by surface water runoff with the contaminated soils and sediments on the site.

3.30 SITEWIDE REMEDIAL ACTION OBJECTIVES

The following is a summary of the remedial action objectives to reduce the risks to human health and the environment from contaminants detected at the SOH site:

- Reduce to the extent practical, further off-site migration of contamination in the overburden groundwater;
- Reduce to the extent practical, the levels of contamination in the overburden groundwater at the site;
- Attain to the extent practical, the proposed cleanup SCGs for overburden groundwater quality at the SOH property boundary;
- Reduce the risk of exposure to overburden groundwater at possible discharge locations by reducing the potential for inhalation of organic vapors, ingestion of contaminated groundwater, and dermal contact with contaminated groundwater;
- Reduce the potential for exposure to contaminated groundwater in the bedrock that may occur via exposure to groundwater from bedrock supply wells;
- Reduce or eliminate to the extent practical, the source of existing contamination in the sumps and catch basins;
- Reduce the potential for future introduction of contaminants into the SOH sumps and catch basins, and if appropriate, decommission or replace the sumps, catch basins and ancillary piping;
- Reduce the potential for direct human or animal contact with the contaminated surface soils, subsurface soils and sediments from the surface water swale;
- Reduce the risk of future contamination of surface water and sediments by reducing further contact by surface water runoff with contaminated surface soils, and sump/catch basin contents on the SOH site;
- Reduce the risk to surface water sediments by reducing the potential for future erosion and transport of the contaminated surface soils; and
- Reduce the risk to groundwater by reducing the potential for infiltration of surface runoff and leaching of contaminants into the groundwater.

4.00 PRELIMINARY SCREENING OF REMEDIAL ACTIONS

This section presents the preliminary screening of remedial actions that may be used to control the contaminants of concern and to achieve the remedial action objectives for the site. The remedial actions are evaluated during the preliminary screening on the basis of implementability, effectiveness and relative cost. The purpose of the preliminary screening is to eliminate remedial actions that cannot be implemented technically at the site, or which may not be effective based on anticipated site conditions and to narrow the list of alternatives that will be evaluated in greater detail later in Section 5.0 of this report.

The remedial actions include general response actions such as institutional controls, containment, in-situ treatment, and extraction with ex-situ treatment. The general response actions may be accomplished with different remedial technologies (eg., containment of contaminated groundwater could be accomplished with a sheet piling wall, or a slurry wall with a collection drain). During the preliminary screening, the intent is to identify general response actions and remedial technologies that may be appropriate for site conditions.

The results of the preliminary screening are summarized in Table 6. The table identifies those general response actions and remedial technologies which appear to meet the remedial action objectives for one or more of the environmental media at the site. Remedial actions which pass the preliminary screening are assembled into sitewide remedial alternatives in Section 5.0 of this report and then evaluated in greater detail on the basis of environmental benefits and cost.

4.10 REMEDIAL ACTION AREAS AND VOLUMES

This subsection describes the estimates of the areas and volumes of contaminated groundwater, soils and sediments to assist in evaluating remedial alternatives later in this report.

The estimated volume of contaminated overburden groundwater on the SOH site is approximately 4.5 million gallons. This estimate is based on the calculated average saturated thickness of the overburden above the lower till, an estimated porosity value for the overburden, and the estimated area of contaminated groundwater on the SOH property. The average saturated thickness is based on depths to the top of the lower till from subsurface explorations and water levels measured in overburden groundwater monitoring wells. The porosity value for the overburden is based on laboratory water content test results on samples of the saturated upper till soils and estimated specific gravity and unit weight values for similar soil types. The estimated area of contaminated groundwater is based on the analytical results from samples of groundwater obtained from monitoring wells on the SOH property.

The volume of contaminated surface soils is estimated to be approximately 475 cubic yards (cy). This estimate is based on an assumed depth of contaminated soil of 12 inches over the non-paved areas of; the western portion of the SOH site, the Ruby-Gordon property between the Ruby-Gordon building and the south SOH property line, and the 50-foot wide right-of-way owned by Marketplace Chrysler west of the site from Commerce Drive south to the southwest corner of the Ruby-Gordon property, excluding areas within the right-of-way covered by surface water and surface water sediments. The approximate limits of contaminated surface soils are shown on the Sitewide Remedial Alternatives, Figure Nos. 4 through 7. Additional sampling and laboratory analyses may indicate that the volume of surface soils that exceed the cleanup goals may be greater or less than 475 cy depending on the actual extent and depth of such soils.

The volume of contaminated surface water sediments in the swale to the west of the SOH and Ruby-Gordon properties is estimated to be approximately 400 cy. The volume estimate is based on analytical test results for sediment sample SED-3 collected from the swale that revealed exceedances of the proposed cleanup SCG. The approximate limits of surface water sediments were estimated from the site topographic map and an assumed depth of 12 inches of contaminated sediments. Based on the analytical data available to date, it appears that the sediments may be classified as hazardous waste. Additional sampling and laboratory analyses may be needed to clarify the regulatory status of the surface water sediments.

The volume of contaminated sump/catch basin contents on the SOH site was estimated to be approximately 150 gallons of sump water and approximately 2 cy of sediments. This estimate is based on the analytical results from four samples of the sump/catch basin contents, the approximate dimensions of the structures and assumed depths of water and sediments. Based on review of analytical data available to date for the sump/catch basin contents using the methods identified above, it appears that the sump/catch basin contents may be hazardous waste. Additional sampling and laboratory analyses would be needed to clarify the regulatory status of the sump/catch basin contents.

4.20 GENERAL RESPONSE ACTIONS

To satisfy the remedial action objectives for the site, remediation will be required for the groundwater, soils/sediments and the contents of the on-site sumps and catch basins. General response actions that are available to meet the remedial action objectives are identified below.

General response actions available for the contaminated groundwater include:

- No Action;
- Institutional Controls;
- Containment;
- In-Situ Treatment; and
- Ex-Situ Treatment and/or Disposal.

General response actions available for the contaminated soils/sediments include:

- No Action;
- Institutional Controls;
- Containment; and
- Ex-Situ Treatment and/or Disposal.

General response actions available for the contaminated contents of the on-site sumps and catch basins include:

- No Action; and
- Ex-Situ Treatment and/or Disposal.

4.30 SCREENING OF REMEDIAL TECHNOLOGIES

In accordance with guidance documents issued by the Department (TAGM 4030 revised May 1990) and the USEPA (Guidance for Conducting RI/FS Studies under CERCLA dated October 1988), the criteria used for preliminary screening of general response actions and remedial technologies include the following:

- Effectiveness - The effectiveness evaluation focuses on the degree to which a remedial action is protective of human health and the environment. An assessment is made of the extent to which an action: (1) reduces the mobility, toxicity and volume of contamination at the site; (2) meets the remediation goals identified in the remedial action objectives; (3) effectively handles the estimated areas and volumes of contaminated media; (4) reduces impacts to human health and the environment in the short-term during the construction and implementation phase; and (5) how proven or reliable the proposed action may be in the long-term with respect to the contaminants and conditions at the site. Alternatives which do not provide adequate protection of human health and the environment are eliminated from further consideration.

- Implementability - The implementability evaluation focuses on the technical and administrative feasibility of a remedial action. Technical feasibility refers to the ability to construct and operate a remedial action for the specific conditions at the site and the availability of necessary equipment and technical specialists. Technical feasibility also includes the future maintenance, replacement and monitoring that may be required for a remedial action.

Administrative feasibility refers to compliance with applicable rules, regulations, statutes and the ability to obtain permits or approvals from other government agencies or offices; and the availability of adequate capacity at permitted treatment, storage and disposal facilities and related services. Remedial actions that do not appear to be technically or administratively feasible, or that would require equipment, specialists or facilities that are not available within a reasonable period of time are eliminated from further consideration.

- Cost - In the preliminary screening of remedial actions, relative costs are considered rather than detailed cost estimates. The capital costs and operation and maintenance costs of the remedial actions are compared on the basis of engineering judgement, where each action is evaluated as to whether the costs are high, low or moderate relative to other remedial actions based on knowledge of site conditions. A remedial action is eliminated during preliminary screening on the basis of cost only if other remedial actions are comparably effective and implementable at a much lower cost.

4.31 Groundwater Remedial Technologies

The following subsections discuss the preliminary screening of general response actions and remedial technologies that were considered for remediation of overburden and bedrock groundwater.

4.31.1 No Action

The No Action alternative involves taking no further action to remedy the condition of the groundwater other than continuing to operate the existing groundwater treatment system in the Ruby-Gordon basement and relying upon naturally occurring biodegradation processes in other areas of the site. This alternative may be appropriate in situations where Interim Remedial Actions have been taken, or systems are in place that are sufficiently protective of human health and the environment, or in situations where risks to human health and the environment are limited and more involved remedial actions are not warranted. Department and USEPA guidance requires that the No Action alternative automatically pass through the preliminary screening and be compared to other alternatives in the detailed analysis of sitewide alternatives (see Section 5.0).

4.31.2 Institutional Controls

Institutional Controls for groundwater may consist of site access restrictions, deed restrictions, groundwater use surveys, or environmental monitoring that may be used to reduce the potential for exposure to contamination from the site.

Effectiveness - It appears that the use of institutional controls would be effective in achieving the remedial action objectives for the bedrock groundwater. The RI data indicate that bedrock supply wells are a potential exposure pathway for contaminated bedrock groundwater. Possible institutional controls for the bedrock groundwater at the SOH site may include restrictions on the use of the existing bedrock supply wells at the SOH site, which are currently not used, periodic groundwater use surveys, and continued monitoring of the bedrock groundwater. The use of institutional controls will not be effective in reducing the mobility, toxicity or volume of the contaminants of concern in the bedrock groundwater.

For overburden groundwater, the contaminants appear to have a higher potential for mobility and exposure to receptors, so the use of institutional controls alone likely would not reduce the mobility, toxicity or volume of contaminants at the site, but may be effective in protecting human health and the environment when used in conjunction with other remedial actions.

Implementability - This action is readily implementable as services are available for making periodic groundwater use surveys and monitoring of the bedrock groundwater. Additional bedrock monitoring wells may be needed at greater depths at the site boundary to implement a bedrock groundwater monitoring program. It should be noted that institutional controls such as deed restrictions and restricting the use of bedrock groundwater may only be implementable for the SOH property.

Cost - Costs associated with institutional controls are relatively low and may include capital costs for decommissioning the existing bedrock wells at the SOH facility and installation of additional bedrock monitoring wells, if necessary. Operation and maintenance costs will include fees for services related to implementing deed restrictions and sampling and laboratory testing costs for bedrock groundwater monitoring.

In summary, institutional controls for remedial action for the bedrock groundwater on the SOH site appear to be implementable at low cost compared to other remedial actions that require design, construction and operation. The use of institutional controls may be effective in achieving the remedial action objectives for the bedrock groundwater on the SOH property at low cost as compared to remediation of the bedrock groundwater. For the overburden groundwater, the use of institutional controls alone may not effectively protect human health and the environment, but may be effective when used in conjunction with other remedial actions. The use of institutional controls will be considered when developing sitewide remedial alternatives (see Section 5.0).

4.31.3 Containment

The purpose of groundwater containment is to isolate, or restrict the flow of contaminated groundwater. This is generally accomplished by removing water from the ground at a rate greater than or equal to the production rate for the water bearing zone such as by pumping from extraction wells, or by using a groundwater collection trench.

Containment technologies that rely on groundwater extraction are occasionally supplemented with a low permeability subsurface barrier wall to improve the effectiveness of the extraction system. Containment technologies may also be used in conjunction with a low permeability cap of the contaminated area to limit the amount of precipitation that infiltrates downward through potentially contaminated materials and into the groundwater. Surface cap construction is discussed in subsection 4.32.3.

4.31.3.1 Vertical Barrier Walls

Typical vertical barrier walls include slurry walls, steel sheetpile walls and grout curtains. These barriers are most effective when they are keyed into an underlying stratum of less permeable soil that limits downward vertical migration of contaminated groundwater.

Slurry walls are commonly constructed by mixing imported bentonite clay with water to form a fluid that has a density greater than water. This fluid is used to stabilize a narrow trench that is excavated in the overburden. The excavated soils, or imported soils are then mixed on-site with the bentonite slurry to form a soil/bentonite mix. This mixture is then placed in the vertical trench and displaces the highly fluid bentonite slurry. The soil/bentonite mix provides a low permeability barrier to groundwater flow after the mixture cures.

Steel sheetpile walls are constructed with interlocking sheets of steel that are driven into the ground using vibratory or drop hammers. Sheetpile walls are used in overburden soils and are generally driven until they are keyed into an underlying stratum of low permeability soil. In applications where steel sheetpiles are used as a relatively permanent low permeability barrier, special sheetpiles with "sealable" joints are occasionally used.

Grout curtains are installed by drilling a series of overlapping boreholes and injecting grout under pressure to form columns of interconnected grout. Grout may consist of a variety of materials (eg., cement, bentonite, polymers, etc.) that are injected into the ground to reduce the permeability of the overburden or bedrock formation. Grouting techniques can be adapted to overburden or bedrock conditions by varying the drilling equipment used.

Effectiveness - A vertical barrier wall keyed into the lower glacial till unit at the site may be effective in limiting the mobility of contaminated overburden groundwater. However, such a barrier would likely raise water levels on the upgradient side of the wall unless a system were provided to remove the groundwater that collects in front of it. A passive (gravity drain) or active (pumping) collection system would be needed to continually remove groundwater from the upgradient side of the wall. The collection system would need to be maintained after remediation is complete unless additional measures were taken to "puncture" or remove the barrier wall when the remediation system is decommissioned. If a vertical barrier wall were installed without an upgradient collection system, the wall may permanently raise water levels on the site and in the vicinity of the Ruby-Gordon basement which could increase the amount of pumping required to maintain the Ruby-Gordon basement. In short, a vertical barrier wall alone would not be effective in reducing the volume or toxicity of the overburden groundwater. Other remedial technologies would be needed to supplement the vertical barrier wall to improve effectiveness. The presence of utilities on the site may reduce the effectiveness of a barrier wall if a large number of penetrations through the wall are necessary.

Implementability - The construction labor, equipment and materials are readily available to install vertical barrier walls. The installation of a vertical barrier wall is expected to be implementable at this site; however, several site specific conditions may make the successful implementation of a vertical barrier wall somewhat difficult. In the case of a slurry wall, relatively large site areas are needed for construction equipment and mixing of slurry which may not be available. The SOH property is currently used as an active manufacturing facility and paved areas of the site are used for employee parking. Based on data collected during the RI, it will be necessary to drive the steel sheet piles through approximately 22 feet of dense upper glacial till and into the very dense lower till confining unit along the north and west property boundaries. The relatively high density of the soil may make it somewhat more difficult to advance the sheet piles to the required depth, or may result in deflection or damage to the piles which would reduce their effectiveness as a groundwater barrier. However, it should be noted that steel sheet piles have been driven successfully in the project area when used in temporary excavation support applications.

Cost - At this site, a vertical barrier wall may be cost-effective if used in conjunction with a passive groundwater collection system. It is anticipated that a vertical barrier wall used in conjunction with an active (pumping) collection system would be more expensive due to operation and maintenance (O&M) costs.

In summary, vertical barrier walls may be effective in reducing the mobility of contaminated overburden groundwater. A vertical barrier wall may be effective when used in conjunction with a passive groundwater collection and treatment system. This technology will be evaluated further in the detailed analysis of sitewide alternatives.

4.31.3.2 Groundwater Collection Trench

A groundwater collection trench is a common method used to control the migration of contaminated groundwater and to collect contaminated groundwater for subsequent treatment. A typical groundwater collection trench consists of a trench excavated and keyed into the top of an underlying low permeability soil unit, placement of a geotextile or a graded filter to limit migration of fines, stone bedding, a perforated collection pipe and additional high permeability stone leading up toward the ground surface to intercept the anticipated saturated thickness of the overburden. The remainder of the excavation is generally backfilled with excavated soils or imported fill placed in controlled lifts and compacted.

Many of the contaminants of concern in the overburden groundwater are chlorinated VOCs that were typically detected in samples recovered from the more permeable sand lenses encountered within the upper glacial till. The data indicates that higher contaminant concentrations were generally noted in the sand lenses located near the base of the upper glacial till. If a groundwater collection system was to be installed to intercept groundwater at the downgradient site boundaries to the north and west, the collection system would need to intercept the sand seams at the base of the upper glacial till. The depth required to intercept these layers is anticipated to range from about 15 to 26 feet with an average depth of approximately 22 feet based on data obtained during the RI. In order to provide a stable and safe excavation at these depths, the trench side walls would require temporary support or sloped back (typically 1.5H:1V, or flatter depending on conditions). Based on this information, possible construction methods may include open cut excavations in conjunction with a trench box. Alternatively, the full depth of the excavation could be supported with temporary sheeting or shoring to reduce the volume of excavation and backfill. An effective construction dewatering system would be required for either of these construction methods.

> *Effectiveness* - A groundwater collection trench appears to be an effective remedy that could be used in conjunction with other technologies to meet the remedial action objectives for the overburden groundwater. A collection trench, in conjunction with a groundwater treatment system, would reduce the mobility, toxicity and volume of contaminated overburden groundwater. A collection trench is a proven and reliable technology for removal of groundwater for remediation.

Implementability - The construction labor, equipment and materials are available to install a groundwater collection trench. Because the depth to the base of the upper till unit is expected to be below the invert elevation for the existing sanitary sewer, it will be necessary to either: (1) install a deep collection trench that would extend to the lower till with collection sumps at selected points along the collection pipe so that groundwater could be pumped to a pretreatment system prior to discharge to the sanitary sewer; or (2) install a shallow collection trench in conjunction with a downgradient vertical barrier wall where the invert of the collection pipe is above the invert of the sanitary sewer so that a passive system could be used to collect groundwater, route it through a subsurface pretreatment system prior to discharge to the municipal sanitary sewer.

For construction of a collection trench, it will be necessary to address worker health and safety for potential exposure to contaminated groundwater and organic vapors during construction. Construction of a collection trench will also involve earthwork below the water table and it is expected that it will be necessary to handle and dispose of contaminated water entering the excavations during construction. The earthwork will need to be completed in compliance with Occupational Safety and Health Administration (OSHA) regulations regarding stability of temporary excavation cut slopes. The presence of utilities and building structures on the site may impact the construction methods used for the installation of a collection trench.

Cost - For this site, the initial capital costs for a collection trench are expected to be moderate to high as compared to other remedial technologies that may be used to remove groundwater for pretreatment due to the depth of excavation required, and supplemental costs for temporary sheeting or shoring and dewatering of contaminated groundwater. Capital costs may include materials, equipment and labor to install the groundwater collection system, sumps and pumps. Operation and maintenance costs may include long-term pumping costs to remove groundwater for pretreatment if a passive system is not used.

In summary, a groundwater collection trench may be an effective and implementable remedy for the overburden groundwater. This technology will be evaluated further in the detailed analysis of sitewide alternatives.

4.31.3.3 Groundwater Extraction Wells

Groundwater extraction wells are a commonly used method to control the migration of contaminated groundwater and to collect contaminated groundwater for subsequent treatment. Groundwater extraction wells are generally installed with a drill rig and can be installed in overburden or bedrock depending on the drilling tools used. The well screen and filter pack are generally installed to intercept the saturated thickness of the contaminated water bearing zone. Extraction wells can be installed in a row at the downgradient limits of a site to provide an hydraulic barrier for control of off-site migration of contaminated groundwater, or at specific locations for source area remediation.

Effectiveness - Groundwater extraction wells appear to be an effective remedy that could be used in conjunction with other technologies to meet the remedial action objectives for the overburden groundwater. Extraction wells, in conjunction with a groundwater treatment system, would reduce the mobility, toxicity and volume of contaminated overburden groundwater. Extraction wells can be installed with limited site disturbance and relatively low potential for impacts to human health and the environment during installation compared to other technologies that are more intrusive. Extraction wells are a proven and reliable technology for removal of groundwater for remediation.

Implementability - For the subsurface conditions at the SOH site, groundwater extraction wells are an implementable technology for removal of overburden groundwater for subsequent treatment. The materials, equipment and labor necessary to install extraction wells are readily available. The extraction wells can be reliably installed to the required depth and the screened interval can be adapted to meet the subsurface conditions at the site. A groundwater pump test will be required to obtain hydraulic parameters needed for design of extraction wells in the overburden.

Cost - The relative costs for extraction wells are expected to be moderate as compared to other remedial technologies used to remove groundwater for pretreatment. Capital costs would include materials, equipment and labor to conduct a pump test and install the extraction wells and submersible pumps. Operation and maintenance costs would include long-term pumping costs to remove groundwater for pretreatment and these costs are expected to be high as compared to a passive collection system.

In summary, groundwater extraction wells appear to be an effective and implementable technology for removal of contaminated overburden groundwater from the ground for subsequent treatment using other remedial technologies. Extraction wells will be evaluated further in the detailed analysis of sitewide alternatives.

4.31.4 In-Situ Treatment

The following subsections present the preliminary screening of in-situ treatment technologies for remediation of contaminated groundwater.

4.31.4.1 Zero Valence Iron Treatment

The zero valence iron treatment process involves the use of iron filings as the reactive media for treating water that contains chlorinated VOCs. The chemical reaction that takes place is an oxidation process similar to the corrosion of iron except that chlorinated VOCs are substituted for oxygen and the VOCs are dechlorinated in the process. According to a vendor of this technology, EnviroMetal Technologies, Inc. (ETI) of Guelph, Ontario, Canada the reactive media can be amended to treat site-specific groundwater that contains other contaminants such as the combination of chlorinated VOCs and metals that are present at the SOH site. The dimensions of the reactive vault are designed so that the cleanup goals for the contaminants of concern are attained as groundwater exits the reactive section.

Effectiveness - The zero valence iron treatment process has been demonstrated to be effective at other sites in treating most chlorinated VOCs. However, according to ETI, the technology is not effective in treating methylene chloride, chloroethane and 1,2-dichloroethane. Methylene chloride has been identified as a contaminant of concern at this site. Chloroethane and 1,2-dichloroethane are not contaminants of concern in the overburden groundwater, but may be produced in the degradation of tetrachloroethane (TCA) in this treatment process and this phenomenon would need to be evaluated in a treatability study. This technology has typically been used in applications where the purpose is treatment of chlorinated VOCs in groundwater and not metals. ETI indicates that it may be possible to treat the metal contaminants of concern by adding calcium carbonate and an organic carbon source to the iron filings in the reactive vault. According to ETI, the zero valence iron treatment technology has been used for in-situ treatment of VOCs at a test site in Ontario for about five years and at another site in California for about two years. ETI indicates they are confident in the long-term ability of this technology to treat chlorinated VOCs (except the parameters noted above), but the long-term reliability of metals treatment is unknown. To maintain the effectiveness of the reactive vault, it may be necessary to flush precipitates from the iron filings periodically (possibly every five to ten years according to ETI) using a closed loop system to reduce the potential impact of loss of porosity in the reactive vault over the long-term.

Implementability - The materials, equipment and labor needed to implement a zero valence iron pretreatment system are available. At this time, it appears that a continuous collection trench discharging to a pretreatment vault may be technically more preferable than a "funnel and gate" system for the conditions at the SOH site due to the apparent discontinuous nature of the more permeable sand strata within the upper till. To evaluate the technical feasibility of this technology, a laboratory treatability study will be necessary. If these results appear favorable, this technology may provide a means to meet the remedial action objectives for overburden groundwater at the site boundary using a passive system as an alternative to long-term operation and maintenance of a pump and treat system.

Cost - The initial capital cost for this technology is expected to be high compared to other remedial technologies used for groundwater treatment, but long-term operation and maintenance costs are expected to be lower.

In summary, the zero valence iron treatment process may be an effective technology for in-situ treatment for some of the contaminants of concern in the overburden groundwater. Due to the types of contaminants present in the overburden groundwater and the elevated concentrations, it appears that the zero valence iron process would be best suited for use in a pretreatment application prior to discharge to the municipal sanitary sewer. This is because the zero valence iron treatment process may not be effective for the entire range of contaminants detected at the site, but may be adequate to meet the pretreatment standards for the local publicly owned treatment works (POTW). Laboratory treatability tests would be required to adequately evaluate the effectiveness of this technology for the conditions at the site. This technology could be used as part of a passive system and may be an alternative to long-term operation and maintenance of a pump and treat system. This technology will be evaluated further in the detailed analysis of sitewide alternatives.

4.31.4.2 Bioremediation

Bioremediation of groundwater is usually accomplished by injecting nutrients into the groundwater to promote the growth of bacteria which in turn feed on the organic contaminants. The products of the biodegradation of the organic contaminants are carbon dioxide, water and biomass.

Effectiveness - Bioremediation is generally most effective for treatment of petroleum based organic contaminants. This technology is less effective in treating chlorinated VOCs and metals. Most naturally occurring bacteria and commercially available strains of bacteria generally produce harmful vinyl chloride as a by-product of the biodegradation of chlorinated VOCs. In addition, the long-term effectiveness of a bioremediation operation can be affected by fluctuations in subsurface nutrient levels and temperature.

Implementability - To implement this technology, it will be necessary to install additional wells to deliver nutrients to the subsurface and treatability studies will be required.

Cost - The cost of this technology is expected to be moderate when compared to other remedial technologies used for in-situ groundwater treatment. Capital costs may include treatability studies, additional wells to deliver nutrients, and nutrient costs. Operation and maintenance costs may include labor intensive oversight to monitor subsurface nutrient levels and frequent sampling and analysis to monitor the performance of the system.

In summary, the use of bioremediation for remediation of the overburden groundwater is expected to have limited effectiveness in achieving the remedial action objectives for the contaminants of concern at this site. This technology will not be evaluated further.

4.31.4.3 Air Sparging

Air sparging involves the injection of air into the subsurface below the water table and applying a vacuum to the soils above the water table. The flow of air strips VOCs from the groundwater and soils above the water table. The air collected in the vacuum wells is then treated and discharged to the atmosphere.

Effectiveness - This technology is effective in removal of VOCs from groundwater, but is not effective for removal of metals. The effectiveness of this technology will be limited by the relatively dense, fine-grained glacial till soils at the site and the ability to effectively intercept the more permeable sand strata within the upper glacial till.

Implementability - This technology is expected to be difficult to implement at the site due to the presence of the sand strata within the upper till which appear to be discontinuous. Installing air injection and extraction wells to intercept the sand strata would be difficult to implement. An above ground vapor phase treatment system would be required to remove organic vapors from the subsurface air stream.

Cost - The cost of this technology is competitive with other remedial technologies used for groundwater treatment.

In summary, the use of air sparging for remediation of the overburden groundwater is expected to have limited effectiveness in achieving the remedial action objectives for the contaminants of concern at this site and may be difficult to implement. This technology will not be evaluated further.

4.31.5 Ex-Situ Treatment and/or Disposal

This general response action involves removing groundwater from the subsurface using other technologies and conducting above-ground treatment prior to disposal. This could involve: (1) treating the groundwater to the cleanup goals and discharging the treated water back into the site groundwater; (2) treating the groundwater and discharging the treated water to the nearby surface water swale in substantive conformance with the State Pollutant Discharge Elimination System (SPDES) permit requirements; or (3) pretreating the water sufficient to meet the pretreatment standards in the sewer use ordinance for the local POTW prior to discharge to the existing sanitary sewer system.

It appears that pretreatment followed by discharge to the sanitary sewer system may be the most cost effective ex-situ treatment and disposal option. If the treated water were to be discharged to the on-site groundwater or discharged to a surface water body, it would be necessary to achieve a higher degree of contaminant removal as compared to pretreatment for the sanitary sewer system. In addition, it appears that metals treatment would be required prior to on-site recharge or discharge to a surface water body, whereas a metals removal system would not be required for the pretreatment/sewer option. The discharge of treated water to the on-site overburden groundwater may not be effective and subsequent groundwater mounding could result due to the low permeability of the lacustrine deposit near the surface and the low permeability of the upper till surrounding the sand strata.

A review of the local pretreatment standards for the Monroe County Pure Waters District indicates that the groundwater must be pretreated to reduce concentrations of total VOCs to approximately 2 ppm or less. Based on the samples of overburden groundwater collected to date, the concentrations of metals (except iron) detected in the groundwater do not exceed the POTW pretreatment standards. Monroe County Department of Environmental Services has indicated that although the current discharge limits for iron are 5 ppm or less, these limits are not enforced as iron is actually added during the County's treatment process. Furthermore, the County has submitted a proposed Sewer Use Law to the USEPA that does not include an iron limit. Therefore, pretreatment for removal of metals is not expected to be necessary.

Based on the above, pretreatment prior to discharge to the municipal sanitary sewer system appears to the most feasible option for remediation of contaminated groundwater. The following subsections describe the preliminary screening of technologies that were considered for ex-situ pretreatment and treatment of groundwater.

4.31.5.1 Publicly Owned Treatment Works

The POTW may be capable of providing a portion of the groundwater treatment required as part of the sitewide remediation program. As stated above, a review of the sewer use ordinance for the Monroe County Pure Waters District indicates that pretreatment of the groundwater will be required prior to discharge to the POTW. The POTW could provide secondary treatment of the contaminated water for VOCs and metals using economy of scale.

Effectiveness - The POTW is a proven and reliable technology for treatment of wastewater. The POTW is capable of treating water containing VOCs and metals that have been detected at the site.

Implementability - Pretreatment of the groundwater to reduce VOC levels to less than 2 ppm may be necessary prior to discharge to the POTW. A review of the available analytical data indicates that the existing concentrations of metals in the groundwater do not exceed the POTW pretreatment standards, except for iron. As noted above, these iron standards are not currently enforced and the County has proposed a change in the law that would eliminate the iron discharge limits. As such, it appears that pretreatment may involve a process to reduce the levels of VOCs, but not metals. A sewer use permit may be required for wastewater discharge to the POTW.

Cost - The relative costs for using the POTW for a portion of the groundwater treatment are expected to be comparable or less than a site-specific system for treatment of VOCs and metals. Capital costs would include installation of piping to connect to the existing sewer main in Commerce Drive. Operation and maintenance costs would include sanitary sewer user fees.

In summary, the use of the POTW for a portion of the groundwater treatment appears to be an effective and implementable treatment technology. The use of the POTW will be evaluated further in the detailed analysis of sitewide alternatives.

4.31.5.2 Air Stripping

Air stripping involves passing air through the contaminated groundwater to induce volatilization and the removal of VOCs. Air that contains organic vapors stripped from the groundwater can be treated by either filtration with granular activated carbon, or catalytic oxidation if necessary, prior to discharge to the atmosphere. Air stripping is most appropriate for situations where the contaminants to be treated are volatile and where there are not significant concentrations of dissolved ions that may precipitate (eg., iron).

Effectiveness - Air stripping is expected to be an effective technology for pretreating the groundwater to achieve the pretreatment standards for the local POTW. This is a proven and reliable technology for treatment of water containing VOCs. A shallow tray air stripper is currently being operated by Ruby-Gordon to effectively pretreat water collected in the basement drainage system prior to discharge to the sanitary sewer system. However, consideration must be given to potential impacts to human health and the environment during operation of the stripper as a result of air emissions. Air stripping is not effective in removing metals from water.

Implementability - The labor, equipment and materials for installation of an air stripper at the site are readily available. It may be necessary to treat the air emissions from the stripper by catalytic oxidation, or other method to meet the requirements in the Department's Air Guide I for allowable concentrations of vinyl chloride in air. The use of vapor phase activated carbon may not be effective on elevated levels of vinyl chloride in air. The process equipment that would be required to implement an air stripping treatment system would include construction of a shelter building, an electrical power source, an equalization/sedimentation tank to receive influent water from several groundwater extraction locations, a pump to move water from the equalization/sedimentation tank to the air stripper, an air stripper unit with an air blower, an off-gas treatment system to remove organic vapors from air prior to discharge to the atmosphere and discharge piping for effluent water leading to a nearby manhole for the existing sanitary sewer system. In addition, a sewer use permit will be required from the local POTW which should be attainable. Existing manholes located on Commerce Drive or in the sewer easement to the west of the SOH property could be used to access the sanitary sewer system. If an air stripper is used at this site for pretreatment, additional studies may be required in order to complete the design. In addition, the system will need to substantially comply with appropriate air permit requirements.

Cost - The relative costs for air stripping are expected to be moderate to high as compared to other remedial technologies used to pretreat contaminated groundwater. Capital costs would include the process equipment noted above and their installation. Operation and maintenance costs would include changing of filters on a regular basis, cleaning and replacing trays or packing media in the air stripper, electrical power consumption, and sanitary sewer user fees.

In summary, air stripping appears to be an effective and implementable technology for ex-situ pretreatment of contaminated overburden groundwater prior to discharge to the existing sanitary sewer system. Air stripping will be evaluated further in the detailed analysis of sitewide alternatives.

4.31.5.3 Chemical Oxidation

This technology involves the mixing of contaminated groundwater with a strong oxidizer (eg., ozone or hydrogen peroxide) in the presence of ultraviolet light. The ultraviolet light promotes the oxidation of chlorinated organic chemicals to produce carbon dioxide, water and halogen ions. This technology is most appropriate in situations where the contaminant concentrations are relatively low, where there are not significant concentrations of ions that may form precipitates, where low cleanup levels are required and electrical power is readily available and inexpensive.

Effectiveness - This technology may be effective for pretreatment of chlorinated VOCs, but is not effective for treatment of metals contamination. The effectiveness of this technology in treating chlorinated VOCs is sensitive to the amount of suspended solids in the groundwater which impedes the penetration of ultraviolet light. As such, filtering for suspended solids will likely be required as a pretreatment step. In addition, this technology has a low tolerance for iron in the groundwater. Vendors of this technology indicate that iron levels should be reduced to 1 to 2 ppm for effective operation. At elevated iron levels, precipitate tends to form on the lamps that supply the ultraviolet light reducing effectiveness. As such, iron pretreatment would be required for this technology to be effective.

Implementability - The materials, labor and equipment necessary to implement this technology are available. Treatability studies would be needed to evaluate the effectiveness of this process to treat the groundwater at the site. The process equipment required would include a shelter building, electrical power source, bag filter for solids filtration, iron removal system, a skid-mounted chemical oxidation unit, a hydrogen peroxide or ozone storage tank, a dose regulation system and an effluent discharge line to the sanitary sewer. It may be difficult to install a collection trench or extraction wells that produce relatively clear water due to the silty nature of the overburden. This may impact the amount of prefiltering required for this treatment process.

Cost - Costs for this process are anticipated to be moderate to high as compared to other treatment technologies when used in a pretreatment application.

In summary, the effectiveness of chemical oxidation in reducing concentrations of chlorinated VOCs in a pretreatment application may be reduced by the presence of suspended solids in the overburden groundwater and elevated iron concentrations. Other technologies such as air stripping are likely to be more effective in achieving the pretreatment standards for the sanitary sewer with less operation and maintenance. Based on the above, this treatment process will not be considered further in the detailed analysis of sitewide alternatives. However, if a pre-remedial design study indicates that the effectiveness of air stripping may be less than anticipated, the designer may wish to reconsider the use of the chemical oxidation treatment process.

4.31.5.4 Liquid Phase Carbon Adsorption

Liquid phase carbon adsorption is used to remove organic compounds from groundwater by adsorbing the organic compounds onto the surface of granular activated carbon. Water is treated as it flows through the granular activated carbon. The granular activated carbon can be packed into a treatment column or placed in properly sized drums or pressure vessels connected in series. The granular activated carbon in the treatment system must be changed on a regular basis as the adsorption capacity is depleted with use.

> *Effectiveness* - Liquid phase carbon adsorption is expected to be an ineffective method of pretreatment for the overburden groundwater. Based on the elevated concentrations of chlorinated VOCs detected in the groundwater, the carbon usage rate is expected to be quite high, particularly during initial start up when higher flow rates are anticipated. Thus, it is anticipated that significant quantities of activated carbon would be consumed that would result in the need for frequent carbon changeout.
>
> *Implementability* - Granular activated carbon treatment columns or containers are readily available and relatively simple to install and replace.
>
> *Cost* - The cost of this technology when used as a method of pretreatment is expected to be high due to labor and materials needed for frequent carbon changeout.

In summary, the use of liquid phase carbon adsorption for pretreatment of the overburden groundwater is not expected to be cost effective as compared to other available pretreatment technologies for the contaminant concentrations detected in the overburden groundwater. This technology will not be evaluated further.

4.32 Soil/Sediment Remedial Technologies

An evaluation of the analytical data for samples of the site soils and sediments indicates that the bulk of the volume of contaminated soils and sediments appear to be below SCGs. However, three samples of surface soils (SS-1, SS-3, and SED-3) had elevated levels of metals and polynuclear aromatic hydrocarbons (PAHs) which exceed the cleanup SCGs and may be considered hazardous waste. Additional sampling and laboratory analyses may be appropriate in order to further clarify the regulatory status of the surface soils.

For the purposes of the FS, alternatives have been developed for on-site isolation and containment of contaminated soils and sediments. On-site encapsulation and landfilling will not be evaluated since the volume of soils that exceeds SCGs is expected to be low and construction of a low permeability cover section as required by 6NYCRR Part 373 (RCRA cap) may be difficult to implement and expensive. If subsequent analyses indicate that additional surface soils exceed SCGs and may be considered hazardous waste in accordance with the Department's TAGM 3028, "'Contained-In Criteria' for Environmental Media", these soils can be excavated and treated using an approved off-site treatment and disposal technology.

The following subsections discuss the preliminary screening of various general response actions and remedial technologies that were considered for remediation of the site soils and sediments.

4.32.1 No Action

The No Action alternative involves taking no further action to remedy the condition of the contaminated soils and sediments. Department and USEPA guidance requires that the No Action alternative automatically pass through the preliminary screening and be compared to other alternatives in the detailed analysis of sitewide alternatives (see Section 5.0).

4.32.2 Institutional Controls

Institutional Controls for soils and sediments may consist of site access restrictions, deed restrictions, security fencing, and warning signs that may be used to reduce the potential for exposure to contamination from the site.

> *Effectiveness* - It appears that institutional controls may be effective in achieving the remedial action objectives for the soils and sediments when used in conjunction with other remedial technologies.
>
> *Implementability* - This action is readily implementable as materials and services are available for installing security fencing and warning signs, and enacting deed restrictions.
>
> *Cost* - Costs associated with institutional controls include capital costs for security fencing and signs and fees for services related to implementing deed restrictions.

In summary, institutional controls may be effective for remedial action for the soils and sediments when used in conjunction with other remedial technologies. The use of institutional controls will be considered when developing sitewide remedial alternatives.

4.32.3 Containment

Containment action for soils and sediments may include the installation of a final cover system (cap) placed over the contaminated materials at the ground surface. A cap is generally used to reduce the potential for direct contact with contaminated materials, limit erosion and transport of contaminated surface soils, and reduce infiltration of precipitation that percolates through contaminated soils and into the groundwater. The following subsections present the preliminary screening of various capping alternatives for possible use at the site.

4.32.3.1 Asphalt Pavement Cover

An asphalt pavement cover includes a layer of base course stone or gravel overlain by an asphalt binder course and a final asphalt top course. The layers of the pavement section are graded into place and compacted. This cover system is appropriate in situations where moderate reductions in infiltration of precipitation are desired while preserving the use of the property for vehicle parking and light traffic.

> *Effectiveness* - It appears that an asphalt pavement cover will be effective in achieving the remedial action objectives for the site soils since it will reduce the potential for direct contact with the contaminated soils, reduce infiltration and limit erosion and transport of contaminated materials. To maintain the long-term effectiveness of an asphalt cover, periodic maintenance (ie., crack sealing, seal coating or pavement overlay) may be required. Although an asphalt pavement cover allows greater infiltration of precipitation than other cap technologies, it is likely that an adequately maintained asphalt pavement cover will be protective of human health and the environment since the contaminants of concern in the surface soils (metals and SVOCs) are expected to have relatively low mobility compared to other types of contaminants due to their higher affinity for adsorption on the surface of soil particles.
>
> *Implementability* - The materials, equipment and labor for construction of an asphalt pavement cover are available and can be readily implemented during the period when the asphalt batching plants in the area are open (generally April to November).
>
> *Cost* - Costs for an asphalt pavement cover are expected to be low to moderate as compared to other cap designs. Capital costs may include materials, labor and equipment to construct the asphalt pavement section. Operation and maintenance costs may include periodic crack sealing, seal coating, and/or repaving with an asphalt overlay.

In summary, an asphalt pavement cover appears to be an effective and implementable technology for meeting the remedial action objectives for site soils. An asphalt pavement cover will be evaluated further in the detailed analysis of sitewide alternatives.

4.32.3.2 Geomembrane Cover System

A geomembrane cover system may consist of a geomembrane barrier layer overlain by a synthetic drainage layer overlain by topsoil with vegetative cover. Alternatively, the drainage layer may consist of a non-woven geotextile and high permeability soil placed over the geomembrane. The actual design of the geomembrane cover system will depend on the potential for physical damage to the barrier layer, the stability of the cover system for the proposed finished grades and the ability of the cover system to support vegetative growth.

Effectiveness - It appears that a geomembrane cover system will be effective in achieving the remedial action objectives for the site soils since it will reduce the potential for direct contact with the contaminated soils, reduce infiltration, and limit erosion and transport of contaminated materials. A geomembrane cover system is expected to allow less infiltration than an asphalt pavement cover, but greater infiltration than a 6NYCRR Part 360 solid waste landfill cap. It is likely that a geomembrane cover system will be protective of human health and the environment since the contaminants of concern in the surface soils (metals and SVOCs) are expected to have relatively low mobility compared to other types of contaminants due to their higher affinity for adsorption on the surface of soil particles. A geomembrane cover system may be susceptible to physical damage depending on the thickness of soil placed over the barrier layer.

A geomembrane cover system may be effective for this project in situations where greater reductions in infiltration of precipitation are desired and existing grades make it impractical to regrade the underlying contaminated soils for placement of an asphalt pavement cover or to use the area for paved parking. This may be applicable to the former drum storage areas on the SOH property along the south and west property lines and on the north side of the Ruby-Gordon property along the north wall of basement to limit infiltration of precipitation and roof drainage. This technology is appropriate in areas where a suitable source of low permeability soil is not available nearby.

Implementability - The materials, equipment and labor for construction of a geomembrane and topsoil cap are available and can be readily implemented during construction periods of when temperatures are moderate (generally April to November). A construction quality control program should be implemented to monitor the placement and seam construction for the geomembrane barrier to improve the effectiveness of the constructed cap.

Cost - Costs for this cover system are expected to be moderate. Capital costs will include materials and installation of the cover system, and quality control testing during construction. Maintenance will include periodic mowing and repairs of surface erosion to protect the integrity of the cap.

In summary, a geomembrane cover system appears to be an effective and implementable technology for meeting the remedial action objectives for site soils. This technology will be evaluated further in the detailed analysis of sitewide alternatives.

4.32.3.3 Low Permeability Soil Cover

A low permeability soil cap can be used to contain materials that are characterized as non-hazardous solid waste. The design and construction requirements for cover systems at solid waste disposal sites are outlined in 6NYCRR Part 360 regulations, as amended October 1993; however, the Department may grant a variance from certain requirements depending on the nature of the waste. The current design requirements for a Part 360 cap on flat slopes include a composite barrier layer consisting of a low permeability soil at least 18 inches thick overlain by a geomembrane at least 40 mils thick [60 mils in the case of high density polyethylene (HDPE) geomembranes], at least 24 inches of barrier protection layer soil and at least 6 inches of topsoil and vegetative cover. A gas venting layer is required beneath the barrier layer if the waste produces gas during decomposition. The total thickness of the cap section would be approximately 4 feet since a gas venting layer most likely is not needed at this site because the waste likely would not produce gas. If the Department grants a variance, the total cap thickness may be on the order of 2 to 4 feet.

> *Effectiveness* - It appears that a low permeability soil cap will be effective in achieving the remedial action objectives for the site soils since it will reduce the potential for direct contact with the contaminated soils, reduce infiltration and limit erosion and transport of contaminated materials. When properly constructed, this cap system will allow less infiltration of precipitation than the asphalt pavement cover. To maintain the effectiveness of this cap system, traffic on the surface must be restricted to protect the integrity of the cap section.
>
> *Implementability* - This type of cover system will result in raising of site grades on the order of 2 to 4 feet in non-paved areas of the site. Construction of this type of cap will limit the use of the capped portion of the property. Tie in of the edges of this cap system will be difficult to implement due to the presence of building structures and utilities. Low permeability soils may be available from excavations in the northwest corner of the site, but soils below the water table may be contaminated.
>
> *Cost* - The cost of a low permeability soil cap is expected to be high compared to other cover systems that meet the remedial action objectives.

In summary, the use of a low permeability cap for covering contaminated site soils is expected to be protective of the environment, but difficult to implement based on site constraints. This technology may be considered during remedial design as an alternative to a geomembrane cap.

4.32.4 In-Situ Treatment

The analytical data for soils samples collected during the RI indicate that soils with contaminants of concern are primarily located in the upper 12 inches of surface soils and in subsurface soils below the overburden groundwater table. As such, an in-situ treatment system may be appropriate for soils below the overburden groundwater table to enhance the performance of a pump and treat system and reduce the time required for groundwater area remediation.

An in-situ soil treatment system would remove and treat residual contamination in the soils located within the cone of depression of a groundwater extraction system. If the soils within the cone of depression were not treated, the residual contamination in the soils, may recontaminate the overburden groundwater when the groundwater extraction system is turned off and water levels return to previous levels.

The benefits of using an in-situ soil treatment system to reduce the time for source area remediation would be greater in cases where the downgradient groundwater control system involves long-term operation and maintenance costs for pumping of groundwater. The need for an in-situ soil treatment system to supplement source area remediation may be less in cases where the downgradient groundwater control system is a passive system with lower annual operation and maintenance costs.

4.32.4.1 Soil Vapor Extraction

Soil vapor extraction is a method of in-situ soil treatment that involves circulating air through the pore spaces of unsaturated soils to induce "stripping" of VOCs from the soil and into the air stream. A typical soil vapor extraction system consists of air injection and extraction wells or trenches to circulate air through the unsaturated zone soils plus an air treatment system to remove VOCs from the extracted soil vapor.

> *Effectiveness* - Soil vapor extraction is an effective technology for removing and treating soils contaminated with VOCs, but is not effective in treating soils contaminated with metals. This technology may be effective in reducing the time required for remediation when used in conjunction with a groundwater extraction system. This technology is proven and reliable for remediation of soils contaminated with VOCs. This technology is less effective in dense, fine-grained glacial till soils that are present in portions of the site.
>
> *Implementability* - The materials, equipment and labor for installation of a soil vapor extraction system are available and can be readily implemented. The system requirements include installation of wells or subsurface trenches to inject and extract air, a blower, an air treatment system such as vapor phase activated carbon or catalytic incineration. A surface seal is generally placed over the area to enhance performance and the existing pavement may be

adequate for this purpose. Substantial compliance with air permit regulations may be required for this system.

Cost - Relative costs are expected to be moderate. Capital costs may include well or trench materials and installation, the blower system and air treatment system. Operation and maintenance costs may include electrical power for the blower system, periodic replacement of vapor phase activated carbon (if used), or power for a catalytic oxidation system (if used).

In summary, a soil vapor extraction system appears to be an effective and implementable technology for source area remediation when used in conjunction with a groundwater pump and treat system. This technology will be evaluated further in the detailed analysis of sitewide alternatives.

4.32.5 Ex-Situ Treatment and/or Disposal

Ex-situ treatment and/or disposal actions are presented below for soils and sediments that may exceed SCGs and be classified as hazardous wastes as defined by TAGM 3028. Additional sampling and analyses may be needed to further confirm the regulatory status of the surface soils. However, the available data indicate that most of the contaminated surface soils and sediments may be below SCGs and would generally be classified as non-hazardous.

4.32.5.1 Off-Site Disposal at a Permitted Landfill

This action involves excavation of contaminated soils or sediments that exceeded SCGs, but may be classified as non-hazardous solid waste in accordance with TAGM 3028. These soils may be excavated and removed for off-site disposal at a permitted solid waste disposal facility.

Effectiveness - Excavation and disposal of solid waste at a permitted landfill is an effective method of reducing potential for direct contact with contaminated soils and sediments provided materials which exceed the cleanup goals are fully removed. In addition, this action reduces the potential for future contamination of surface water or groundwater. Placing these materials in a permitted solid waste facility reduces the risk to human health and the environment since the materials will be in a secure location with environmental monitoring.

Implementability - This action is readily implementable at this site. Solid waste facilities which are currently permitted in the site area include the Mill Seat Landfill in Riga, New York; the High Acres Landfill and Recycling Center in Perinton, New York; and Seneca Meadows Landfill in Waterloo, New York.

Cost - Costs for this action are expected to be moderate and may include excavation, loading, hauling and tipping fees at the solid waste facility.

In summary, excavation and disposal at a permitted solid waste facility appears to be an effective and implementable technology for remediation of contaminated soils and sediments that may be classified as non-hazardous solid waste. This technology will be evaluated further in the detailed analysis of sitewide alternatives.

4.32.5.2 Off-site Treatment and Disposal

This technology is applicable to remediation of soils that may be classified as hazardous waste. This action would involve excavation of the contaminated soils followed by off-site treatment and disposal. Solidification and stabilization would be an acceptable treatment method since the hazardous constituents will likely be metals. Solidification and stabilization involves mixing the contaminated soils with stabilizing agents such as cement, lime or polymers to produce a matrix that reduces the potential of leaching of the contaminants from the soil. If cement is selected as the stabilizing agent, the treated soils may resemble a cement-like slurry that can be poured into transportable blocks, or placed in pre-excavated depressions at the disposal facility. Other stabilizing agents may produce a clay-like soil that can be hauled and spread at the disposal facility.

Effectiveness - This technology is expected to be effective in reducing the toxicity and mobility of the metals contamination in the soils. This technology is expected to be reliable in the long-term in isolating the contaminants of concern in the soils when properly mixed with the stabilizing agents and placed at the disposal facility.

Implementability - Contractors, treatment facilities and disposal facilities are available to implement this technology. Bench-scale treatability studies may be warranted depending on the volume of soil to be treated.

Cost - Costs for off-site treatment and disposal are expected to be moderate. Costs for on-site treatment and disposal are expected to be higher due to mobilization costs and the relatively small volume of soil that is anticipated to require treatment.

In summary, excavation and off-site treatment and disposal appears to be an effective and implementable technology for remediation of contaminated soils and sediments classified as characteristic hazardous waste. This technology will be evaluated further in the detailed analysis of sitewide alternatives.

4.33 SOH Sump/Catch Basin Remedial Technologies

An evaluation of the analytical data for samples of the SOH sump/catch basin contents indicates that the contents are likely to be hazardous in accordance with TAGM 3028. Four samples of the sump/catch basin contents had significant levels of VOCs and metals which likely exceed the regulatory thresholds. Additional sampling and laboratory analyses may be appropriate in order to clarify the regulatory status of the sump/catch basin contents. For the purposes of the FS, alternatives will be only be developed for off-site treatment and encapsulation of hazardous waste. On-site disposal of hazardous waste will not be evaluated.

The following subsections discuss the preliminary screening of general response actions and remedial technologies that were considered for remediation of the sump/catch basin contents.

4.33.1 No Action

The No Action alternative involves taking no further action to remedy the condition of the sump/catch basin contents. Department and USEPA guidance requires that the No Action alternative automatically pass through the preliminary screening and be compared to other alternatives in the detailed analysis of sitewide alternatives (see Section 5.0).

4.33.2 Ex-Situ Treatment and/or Disposal

Ex-situ treatment and disposal actions are presented below for sump/catch basin contents that may be classified as hazardous wastes as identified in TAGM 3028.

4.33.2.1 Off-site Treatment and Disposal

This action would involve removal of the contaminated sump/catch basin contents using a vacuum truck followed by off-site treatment and disposal. Treatment by thermal desorption followed by solidification and stabilization is a technically acceptable treatment method since the hazardous constituents will likely be VOCs and metals.

> *Effectiveness* - This technology is expected to be effective in reducing the toxicity and mobility of the contaminants in the sump/catch basin contents. This technology is expected to be reliable in the long-term in treating and isolating the contaminants of concern when properly mixed with the stabilizing agents and placed at the disposal facility.

Implementability - Contractors, treatment facilities and disposal facilities are available to implement this technology. Bench-scale treatability studies may not be warranted due to the small volume of sump/catch basin contents to be treated.

Cost - Costs for off-site treatment and disposal are expected to be moderate. Costs for on-site treatment and disposal are expected to be higher due to mobilization costs and the relatively small volume of sump/catch basin contents to be treated and disposed.

In summary, removal and off-site treatment and disposal appears to be an effective and implementable technology for remediation of contaminated sump/catch basin contents. This technology will be evaluated further in the detailed analysis of sitewide alternatives.

4.40 RESULTS OF PRELIMINARY SCREENING

The results of the preliminary screening are summarized in Table 6. The table identifies the environmental media, general response actions and remedial technologies that were subjected to preliminary screening and those that will be considered further in the Detailed Analysis of Sitewide Alternatives (Section 5.0).

5.00 DETAILED ANALYSIS OF SITEWIDE ALTERNATIVES

The purpose of the detailed analysis of sitewide alternatives is to present the relevant information needed by the Department to select a site remedy. During the detailed analysis, the sitewide alternatives are compared on the basis of environmental benefits and costs using criteria established by the Department in TAGM 4030, "Selection of Remedial Actions at Inactive Hazardous Waste Sites". This approach is intended to provide the Department with information needed to compare the merits of each alternative and select an appropriate remedy that satisfies the remedial action objectives for the site.

This section includes a summary of the seven evaluation criteria in TAGM 4030 and a description of the five sitewide alternatives that have been developed for this project. The sitewide alternatives were developed using the general response actions and remedial technologies that passed the preliminary screening. The alternatives are then compared on the basis of the seven evaluation criteria (six environmental criteria and cost). The section concludes with recommendations for a site remedy.

5.10 EVALUATION CRITERIA

Each remedial alternative is evaluated with respect to the seven criteria outlined in TAGM 4030 as summarized below.

1. Short-Term Effectiveness: This criterion addresses the impacts of the alternative during the construction and implementation phase until the remedial action objectives are met. Factors to be evaluated include protection of the community during the remedial actions, protection of workers during the remedial actions, and the time required to achieve the remedial action objectives.

2. Long-Term Effectiveness: This criterion addresses the long-term protection of human health and the environment after completion of the remedial action. An assessment is made of the effectiveness of the remedial action in managing the risk posed by untreated wastes and/or the residual contamination remaining after treatment, and the long-term reliability of the remedial action.

3. Reduction of Toxicity, Mobility, and Volume: This criterion addresses the Department's preference for selecting "remedial technologies that permanently and significantly reduce the toxicity, mobility and volume" of the contaminants of concern at the site. An evaluation is made as to the extent that the treatment technology destroys toxic contaminants, reduces mobility of the contaminants using irreversible treatment processes, and/or reduces the total volume of contaminated media.

4. Implementability: This criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of services and materials. Technical feasibility refers to the ability to construct and operate a remedial action for the specific conditions at the site and the availability of necessary equipment and technical specialists. Technical feasibility also includes the future operation and maintenance, replacement and monitoring that may be required for a remedial action. Administrative feasibility refers to compliance with applicable rules, regulations, statutes and the ability to obtain permits or approvals from other government agencies or offices; and the availability of adequate capacity at permitted treatment, storage and disposal facilities and related services.

5. Compliance with SCGs and Cleanup Goals: This criterion is used to evaluate the extent to which each alternative may achieve the proposed cleanup goals. The cleanup goals were developed based on SCGs promulgated by Federal and New York State agencies.

6. Overall Protection of Human Health and the Environment: This criterion provides an overall assessment of protection with respect to long-term and short-term effectiveness and compliance with cleanup goals.

7. Cost: The estimated capital costs, long-term operation and maintenance costs, and environmental monitoring costs are evaluated. A present worth analysis is made to compare the remedial alternatives on the basis of a single dollar amount for a base year. For the present worth analysis, assumptions are made regarding the interest rate applicable to borrowed funds and the average inflation rate. It was also assumed that a 30-year operational period would be necessary for groundwater control systems and site monitoring. The comparative cost estimates are intended to reflect actual costs with an accuracy of +50 percent to -30 percent.

5.20 DEVELOPMENT OF SITEWIDE ALTERNATIVES

Five sitewide remedial alternatives have been assembled using the general response actions and remedial technologies that passed the preliminary screening. Table 7 provides a summary of the five sitewide alternatives. An expanded description of each of the sitewide alternatives is provided below.

5.21 Sitewide Alternative #1: No Action

The No Action alternative involves taking no further action to remedy the condition of the site other than continuing to operate the existing groundwater treatment system in the Ruby-Gordon basement and relying upon natural attenuation in other areas of the site. Department and USEPA guidance requires that the No Action alternative be considered in the detailed analysis of sitewide alternatives. The No Action alternative is considered an unacceptable alternative as the site would remain in its present condition and human health and the environment would not be adequately protected.

5.22 Sitewide Alternative #2: Deep Perimeter Collection Trench/Soil and Sediment Disposal Off-Site

A conceptual sketch for Sitewide Alternative No. 2 is provided on Figure 4. Sitewide Alternative No. 2 includes the following remedial actions for the environmental media in the study area:

Overburden Groundwater Actions for Alternative #2

- Install a groundwater collection trench along the north and west SOH property boundaries to provide containment of contaminated groundwater leaving that portion of the site. Pump from groundwater collection sumps to a groundwater pretreatment system in a shelter building on the SOH site. Operate for long-term groundwater control at the north and west site boundaries.

- Install a groundwater pretreatment system in a shelter building on the SOH site. The pretreatment system would consist of an air stripper followed by discharge via a gravity line to the existing sanitary sewer. An off-gas treatment system may be required for destruction of organic air emissions from the air stripper.

- Operate groundwater extraction wells near OW-7S for initial remediation of a portion of the contamination near the suspected source area. Pump groundwater to the pretreatment system on the SOH site. Install a soil vapor extraction system to enhance the performance of the remediation at the suspected source area and to reduce the pumping time required at the downgradient collection trench and at the suspected source area. Operate short-term for remediation of the suspected source area.

- Pump contaminated water collected from the Ruby-Gordon basement drainage system to the groundwater pretreatment system on the SOH site for the long-term control of groundwater in the area south of the SOH site. Take the existing air stripper in the Ruby-Gordon basement off-line. Upgrade and secure the vapor barriers over the Ruby-Gordon basement sumps. Divert surface water currently entering the basement drainage system from the Ruby-Gordon loading dock to reduce the volume of water requiring pretreatment.

- Conduct overburden groundwater monitoring to evaluate the extent to which the remedial action objectives are being met at the site property boundaries.

- Construct an asphalt-lined drainage swale on Ruby-Gordon property north of the basement to limit groundwater recharge.

Bedrock Groundwater Actions for Alternative #2

- Use institutional controls to reduce the potential for exposure to contaminated bedrock groundwater. The remedial actions would include; disconnecting the existing bedrock supply wells on the SOH property, implementing deed restrictions on the SOH site, conducting periodic groundwater use surveys in the immediate site area and conducting bedrock groundwater monitoring.

Soil and Surface Water Sediment Actions for Alternative #2

- Excavate the contaminated on-site and off-site surface soils that exceed SCGs. Soils that are classified as hazardous waste based on TAGM 3028 are hauled off-site for treatment and disposal at a hazardous waste disposal facility.

SOH Sump/Catch Basin Actions for Alternative #2

- Remove the sump contents that are classified as hazardous waste using a vacuum truck. Transport off-site for treatment and disposal in a hazardous waste disposal facility.

- Decommission waste lines leading from the SOH building to the sumps and catch basins, if present, and/or upgrade the sumps and catch basins, as appropriate.

<u>5.23 Sitewide Alternative #3: Perimeter Extraction Wells/Off-Site Soil and Sediment Disposal</u>

A conceptual sketch of Sitewide Alternative No. 3 is provided on Figure 5. Sitewide Alternative No. 3 includes the following remedial actions for the environmental media in the study area:

Overburden Groundwater Actions for Alternative #3

- Install groundwater extraction wells along the north and west SOH property boundaries to provide containment of contaminated groundwater leaving that portion of the site. Pump groundwater from wells to a groundwater pretreatment system in a shelter building on the SOH site. Operate for long-term groundwater control at the north and west site boundaries.

- Install a groundwater pretreatment system in a shelter building on the SOH site. The pretreatment system would consist of an air stripper followed by discharge via a gravity line to the existing sanitary sewer. An off-gas treatment system may be required for destruction of organic air emissions from the air stripper.

- Operate groundwater extraction wells near OW-7S for initial remediation of a portion of the contamination near the suspected source area. Pump groundwater to the pretreatment system on the SOH site. Install a soil vapor extraction system to enhance the performance of the remediation at the suspected source area and to reduce the pumping time required at the downgradient extraction wells and at the suspected source area. Operate short-term for remediation of the suspected source area.

- Pump contaminated water collected from the Ruby-Gordon basement drainage system to the groundwater pretreatment system on the SOH site for the long-term control of groundwater quality in the area south of the SOH site. Take the existing air stripper in the Ruby-Gordon basement off-line. Upgrade and secure the vapor barriers over the Ruby-Gordon basement sumps. Divert surface water currently entering the basement drainage system from the Ruby-Gordon loading dock to reduce the volume of water requiring pretreatment.

- Conduct overburden groundwater monitoring to evaluate the extent to which the remedial action objectives are being met at the site property boundaries.

- Construct an asphalt-lined drainage swale on Ruby-Gordon property north of the basement to limit groundwater recharge.

Bedrock Groundwater Actions for Alternative #3

- Use institutional controls to reduce the potential for exposure to contaminated bedrock groundwater. The remedial actions would include; disconnecting the existing bedrock supply wells on the SOH property, implementing deed restrictions on the SOH site, conducting periodic groundwater use surveys in the immediate site area and conducting bedrock groundwater monitoring.

Soil and Surface Water Sediment Actions for Alternative #3

- Excavate the contaminated on-site and off-site surface soils that exceed SCGs. Soils that are classified as hazardous waste based on TAGM 3028 are hauled off-site for treatment and disposal at a hazardous waste disposal facility.

SOH Sump/Catch Basin Actions for Alternative #3

- Remove the sump contents that are classified as hazardous waste using a vacuum truck. Transport off-site for treatment and disposal in a hazardous waste disposal facility.

- Decommission waste lines leading from the SOH building to the sumps and catch basins, if present, and/or upgrade the sumps and catch basins, as appropriate.

<u>5.24 Sitewide Alternative #4: Perimeter Extraction Wells/Off-Site Soil Sediment Disposal</u>

A conceptual sketch for Sitewide Alternative No. 4 is provided on Figure 6. Sitewide Alternative No. 4 includes the following remedial actions for the environmental media in the study area:

Overburden Groundwater Actions for Alternative #4

- Install groundwater extraction wells along the north and west SOH property boundaries to provide containment of contaminated groundwater leaving that portion of the site. Pump groundwater from wells to a groundwater pretreatment system in a shelter building on the SOH site. Operate for long-term groundwater control at the north and west site boundaries.

- Install a groundwater pretreatment system in a shelter building on the SOH site. The pretreatment system would consist of an air stripper followed by discharge via a gravity line to the existing sanitary sewer. An off-gas treatment system may be required for destruction of organic air emissions from the air stripper.

- Operate groundwater extraction wells near OW-7S for initial remediation of a portion of the contamination near the suspected source area. Pump groundwater to the pretreatment system on the SOH site. Install a soil vapor extraction system to enhance the performance of the remediation at the suspected source area and to reduce the pumping time required at the downgradient extraction wells and at the suspected source area. Operate for short-term remediation of the suspected source area.

- Pump contaminated water collected from the Ruby-Gordon basement drainage system to the groundwater pretreatment system on the SOH site for the long-term control of groundwater quality in the area south of the SOH site. Take the existing air stripper in the Ruby-Gordon basement off-line. Upgrade and secure the vapor barriers over the Ruby-Gordon basement sumps. Divert surface water currently entering the basement drainage system from the Ruby-Gordon loading dock to reduce the volume of water requiring pretreatment.

- Conduct overburden groundwater monitoring to evaluate the extent to which the remedial action objectives are being met at the site property boundaries.

- Construct a geomembrane cover system with a drainage swale on Ruby-Gordon property north of the basement to limit groundwater recharge.

Bedrock Groundwater Actions for Alternative #4

- Use institutional controls to reduce the potential for exposure to contaminated bedrock groundwater. The remedial actions would include; disconnecting the existing bedrock supply wells on the SOH property, implementing deed restrictions on the SOH site, conducting periodic groundwater use surveys in the immediate site area and conducting bedrock groundwater monitoring.

Soil and Surface Water Sediment Actions for Alternative #4

- Excavate the contaminated on-site and off-site surface soils that exceed SCGs. Soils that are classified as hazardous waste based on TAGM 3028 are hauled off-site for treatment and disposal at a hazardous waste disposal facility.

SOH Sump/Catch Basin Actions for Alternative #4

- Remove the sump contents that are classified as hazardous waste using a vacuum truck. Transport off-site for treatment and disposal in a hazardous waste disposal facility.

- Decommission waste lines leading from the SOH building to the sumps and catch basins, if present, and/or upgrade the sumps and catch basins, as appropriate.

<u>5.25 Sitewide Alternative #5: Vertical Barrier Wall and Shallow Collection Trench with Zero Valence Iron Pretreatment/Off-Site Soil/Sediment Disposal</u>

A conceptual sketch of Sitewide Alternative No. 5 is provided on Figure 7. Sitewide Alternative No. 5 includes the following remedial actions for the environmental media in the study area:

Overburden Groundwater Actions for Alternative #5

- Install a groundwater containment and collection system along the north and west property boundaries to limit off-site migration of contaminated groundwater from that portion of the site. The system along the north and west property boundaries would consist of a vertical barrier wall together with a shallow upgradient collection trench with high permeability relief columns beneath the trench. Collected groundwater would flow by gravity to a subsurface groundwater pretreatment vault. Operate for long-term groundwater control at the north and west site boundaries.

- Install a groundwater pretreatment system consisting of subsurface vaults containing iron filings to promote zero valence oxidation of chlorinated VOCs for pretreatment of groundwater prior to discharge by gravity to the municipal sanitary sewer.

- Operate groundwater extraction wells near OW-7S for initial remediation of a portion of the contamination near the suspected source area. Pump groundwater to a subsurface groundwater pretreatment vault on the SOH site. Operate short-term for remediation of the suspected source area.

- Install a groundwater collection trench along a portion of the south site boundary near the Ruby-Gordon basement. Collected groundwater would flow by gravity to a subsurface groundwater pretreatment vault. Operate for the long-term control of groundwater quality south of the SOH site. Continue to operate the existing groundwater pretreatment system in the Ruby-Gordon basement until the groundwater collection trench becomes effective. Upgrade and secure the vapor barriers over Ruby-Gordon sumps.

- Conduct overburden groundwater monitoring to evaluate the extent to which the remedial action objectives are being met at the site property boundaries.

- Construct a geomembrane cover system with a drainage swale on Ruby-Gordon property north of the basement to limit groundwater recharge.

Bedrock Groundwater Actions for Alternative #5

- Use institutional controls to reduce the potential for exposure to contaminated bedrock groundwater. The remedial actions would include; disconnecting the existing bedrock supply wells on the SOH property, implementing deed restrictions on the SOH site, conducting periodic groundwater use surveys in the immediate site area and conducting bedrock groundwater monitoring.

Soil and Surface Water Sediment Actions for Alternative #5

- Excavate the contaminated on-site and off-site surface soils that exceed SCGs. Soils that are classified as hazardous waste based on TAGM 3028 are hauled off-site for treatment and disposal at a hazardous waste disposal facility.

SOH Sump/Catch Basin Actions for Alternative #5

- Remove the sump contents that are classified as hazardous waste using a vacuum truck. Transport off-site for treatment and disposal in a hazardous waste disposal facility.

- Decommission waste lines leading from the SOH building to the sumps and catch basins, if present, and/or upgrade the sumps and catch basins, as appropriate.

5.30 COMPARISON OF SITEWIDE ALTERNATIVES

The sitewide alternatives are compared on the basis of the seven environmental and cost criteria in TAGM 4030. Sitewide alternative Nos. 1 through 5 are compared in the following sections.

5.31 Short-Term Impacts and Effectiveness

This evaluation addresses the impacts of the alternatives during the construction and implementation phase until the remedial action objectives are met.

Alternative Nos. 3 and 4 appear to involve the least impact to the community and to workers during construction since these alternatives result in the least amount of site disturbance through the use of drilled wells. Alternative No. 3 appears to involve the most impact during construction due to the relatively large amount of excavation required and due to the need to handle and dispose of greater quantities of potentially contaminated excavation spoils and contaminated groundwater collected during construction dewatering. Alternative No. 5 appears to involve less impact during construction than Alternative No. 2 and more than Alternative Nos. 3 and 4 due to the need to handle and dispose of some potentially contaminated excavation spoils and some contaminated groundwater collected during the installation of the shallow collection trench.

The time required to achieve the remedial action objectives at the SOH property boundaries appears to be comparable for Alternative Nos. 2 through 5. However, within the SOH property boundaries, Alternative Nos. 2 through 4 are expected to cleanup the site groundwater faster than Alternative No. 5 since Alternative Nos. 2 through 4 will induce greater hydraulic gradients on-site and promote faster flushing of the site groundwater. However, since Alternative No. 5 involves the use of a gravity collection system, the increased time to cleanup the groundwater within the SOH site boundaries may not be a significant issue. Alternative No. 5 has the additional benefit of a south side groundwater collection trench to intercept groundwater before it reaches the Ruby-Gordon property.

Alternative No. 1 is not considered to be effective since no action would leave the site in its present condition and human health and the environment would not be protected.

5.32 Long-Term Effectiveness and Permanence

This evaluation addresses the ability of the alternatives to provide long-term protection to human health and the environment after completion of the remedial action, the ability to effectively reduce risk imposed by untreated waste and/or residual contamination remaining after treatment, and the long-term reliability of the remedial action.

Alternative Nos. 2 through 5 appear to effectively reduce potential risk associated with residual contamination or untreated waste since the groundwater is removed and treated both on-site and off-site for the contaminants of concern and since the contaminated soils and sediments are removed from the site.

Alternative Nos. 2 through 5 also appear to be comparable in terms of their ability to protect human health and the environment after completion of the remedial action. Alternative No. 1 is not expected to provide long-term protection to human health and the environment.

5.33 Reduction of Toxicity, Mobility and Volume

This evaluation addresses the ability of the alternatives to destroy or treat toxic contaminants, reduce the mobility of contaminants, and reduce the total volume of contaminated media.

Alternative Nos. 2 through 5 appear to be effective in reducing the toxicity of the contaminants in the overburden groundwater since the groundwater is subjected to on-site pretreatment and off-site treatment by the POTW. For the hazardous soils and sediments, Alternative Nos. 2 through 5 reduce the toxicity of hazardous materials through treatment prior to disposal.

Alternative Nos. 2 through 5 appear to be comparable in reducing the mobility and volume of contaminants in the overburden groundwater in that these alternatives limit the potential for off-site migration of contaminated groundwater and reduce the volume of contaminated overburden groundwater in the study area.

Alternative Nos. 2 through 5 appear to be comparable in reducing the mobility of contaminants in the hazardous soils and sediments, in that the soils and sediments are subjected to treatment prior to disposal. The volume of hazardous soils and sediments is not reduced with these alternatives.

Alternative No. 1 would not reduce the toxicity, mobility or volume or contaminated media at the site.

5.34 Implementability

This evaluation addresses the ability to construct and operate a remedial action for the specific conditions at the site, the availability of necessary equipment and technical specialists, future maintenance and monitoring that may be required, compliance with applicable rules and regulations, the ability to obtain permits or approvals from other government agencies or offices, and the availability of adequate capacity at permitted disposal facilities.

Alternative Nos. 2 through 5 are comparable with regard to these criteria except constructability and the amount of operation and maintenance required. Alternative Nos. 3 and 4 appear to be easily constructable in that the amount of intrusive work is limited through the use of drilled wells and contaminated surface soils and sediments are excavated and hauled for disposal. Alternative Nos. 2 and 5 may be more difficult to construct due to the depth and volume of excavation required, possible difficulties in placing pipe and stone, and handling of potentially contaminated soil and groundwater during excavation and construction dewatering.

With regard to operation and maintenance, Alternative No. 5 may require the least amount of labor and expense for long-term operation and maintenance. Alternative Nos. 2 through 4 require long-term operation of pumping systems for groundwater extraction.

Alternative No. 1 is easily implementable in that it involves no action other than continued operation of the existing groundwater pretreatment system in the Ruby-Gordon basement.

5.35 Compliance with SCGs and SCG Goals

This evaluation addresses the extent to which the alternatives may achieve the proposed cleanup SCGs for environmental media at the site. As noted, the cleanup SCGs have been developed based on review of applicable, relevant and appropriate requirements promulgated by State and Federal agencies.

Alternative Nos. 2 through 5 appear to be comparable with respect to ability to achieve the proposed overburden groundwater SCG goals for the site. These alternatives involve on-site pretreatment of overburden groundwater and off-site treatment at the local POTW to achieve the proposed SCG goals.

For soils and sediments, Alternative Nos. 2 through 5 appear to be comparable in ability to achieve the proposed SCG goals in that the contaminated soils and sediments are removed from the site.

Alternative No. 1 will not achieve the proposed SCG goals for the contaminated overburden groundwater, or the contaminated soils and sediments at the site.

5.36 Protection of Human Health and the Environment

This evaluation provides an overall assessment of the long-term and short-term effectiveness of the sitewide alternatives.

With respect to contaminated groundwater, Alternative Nos. 2 through 5 appear to be comparable in overall protection of human health and the environment. These alternatives limit the potential for off-site migration of contaminated groundwater, reduce the volume of contaminated overburden groundwater and utilize proven technologies to treat the contaminants of concern. Alternative No. 5 has the additional benefit of the south side groundwater collection trench which would intercept contaminated groundwater before it enters the Ruby-Gordon basement drainage system.

With respect to soils and sediments, Alternative Nos. 2 through 5 appear to be comparable in overall protection as the hazardous soils are removed and disposed at a permitted waste facility.

Alternative No. 1 would not be protective of human health and the environment since no action would leave the site in its present condition.

5.37 Cost

Cost estimates are presented for the purpose of comparing the sitewide remedial alternatives. The estimates include capital costs, indirect capital costs, long-term (30-year) operation and maintenance costs, and environmental monitoring costs. A present worth analysis is provided to compare the remedial alternatives on the basis of a single dollar amount for a base year of 1996. The present worth analysis is based on an interest rate of 8 percent for borrowed funds and an average inflation rate of 4 percent. The comparative cost estimates are intended to reflect actual costs with an accuracy of +50 percent to -30 percent as required by TAGM 4030.

Cost estimate worksheets are provided in Appendix A for each sitewide alternative. Attached to the worksheets are a list of assumptions made in developing the comparative cost estimates. It should be noted that assumptions made at this stage are based on information available at this time and engineering judgements made in accordance with generally accepted engineering practices. It is likely that many of the estimated quantities and costs will vary based on the results of additional testing and engineering work to be completed during remedial design. For example, assumptions have been made regarding the types of treatment process equipment required, anticipated flow rates, the number and spacing of extraction wells required, the volume of contaminated soils to be handled, etc. As such, these estimates should be used by the Department only for the purpose of comparing remedial alternatives to assist in selecting a site remedy and may not be representative of final project costs.

As noted, the comparative cost estimates should be considered approximate, and the actual construction costs may vary. The comparative costs are based on published unit costs and information provided by vendors. As such, there is an inherent uncertainty associated with the cost estimates. In addition, it is possible that the actual construction costs may be different based on the availability of certain materials at the time of construction (e.g. it is reported that additional steel mills may produce the iron required for the zero-valence treatment).

A summary of the comparative cost estimates is as follows:

Sitewide Alternatives	Present Worth Cost			
	Direct Capital Cost	Indirect Capital Cost	Operation & Maintenance Cost	Total Estimated Cost
#1 - No Action	$0	$10,000	$191,500	$201,500
#2 - Deep Collection Trench Source Wells/Remove Soils	$940,000	$470,000	$1,576,700	$2,986,700
#3 - Extraction Wells Source Wells/Remove Soils	$743,000	$371,500	$1,663,800	$2,778,300
#4 - Extraction Wells/Source Wells/Remove Soils	$737,000	$368,500	$1,654,900	$2,760,400
#5 - Barrier Wall & Shallow Collection Trench/Source Wells/Remove Soils	$1,278,000	$639,000	$861,100	$2,778,100

5.40 RECOMMENDED SITEWIDE REMEDY

It is recommended that Alternative Nos. 3, 4 or 5 be considered for use as a sitewide remedy. It appears that these alternatives may achieve the remedial action objectives in a cost effective manner as compared to the other sitewide alternatives. Alternative Nos. 3, 4 and 5 are described in greater detail in Section 5.0 of the report and Table 7.

6.00 SUMMARY AND CONCLUSIONS

This report presents the results of a Feasibility Study (FS) of alternatives for the environmental remediation of the Stuart-Olver-Holtz (SOH) site located in the Town of Henrietta, Monroe County, New York. The purpose of the FS is to identify and evaluate technologies that are available to remediate the portions of the site identified in the Remedial Investigation (RI) as requiring remedial action. Technologies appropriate for the site conditions have been developed into sitewide alternatives that have been evaluated on the basis of their environmental benefits and comparative cost. The information presented herein will be used by the Department to select remedial action(s) for the site.

The results of the FS indicate that Alternative Nos. 3, 4 or 5 may be the preferred remedy for environmental restoration of the SOH site. Each of these alternatives involve installation of a groundwater collection system near the downgradient property boundaries and in the vicinity of the suspected source area near the southwest corner of the SOH building, installation of a groundwater pretreatment system, and discharge of the pretreated water to the existing municipal sanitary sewer system. Alternative Nos. 4 and 5 differ from Alternative No. 3 in the manner in which the drainage area north of Ruby-Gordon is addressed. In addition, Alternative No. 5 includes a shallow groundwater collection system immediately north of Ruby-Gordon that would provide greater environmental benefit. Alternative Nos. 3, 4 and 5 are described in greater detail in Table 7 and Section 5.0 of the report.

The estimated costs of Alternative Nos. 3, 4 and 5 range from $2,760,400 to $2,986,700. These comparative cost estimates are intended to reflect actual costs with an accuracy of +50 percent to -30 percent. The basis of the cost estimates is presented in Section 5.37 of the report. Cost estimate worksheets and assumptions made for the cost estimates are provided in Appendix A.

To facilitate the most cost effective design, the Department may wish to consider proceeding forward with supplemental studies to further evaluate the effectiveness of the zero valence iron pretreatment process if Alternative No. 5 is selected. Consideration should also be given to completing, concurrently with remedial design, a pump test to obtain hydraulic parameters for the design of the groundwater collection systems, particularly in the areas near the south and west portions of the SOH building to obtain information that could be used to improve the effectiveness of the source area remediation system.

ACRONYMS

ARARs	Applicable and Relevant and Appropriate Requirements
ASP	Analytical Services Protocols
cm/s	centimeters per second
cy	cubic yards
Department	New York State Department of Environmental Conservation
ETI	EnviroMetal Technologies, Inc.
FS	Feasibility Study
GZA	GZA GeoEnvironmental of New York
HDPE	high density polyethylene
MCDOH	Monroe County Department of Health
NYSDOH	New York State Department of Health
O&M	operation and maintenance
OSHA	Occupational Safety and Health Administration
PAHs	polynuclear aromatic hydrocarbons
PCBs	Polychlorinated biphenyls
POTW	publicly owned treatment works
ppm	parts per million
PRAP	Proposed Remedial Action Plan
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SCGs	State Standards, Criteria and Guidelines
SOH	Stuart-Olver-Holtz
SPDES	State Pollutant Discharge Elimination System
SVOCs	semi-volatile organic compounds
TAGM	Technical and Administrative Guidance Memorandum
TAMS	TAMS Consultants, Inc.
TCA	tetrachloroethane
TCE	tetrachloroethene
TCLP	Toxicity Characteristic Leaching Procedure
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds

Table No. 1
Chemical Specific Standards, Criteria and Guidelines (SCGs)

Feasibility Study
Stuart - Olver - Holtz
Site No. 8-28-079
Henrietta, New York

Standard, Requirement Criteria of Limitation	Citation or Reference	Description	Comments
Federal			
Groundwater			
National Primary Drinking Water Standards	40 CFR Part 141	Applicable to the use of public water systems; establishes maximum contaminant levels (MCLs), monitoring requirements and treatment techniques.	
National Secondary Drinking Water Standards	40 CFR Part 143	Applicable to the use of public water systems; controls contaminants in drinking water that primarily effect the aesthetic qualities relating to public acceptance of drinking water.	
Safe Drinking Water Act	40 CFR 141.11-.16	Establishes primary maximum contaminant levels (MCLs) for "public water systems" defined as systems with at least 15 connections which service a minimum of 25 persons.	Groundwater standards are listed as a basis for evaluation of the potential effect contaminated soil may have on groundwater quality.
Safe Drinking Water Act	40 CFR 141.50-.51	Establishes non-enforceable health goals for public water systems (maximum contaminant level goals (MCLG)).	Groundwater standards are listed as a basis for evaluation of the potential effect contaminated soil may have on groundwater quality.
Safe Drinking Water Act	40 CFR 141.11-.16	Establishes secondary non-enforceable goals regarding taste, odor, color and appearance of drinking water (maximum contaminant levels (MCLs)).	Groundwater standards are listed as a basis for evaluation of the potential effect contaminated soil may have on groundwater quality.
USEPA Office of Drinking Water Health Advisories		Standards issued by the USEPA Office of Drinking Water.	
Surface Water			
Clean Water Act (CWA)	FR 79318 Nov. 29, 1980	Establishes Federal Water Quality Criteria (FWQC) for human health protection and aquatic life protection.	FWQC may be used by NYSDEC in setting NPDES permit levels.

Table No. 1
Chemical Specific Standards, Criteria and Guidelines (SCGs)

Feasibility Study
Stuart - Olver - Holtz
Site No. 8-28-079
Henrietta, New York

Standard, Requirement Criteria of Limitation	Citation or Reference	Description	Comments
Toxic Pollutant Effluent Standards	40 CFR Part 129	Applicable to the discharge of toxic pollutants into navigable waters.	Effluent limitation for toxic pollutants are based on the Best Available Technology Economically Achievable for point source discharges.
General Provisions for Effluent Guidelines and Standards	40 CFR 401	Establishes legal authority and general definitions that apply to all regulations issued concerning specific classes and categories of point sources.	Provides for point source identification.
Soil			
National Oil and Hazardous Substances Pollution Contingency Plan (NCP)	40 CFR 300	Establishes USEPA's policy for the evaluation of public health risks at Superfund sites.	The NCP outlined the USEPA's policy for evaluation of public health risks.
Superfund Evaluation Public Health Manual		Establishes policies for determining contaminant concentration goals when ARAR are not available.	The NCP outlined the USEPA's policy for evaluation of public health risks.

Table No. 1
Chemical Specific Standards, Criteria and Guidelines (SCGs)

Feasibility Study
Stuart - Olver - Holtz
Site No. 8-28-079
Henrietta, New York

Standard, Requirement Criteria of Limitation	Citation or Reference	Description	Comments
Air			
Clean Air Act	42 7401 Section 112 (as amended 1993)	Establishes upper limits on parameter emissions to atmosphere.	Pollutants deemed hazardous or non-hazardous based on public health.
National Primary and Secondary Ambient Air Quality Standards	40 CFR 50	Establishes primary and secondary NAAQS under Section 109 of the Clean Air Act.	Primary NAAQS define levels of air quality necessary to protect public health. Secondary NAAQS define levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.
National Emissions Standards for Hazardous Air Pollutants	40 CFR 61	Establishes limits for hazardous air pollution with regards to a point source.	
RCRA			
Resource Conservation and Recovery Act - Identification and Listing of Hazardous Wastes	40 CFR 264.1	Defines those wastes which are subject to regulations as hazardous wastes under 40 CFR Parts 262 - 265 and Parts 124, 270, 271.	
RCRA Maximum Concentration Limits	40 CFR 264	Establishes groundwater protection standards for toxic metals and pesticides.	These provisions are applicable to RCRA regulated units that are subject to permitting.
New York State			
Groundwater			
NYSDEC Ground Water Quality Regulations	6 NYCRR Part 702	Establishes procedures to derive standards and guidance values.	Applicable to groundwater cleanup levels.
NYSDEC Ground Water Quality Regulations	6 NYCRR Part 703	Establishes criteria for the consumption of potable water.	Applicable to the groundwater quality of both the shallow and deep aquifers.

Table No. 1
Chemical Specific Standards, Criteria and Guidelines (SCGs)

Feasibility Study
Stuart - Olver - Holtz
Site No. 8-28-079
Henrietta, New York

Standard, Requirement Criteria of Limitation	Citation or Reference	Description	Comments
Ambient Water Quality Standards and Guidance Values	TOGS 1.1.1, October 22, 1993	Establishes groundwater quality standards.	
New York Water Classifications	6 NYCRR Parts 609, 700-704	Describes classification system for surface water and groundwater. Establishes standards of Quality and Purity.	Establishes required clean-up criteria based on water classification.
NYSDEC Standards Raw Water Quality	10 NYCRR 170.4	Provides water quality standards.	May be applicable to groundwater clean up levels.
Sediment			
NYSDEC Technical Guidance for Screening Contaminated Sediments, July, 1994		Provides methodology for purposes of determining sediment criteria.	
Surface Water			
New York State Surface Water Quality Standards	6 NYCRR 701	Provides regulatory criteria for maintaining the quality of surface waters.	
Drinking Water			
Public Health Law Section 225 (NYSDOH, part 5) Maximum Contaminant Levels (MCLs)	NYSDOH - Part 5	Establishes for the ultimate use via a public water supply system.	
Soil			
NYSDEC Soil Cleanup Objectives	NYSDEC TAGM, HWR-94-4606, January 24, 1994.	Recommended cleanup goals based on human health criteria, groundwater protection, background levels, and laboratory quantification levels.	These objectives provide the maximum values for determining spill cleanup levels.

Table No. 1
Chemical Specific Standards, Criteria and Guidelines (SCGs)

Feasibility Study
Stuart - Olver - Holtz
Site No. 8-28-079
Henrietta, New York

Standard, Requirement Criteria of Limitation	Citation or Reference	Description	Comments
Air			
NYSDEC Division of Air Guidelines for the control of Toxic Ambient air Contaminants	Air Guide 1	Establishes air quality standards.	
New York Ambient Air Quality Standards	6 NYCRR 256-257	Establishes air quality standards.	
Hazardous Waste			
New York Identification and Listing of Hazardous Waste Regulations	6 NYCRR part 371	Identifies hazardous wastes that are subject to land disposal restrictions.	
NYSDEC Land Disposal Restrictions	6 NYCRR Part 376	Identifies hazardous wastes that are subject to land disposal restrictions.	

Table No. 2
Location Specific Standards, Criteria and Guidelines (SCGs)

Feasibility Study
Stuart - Olver - Holtz
Site No. 8-28-079
Henrietta, New York

Standard, Requirement Criteria or Limitation	Citation or Reference	Description	Comments
Federal			
Within 100 year floodplain			
RCRA hazardous waste	40 CFR 264.18(b)	Facility must be designed, constructed, operated, and maintained to avoid washout.	
Within floodplain			
Executive Order on Floodplain Management	Executive Order 11988, Protection of Floodplains (40 CFR 6, Appendix A)	Action to avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial values of the floodplain.	
FEMA requirements	Flood Disaster Protection Act of 1973	Regulates development in flood-prone areas	
Wetland			
Protection of Wetlands	Executive Order 11990, Protection of Wetlands (40 CFR 6, Appendix A)	Action to minimize the destruction, loss of degradation of wetlands.	
New York Standards for Construction in Flood Hazard Areas	6 NYCRR Part 500	Governs activities within designated floodplain areas.	
Freshwater Wetland Regulations	6 NYCRR Parts 663-665	Regulations governing mapping, land use, and permitting freshwater wetlands.	
Clean Water Act	Section 404; 40 CFR Parts 230,231	Action to prohibit discharge of dredged or fill material into wetland without permit.	

Table No. 2
Location Specific Standards, Criteria and Guidelines (SCGs)

Feasibility Study
Stuart - Olver - Holtz
Site No. 8-28-079
Henrietta, New York

Standard, Requirement Criteria or Limitation	Citation or Reference	Description	Comments
Area affecting stream of river			
Fish and Wildlife Coordination Act	16 USC 661 et seq; 40 CFR 6.302	Action to protect fish or wildlife	
New York State			
Streams and Navigable Waterways			
Use and Protection of waters	6 NYCRR Part 608	Permits/approvals for disturbances of protected streams, construction of dams or docks or excavation or placement of fill in navigable water.	

Table No. 3
Action Specific Standards, Criteria and Guidelines (SCGs)

Feasibility Study
Stuart - Olver - Holtz
Site No. 8-28-079
Henrietta, New York

Standard, Requirement Criteria or Limitation	Citation or Reference	Description	Comments
Federal			
CERCLA (Title 1 Section 101, 111)	National Contingency Plan (40 CFR 300)	Establishes funding and provisions for the clean-up of hazardous waste sites.	
Clean-up Standards/Response Action	Superfund Amendments & Reauthorization Act (42 USC 9601)	Establishes treatment standards	Treatments must provide permanent reductions in volume, toxicity and mobility of wastes & satisfy ARARs.
Executive Order	Executive Order 12316 and Coordination with Other Agencies	Delegates authority over remedial actions to Federal Agencies.	
General Industry Standards	Occupational Safety and Health Act (29 CFR 1910)	Establishes requirement for 40 hour training and medical surveillance of hazardous waste workers.	
Safety and Health Standards	Occupational Safety and Health Act (29 CFR 1926)	Establishes regulations that specify the type of safety equipment and procedures for site remediation/excavation.	
Record keeping, Reporting and Related Regulations	Occupational Safety and Health Act (29 CFR 1904)	Outlines record keeping and reporting requirements.	
General Facility Standards, Contingency Planning, Recordkeeping, and Reporting	Resource Conservation and Recovery Act-Subparts B-E (40 CFR 264.10-.77	Establishes procedural requirements for the management of a treatment, storage of disposal facility.	
Clean Air Act	42 USC. 7401	Establishes primary and secondary ambient air quality standards.	
National Ambient Air Quality Standards	40 CFR Part 50	Establishes standards to protect public health and welfare with regards to pollutants in the air.	

Table No. 3
Action Specific Standards, Criteria and Guidelines (SCGs)

Feasibility Study
Stuart - Olver - Holtz
Site No. 8-28-079
Henrietta, New York

Standard, Requirement Criteria or Limitation	Citation or Reference	Description	Comments
Resource Conservation and Recovery Act (RCRA)	42 USC 6901-6987 40 CFR part 264 RCRA Subtitle C	Establishes requirements for treatment, storage, transportation and disposal of hazardous wastes and wastes under 6 NYCRR Part 371.	
	40 CFR Part 264 RCRA Subtitle D	Regulates management and disposal of non-hazardous wastes.	
	40 CFR Part 265	Establishes interim standards for owners of hazardous waste facilities.	
	40 CFR Part 262 and 263	Regulates generators and transporters of hazardous waste.	
	40 CFR Part 268	Regulates alternatives involving off-sit disposal of hazardous waste; requires treatment to diminish waste toxicity.	
CERCLA/SARA/NCP	40 CFR Part 300	Applicable to remedial actions at CERCLA and NYS Superfund Sites.	
	40 CFR 270,124	EPA administers hazardous waste permit program for CERCLA/Superfund Sites. Covers basic permitting, application, monitoring, and reporting, requirements for off-site hazardous waste management facilities.	
Clean Water Act	33 USC 1251	Restoration and maintenance of the chemical, physical and biological integrity of the nation's water.	
Safe Drinking Act Underground Injection	40 CFR Parts 144 and 146	Regulates waste water treatment alternatives involving underground injections that may endanger drinking water sources.	
New York State			
NYS Uniform Procedures	6 NYCRR Part 621	Establishes the procedures used in the processing of applications for permits.	
Hazardous Waste Management	6 NYCRR Part 373	Standards for owners of hazardous waste facilities.	

Table No. 3
Action Specific Standards, Criteria and Guidelines (SCGs)

Feasibility Study
Stuart - Olver - Holtz
Site No. 8-28-079
Henrietta, New York

Standard, Requirement Criteria or Limitation	Citation or Reference	Description	Comments
Transportation of Hazardous Materials	6 NYCRR Part 364	Regulates transportation of hazardous materials.	
Occupational Safety and Health Act	29 CFR Part 1910 and 300.38	Regulations regarding the workers and the workplace during remediation of the site.	
Groundwater clean-up criteria	NYSDEC TOGS 1.1.1	Site specific groundwater clean-up criteria.	
Implementation of NPDES Systems in NY.	6 NYCRR Parts 750-757	Regulates the discharge of pollutants to the environment.	
Hazardous Materials Transportation Act	49 USC ss 1801-1813, 49 CFR Parts 107, 171	Regulates the transporters of hazardous materials.	
New York State Hazardous Waste Regulations	ECL Article 27	Establishes policies pertaining to the collection, treatment, and disposal of refuse and other solid wastes.	
Hazardous Waste Management System	6 NYCRR 370	General Information and definitions.	
Inactive Hazardous Waste Disposal Site Remedial Program	6 NYCRR 375	Promote the orderly and efficient cleanup of a contaminated site.	
Air			
New York State Air Regulations	6 NYCRR Part 212	General process emission sources.	Sets allowable emissions for remedial options resulting in air emissions
	6 NYCRR Part 201, 202	Permits for construction/operation of air pollution sources.	
	6 NYCRR Part 219	Particulate emission limits	
	6 NYCRR Part 211	Regulates fugitive dust emissions.	
	6 NYCRR Part 257	Air quality standards.	

Table No. 4a
Chemical Specific Standards, Criteria and Guidelines (SCGs)

Feasibility Study
Stuart-Oliver-Holtz
Site No 8-28-079
Henrietta, New York

Overburden Groundwater

Parameter	SCG's NYSDEC Class GA	SCG's USEPA MCL's	SCG's USEPA MCLG's	USEPA Health Advisories Child/ One Day	USEPA Health Advisories Child/ Long Term	USEPA Health Advisories Adult Lifetime	Selected SCG Goal: SCG Goal	Selected SCG Goal: Basis of Selected SCG Goal
Volatile Organics (ug/l)								
Vinyl chloride	2	2	0	3000	10		2	Class GA
Chloroethane	5						5	Class GA
Methylene chloride	5						5	Class GA
Acetone	50						50	Class GA
1,1-Dichloroethene	5	7	7	2000	1000	7	5	Class GA
1,1-Dichloroethane	5						5	Class GA
1,2-Dichloroethene (total)	5	70	70	20000	2000	100	5	Class GA
Chloroform	7	100					7	Class GA
1,1,1-Trichloroethane	5	200	200	100000	40000	200	5	Class GA
Trichloroethene (TCE)	5	5	0				5	Class GA
1,1,2-Trichloroethane	35	5	3	600	400	3	35	Class GA
Tetrachloroethene	5	5	0	2000	1000		5	Class GA
Semi-Volatile Organics (ug/l)								
Phenol	1			6000	6000	4000	1	Class GA
4-Methyl Phenol	50						50	Class GA
2-Methylphenol	50						50	Class GA
Isophorone	50			15000	15000	100	50	Class GA
Di methyl Phthalate	50						50	Class GA
Di-n-butyl phthalate	50						50	Class GA
Diethyl Phthalate	50						50	Class GA
Bis(2-ethylhexyl)phthalate	50						50	Class GA
Metals (ug/l)								
Aluminum	100						100	Class GA
Arsenic	25	5					25	Class GA
Barium	1000	2000	2000			2000	1000	Class GA
Cadmium	10	5	5	40	5	5	10	Class GA
Calcium	10						10	Class GA
Chromium	50	100	100	1000	200	100	50	Class GA
Cobalt	5						5	Class GA
Copper	200		1300				200	Class GA
Iron	300						300	Class GA
Lead	25		0				25	Class GA
Magnesium	35000						35000	Class GA
Manganese	500		200				500	Class GA
Mercury		2	2			2	2	MCL's/MCLG's/USEPA Lifetime
Nickel		100	100	1000	500	100	100	MCL's/MCLG's/USEPA Lifetime
Potassium							N.A	No SCG Available
Silver	50			200	200	100	50	Class GA
Sodium	20000						20000	Class GA
Vanadium				80	30	20	20	USEPA Lifetime
Zinc	300			6000	3000	2000	300	Class GA
Others								
Cyanide (ug/l)	100	200	200	200	200	200	100	Class GA

Notes:
1) This table lists those analytical parameters that were detected at a concentration exceeding chemical specific SCG's.
2) This table lists Selected SCG Goals that were derived by comparing chemical specific SCG's See text for additional details
3) USEPA MCLs and MCLGs apply to public water supplies
4) USEPA Health Advisories developed to be protective of adverse non-carcinogenic health effects associated with exposure of child for one day and longer term (approximately 7 years or 10 % of lifetime) and lifetime exposure for adults

Table No. 4b
Chemical Specific Standards, Criteria and Guidelines (SCGs)

Feasibility Study
Stuart-Olver-Holtz
Site No. 8-28-079
Henrietta, New York

Bedrock Groundwater

Parameter	SCG's NYSDEC Class GA	USEPA MCL's	USEPA MCLG's	USEPA Health Advisories Child/ One Day	Child/ Long Term	Adult Lifetime	Selected SCG Goal: SCG Goal	Basis of Selected SCG Goal
Volatile Organics (ug/l)								
Chloromethane	5			9000	1000	3	5	Class GA
Vinyl chloride	2	2	0	3000	10		2	Class GA
Chloroethane	5						5	Class GA
Methylene chloride	5	5	0	10000			5	Class GA
Acetone	50						50	Class GA
Carbon disulfide	50						50	Class GA
1,1-Dichloroethene	5	7	7	2000	1000	7	5	Class GA
1,1-Dichloroethane	5						5	Class GA
1,2-Dichloroethene (total)	5	70	70	20000	2000	100	5	Class GA
1,2 Dichloroethane	5	5	0	700	700		5	Class GA
1,1,1-Trichloroethane	5	200	200	100000	40000	200	5	Class GA
Trichloroethene (TCE)	5	5	0				5	Class GA
Benzene	5	5	0	200			5	Class GA
2-Hexanone	50						50	Class GA
Tetrachloroethene	5	5	0	2000	1000		5	Class GA
Toluene	5						5	Class GA
Ethyl benzene	5	700	700	30000		700	5	Class GA
Xylenes (total)	5	10000	10000	40000	40000	10000	5	Class GA
Semi-Volatile Organics (ug/l)								
2 Methyl Phenol	50						50	Class GA
Phenol	1			6000	6000	4000	1	Class GA
4-Methylphenol	50						50	Class GA
Isophorone	50			15000	15000	100	50	Class GA
Di-n-butyl phthalate	50						50	Class GA
Bis (2-ehtylhexyl) Phthalate	50						50	Class GA
Metals (ug/l)								
Aluminum	100						100	Class GA
Antimony	3	6	6	15	15	3	3	Class GA
Arsenic	25	5					25	Class GA
Barium	1000	2000	2000			2000	1000	Class GA
Cadmium	10	5	5	40	5	5	10	Class GA
Calcium							N.A.	No SCG Available
Chromium	50	100	100	1000	200	100	50	Class GA
Cobalt	5						5	Class GA
Copper	200		1300				200	Class GA
Iron	300						300	Class GA
Lead	25		0				25	Class GA
Magnesium	35000						35000	Class GA
Manganese	500		200				500	Class GA
Mercury	2						2	Class GA
Nickel		100	100	1000	500	100	100	MCL's
Potassium							N.A.	No SCG Available
Silver	50			200	200	100	50	Class GA
Sodium	20000						20000	Class GA
Vanadium				80	30	20	20	Adult Lifetime
Zinc	300			6000	3000	2000	300	Class GA
Others								
Cyanide (ug/l)	100	200	200	200	200	200	100	Class GA

Notes:
1) This table lists those analytical parameters that were detected at a concentration exceeding chemical specific SCG's.
2) This table lists selected SCG goals that were derived by comparing chemical specific SCG's.
See text for additional details.
3) USEPA MCLs and MCLGs apply to public water supplies.
4) USEPA Health Advisories developed to be protective of adverse non-carcinogenic health effects associated with exposure of child for one day and longer term (approximately 7 years or 10% of lifetime exposure for adults.

Table No 4c
Chemical Specific Standards, Criteria and Guidelines (SCGs)

Feasibility Study
Stuart-Olver-Holtz
Site No 8-28-079
Henrietta, New York

SOH Sump Sediment Samples

Parameter	SCG's NYSDEC TAGM 4046	USEPA HEAST	USEPA PRGs	NYS Agencies Total PAH	Selected SCG Goal: SCG Goal	Basis of Selected SCG Goal
Volatile Organics (ug/kg)						
1,1-Dichloroethane	200	8000000	400000		200	TAGM 4046
1,2-Dichloroethene(Total)	300	800000	1400		300	TAGM 4046
1,1,1-Trichloroethane	800	7000000	49000		800	TAGM 4046
Trichloroethene	700	64000	34000		700	TAGM 4046
Tetrachloroethene	1400	14000	650		1400	TAGM 4046
Toluene	1500	20000000	280000		1500	TAGM 4046
Chlorobenzene	1700	2000000	300000		1700	TAGM 4046
Ethyl benzene	5500	8000000	68000		5500	TAGM 4046
Xylene (total)	1200	200000000	99000		1200	TAGM 4046
Semi-Volatile Organics (ug/kg)						
1,4-Dichlorobenzene	8500	29000	32000		8500	TAGM 4046
1,2 Dichlorobenzene	7900	700000	230000		7900	TAGM 4046
Naphthalene	13000	300000	80000		13000	TAGM 4046
2-Methylnaphthalene	36400				36400	TAGM 4046
Dimethyl Phthalate			100000000		100000000	USEPA PRGs
Acenaphthylene	41000	300000			41000	TAGM 4046
Acenaphthene	50000	5000000	36000		50000	TAGM 4046
Dibenzofuran	6200				6200	TAGM 4046
Fluorene	50000	3000000	28000		50000	TAGM 4046
Phenanthrene	50000				50000	TAGM 4046
Anthracene	50000	20000000	1900		50000	TAGM 4046
Carbazole	50000	8300	290000		50000	TAGM 4046
Di-n-Butylphthalate	8100		100000000		8100	TAGM 4046
Fluoranthene	50000	3000000	82000000		50000	TAGM 4046
Pyrene	50000	2000000	61000000		50000	TAGM 4046
Butylbenzylphthalate	50000	20000000	100000000		50000	TAGM 4046
Benzo (a) Anthracene	224 or MDL	220	9900		9900	USEPA PRG
Chrysene	400		990000		990000	USEPA PRG
Bis (2-Ethylhexyl) Phthalate	50000	50000	410000		50000	TAGM 4046/ USEPA HEAST
Di-n-Octyl Phthalate	50000	2000000	41000000		50000	TAGM 4046
Benzo (b) Fluoranthene	1100	220	9900		9900	USEPA PRG
Benzo (k) Fluoranthene	1100	220	9900		9900	USEPA PRG
Benzo (a) Pyrene	61 or MDL	60	990		990	USEPA PRG
Indeno (1,2,3-cd) Pyrene	3200		9900		9900	USEPA PRG
Dibenz (a,h) Anthracene	14 or MDL	14	990		990	USEPA PRG
Benzo(g,h,i) Perylene	50000				50000	TAGM 4046
Total PAH				100000	100000	NYS Agencies
Metals (mg/kg)						
Aluminum			100000		100000	USEPA PRG
Antimony		30	820		820	USEPA PRG
Arsenic	7.5	80	3.3		7 5	TAGM 4046
Barium	300	4000	100000		300	TAGM 4046
Cadmium	1	80	1000		1	TAGM 4046
Calcium					N.A	No SCG Available
Chromium	10	80000	100000		10	TAGM 4046
Cobalt	30				30	TAGM 4046
Copper	25		76000		25	TAGM 4046
Iron	2000				2000	TAGM 4046
Lead	500	250			500	TAGM 4046
Magnesium					N.A	No SCG Available
Manganese		20000	200000		20000	USEPA HEAST
Mercury	3	20	610		3	TAGM 4046
Nickel	13	2000	41000		13	TAGM 4046
Potassium					N.A	No SCG Available
Selenium	2		10000		2	TAGM 4046
Silver		200	10000		10000	USEPA PRG
Sodium					N.A	No SCG Available
Vanadium	150	600	14000		150	TAGM 4046
Zinc	20	20000	100000		20	TAGM 4046

Notes:

1) This table lists those analytical parameters that were detected at a concentration exceeding chemical specific SCG's.
2) This table lists selected SCG goals that were derived by comparing chemical specific SCGs
See text for additional details
3) TAGM 4046 = "Technical and Administrative Guidance Memorandum Determination of Soil Cleanup Objectives Levels", prepared by NYSDEC, January 24, 1994 For organic compounds, a TOC of 1 percent was assumed
4) HEAST - Values derived from USEPA Health Effects Summary Table.
5) HEAST value for chromium assumes trivalent chromium
6) USEPA PRGs - Region IX Preliminary Remediation Goals, April 1993
7) Total PAH (polynuclear aromatic hydrocarbons) SCG based on potential exposure scenarios provided by New York State Agencies.

Table No. 4d
Chemical Specific Standards, Criteria and Guidelines (SCGs)

Feasibility Study
Stuart-Olver-Holtz
Site No. 8-28-079
Henrietta, New York

SOH Sump Water Samples

Parameter	SCG's NYSDEC Class GA	USEPA MCL's	USEPA MCLG's	USEPA Health Advisories Child/ One Day	Child/ Long Term	Adult Lifetime	NYSDEC Class C Water	USEPA AWQC Health	AWQC Aquatic Acute	AWQC Aquatic Chronic	Selected SCG Goals SCG Goal	Basis of Selected SCG Goal
Volatile Organics (ug/l)												
1,1-Dichloroethane	5										5	Class GA
1,1,1-Trichloroethane	5	200	200	100000	40000	200		1.03			5	Class GA
Toluene	5	1000	1000	20000	2000	1000		14300	17500		5	Class GA
Ethyl benzene	5	700	700	30000	1000	700		3000	32000		5	Class GA
Xylene (total)	5	10000	10000	40000	40000	10000					5	Class GA
Semi-Volatile Organics (ug/l)												
Phenol	1			6000	6000	4000		20900	10200	2560	1	Class GA
4-Methylphenol	50										50	Class GA
Phenanthrene	50										50	Class GA
Anthracene	50										50	Class GA
Fluoranthene	50							310	3980		50	Class GA
Pyrene	50										50	Class GA
Butylbenzylphthalate	50	100	0								50	Class GA
Benzo (a) Anthracene	50										50	Class GA
Chrysene	50	0.2	0								50	Class GA
Bis (2-Ethylhexyl) Phthalate	50						0.6				50	Class GA
Benzo (b) Fluoranthene	50	0.2	0								50	Class GA
Benzo (k) Fluoranthene	50	0.2	0								50	Class GA
Benzo (a) Pyrene	50	0.2	0					2800			50	Class GA
Indeno (1,2,3-cd) Pyrene	50	0.4	0								50	Class GA
Benzo(g,h,i) Perylene	50										50	Class GA
Metals (ug/l)												
Aluminum	100						100		750	87	100	Class GA
Antimony		6	6	1.5	1.5	3		146	88	30	146	USEPA AWQC
Arsenic	25	50					190	0.0022			25	Class GA
Barium	1000	2000	2000			2000		1000			1000	Class GA
Cadmium	10	5	5	40	5	5	3.03	10	130	503	10	Class GA
Calcium											N.A	No SCG Available
Chromium	50	100	100	1000	200	100	824	170000	1700	210	50	Class GA
Cobalt	5						5				5	Class GA
Copper	200		1300				50	1000	18	12	1300	USEPA MCLGs
Iron	300						300	30		1000	300	Class GA
Lead	25		0				27	50	8.2	3.2	25	Class GA
Magnesium	35000										35000	Class GA
Manganese	500		200					50			500	Class GA
Mercury	2							0.144	2.4	0.012	2	Class GA
Nickel		100	100	1000	500	100	345	13.4	1400	100	100	USEPA MCLs
Potassium											N.A	No SCG Available
Selenium	10	60	50				1	10	20	5	10	Class GA
Silver	50			200	200	100	0.1	50	0.92	0.12	50	Class GA
Sodium	20000										20000	Class GA
Thallium		2	0.5	7	7	0.4	8	13	1400	40	13	USEPA AWQC
Vanadium				80	30	20	14				14	Class C
Zinc	300			6000	3000	2000	346	5000	96	86	300	Class GA
Others												
Cyanide ug/l	100	200	200	200	200	200	5.2	200	22	52	100	Class GA

Notes:

1) This table lists those analytical parameters that were detected at a concentration exceeding chemical specific SCG's
2) This table lists selected SCG goals that were derived by comparing chemical specific SCG's See text for additional details
4) Class C Surface Water Standards as promulgated in 6 NYCRR 703
5) Class C Surface Water Standards for selected metals are based on the hardness of the water
For the purposes of making these calculations, a hardness of 540 ppm was assumed
Chromium = exp (0.819 [ln (ppm hardness)] + 1.561)
Copper = exp (0.8545 [ln (ppm hardness)] - 1.465)
Lead = exp (1.266 [ln (ppm hardness)] - 4.661)
Nickel = exp (0.76 [ln (ppm hardness)] + 1.06)
Zinc = exp (0.85 [ln (ppm hardness)] + 0.50)
6) AWQC = USEPA Ambient Water Quality Criteria for Human Health, water and fish ingestion
7) Chromium is assumed to be trivalent chromium
8) Silver Class C Surface Water Standard is for ionic silver
9) USEPA MCLs and MCLGs apply to public water supplies
10) USEPA Health Advisories developed to be protective of adverse non-carcinogenic health effects associated with exposure of child for one day and longer term (approximately 7 years or 10 % of lifetime) and lifetime exposure for adults

Table No 4e
Chemical Specific Standards, Criteria and Guidelines (SCGs)

Feasibility Study
Stuart-Olver-Holtz
Site No. 8-28-079
Henrietta, New York

Surface Soils

Parameter	SCG's NYSDEC TAGM 4046	SCG's USEPA HEAST	SCG's USEPA PRGs	SCG's NYS Agencies Total PAH	Background OW-11S 26-32' 6/22/95	Q	Background OW-9S 8-10' 6/20/95	Q	Selected SCG Goal: SCG Goal	Selected SCG Goal: Basis of Selected SCG Goal
Volatile Organics (ug/kg)										
Methylene chloride	100	93000	62000						100	TAGM 4046
Toluene	1500	20000000	280000						1500	TAGM 4046
Chlorobenzene	1700	2000000	300000						1700	TAGM 4046
Semi-Volatile Organics (ug/kg)										
Naphthalene	13000	300000	80000						80000	USEPA PRG
2-Methylnaphthalene	36400								36400	TAGM 4046
Acenaphthylene	41000	300000							41000	TAGM 4046
Acenaphthene	50000	5000000	36000						50000	TAGM 4046
Dibenzofuran	6200								6200	TAGM 4046
Fluorene	50000	3000000	28000						50000	TAGM 4046
Phenanthrene	50000								50000	TAGM 4046
Anthracene	50000	20000000	1900						50000	TAGM 4046
Carbazole	50000	8300	290000						290000	USEPA PRG
Di-n-Butylphthalate	8100		100000000						8100	TAGM 4046
Fluoranthene	50000	3000000	82000000						50000	TAGM 4046
Pyrene	50000	2000000	61000000						50000	TAGM 4046
Butylbenzylphthalate	50000	20000000	100000000						50000	TAGM 4046
Benzo (a) Anthracene	224 or MDL	220	9900						9900	USEPA PRG
Chrysene	400		9900000						9900000	USEPA PRG
Bis (2-Ethylhexyl) Phthalate	50000	50000	410000						410000	USEPA PRG
Di-n-Octyl Phthalate	50000	2000000	41000000						41000000	USEPA PRG
Benzo (b) Fluoranthene	1100	220	9900						9900	USEPA PRG
Benzo (k) Fluoranthene	1100	220	9900						9900	USEPA PRG
Benzo (a) Pyrene	61 or MDL	60	990						990	USEPA PRG
Indeno (1,2,3-cd) Pyrene	3200		9900						9900	USEPA PRG
Dibenz (a,h) Anthracene	14 or MDL	14	990						990	USEPA PRG
Benzo(g,h,i) Perylene	50000								50000	TAGM 4046
Total PAH				100000					100000	NYS Agencies
Metals (mg/kg)										
Aluminum			100000		5540	*	3430	*	100000	USEPA PRG
Antimony		30	820						820	USEPA PRG
Arsenic	7.5	80	3.3		0.86	BJ	1.2	BJ	7.5	TAGM 4046
Barium	300	4000	100000		60.8		40.2	B	100000	USEPA PRG
Beryllium	0.16	0.16	1300		0.28	B			1300	USEPA PRG
Cadmium	1	80	1000						1000	USEPA PRG
Calcium					80100		50100		80100	Background
Chromium	10	80000	100000		9.5		7.4		100000	USEPA PRG
Cobalt	30				3.6	B	3.7	B	30	TAGM 4046
Copper	25		76000		3.6	B	10.3	J	76000	USEPA PRG
Iron	2000				12400	*	9020	*	12400	Background
Lead	500	250			1.6	S	3.2	S	500	TAGM 4046
Magnesium					42300		16800		42300	Background
Manganese		20000	200000		299		260		200000	USEPA PRG
Mercury	3	20	610						3	TAGM 4046
Nickel	13	2000	41000		8.5	B	9.2		41000	USEPA PRG
Potassium					2560		1030	B	2560	Background
Selenium	2		10000						10000	USEPA PRG
Silver		200	10000		0.45	U	0.44	U	10000	USEPA PRG
Sodium					201	B	154	B	201	Background
Vanadium	150	600	14000		9.7	B	11.1		14000	USEPA PRG
Zinc	20	20000	10000			R		R	10000	USEPA PRG
Others (mg/kg)										
Cyanide		2000	41000						41000	USEPA PRG

Notes.

1) This table lists those analytical parameters that were detected at a concentration exceeding chemical specific SCG's
2) This table lists selected SCG goals that were derived by comparing chemical specific SCG's and in the case of metals, site background levels
See text for additional details.
3) TAGM 4046 = "Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives Levels", prepared by NYSDEC, January 24, 1994 For organic compounds, a TOC of 1 percent was assumed For metals, site surface soil background test results were not available
4) HEAST - Values derived from USEPA Health Effects Summary Table
5) HEAST value for chromium assumes trivalent chromium
6) USEPA PRGs - Region IX Preliminary Remediation Goals, April 1993
7) Total PAH (polynuclear aromatic hydrocarbons) SCG based on potential exposure scenarios provided by New York State Agencies

Table No. 4f
Chemical Specific Standards, Criteria and Guidelines (SCGs)

Feasibility Study
Stuart-Oliver-Holtz
Site No. 8-28-079
Henrietta, New York

Subsurface Soils

	SCG's				Background				Selected SCG Goal	
Parameter	NYSDEC TAGM 4046	USEPA HEAST	USEPA PRGs	NYS Agencies Total PAH	OW-11S 26-32' 6/22/95	Q	OW-9S 8-10' 6/20/95	Q	SCG Goal	Basis of Selected SCG Goal
Volatile Organics (ug/kg)										
Chloroethane	1900	540000							1900	TAGM 4046
Methylene chloride	100	93000	62000						62000	USEPA PRG
Acetone	200	6000000	13000000						200	TAGM 4046
1,1-Dichloroethane	400	12000	120						400	TAGM 4046
1,1-Dichloroethene	200	8000000	400000						200	TAGM 4046
1,2-Dichloroethene(Total)	300	800000	1400						1400	USEPA PRG
Chloroform	300	110000	1600						300	TAGM 4046
1,2-Dichloroethane	100	7700	1400						100	TAGM 4046
1,1,1-Trichloroethane	800	7000000	49000						800	TAGM 4046
Trichloroethene	700	64000	34000						34000	USEPA PRG
1,1,2-Trichloroethane		120000	6900						6900	USEPA PRG
Benzene	60	24000	4600						4600	USEPA PRG
Tetrachloroethene	1400	14000	650						1400	TAGM 4046
Toluene	1500	20000000	280000						1500	TAGM 4046
Chlorobenzene	1700	2000000	300000						1700	TAGM 4046
Ethylbenzene	5300	8000000	68000						5300	TAGM 4046
Xylene (total)	1200	200000000	99000						1200	TAGM 4046
Semi-volatile Organics (ug/kg)										
Phenol	30 or MDL	50000000	100000000						100000000	USEPA PRG
1,4 Dichlorobenzene	8,500	29000	32000						8500	TAGM 4046
Diethylphthalate	7100	60000000	100000000						7100	TAGM 4046
Phenanthrene	50000								50000	TAGM 4046
Anthracene	50000	20000000	1900						50000	TAGM 4046
Carbazole	50000	8300	290000						50000	TAGM 4046
Di-n-Butylphthalate	8100		100000000						8100	TAGM 4046
Fluoranthene	50000	3000000	82000000						50000	TAGM 4046
Pyrene	50000	2000000	61000000						50000	TAGM 4046
Butylbenzylphthalate	50000	20000000	100000000						50000	TAGM 4046
Benzo (a) Anthracene	224 or MDL	220	9900						9900	USEPA PRG
Chrysene	400		990000						990000	USEPA PRG
Bis (2-Ethylhexyl) Phthalate	50000	50000	410000						410000	USEPA PRG
Di-n-Octyl Phthalate	50000	2000000	41000000						50000	TAGM 4046
Benzo (b) Fluoranthene	1100	220	9900						9900	USEPA PRG
Benzo (k) Fluoranthene	1100	220	9900						9900	USEPA PRG
Benzo (a) Pyrene	61 or MDL	60	990						990	USEPA PRG
Indeno (1,2,3-cd) Pyrene	3200		9900						9900	USEPA PRG
Dibenz (a,h) Anthracene	14 or MDL	14	990						990	USEPA PRG
Benzo(g,h,i) Perylene	50000								50000	TAGM 4046
Total PAH				100000					100000	NYS Agencies
PCB/Pesticides (mg/kg)										
Aroclor - 1254	10		0.74						10	TAGM 4046
Metals (mg/kg)										
Aluminum			100000		5540	*	3430	*	100000	USEPA PRG
Antimony		30	820						820	USEPA PRG
Arsenic	7.5	80	3.3		0.86	BJ	1.2	BJ	7.5	TAGM 4046
Barium	300	4000	100000		60.8		40.2	B	300	TAGM 4046
Beryllium	0.16	0.16	1.3		0.28	B			1.3	USEPA PRG
Cadmium	1	80	1000						1000	USEPA PRG
Calcium					80100		50100		80100	Background
Chromium	10	80000	100000		9.5		7.4		100000	USEPA PRG
Cobalt	30				3.6	B	3.7	B	30	TAGM 4046
Copper	25		76000		3.6	B	10.3	J	76000	USEPA PRG
Iron	2000				12400	*	9020	*	12400	Background
Lead	500	250			1.6	S	3.2	S	500	TAGM 4046
Magnesium					42300		18800		42300	Background
Manganese		20000	200000		299		260		200000	USEPA PRG
Mercury	3	20	610						3	TAGM 4046
Nickel	13	2000	41000		8.5	B	9.2		41000	USEPA PRG
Potassium					2560		1030	B	2560	Background
Selenium	2		10000						10000	USEPA PRG
Sodium			10000		201	B	154	B	201	Background
Thallium		6	160						160	USEPA PRG
Vanadium	150	600	14000		9.7	B	11.1		150	TAGM 4046
Zinc	20	20000	100000			R		R	100000	USEPA PRG
Others (mg/kg)										
Cyanide		2000	41000						41000	USEPA PRG

Notes:

1) This table lists those analytical parameters that were detected at a concentration exceeding chemical specific SCG's.
2) This table lists selected SCG goals that were derived by comparing chemical specific SCG's, and in the case of metals, site background levels. See text for additional details
3) TAGM 4046 = "Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives Levels", prepared by NYSDEC, January 24, 1994. For organic compounds, a TOC of 1 percent was assumed. For metals, soil test results for samples from OW-11S and OW-9S are used as background as shown above
4) HEAST - Values derived from USEPA Health Effects Summary Table
5) HEAST value for chromium assumes trivalent chromium
6) USEPA PRGs - Region IX Preliminary Remediation Goals, April 1993.
7) Total PAH (polynuclear aromatic hydrocarbons) SCG based on potential exposure scenarios provided by New York State Agencies

Table No. 4g
Chemical Specific Standards, Criteria and Guidelines (SCGs)

Remedial Investigation
Stuart-Olver-Holtz
Site No 8-28-079
Henrietta, New York

Surface Water Sediments

Parameter	SCG's											Selected SCG Goal	
	NYSDEC TAGM 4046	NYSDEC Sediment Criteria Human Health Bioaccumulation	USEPA HEAST	USEPA PRGs	NYS Agencies Total PAH	NYSDEC Sediment Criteria Aquatic Toxicity Acute	NYSDEC Sediment Criteria Aquatic Toxicity Chronic	NYSDEC Sediment Criteria Wildlife Bioaccumulation	NOAA Memo SOMA5 ER-L	NOAA Memo SOMA5 ER-M	USEPA Sediment Criteria	SCG Goal	Basis of Selected SCG Goal
Volatile Organics (ug/kg)													
Methylene chloride	100		93000	62000								100	TAGM 4046
1,1-Dichloroethane	200		8000000	400000								200	TAGM 4046
1,1,1-Trichloroethane	800		7000000	49000								800	TAGM 4046
Tetrachloroethane	1400	8	14000	650								1400	TAGM 4046
Semi-Volatile Organics (ug/kg)													
Naphthalene	13000		300000	80000					140	2100		80000	USEPA PRG
2-Methylnaphthalene	36400								65	670		36400	TAGM 4046
Acenaphthylene	41000		300000									41000	TAGM 4046
Acenaphthene	50000		5000000	36000			1400		150	650	1400	50000	TAGM 4046
Dibenzofuran	6200											6200	TAGM 4046
Fluorene	50000		3000000	28000					35	640		28000	USEPA PRG
Phenanthrene	50000						1200		225	1380	1200	50000	TAGM 4046
Anthracene	50000		2000000	1900					85	960		1900	USEPA PRG
Carbazole	50000		6300	290000								290000	USEPA PRG
Di-n-Butylphthalate	8100			100000000								8100	TAGM 4046
Fluoranthene	50000		3000000	82000000			10200		600	3600	10200	50000	TAGM 4046
Pyrene	50000		2000000	61000000					350	2200		50000	TAGM 4046
Benzo (a) Anthracene	224 or MDL	13	220	9900					230	1600		9900	USEPA PRG
Chrysene	400	13		990000					400	2800		990000	USEPA PRG
Bis (2-Ethylhexyl) Phthalate	50000		50000	410000			1995					50000	TAGM 4046
Di-n-Octyl Phthalate	50000		2000000	41000000								50000	TAGM 4046
Benzo (b) Fluoranthene	1100	13	220	9900								9900	USEPA PRG
Benzo (k) Fluoranthene	1100	13	220	9900								9900	USEPA PRG
Benzo (a) Pyrene	61 or MDL	13	60	990					400	2500		990	USEPA PRG
Indeno (1,2,3-cd) Pyrene	3200	13		9900								9900	USEPA PRG
Dibenz (a,h) Anthracene	14 or MDL		14	990					60	260		990	USEPA PRG
Benzo(g,h,i) Perylene	50000											50000	TAGM 4046
Total PAH					100000							100000	NYS Guidance

Table No. 4g
Chemical Specific Standards, Criteria and Guidelines (SCGs)

Remedial Investigation
Stuart-Olver-Holtz
Site No. 8-28-079
Henrietta, New York

Surface Water Sediments

Parameter	SCG's: NYSDEC TAGM 4046	NYSDEC Sediment Criteria Human Health Bioaccumulation	USEPA HEAST	USEPA PRGs	NYS Agencies Total PAH	NYSDEC Sediment Criteria Aquatic Toxicity Acute	NYSDEC Sediment Criteria Aquatic Toxicity Chronic	NYSDEC Sediment Criteria Wildlife Bioaccumulation	NOAA Memo SOMA5 ER-L	NOAA Memo SOMA5 ER-M	USEPA Sediment Criteria	Selected SCG Goal: SCG Goal	Basis of Selected SCG Goal
Metals (mg/kg)													
Aluminum				100000								100000	USEPA PRG
Antimony			30	820			2	25	2	25		25	NYSDEC Sediment
Arsenic	7.5		80	3.3		7.5	6	33	33	85		7.5	NYSDEC Sediment
Barium	300		4000	100000		300						300	TAGM 4046/NYSDEC Aquatic Acute
Beryllium	0.16		0.16	1.3		0.16				9		1.3	USEPA PRG
Cadmium	1		80	1000		1	0.6	9	5			9	NYSDEC Sediment
Calcium										145		145	NOAA ER-M
Chromium	10		80000	100000		10	26	110	80			110	NYSDEC Sediment
Cobalt	30					30				390		30	TAGM 4046/NYSDEC Aquatic Chronic
Copper	25			76000		25	16	110	70			110	NYSDEC Sediment
Iron	2000					2000	20000	40000		110		40000	NYSDEC Sediment
Lead	500		250			200-500	31	110	35			110	NYSDEC Sediment
Magnesium												N.A.	No SCG Available
Manganese			20000	200000			460	1100		50		1100	NYSDEC Sediment
Nickel	13		2000	41000		13	16	50	30			50	NYSDEC Sediment
Potassium										2.2		2.2	NOAA ER-M
Silver			200	10000			1	2.2	1			2.2	NYSDEC Sediment
Sodium				10000								N.A.	No SCG Available
Vanadium	150		600	14000		150			120	270		150	NYSDEC Sediment
Zinc	20		20000	100000		20	120	270				270	NYSDEC Sediment

Notes:

1) This table lists those analytical parameters that were detected at a concentration exceeding chemical specific SCGs
2) This table lists selected SCG goals that were derived by comparing chemical specific SCG's. See text for additional details.
3) TAGM 4046 = "Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives Levels", prepared by NYSDEC, January 24, 1994. For organic compounds a TOC value of 1 percent was assumed. For metals, site sediment background test results were not available
4) HEAST - Values derived from USEPA Health Effects Summary Table
5) HEAST value for chromium assumes trivalent chromium
6) NYSDEC Sediment Criteria = "Technical Guidance for Screening of Contaminated Sediments", NYSDEC, July 1994. A TOC value of 1 percent was assumed in deriving criteria
7) USEPA Sediment Criteria based on an assumed TOC value of 1 percent
8) NOAA Memo SOMA 52 = "The Potential for Biological Effects of Sediment Sorbed Contaminants Tested in National Status and Trends Program", NOAA, 1990. ER-L = Effects Range Low, ER-M - Effects Range Median
9) NYSDEC Sediment Criteria = "Technical Guidance for Screening of Contaminated Sediments", NYSDEC, July 1994. A TOC value of 1 percent was assumed in deriving criteria
10) USEPA PRGs - Region IX Preliminary Remediation Goals, April 1993
11) Total PAH (polynuclear aromatic hydrocarbons) SCG based on potential exposure scenarios provided by New York State Agencies

Table No. 4h
Chemical Specific Standards, Criteria and Guidelines (SCGs)

Feasibility Study
Stuart-Olver-Holtz
Site No. 8-28-079
Henrietta, New York

Surface Water

Parameter	SCG's				Selected SCG Goal	
	NYSDEC Water Standards and Guidance	AWQC Aquatic Acute	AWQC Aquatic Chronic	USEPA AWQC Health	SCG Goal	Basis of Selected SCG Goal
Volatile Organics (ug/l)						
Acetone	50				50	NYSDEC H(WS)
Semi Volatile Organics (ug/l)						
Pentachlorophenol	0.4				0.4	Class C
Fluoranthene		3980		310	310	AWQC Health
Pyrene	50				50	NYSDEC H(WS)
Metals (ug/l)						
Aluminum	100				100	Class C
Barium				1000	1000	AWQC Health
Calcium					N.A.	No SCG Available
Chromium	5594	1700	210	170000	5594	Class C
Cobalt	5				5	Class C
Copper	368	18	12	1000	368	Class C
Iron	300		1000	30	300	NYSDEC H(WS)
Lead	526	8.2	3.2	50	526	Class C
Magnesium					N.A.	No SCG Available
Manganese	300			50	300	NYSDEC H(WS)
Potassium					N.A.	No SCG Available
Silver	50	0.92	0.12	50	50	NYSDEC H(WS)
Sodium					N.A.	No SCG Available
Vanadium	14				14	Class C
Zinc	2530	96	86	5000	2530	Class C

Notes:

1) This table lists those analytical parameters that were detected at a concentration exceeding chemical specific SCG's.
2) This table lists selected SCG goals that were derived by comparing chemical specific SCG's. See text for additional details.
3) Surface Water and Groundwater Standards and Guidance Values as promulgated in 6 NYCRR 703 and Division of Water Technical and Operational Guidance Series (TOGS 1.1.1) Ambient Water Quality and Guidance Values, October 1993.
4) Surface Water Standards for selected metals are based on the hardness of the water.
   For the purposes of making these calculations, a hardness of 5300 ppm was assumed
   Chromium = exp (0.819 [ln (ppm hardness)] + 1.561)
   Copper = exp (0.8545 [ln (ppm hardness)] - 1.465)
   Lead = exp (1.266 [ln (ppm hardness)] - 4.661)
   Nickel = exp (0.76 [ln (ppm hardness)] + 1.06)
   Zinc = exp (0.85 [ln (ppm hardness)] + 0.50)
5) NYSDEC H(WS) = New York State DEC Health Water Sources Standard (TOGS 1.1.1).
6) AWQC = USEPA Ambient Water Quality Criteria for Human Health; water and fish ingestion.
7) Chromium is assumed to be trivalent chromium.

Table No. 5a
Contaminants of Concern and SCG Goals

Feasibility Study
Stuart-Olver-Holtz
Site No. 8-28-079
Henrietta, New York

Overburden Groundwater

Parameter	Concentration Range		Selected SCG Goal	Number of Samples Exceeding	Number of Samples Tested
	Minimum	Maximum			
Volatile Organics (ug/l)					
Vinyl chloride	2.7	11000	2	9	32
Methylene chloride	3.9	350	5	4	32
1,1-Dichloroethene	3.6	900	5	14	32
1,1-Dichloroethane	8.6	10000	5	18	32
1,2-Dichloroethene (total)	2.9	10000	5	13	32
1,1,1-Trichloroethane	3.1	24000	5	12	32
Trichloroethene (TCE)	1.4	140000	5	12	32
Tetrachloroethene	3.3	8800	5	8	32
Semi-Volatile Organics (ug/l)					
Phenol	8	9	1	2	17
Metals (ug/l)					
Aluminum	28.9	14900	100	15	16
Cobalt	2.8	19.1	5	7	16
Lead	1.2	61.8	25	2	32
Manganese	85.4	1420	500	7	16
Nickel	15.6	169	100	2	32
Vanadium	2.6	28.2	20	1	16

Notes:

1) This table lists contaminants of concern for purposes of site remediation. Contaminants of concern include parameters detected at concentrations that exceed the selected SCG goal in greater than 5 percent of the samples analyzed for the medium and excluding essential human nutrients that are present at levels slightly above background such as iron, magnesium, calcium, potassium, and sodium. See Table 4 for derivation of proposed SCG goals.
2) The range of concentrations shown represents the maximum and minimum for those samples in which the contaminant was detected and the concentration quantified after data validation. Samples with "non-detect' results were not considered in the range.
3) "Number of Samples Exceeding " denotes the number of samples tested that exceed the selected SCG goal.

Table No. 5b
Contaminants of Concern and SCG Goals

Feasibility Study
Stuart-Olver-Holtz
Site No. 8-28-079
Henrietta, New York

Bedrock Groundwater

Parameter	Concentration Range Minimum	Concentration Range Maximum	Selected SCG Goal	Number of Samples Exceeding	Number of Samples Tested
Volatile Organics (ug/l)					
Chloromethane	8.1	8.1	5	1	14
Vinyl chloride	8.8	110	2	4	14
Chloroethane	21	21	5	1	14
Methylene chloride	7	5500	5	3	14
Acetone	6.5	100	50	1	14
1,1-Dichloroethene	5	250	5	2	14
1,1-Dichloroethane	1.5	5900	5	6	14
1,2-Dichloroethene (total)	3.8	9000	5	7	14
1,2 Dichloroethane	12	12	5	1	14
1,1,1-Trichloroethane	110	170	5	3	14
Trichloroethene (TCE)	1.5	10000	5	6	14
Tetrachloroethene	4	66	5	1	14
Toluene	1.5	8.0	5	1	14
Xylenes (total)	9	9	5	1	14
Semi-Volatile Organics (ug/l)					
Phenol	10	10	1	1	8
Metals (ug/l)					
Aluminum	247	1400	100	7	7
Antimony	47.8	47.8	3	1	7
Cadmium	2.7	797	10	4	14
Chromium	2.5	4380	50	4	14
Cobalt	2.1	19.4	5	2	7
Copper	4.5	708	200	4	14
Lead	2.2	78.1	25	4	14
Manganese	428	1670	500	6	7
Nickel	19.5	7770	100	4	14
Vanadium	3	22.7	20	1	7
Zinc	20.7	4280	300	3	14

Notes:

1) This table lists contaminants of concern for purposes of site remediation. Contaminants of concern include parameters detected at concentrations that exceed the selected SCG goal in greater than 5 percent of the samples analyzed for the medium and excluding essential human nutrients that are present at levels slightly above background such as iron, magnesium, calcium, potassium, and sodium. See Table 4 for derivation of proposed SCG goals.
2) The range of concentrations shown represents the maximum and minimum for those samples in which the contaminant was detected and the concentration quantified after data validation. Samples with "non-detect' results were not considered in the range.
3) "Number of Samples Exceeding " denotes the number of samples tested that exceed the selected SCG goal.

Table No. 5c
Contaminants of Concern and SCG Goals

Feasibility Study
Stuart-Olver-Holtz
Site No. 8-28-079
Henrietta, New York

SOH Sump Sediment Samples

Parameter	Concentration Range Minimum	Concentration Range Maximum	Selected SCG Goal	Number of Samples Exceeding	Number of Samples Tested
Volatile Organics (ug/kg)					
1,1-Dichloroethane	32000	32000	200	1	2
1,2-Dichloroethene(Total)	17000	17000	300	1	2
1,1,1-Trichloroethane	8300	2000000	800	2	2
Trichloroethene	8900	8900	700	1	2
Tetrachloroethene	350	91000	1400	1	2
Toluene	580	110000	1500	1	2
Chlorobenzene	8600	8600	1700	1	2
Ethyl benzene	9200	9200	5500	1	2
Xylene (total)	490	46000	1200	1	2
Semi-Volatile Organics (ug/kg)					
Total PAH	43680	131690	100000	1	2
Metals (mg/kg)					
Arsenic	6.6	46.2	7.5	1	2
Barium	148	384	300	1	2
Cadmium	4.2	63.3	1	2	2
Chromium	165	714	10	2	2
Copper	90.8	355	25	2	2
Nickel	233	983	13	2	2
Selenium	4.4	89.8	2	2	2
Zinc	256	2210	20	2	2

Notes:

1) This table lists contaminants of concern for purposes of site remediation. Contaminants of concern include parameters detected at concentrations that exceed the selected SCG goal in greater than 5 percent of the samples analyzed for the medium and excluding essential human nutrients that are present at levels slightly above background such as iron, magnesium, calcium, potassium, and sodium. See Table 4 for derivation of proposed SCG goals.
2) The range of concentrations shown represents the maximum and minimum for those samples in which the contaminant was detected and the concentration quantified after data validation. Samples with "non-detect" results were not considered in the range.
3) "Number of Samples Exceeding" denotes the number of samples tested that exceed the selected SCG goal.

Table No. 5d

Contaminants of Concern and SCG Goals

Feasibility Study
Stuart-Olver-Holtz
Site No. 8-28-079
Henrietta, New York

SOH Sump Water Samples

Parameter	Concentration Range		Selected SCG Goal	Number of Samples Exceeding	Number of Samples Tested
	Minimum	Maximum			
Volatile Organics (ug/l)					
1,1-Dichloroethane	72000	72000	5	1	2
1,1,1-Trichloroethane	7900	7900	5	1	2
Toluene	5800	5800	5	1	2
Ethyl benzene	2700	2700	5	1	2
Xylene (total)	15000	15000	5	1	2
Semi-Volatile Organics (ug/l)					
Phenol	360	360	1	1	2
Metals (ug/l)					
Aluminum	2940	15700	100	2	2
Cadmium	34.7	4430	10	2	2
Chromium	454	4940	50	2	2
Cobalt	11.6	266	5	2	2
Copper	261	3580	1300	1	2
Lead	457	696	25	2	2
Manganese	288	7980	500	1	2
Mercury	2.4	2.4	2	1	2
Nickel	840	56700	100	2	2
Silver	6.3	99.9	50	1	2
Thallium	20	20	13	1	2
Vanadium	3.7	102	14	1	2
Zinc	7610	63500	300	2	2

Notes:

1) This table lists contaminants of concern for purposes of site remediation. Contaminants of concern include parameters detected at concentrations that exceed the selected SCG goal in greater than 5 percent of the samples analyzed for the medium and excluding essential human nutrients that are present at levels slightly above background such as iron, magnesium, calcium, potassium, and sodium. See Table 4 for derivation of proposed SCG goals.

2) The range of concentrations shown represents the maximum and minimum for those samples in which the contaminant was detected and the concentration quantified after data validation. Samples with "non-detect" results were not considered in the range.

3) "Number of Samples Exceeding" denotes the number of samples tested that exceed the selected SCG goal.

Table No. 5e
Contaminants of Concern and SCG Goals

Feasibility Study
Stuart-Olver-Holtz
Site No. 8-28-079
Henrietta, New York

Surface Soils

Parameter	Concentration Range			Number of Samples Exceeding	Number of Samples Tested
	Minimum	Maximum	Selected SCG Goal		
Semi-Volatile Organics (ug/kg)					
Total PAH	815	741500	100000	3	8
Metals (mg/kg)					
Arsenic	3	72.9	7.5	2	8
Cobalt	3.2	366	30	1	8
Lead	15.8	529	500	1	8

Notes:

1) This table lists contaminants of concern for purposes of site remediation. Contaminants of concern include parameters detected at concentrations that exceed the selected SCG goal in greater than 5 percent of the samples analyzed for the medium and excluding essential human nutrients that are present at levels slightly above background such as iron, magnesium, calcium, potassium, and sodium. See Table 4 for derivation of proposed SCG goals.
2) The range of concentrations shown represents the maximum and minimum for those samples in which the contaminant was detected and the concentration quantified after data validation. Samples with "non-detect" results were not considered in the range.
3) "Number of Samples Exceeding" denotes the number of samples tested that exceed the selected SCG goal.

Table No. 5f
Contaminants of Concern and SCG Goals

Feasibility Study
Stuart-Olver-Holtz
Site No. 8-28-079
Henrietta, New York

Subsurface Soils

Parameter	Concentration Range Minimum	Concentration Range Maximum	Selected SCG Goal	Number of Samples Exceeding	Number of Samples Tested
Metals (mg/kg)					
Arsenic	0.48	8.8	7.5	2	34

Notes:
1) This table lists contaminants of concern for purposes of site remediation. Contaminants of concern include parameters detected at concentrations that exceed the selected SCG goal in greater than 5 percent of the samples analyzed for the medium and excluding essential human nutrients that are present at levels slightly above background such as iron, magnesium, calcium, potassium, and sodium. See Table 4 for derivation of proposed SCG goals.
2) The range of concentrations shown represents the maximum and minimum for those samples in which the contaminant was detected and the concentration quantified after data validation. Samples with "non-detect" results were not considered in the range.
3) "Number of Samples Exceeding" denotes the number of samples tested that exceed the selected SCG goal.

Table No. 5g
Contaminants of Concern and SCG Goals

Remedial Investigation
Stuart-Olver-Holtz
Site No. 8-28-079
Henrietta, New York

Surface Water Sediments

Parameter	Concentration Range		Selected SCG Goal	Number of Samples Exceeding	Number of Samples Tested
	Minimum	Maximum			
Semi-Volatile Organics (ug/kg)					
Total PAH	3707	220830	100000	1	2
Metals (mg/kg)					
Zinc	442	844	270	2	2

Notes:
1) This table lists contaminants of concern for purposes of site remediation. Contaminants of concern include parameters detected at concentrations that exceed the selected SCG goal in greater than 5 percent of the samples analyzed for the medium and excluding essential human nutrients that are present at levels slightly above background such as iron, magnesium, calcium, potassium, and sodium. See Table 4 for derivation of proposed SCG goals.
2) The range of concentrations shown represents the maximum and minimum for those samples in which the contaminant was detected and the concentration quantified after data validation. Samples with "non-detect" results were not considered in the range.
3) "Number of Samples Exceeding" denotes the number of samples tested that exceed the selected SCG goal.

Table No. 5h
Contaminants of Concern and SCG Goals

Feasibility Study
Stuart-Olver-Holtz
Site No. 8-28-079
Henrietta, New York

Surface Water

Parameter	Concentration Range			Number of Samples Exceeding	Number of Samples Tested
	Minimum	Maximum	Selected SCG Goal		
Semi Volatile Organics (ug/l)					
Pentachlorophenol	4	4	0.4	1	3
Metals (ug/l)					
Aluminum	158	997	100	3	3
Manganese	185	909	300	2	3

Notes:

1) This table lists contaminants of concern for purposes of site remediation. Contaminants of concern include parameters detected at concentrations that exceed the selected SCG goal in greater than 5 percent of the samples analyzed for the medium and excluding essential human nutrients th are present at levels slightly above background such as iron, magnesium, calcium, potassium, and sodium. See Table 4 for derivation of proposed SCG goals.
2) The range of concentrations shown represents the maximum and minimum for those samples in which the contaminant was detected and the concentration quantified after data validation. Samples with "non-detect" results were not considered in the range.
3) "Number of Samples Exceeding" denotes the number of samples tested that exceed the selected S

Table No. 6

Results of Preliminary Screening of General Response Actions and Remedial Technologies

Feasibility Study
Stuart - Olver - Holtz
Site No. 8-28-079
Henrietta, New York

GENERAL RESPONSE ACTIONS AND REMEDIAL TECHNOLOGIES	DESCRIPTION	EFFECTIVENESS	IMPLEMENTABILITY	RELATIVE COST	PASSES PRELIMINARY SCREENING ? Yes or No
Groundwater Remedial Technologies					
No Action	Continue to operate the existing groundwater treatment system in the Ruby Gordon basement. Rely upon natural attenuation for areas outside the hydraulic influence of the Ruby Gordon Basement.	Ineffective for the protection of human health and the environment.	Readily implementable.	L	Yes, Required by Guidance
Institutional Controls	Access and deed restrictions, groundwater use surveys, providing alternative process water supply for SOH building, and groundwater monitoring.	Effective in achieving remedial action objectives for bedrock groundwater . Ineffective in achieving remedial action objectives for overburden groundwater.	Readily implementable.	L	Yes
Containment Vertical Barrier Walls	Slurry walls, sheet pile walls, or grout curtains keyed into the lower glacial till.	Effective in reducing the mobility of contaminated overburden groundwater. Ineffective in reducing the volume or toxicity of the overburden groundwater. Requires collection system just upgradient of the wall to be effective, otherwise wall may raise water levels in area.	Implementable with some potential difficulties due to site-specific subsurface conditions.	M	Yes
Groundwater Collection Trench	Stone filled trench to intercept and collect contaminated overburden groundwater downgradient of site.	Effective in reducing the mobility of the contaminated overburden groundwater. Effective in reducing the volume and toxicity of the overburden groundwater if used in conjunction with a groundwater treatment system.	Active pumping system required for deep collection trench keyed into lower till. Vertical barrier wall needed for shallow collection system.	M to H	Yes
Groundwater Extraction Wells	Extraction wells installed in a row to provide a hydraulic barrier downgradient of the site, or at specific points for source area remediation.	Effective in reducing the mobility of the contaminated overburden groundwater. Effective in reducing the volume and toxicity of the overburden groundwater if used in conjunction with a groundwater treatment system.	Readily implementable	M	Yes
In-Situ Treatment Zero Valence Iron Treatment	Uses iron filings as the reactive media for treating water that contains chlorinated VOCs.	Effective for treatment of most VOC's. Ineffective for the treatment of methlyene chloride. Long term reliability of metals treatment is unknown.	Will require laboratory treatability studies prior to a full scale use.	M	Yes
Bioremediation	Injection of nutrients into the groundwater to promote the growth of bacteria which feed on the contaminants.	Ineffective for the treatment of chlorinated VOC's and metals.	Requires a treatibility study and additional wells, to inject nutrients.	M	No
Air Sparging	Injection of air into the subsurface below the water table and applying a vacuum to the soils above the water table. The collected air is then treated and discharged to the atmosphere.	Effective for the removal of VOC's from the groundwater. Ineffective for the removal of metals Presence of tight glacial till soils may reduce effectiveness.	Difficult to implement due to tight till soils and presence of sand strata within till that appear to be discontinuous.	M to H	No

Table No. 6
Results of Preliminary Screening of General Response Actions and Remedial Technologies

Feasibility Study
Stuart - Olver - Holtz
Site No. 8-28-079
Henrietta, New York

GENERAL RESPONSE ACTIONS AND REMEDIAL TECHNOLOGIES	DESCRIPTION	EFFECTIVENESS	IMPLEMENTABILITY	RELATIVE COST	PASSES PRELIMINARY SCREENING ? Yes or No
Groundwater Remedial Technologies (cont'd)					
Ex-Situ Treatment and/or Disposal Publicly Owned Treatment Works	Use existing Monroe County wastewater treatment plant to treat contaminated groundwater.	Effective in achieving cleanup goals for site groundwater.	Pretreatment for VOCs and possibly iron will be required by sewer use ordinance prior to discharge to the sanitary sewer.	L	Yes
Air Stripping	Force air through the contaminated groundwater to induce volatilization and removal of VOC's. The pretreated groundwater contaminated with metals is then discharged into the POTW. The air is treated with vapor phase activated carbon or by catalytic oxidation prior to discharge to the atmosphere.	Effective for pretreatment to achieve the pretreatment standards for the local POTW. Ineffective for the treatment of metals, but the metal contamination is within the pretreatment standards for the local POTW, except for Iron.	Requires prefiltering to reduce iron concentrations to meet pretreatment standards. Requires treatment of exhaust prior to discharge to the atmosphere. Pilot study may be required.	M to H	Yes
Chemical Oxidation	Mixing of contaminated groundwater with a strong oxidizer such as ozone, or hydrogen peroxide in the presence of ultraviolet light.	Ineffective for the treatment of metals, but the metal contamination is within the pretreatment standards for the local POTW, except for Iron. Effective for the treatment of VOC's. Sensitive to the amount of suspended solids in the groundwater, and a low tolerance for iron in the groundwater.	Requires a filter to reduce suspended solids. Requires iron removal to concentrations below POTW pretreatment standards. Pilot study may be required.	M to H	No
Liquid Phase Carbon Adsorption	Pump the contaminated groundwater through granular activated carbon in a treatment column or canisters.	Ineffective due to the high concentrations of chlorinated VOCs. High carbon usage rate.	Readily Implementable	H	No
Soil/Sediment Remedial Technologies					
No Action	No further action to remedy the condition of the contaminated soils and sediments.	Ineffective for the protection of human health and the environment.	Readily implementable.	L	Yes, Required by Guidance
Institutional Controls	Access and deed restrictions, security fencing, and warni signs.	Effective when used in conjunction with other remedial technologies to achieve the remedial action objectives for the soils and sediments.	Readily implementable.	L	Yes
Containment Asphalt Pavement Cover	Crushed stone subbase, asphalt binder course, and an asphalt top course.	Effective in reducing the potential for direct contact with the contaminated soil. Effective in reducing infiltration and limiting erosion and transport of contaminated materials.	Readily implementable.	L to M	Yes
Geomembrane/ Topsoil Cover	Geomembrane overlain by topsoil with a vegetative cover.	Effective in reducing the potential for direct contact with the contaminated soil. Effective in reducing infiltration and limiting erosion and transport of contaminated materials.	Readily implementable.	M	Yes
Low Permeability Soil Cover	A low permeability soil barrier layer overlain by barrier protection layer soil, and topsoil and seed.	Effective in reducing the potential for direct contact with the contaminated soil. Effective in reducing infiltration and limiting erosion and transport of contaminated materials.	Difficult to implement due to site constraints. Requires increasing grades at the site up to 4 ft.	H	Yes

Table No. 6
Results of Preliminary Screening of General Response Actions and Remedial Technologies

Feasibility Study
Stuart - Olver - Holtz
Site No. 8-28-079
Henrietta, New York

GENERAL RESPONSE ACTIONS AND REMEDIAL TECHNOLOGIES	DESCRIPTION	EFFECTIVENESS	IMPLEMENTABILITY	RELATIVE COST	PASSES PRELIMINARY SCREENING ? Yes or No
Soil/Sediment Remedial Technologies (cont'd)					
In-Situ Treatment Soil Vapor Extraction	Circulate air through the pore spaces of unsaturated soils to induce "stripping" of VOCs from the soil. The soil vapor is then collected, treated and discharged to the atmosphere.	Effective for removing VOCs. Ineffective for removal of metals. Effective for use in conjunction with groundwater pump and treat systems.	Readily implementable.	M	Yes
Ex-Situ Treatment and Disposal Off-Site Disposal at Landfill	Excavation, hauling, and disposal of the contaminated materials classified as non-hazardous solid waste at a permitted solid waste facility.	Effective in reducing the potential for direct contact with the contaminated soils. Effective in reducing the toxicity and mobility of the contaminants.	Readily implementable.	M	Yes
Off-Site Treatment and Disposal	Excavation, hauling, treatment, and disposal of the contaminated material classified as hazardous waste. Treatment may consist of stabilization and solidification followed by disposal at a secure hazardous waste disposal facility.	Effective in reducing the potential for direct contact with the contaminated soils. Effective in reducing the toxicity and mobility of the contaminants.	Readily implementable.	M	Yes
SOH Sump/Catch Basin Remedial Technologies					
No Action	No further action to remedy the condition of the SOH sump/catch basin contents.	Ineffective for the protection of human health and the environment.	Readily implementable.	L	Yes, Required by Guidance
Ex-Situ Treatment and Disposal Off-Site Treatment and Disposal	Removal of the contaminated sump/catch basin contents using a vacuum truck Off-site treatment may include thermal desorption followed by solidification and stabilization prior to disposal at a secure hazardous waste disposal facility.	Effective in reducing the potential for direct contact with the contaminated soils. Effective in reducing the toxicity and mobility of the contaminants.	Readily implementable.	M	Yes

NOTES:

1 This table summarizes the results of preliminary screening of general response actions and remedial technologies on the basis of effectiveness and implementability. See Section 4.0 of text for criteria used during preliminary screening evaluation and additional detail.
2 The No Action alternative passes the preliminary screening and must be considered in the detailed analysis of alternatives as required by regulatory guidance. The No Action alternative may not provide effective protection from contamination in these media.
3 Effectiveness evaluation focuses on the degree to which a remedial action is protective of human health and the environment.
4 Implementability evaluation focuses on the technical and administrative feasibility of a remedial action.
5 The costs are H (high), M (moderate), or L (low). relative to other remedial actions based on knowledge of site conditions.

Table No. 7
Summary of Sitewide Remedial Alternatives

Feasibility Study
Stuart - Olver - Holtz
Site No. 8-28-079
Henrietta, New York

Proposed Remedial Actions	Sitewide Alternatives				
	Alt. No. 1	Alt. No. 2	Alt. No. 3	Alt. No. 4	Alt. No. 5
<u>OVERBURDEN GROUNDWATER</u>					
Groundwater Collection at Downgradient Site Boundary Remedial Actions					
Deep collection trench with pumping to above-ground pretreatment system.		X			
Extraction wells with pumping to above-ground pretreatment system.			X	X	
Barrier wall and shallow collection trench with gravity flow to subsurface pretreatment vaults					X
Groundwater Treatment Remedial Actions					
Above ground pretreatment using air stripper with discharge to POTW.		X	X	X	
Subsurface pretreatment vaults using zero valence iron process with discharge to POTW.					X
Overburden groundwater monitoring.		X	X	X	X
Suspected Source Area Remedial Actions					
Source area extraction wells near OW-7S and pump to pretreatment system.		X	X	X	X
Supplement source area wells with soil vapor extraction.		X	X	X	
Ruby-Gordon Basement Remedial Actions					
Pump Ruby-Gordon basement water to SOH pretreatment system. Take existing pretreatment system in basement off line.		X	X	X	
Install collection trench along south SOH property line. Operate existing R-G pretreatment system until trench is effective.					X
Asphalt lined drainage swale north of Ruby-Gordon basement.		X	X		
Geomembrane cover system north of Ruby-Gordon basement.				X	X
<u>BEDROCK GROUNDWATER</u>					
Institutional controls		X	X	X	X
<u>SOILS AND SURFACE WATER SEDIMENTS</u>					
Excavate hazardous on-site and off-site surface soils and sediments for off-site treatment and disposal.		X	X	X	X
<u>SOH SUMP CONTENTS</u>					
Remove sump contents as hazardous materials for off-site treatment and disposal.		X	X	X	X
Decommission waste lines and/or upgrade sumps/catch basins, as appropriate.		X	X	X	X

Table No. 7
Summary of Sitewide Remedial Alternatives

Feasibility Study
Stuart - Olver - Holtz
Site No. 8-28-079
Henrietta, New York

Sitewide Alternative No. 1
No Action
This is an unacceptable alternative as the site would remain in its present condition. Human health and the environment would not be adequately protected.

Table No. 7
Summary of Sitewide Remedial Alternatives

Feasibility Study
Stuart - Olver - Holtz
Site No. 8-28-079
Henrietta, New York

Sitewide Alternative No. 2

Downgradient Deep Collection Trench with Air Stripper Pretreatment and Discharge to Municipal Sanitary Sewer, Source Area Extraction Wells with Air Stripper Pretreatment and Discharge to Municipal Sanitary Sewer, Off-Site Treatment and Disposal of Hazardous Site Soils and Sump Contents.

OVERBURDEN GROUNDWATER

Install a deep groundwater collection trench along north and west property boundaries to provide containment of contaminated groundwater leaving that portion of the site. Pump from groundwater collection sumps to a groundwater pretreatment system on the SOH site for the long term control of groundwater quality at the north and west site boundaries.

Install a groundwater pretreatment system in a shelter building on the SOH site. The pretreatment system would consist of an air stripper followed by discharge via a gravity line to the existing sanitary sewer. An off-gas treatment system may be required for destruction of organic air emissions from the air stripper.

Operate groundwater extraction wells near OW-7S for initial remediation of the contamination near the suspected source area. Pump groundwater to the groundwater pretreatment system on the SOH site. Install a soil vapor extraction system to enhance the performance of the remediation system at the suspected source area and to reduce the pumping time required at the downgradient collection trench. Operate short term for remediation of the suspected source area.

Pump contaminated water collected from the Ruby-Gordon basement drainage system to a groundwater pretreatment system on the SOH site for the long term control of groundwater quality in the area south of the SOH site. Take existing air stripper in basement off-line. Upgrade and secure vapor barriers over Ruby-Gordon sumps. Divert surface water currently entering basement drainage system from Ruby-Gordon loading dock.

Conduct overburden groundwater monitoring to evaluate the extent to which the remedial action objectives are being met at the site property boundaries.

Construct asphalt lined drainage swale on Ruby-Gordon property north of basement to limit groundwater recharge.

BEDROCK GROUNDWATER

Use institutional controls to reduce potential for exposure including; access and deed restrictions, disconnect existing bedrock supply wells on SOH property, conduct periodic groundwater use surveys in the immediate site area and bedrock groundwater monitoring.

SOILS AND SURFACE WATER SEDIMENTS

Excavate the contaminated on-site and off-site surface soils that exceed SCGs for off-site treatment and disposal at a hazardous or solid waste disposal facility, as appropriate. Backfill, regrade, and seed excavated areas.

SOH SUMP CONTENTS

Remove sump contents that exceed SCGs using a vacuum truck for off-site treatment and disposal at a hazardous waste disposal facility. Decommission waste lines leading from SOH building to sumps and catch basins, if present, and/or upgrade sumps/catch basins, as appropriate.

Table No. 7
Summary of Sitewide Remedial Alternatives

Feasibility Study
Stuart - Olver - Holtz
Site No. 8-28-079
Henrietta, New York

Sitewide Alternative No. 3

Downgradient Extraction Wells with Air Stripper Pretreatment and Discharge to Municipal Sanitary Sewer,
Source Area Extraction Wells with Air Stripper Pretreatment and Discharge to Municipal Sanitary Sewer,
Off-Site Treatment and Disposal of Hazardous Site Soils and Sump Contents.

OVERBURDEN GROUNDWATER

Install groundwater extraction wells along north and west property boundaries to provide containment of contaminated groundwater leaving that portion of the site. Pump from wells to a groundwater pretreatment system on the SOH site for the long term control of groundwater quality at the north and west site boundaries.

Install a groundwater pretreatment system in a shelter building on the SOH site. The pretreatment system would consist of an air stripper followed by discharge via a gravity line to the existing sanitary sewer. An off-gas treatment system may be required for destruction of organic air emissions from the air stripper.

Operate groundwater extraction wells near OW-7S for initial remediation of the contamination near the suspected source area. Pump groundwater to the groundwater pretreatment system on the SOH site. Install a soil vapor extraction system to enhance the performance of the remediation system at the suspected source area and to reduce the pumping time required at the downgradient collection trench. Operate short term for remediation of the suspected source area.

Pump contaminated water collected from the Ruby-Gordon basement drainage system to a groundwater pretreatment system on the SOH site for the long term control of groundwater quality in the area south of the SOH site. Take existing air stripper in basement off-line. Upgrade and secure vapor barriers over Ruby-Gordon sumps. Divert surface water currently entering basement drainage system from Ruby-Gordon loading dock.

Conduct overburden groundwater monitoring to evaluate the extent to which the remedial action objectives are being met at the site property boundaries.

Construct asphalt lined drainage swale on Ruby-Gordon property north of basement to limit groundwater recharge.

BEDROCK GROUNDWATER

Use institutional controls to reduce potential for exposure including; access and deed restrictions, disconnect existing bedrock supply wells on SOH property, conduct periodic groundwater use surveys in the immediate site area and bedrock groundwater monitoring.

SOILS AND SURFACE WATER SEDIMENTS

Excavate the contaminated on-site and off-site surface soils that exceed SCGs for off-site treatment and disposal at a hazardous or solid waste disposal facility, as appropriate. Backfill, regrade , and seed excavated areas.

SOH SUMP CONTENTS

Remove sump contents that exceed SCGs using a vacuum truck for off-site treatment and disposal at a hazardous waste disposal facility. Decommission waste lines leading from SOH building to sumps and catch basins, if present, and/or upgrade sumps/catch basins, as appropriate.

Table No. 7
Summary of Sitewide Remedial Alternatives

Feasibility Study
Stuart - Olver - Holtz
Site No. 8-28-079
Henrietta, New York

Sitewide Alternative No. 4

Downgradient Extraction Wells with Air Stripper Pretreatment and Discharge to Municipal Sanitary Sewer, Source Area Extraction Wells with Air Stripper Pretreatment and Discharge to Municipal Sanitary Sewer, Off-Site Treatment and Disposal of Hazardous Site Soils and Sump Contents.

OVERBURDEN GROUNDWATER

Install groundwater extraction wells along north and west property boundaries to provide containment of contaminated groundwater leaving that portion of the site. Pump from wells to a groundwater pretreatment system on the SOH site for the long term control of groundwater quality at the north and west site boundaries.

Install a groundwater pretreatment system in a shelter building on the SOH site. The pretreatment system would consist of an air stripper followed by discharge via a gravity line to the existing sanitary sewer. An off-gas treatment system may be required for destruction of organic air emissions from the air stripper.

Operate groundwater extraction wells near OW-7S for initial remediation of the contamination near the suspected source area. Pump groundwater to the groundwater pretreatment system on the SOH site. Install a soil vapor extraction system to enhance the performance of the remediation system at the suspected source area and to reduce the pumping time required at the downgradient collection trench. Operate short term for remediation of the suspected source area.

Pump contaminated water collected from the Ruby-Gordon basement drainage system to a groundwater pretreatment system on the SOH site for the long term control of groundwater quality in the area south of the SOH site. Take existing air stripper in basement off-line. Upgrade and secure vapor barriers over Ruby-Gordon sumps. Divert surface water currently entering basement drainage system from Ruby-Gordon loading dock.

Conduct overburden groundwater monitoring to evaluate the extent to which the remedial action objectives are being met at the site property boundaries.

Construct geomembrane cover system on Ruby-Gordon property north of basement to limit groundwater recharge.

BEDROCK GROUNDWATER

Use institutional controls to reduce potential for exposure including; access and deed restrictions, disconnect existing bedrock supply wells on SOH property, conduct periodic groundwater use surveys in the immediate site area and bedrock groundwater monitoring.

SOILS AND SURFACE WATER SEDIMENTS

Excavate the contaminated on-site and off-site surface soils that exceed SCGs for off-site treatment at a hazardous or solid waste disposal facility, as appropriate. Backfill, regrade and seed excavated areas.

SOH SUMP CONTENTS

Remove sump contents that exceed SCGs using a vacuum truck for off-site treatment and disposal at a hazardous waste disposal facility. Decommission waste lines leading from SOH building to sumps and catch basins, if present, and/or upgrade sump/catch basins, if appropriate.

Table No. 7
Summary of Sitewide Remedial Alternatives

Feasibility Study
Stuart - Olver - Holtz
Site No. 8-28-079
Henrietta, New York

Sitewide Alternative No. 5

Barrier Wall and Shallow Collection Trench with Zero Valence Iron Pretreatment and Discharge to Municipal Sanitary Sewer, Source Area Extraction Wells with Zero Valence Iron Pretreatment and Discharge to Municipal Sanitary Sewer, Off-Site Treatment and Disposal of Hazardous Site Soils and Sump Contents.

OVERBURDEN GROUNDWATER

Install a groundwater containment and collection system along the north and west property boundaries to limit off-site migration of contaminated groundwater from that portion of the site. The system along the north and west property boundaries would consist of a vertical barrier wall together with a shallow upgradient collection trench with high permeability relief columns beneath the trench. Collected groundwater would flow by gravity to a subsurface groundwater pretreatment vault. Operate for long term control of groundwater quality at the north and west site boundaries.

Install a groundwater pretreatment system consisting of subsurface vaults containing iron filings to promote zero valence oxidation of chlorinated VOC's for pretreatment of groundwater prior to discharge by gravity to the municipal sanitary sewer.

Operate groundwater extraction wells near OW-7S for initial remediation of the contamination near the suspected source area. Pump groundwater to a subsurface groundwater pretreatment vaults on the SOH site. Operate short term for remediation of the suspected source area.

Install a groundwater collection trench along a portion of the south site boundary near the Ruby-Gordon basement. Collected groundwater would flow by gravity to a subsurface groundwater pretreatment vault. Operate for the long term control of groundwater quality south of the SOH site. Continue to operate the existing groundwater pretreatment system in the Ruby-Gordon basement until the groundwater collection trench becomes effective. Upgrade and secure vapor barriers over Ruby Gordon sumps.

Conduct overburden groundwater monitoring to evaluate the extent to which the remedial action objectives are being met at the site property boundaries.

Construct geomembrane cover system on Ruby-Gordon property north of basement to limit groundwater recharge.

BEDROCK GROUNDWATER

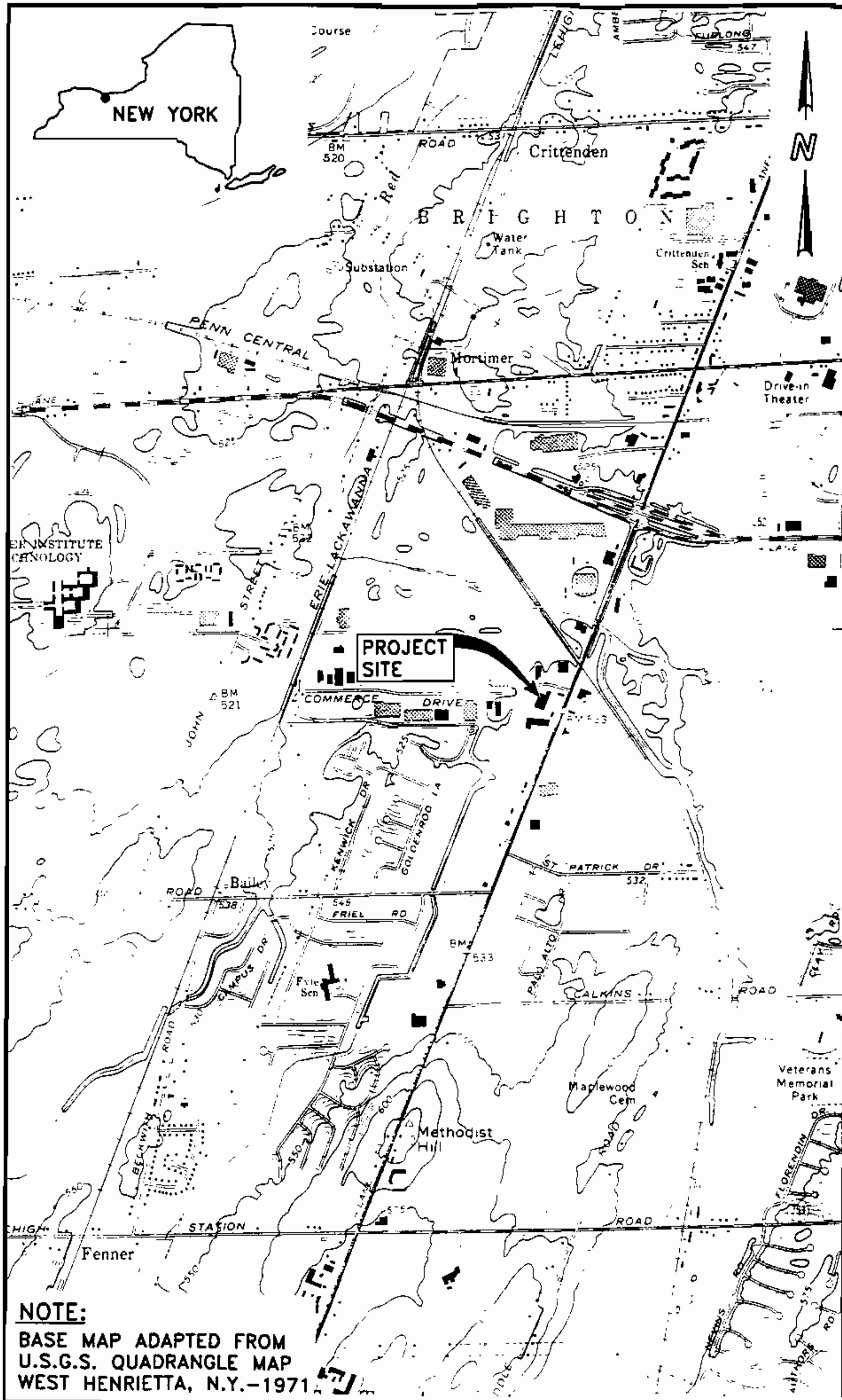
Use institutional controls to reduce potential for exposure including; access and deed restrictions, disconnect existing bedrock supply wells on SOH property, conduct periodic groundwater use surveys in the immediate site area and bedrock groundwater monitoring.

SOILS AND SURFACE WATER SEDIMENTS

Excavate the contaminated on-site and off-site surface soils that exceed SCGs for off-site treatment and disposal at a hazardous or solid waste disposal facility, as appropriate. Backfill, regrade and seed excavation areas.

SOH SUMP CONTENTS

Remove sump contents that exceed SCGs using a vacuum truck for off-site treatment and disposal at a hazardous waste disposal facility. Decommission waste lines leading from SOH building to sumps and catch basins, if present, and/or upgrade sumps/catch basins, as appropriate.



DRAWN BY: DEW

DATE: MAY 1996

GZA GeoEnvironmental of New York

SCALE IN FEET

0 1000 2000 4000

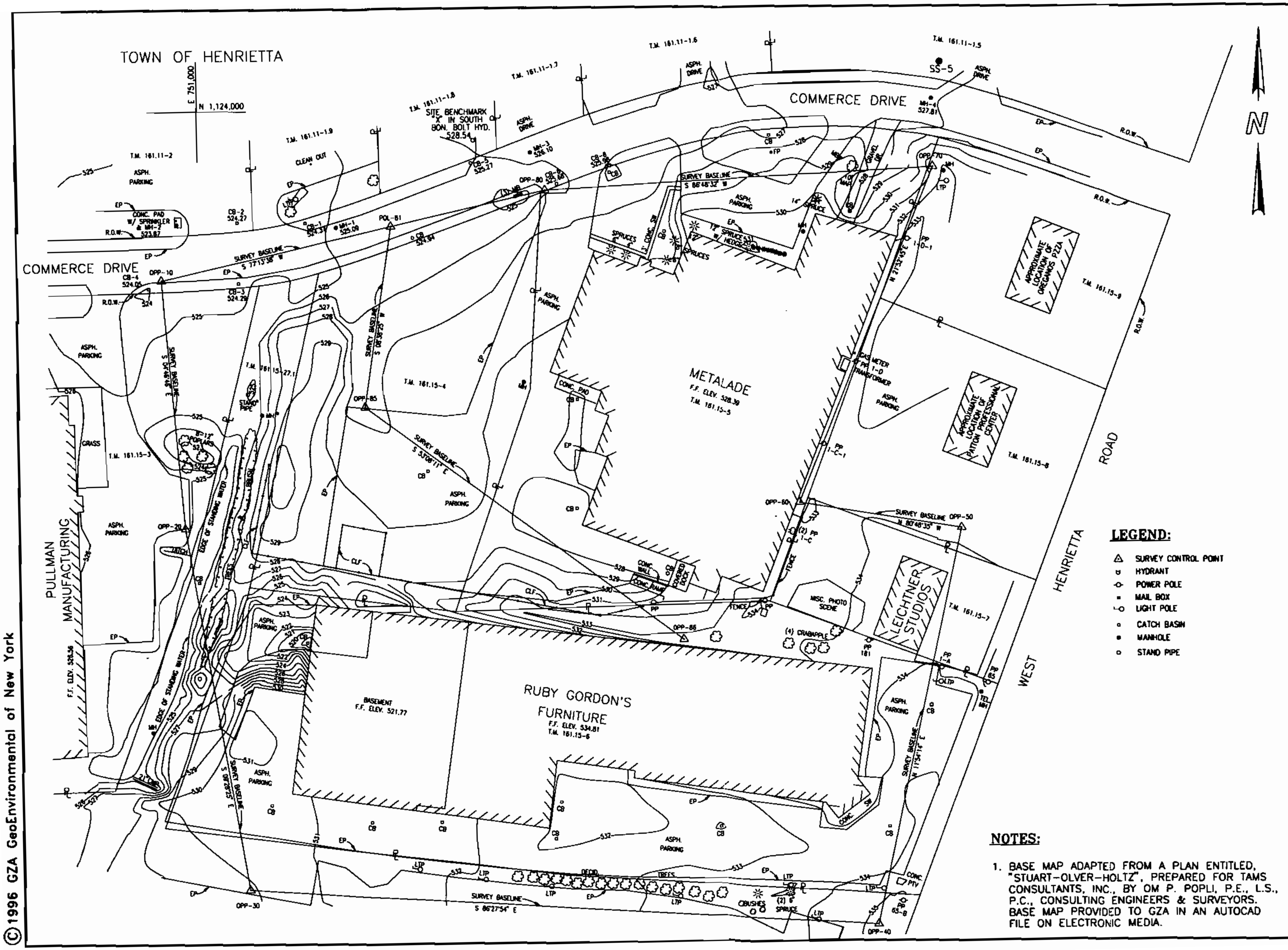
STUART-OLVER-HOLTZ SITE
HENRIETTA, NEW YORK

FEASIBILITY STUDY

LOCUS PLAN

PROJECT No.
19078.2

FIGURE No.
1



LEGEND:

- △ SURVEY CONTROL POINT
- HYDRANT
- POWER POLE
- MAIL BOX
- LIGHT POLE
- CATCH BASIN
- MANHOLE
- STAND PIPE

NOTES:

1. BASE MAP ADAPTED FROM A PLAN ENTITLED, "STUART-OLVER-HOLTZ", PREPARED FOR TAMS CONSULTANTS, INC., BY OM P. POPLI, P.E., L.S., P.C., CONSULTING ENGINEERS & SURVEYORS. BASE MAP PROVIDED TO GZA IN AN AUTOCAD FILE ON ELECTRONIC MEDIA.

REV No.	DESCRIPTION	BY	DATE

DRAWN BY: DEW

DATE: MAY 1996

GZA GeoEnvironmental of New York

SCALE IN FEET: 0 40 80 160

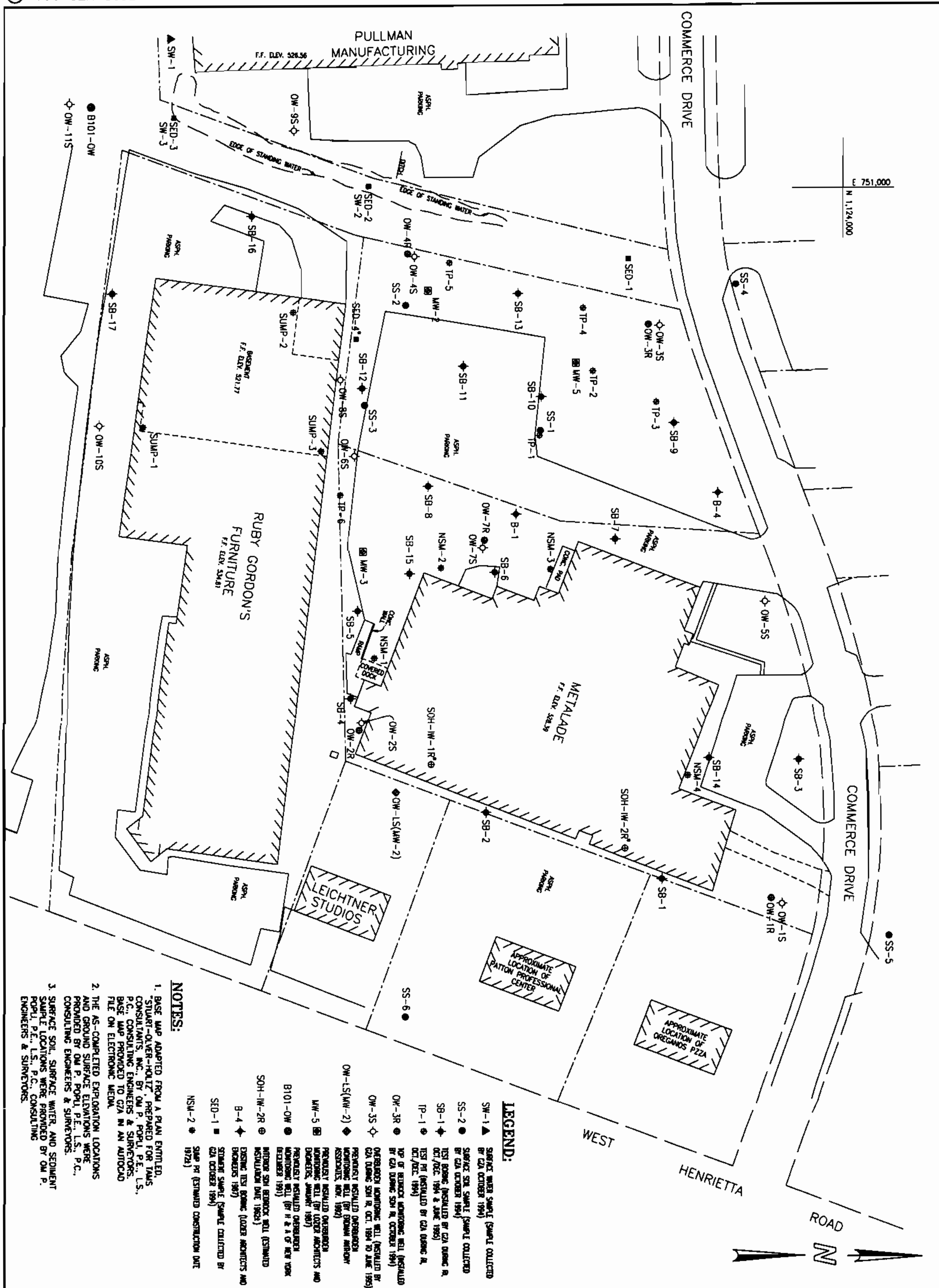
STUART-OLVER-HOLTZ SITE
HENRIETTA, NEW YORK

FEASIBILITY STUDY

SITE PLAN

PROJECT No. 19078.2

FIGURE No. 2



STUART-OLVER-HOLTZ SITE
HENRIETTA, NEW YORK

FEASIBILITY STUDY

MONITORING WELL AND SAMPLE LOCATION PLAN

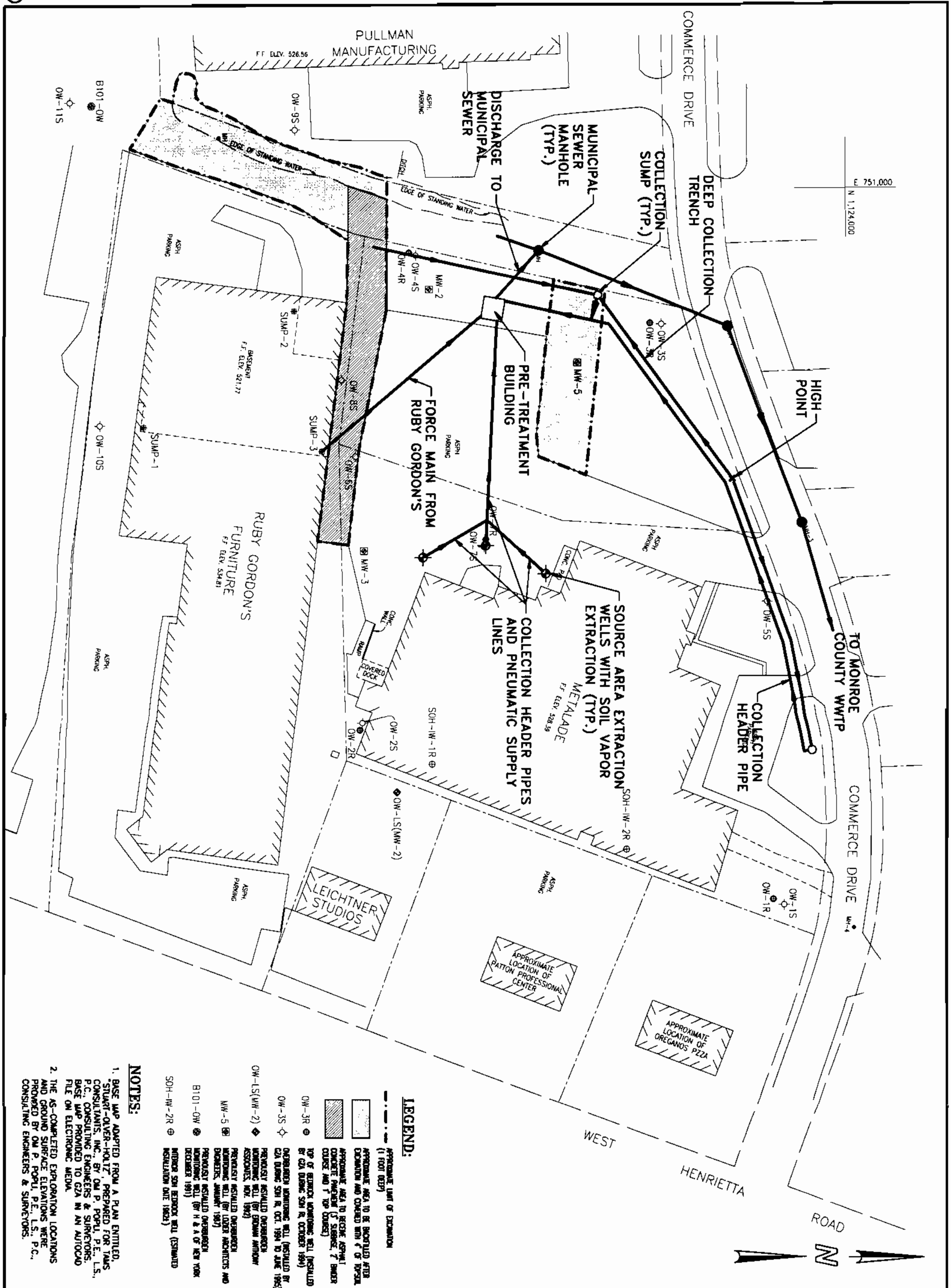
REV No.	DESCRIPTION	BY	DATE

SCALE IN FEET: 0 40 80 160

DRAWN BY: DEW
DATE: MAY 1996

GZA GeoEnvironmental of New York

PROJECT No. 19078.2
FIGURE No. 3



REV No.	DESCRIPTION	BY	DATE

STUART-OLVER-HOLTZ SITE
HENRIETTA, NEW YORK

FEASIBILITY STUDY

CONCEPTUAL SKETCH SWA-2
DEEP PERIMETER COLLECTION TRENCH, SOIL DISPOSAL OFF-SITE

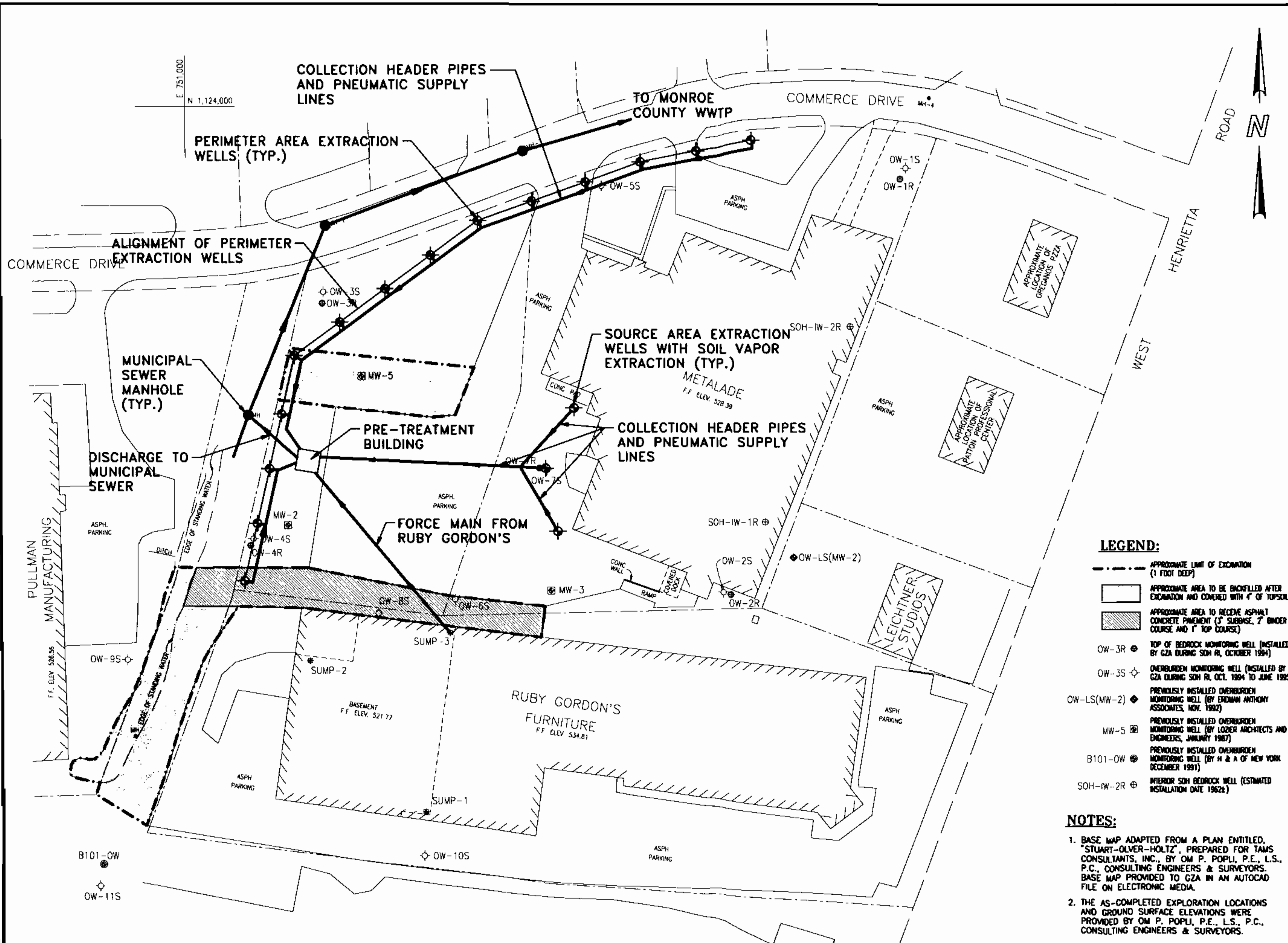
PROJECT No. 19078.2

FIGURE No. 4

SCALE IN FEET
0 40 80 160

DRAWN BY: DEW
DATE: OCTOBER 1996

GZA GeoEnvironmental of New York



LEGEND:

- APPROXIMATE LIMIT OF EXCAVATION (1 FOOT DEEP)
- APPROXIMATE AREA TO BE BACKFILLED AFTER EXCAVATION AND COVERED WITH 4" OF TOPSOIL
- APPROXIMATE AREA TO RECEIVE ASPHALT CONCRETE PAVEMENT (5" SUBBASE, 2" BINDER COURSE AND 1" TOP COURSE)
- OW-3R — TOP OF BEDROCK MONITORING WELL (INSTALLED BY GZA DURING SOH RI, OCTOBER 1994)
- OW-3S — OVERBURDEN MONITORING WELL (INSTALLED BY GZA DURING SOH RI, OCT. 1994 TO JUNE 1995)
- OW-LS(MW-2) — PREVIOUSLY INSTALLED OVERBURDEN MONITORING WELL (BY ERDMAN ANTHONY ASSOCIATES, NOV. 1992)
- MW-5 — PREVIOUSLY INSTALLED OVERBURDEN MONITORING WELL (BY LOZIER ARCHITECTS AND ENGINEERS, JANUARY 1987)
- B101-OW — PREVIOUSLY INSTALLED OVERBURDEN MONITORING WELL (BY H & A OF NEW YORK DECEMBER 1991)
- SOH-IW-2R — INTERIOR SOH BEDROCK WELL (ESTIMATED INSTALLATION DATE 1962±)

NOTES:

1. BASE MAP ADAPTED FROM A PLAN ENTITLED, "STUART-OLVER-HOLTZ", PREPARED FOR TAMS CONSULTANTS, INC., BY OM P. POPLI, P.E., L.S., P.C., CONSULTING ENGINEERS & SURVEYORS. BASE MAP PROVIDED TO GZA IN AN AUTOCAD FILE ON ELECTRONIC MEDIA.
2. THE AS-COMPLETED EXPLORATION LOCATIONS AND GROUND SURFACE ELEVATIONS WERE PROVIDED BY OM P. POPLI, P.E., L.S., P.C., CONSULTING ENGINEERS & SURVEYORS.

REV No.	DESCRIPTION	BY	DATE

DRAWN BY: DEW
DATE: OCTOBER 1996

SCALE IN FEET: 0 40 80 160

GZA GeoEnvironmental of New York

STUART-OLVER-HOLTZ SITE

HENRIETTA, NEW YORK

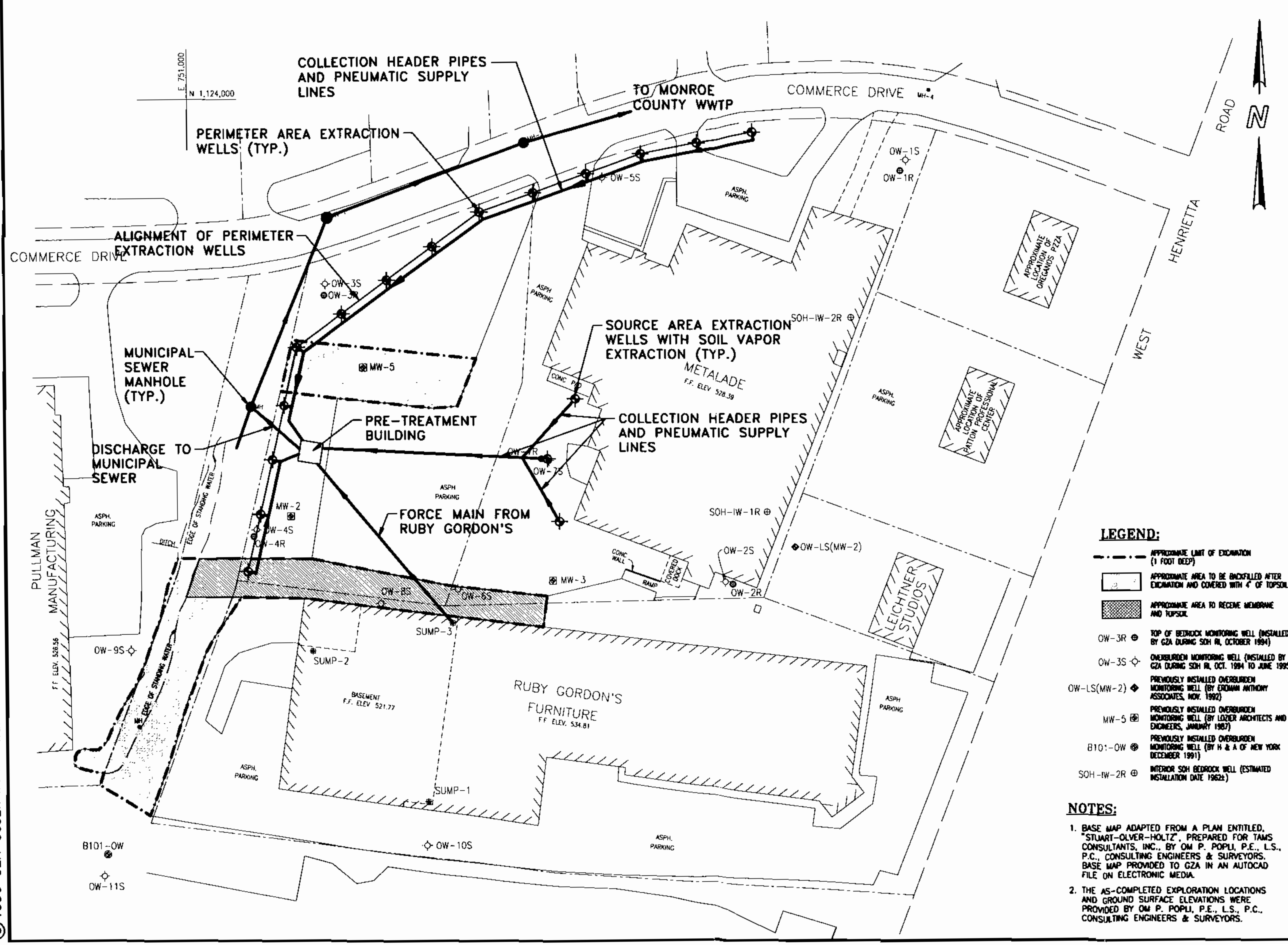
FEASIBILITY STUDY

CONCEPTUAL SKETCH SWA-3

PERIMETER EXTRACTION WELLS, SOIL DISPOSAL OFF-SITE

PROJECT No. 19078.2

FIGURE No. 5



LEGEND:

— · —	APPROXIMATE LIMIT OF EXCAVATION (1 FOOT DEEP)
(open box)	APPROXIMATE AREA TO BE BACKFILLED AFTER EXCAVATION AND COVERED WITH 4" OF TOPSOIL
(shaded box)	APPROXIMATE AREA TO RECEIVE MEMBRANE AND TOPSOIL
OW-3R ⊕	TOP OF BEDROCK MONITORING WELL (INSTALLED BY GZA DURING SOH RI, OCTOBER 1994)
OW-3S ◇	OVERBURDEN MONITORING WELL (INSTALLED BY GZA DURING SOH RI, OCT. 1994 TO JUNE 1995)
OW-LS(MW-2) ◆	PREVIOUSLY INSTALLED OVERBURDEN MONITORING WELL (BY ERDMAN ANTHONY ASSOCIATES, NOV. 1992)
MW-5 ⊞	PREVIOUSLY INSTALLED OVERBURDEN MONITORING WELL (BY LOZIER ARCHITECTS AND ENGINEERS, JANUARY 1987)
B101-OW ⊛	PREVIOUSLY INSTALLED OVERBURDEN MONITORING WELL (BY H & A OF NEW YORK DECEMBER 1991)
SOH-IW-2R ⊕	INTERIOR SOH BEDROCK WELL (ESTIMATED INSTALLATION DATE 1962±)

NOTES:

1. BASE MAP ADAPTED FROM A PLAN ENTITLED, "STUART-OLVER-HOLTZ", PREPARED FOR TAMS CONSULTANTS, INC., BY OM P. POPLI, P.E., L.S., P.C., CONSULTING ENGINEERS & SURVEYORS. BASE MAP PROVIDED TO GZA IN AN AUTOCAD FILE ON ELECTRONIC MEDIA.
2. THE AS-COMPLETED EXPLORATION LOCATIONS AND GROUND SURFACE ELEVATIONS WERE PROVIDED BY OM P. POPLI, P.E., L.S., P.C., CONSULTING ENGINEERS & SURVEYORS.

REV No.	DESCRIPTION	BY	DATE

DRAWN BY: DEW
DATE: OCTOBER 1996

SCALE IN FEET: 0 40 80 160

GZA GeoEnvironmental of New York

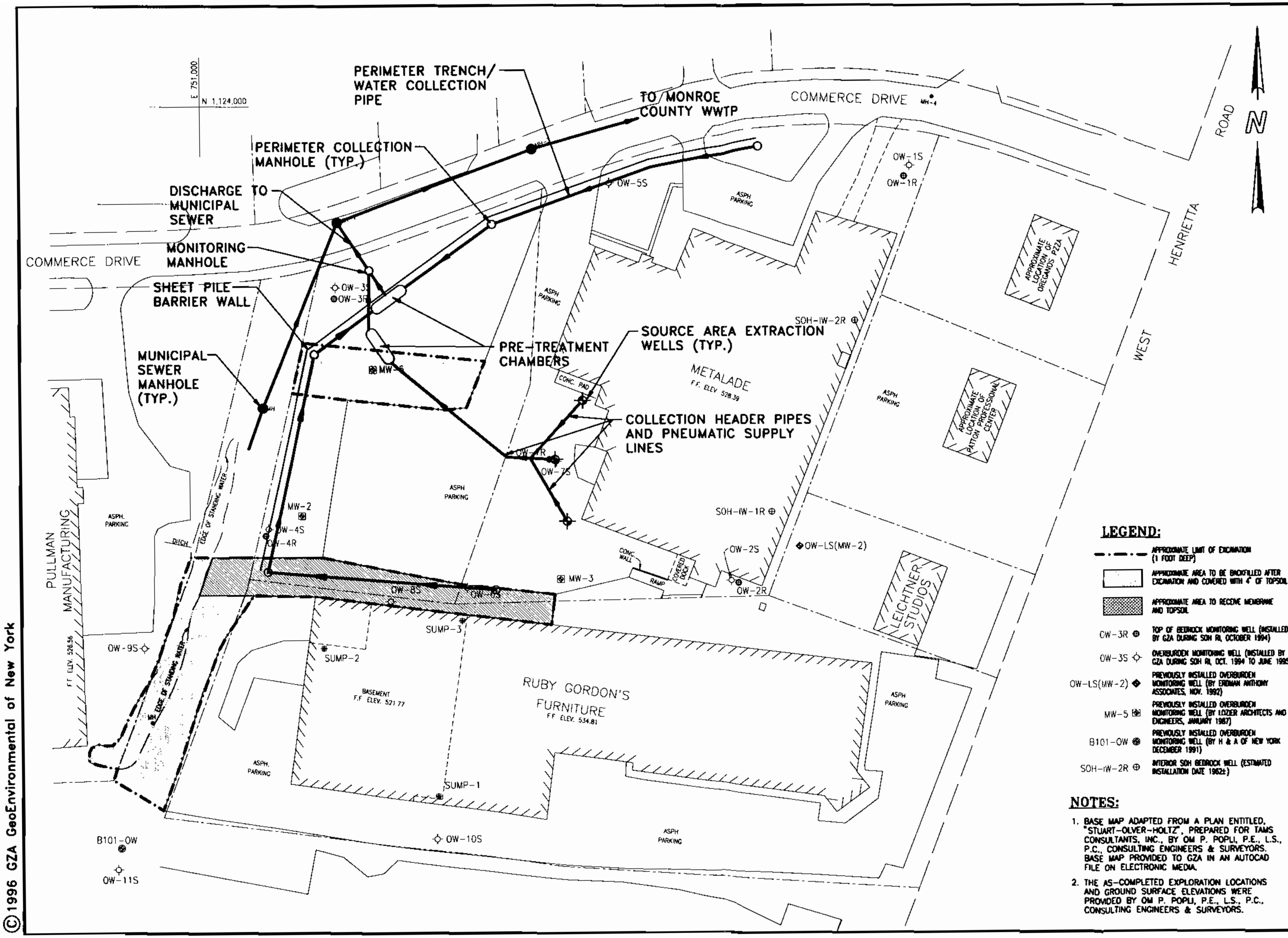
STUART-OLVER-HOLTZ SITE
HENRIETTA, NEW YORK

FEASIBILITY STUDY

CONCEPTUAL SKETCH SWA-4
PERIMETER EXTRACTION WELLS, COMBINED DISPOSAL OF OFF-SITE SOIL AND ON-SITE CAPPING

PROJECT No. 19078.2

FIGURE No. 6



LEGEND:

- APPROXIMATE LIMIT OF EXCAVATION (1 FOOT DEEP)
- APPROXIMATE AREA TO BE BACKFILLED AFTER EXCAVATION AND COVERED WITH 4" OF TOPSOIL
- APPROXIMATE AREA TO RECEIVE MEMBRANE AND TOPSOIL
- OW-3R ⊕ TOP OF BEDROCK MONITORING WELL (INSTALLED BY GZA DURING SOH RI, OCTOBER 1994)
- OW-3S ◇ OVERBURDEN MONITORING WELL (INSTALLED BY GZA DURING SOH RI, OCT. 1994 TO JUNE 1995)
- OW-LS(MW-2) ◆ PREVIOUSLY INSTALLED OVERBURDEN MONITORING WELL (BY ERDMAN ANTHONY ASSOCIATES, NOV. 1992)
- MW-5 ⊞ PREVIOUSLY INSTALLED OVERBURDEN MONITORING WELL (BY LOZIER ARCHITECTS AND ENGINEERS, JANUARY 1987)
- B101-OW ⊗ PREVIOUSLY INSTALLED OVERBURDEN MONITORING WELL (BY H & A OF NEW YORK DECEMBER 1991)
- SOH-IW-2R ⊕ INTERIOR SOH BEDROCK WELL (ESTIMATED INSTALLATION DATE 1962±)

NOTES:

1. BASE MAP ADAPTED FROM A PLAN ENTITLED, "STUART-OLVER-HOLTZ", PREPARED FOR TAMS CONSULTANTS, INC., BY OM P. POPLI, P.E., L.S., P.C., CONSULTING ENGINEERS & SURVEYORS. BASE MAP PROVIDED TO GZA IN AN AUTOCAD FILE ON ELECTRONIC MEDIA.
2. THE AS-COMPLETED EXPLORATION LOCATIONS AND GROUND SURFACE ELEVATIONS WERE PROVIDED BY OM P. POPLI, P.E., L.S., P.C., CONSULTING ENGINEERS & SURVEYORS.

REV No.	DESCRIPTION	BY	DATE

DRAWN BY: DEW

DATE: OCTOBER 1996

SCALE IN FEET: 0 40 80 160

GZA GeoEnvironmental of New York

STUART-OLVER-HOLTZ SITE

HENRIETTA, NEW YORK

FEASIBILITY STUDY

CONCEPTUAL SKETCH SWA-5

SHALLOW PERIMETER COLLECTION TRENCH WITH ZERO VALANCE IRON PRE-TREATMENT, COMBINED DISPOSAL OF OFF-SITE SOIL AND ON-SITE CAPPING

PROJECT No. 19078.2

FIGURE No. 7

Appendix A
Cost Estimates, Site Wide Remedial Alternatives

Feasibility Study
Stuart - Olver - Holtz
Site No. 8-28-079
Henrietta, New York

Sitewide Alternative No. 1:
No Action

Activities and Work Items are summarized on the attached assumptions.

Item No.	Description	Capital Cost	O&M Present Worth
1	Ruby-Gordon Basement Sumps	$0	$191,500
Subtotal		$0	$191,500
Engineering		$0	
Contingency		$0	
Administration		$10,000	
TOTAL		$10,000	$191,500

Net Present Worth

Capital Cost	$10,000
Present worth of annual O&M Cost	$191,500

TOTAL NET PRESENT WORTH = $201,500

Notes:

(1) Total Costs (Capital, Present Worth) are rounded to the nearest $1,000.
(2) Cost of money (Interest Rate) set at 8%, Inflation rate at 4%, Net Cost Rate is 4%
(3) Present Worth (P&W) of annual O&M cost = (Annual O&M Cost) *
(P/A, 4%, n years).

APPENDIX A

SITEWIDE ALTERNATIVE NO. 1
ASSUMPTIONS FOR COMPARATIVE COST ESTIMATE

No Action Alternative

The No Action alternative involves no remedial action in the study area other than continuing to operate the existing groundwater treatment system (air stripper) in the Ruby-Gordon basement to pretreat water collected in the basement drainage system prior to discharge to the municipal sanitary sewer.

Costs for this alternative include an allowance of $10,000 for administration of the site by regulatory agencies and operation and maintenance costs for the existing pretreatment system. These costs include electrical power, monthly maintenance visits for the treatment system, monthly sampling and analysis of effluent water samples, and sewer use fees based an on average flow rate of 2 gpm for 30 years.

Appendix A
Cost Estimates, Site Wide Remedial Alternatives

Feasibility Study
Stuart - Olver - Holtz
Site No 8-28-079
Henrietta, New York

Sitewide Alternative No. 2:
Downgradient Collection Trench with Air Stripper Pretreatment and Discharge to Municipal Sanitary Sewer,
Source Area Extraction Wells with Air Stripper Pretreatment and Discharge to Municipal Sanitary Sewer,
Soil vapor extraction system at the source area,
Off-Site Disposal of Hazardous Soils and Sediments.
Off-Site Treatment and Disposal of Hazardous Site Sump Contents.

Activities and Work Items are summarized on the attached assumptions.

Item No.	Description	Capital Cost	O&M Present Worth
1	Collection Trench	$381,000	$398,500
2	Source Area Extraction Wells/Soil Vapor Ext.	$88,000	$58,100
4	Ex-Situ Pretreatment of Groundwater	$78,000	$686,200
5	Bedrock Groundwater Institutional Controls	$42,000	$369,100
6	Soils and Surface Water Sediments	$337,000	$62,300
7	SOH Sump/Catch Basin Contents	$8,000	$000
Subtotal		$940,000	$1,576,700
Engineering (25%)		$235,000	
Contingency (15%)		$141,000	
Administration (10%)		$94,000	
TOTAL		$1,410,000	$1,576,700

Net Present Worth

Capital Cost	$1,410,000
Present worth of annual O&M Cost	$1,576,700

TOTAL NET PRESENT WORTH = $2,986,700

Notes:

(1) Total Costs (Capital, Present Worth) are rounded to the nearest $1,000.
(2) Cost of money (Interest Rate) set at 8%, Inflation rate at 4%, Net Cost Rate is 4%.
(3) Present Worth (P&W) of annual O&M cost = (Annual O&M Cost) * (P/A, 4%, n years).

APPENDIX A

SITEWIDE ALTERNATIVE NO. 2
ASSUMPTIONS FOR COMPARATIVE COST ESTIMATE

Downgradient Collection Trench

For the purposes of developing the comparative cost estimate for Sitewide Alternative No. 2, it is assumed that an approximately 650 feet long downgradient collection trench would be installed along the west and north property lines with an average depth of approximately 22 feet. It is assumed that the downgradient collection trench would be installed using a combination of open cut excavation and temporary sheeting or shoring. It was assumed that supplemental analytical testing would be conducted on the excavated soils. The laboratory test results would be compared with NYSDEC TAGM 3028 guidance levels. The excavated soils, if hazardous would be transported to an a permitted hazardous waste disposal facility, and if non-hazardous, would be hauled to a permitted solid waste facility.

Capital costs for the downgradient collection trench in the estimate include: mobilization and demobilization of the contractor; temporary shoring and excavation for the trench; supplemental analytical laboratory testing of 4 composite samples of the excavation spoils; off-site soil disposal at a solid waste landfill; on-site pretreatment of water collected during the excavation dewatering with discharge to the sanitary sewer; installation of bedding stone, perforated pipe and high permeability stone from the top of the lower glacial till to within 3 feet of the ground surface; soil backfill for the upper 3 feet; three manholes used as collection sumps; pipe cleanouts; three submersible pumps; power supply and wiring for the pumps; and pressure discharge lines leading to the pretreatment system building on the SOH site.

Operation and maintenance costs for the downgradient collection trench are based on an assumed operation period of 30 years. Operation and maintenance costs are assumed to include electrical power costs for the submersible pumps and submersible pump replacement approximately every 5 years. The estimate includes quarterly monitoring of the overburden groundwater for the first 5 years and semi-annual monitoring for the following 25 years. Testing would be conducted for chlorinated VOCs and the metal contaminants of concern using six existing monitoring wells and NYSDEC Contract Laboratory Program (CLP) analytical methods and protocols and Level A data validation.

Ex-Situ Groundwater Pretreatment System for Discharge to Municipal Sanitary Sewer

The estimate assumes that the pretreatment system would consist of a shelter building, an equalization/sedimentation tank, an air stripper for VOC pretreatment, a flowmeter, and a gravity discharge line leading to an existing sanitary sewer manhole west of the site. The cost estimate assumes that a catalytic oxidation system will be needed for treatment of off-gas from the air stripper.

The estimate assumes that capital costs for the pretreatment system would include a pre-design confirmatory testing, a shelter building, the pretreatment process equipment described above, and a gravity discharge line to the sanitary sewer.

Estimated operation and maintenance costs for the groundwater pretreatment system are based on an assumed remediation period of approximately 30 years. These costs are assumed to include: electrical power costs for the pretreatment system; monthly maintenance visits; to maintain the air stripper and off-gas treatment system and to take flowmeter measurements; and sewer use fees based on an assumed average discharge rate of approximately 3 to 4 gallons per minute (gpm) from the three source area extraction wells for approximately 10 years, and inflow from the downgradient collection trench and the Ruby-Gordon basement sumps assumed at an average inflow of 16 gpm for approximately 30 years.

Source Area Extraction Wells

For the remediation of the suspected source area, the comparative cost estimate for Sitewide Alternative No. 2 assumes that two 6-inch diameter extraction wells would be installed in the vicinity of OW-7S and that three wells (two new wells plus OW-7S) would be used for groundwater extraction. It is assumed that submersible pumps in the wells would pump the groundwater via buried force lines beneath the existing pavement to an above-ground pretreatment system inside a shelter building on the SOH site. It is assumed that a soil vapor extraction system would be installed near the extraction wells to supplement the source area remediation.

Capital costs for the source area extraction wells are assumed to include a pump test to obtain hydraulic parameters for design of the extraction wells, drilling and field monitoring costs to install the two extraction wells, three pneumatic submersible pumps and discharge lines leading to the pretreatment building, and the soil vapor extraction system. It is assumed that the water obtained during the short term pump test could be disposed directly into the sanitary sewer system without pretreatment by agreement with the Monroe County Pure Waters District.

Estimated operation and maintenance costs for the source area extraction wells are based on an assumed source area remediation period of approximately 10 years. These costs are expected to include electrical power costs for the submersible pumps and soil vapor extraction system and replacement of submersible pumps approximately every 5 years.

Ruby-Gordon Basement Sumps

It is assumed that the basement water collected in the Ruby-Gordon sumps would be pumped to the pretreatment system on the SOH site for approximately 30 years for control of groundwater quality in the area south of the SOH site. After that time, it is assumed the basement water would be discharged to the existing storm drain system on the Ruby-Gordon property. For the Ruby-Gordon basement sumps, the comparative cost estimate assumes that the existing groundwater pretreatment system in the Ruby-Gordon basement would be taken off-line.

Capital costs for the Ruby-Gordon basement sumps are assumed to include costs to: decommission the existing air stripper in the Ruby-Gordon basement; install a pump and pressure line leading to the SOH pretreatment system; upgrade and secure vapor barriers over the three basement sumps; and install a system to divert storm water runoff from entering the basement drainage system from outside the Ruby-Gordon loading dock area.

Operation and maintenance costs for the Ruby-Gordon basement sumps are assumed to include electrical power for pumping of basement water to the SOH pretreatment system for 30 years.

Bedrock Groundwater

For the bedrock groundwater, capital costs for institutional controls are assumed to include disconnecting the two existing bedrock wells at the SOH facility, and if required for adequate monitoring, the installation of two additional bedrock monitoring wells at depths of approximately 60 feet.

Operation and maintenance costs are assumed to include fees for services related to implementing deed restrictions. The estimate includes sampling costs and laboratory fees for bedrock groundwater monitoring on a quarterly basis the first 5 years and semi-annual monitoring the following 25 years. Testing would be conducted for chlorinated VOCs and the metal contaminants of concern using seven bedrock monitoring wells and NYSDEC CLP laboratory analytical methods and protocols and Level A data validation.

Soils and Surface Water Sediments

For the surface soils and sediments, the following assumptions were made to provide a comparative cost estimate. It is anticipated that additional analytical laboratory testing would be conducted during project design, and that the additional testing would more fully characterize the soils and sediments and clarify the regulatory status for disposal.

It is assumed that the volume of contaminated surface soils is approximately 475 cubic yards (cy). This volume is based on an assumed depth of contaminated soil of 12 inches over the non-paved, contaminated areas of; the western portion SOH site, the Ruby-Gordon property between the Ruby-Gordon building and the south SOH property line, and the 50-foot wide right-of-way owned by Dennis Petrisak west of the site from Commerce Drive south to the southwest corner of the Ruby-Gordon property, excluding areas within the right-of-way covered by surface water and surface water sediments. For the comparative cost estimate, it was assumed that the entire volume of soil that would be excavated from this area would be classified as hazardous based on NYSDEC TAGM 3028.

The volume of contaminated surface water sediments in the swale to the west of the SOH and Ruby-Gordon properties is assumed to be approximately 400 cy. This volume is based on the approximate limits of surface water sediments estimated from the site topographic map and an assumed depth of 12 inches of contaminated sediments. For the comparative cost estimate, it is assumed that the sediments would be classified as hazardous solid waste. Additional sampling and laboratory analyses, as noted above, would be conducted during project design in order to clarify the regulatory status of the surface water sediments.

It is assumed that non-hazardous on-site soils excavated from the collection trench would be hauled to a local permitted solid waste facility within one hour drive of the site. The disposal costs include loading, transportation and tipping fees at the landfill.

It is assumed that hazardous on-site and off-site soils would be hauled off-site for treatment and disposal in a secure permitted hazardous waste facility. The disposal costs include loading, transportation, treatment and disposal costs assuming the material is classified as a hazardous waste.

Capital costs are assumed to include the excavation, loading, hauling, treatment (as applicable) and disposal of the contaminated soils and sediments. The estimate also includes collection of 6 samples for supplemental analytical laboratory analyses, perimeter fencing from the SOH building and along the north, west and south property lines, and a paved drainage swale just north of the Ruby-Gordon basement. The estimate assumes that the excavated areas would be backfilled and regraded followed by placement of about 4 inches of topsoil and seed. Maintenance costs would include lawn care for the reseeded areas and maintenance of the paved drainage swale.

<u>SOH Sump/Catch Basin Contents</u>

For SOH sump/catch basin contents, it is assumed that the contents are hazardous waste until such time as additional data are available to characterize the materials. For the purposes of the comparative cost estimate, it is assumed that the volume of contaminated sump/catch basin contents on the SOH site is approximately 150 gallons of sump water and approximately 2 cy of sediments.

The estimate assumes that these materials would be loaded into a vacuum truck and hauled off-site for treatment and disposal as a hazardous waste at a permitted hazardous waste disposal facility. The estimate assumes that the available analytical data and NYSDEC TAGM 3028 guidance levels would be used to confirm the required treatment/disposal requirements of these materials.

An allowance of $2000 has been made for decommissioning of lines entering the sumps and catch basins from the SOH facility and/or replacement of the sump/catch basin structures, if necessary.

Appendix A
Cost Estimates, Site Wide Remedial Alternatives

Feasibility Study
Stuart - Olver - Holtz
Site No. 8-28-079
Henrietta, New York

Sitewide Alternative No. 3:
Downgradient Extraction Wells with Air Stripper Pretreatment and Discharge to Municipal Sanitary Sewer,
Source Area Extraction Wells with Air Stripper Pretreatment and Discharge to Municipal Sanitary Sewer,
Soil vapor extraction system at the source area,
Off-Site Disposal of Hazardous Soils and Sediments.
Off-Site Treatment and Disposal of Hazardous Site Sump Contents.

Activities and Work Items are summarized on the attached assumptions.

Item No.	Description	Capital Cost	O&M Present Worth
1	Extraction wells	$184,000	$485,600
2	Source Area Extraction Wells/Soil Vapor Ext.	$88,000	$58,100
3	Ruby-Gordon Basement Sumps	$6,000	$2,500
4	Ex-Situ Pretreatment of Groundwater	$78,000	$686,200
5	Bedrock Groundwater Institutional Controls	$42,000	$369,100
6	Soils and Surface Water Sediments	$337,000	$62,300
7	SOH Sump/Catch Basin Contents	$8,000	$000
Subtotal		$743,000	$1,663,800
Engineering (25%)		$185,750	
Contingency (15%)		$111,450	
Administration (10%)		$74,300	
TOTAL		$1,114,500	$1,663,800

Net Present Worth

Capital Cost	$1,114,500
Present worth of annual O&M Cost	$1,663,800

TOTAL NET PRESENT WORTH = $2,778,300

Notes:

(1) Total Costs (Capital, Present Worth) are rounded to the nearest $1,000.
(2) Cost of money (Interest Rate) set at 8%, Inflation rate at 4%, Net Cost Rate is 4%
(3) Present Worth (P&W) of annual O&M cost = (Annual O&M Cost) * (P/A, 4%, n years).

APPENDIX A

SITEWIDE ALTERNATIVE NO. 3
ASSUMPTIONS FOR COMPARATIVE COST ESTIMATE

Downgradient Extraction Wells

For the purposes of developing the comparative cost estimate for Sitewide Alternative No. 3, it is assumed that the downgradient groundwater containment system would consist of a single row of overburden extraction wells spaced approximately 50 feet on centers over a length of approximately 650 feet near the north and west property lines. It is assumed that this would involve installation of 12 additional overburden extraction wells and use of 3 existing monitoring wells for groundwater extraction.

Capital costs for the downgradient extraction wells in the estimate include: mobilization and demobilization of the drilling contractor; soil test borings for the wells; 6-inch diameter well screens and risers with protective casings; well development; field oversight of the drilling contractor during well installation and development; supplemental analytical laboratory testing of 4 composite samples of the drill cuttings and development water; disposal of the drill cuttings and development water assuming approximately half of the materials will be classified as hazardous waste and half of the material as solid waste; 15 submersible pumps; power supply and wiring for the pumps; and pressure discharge lines leading to the pretreatment system building on the SOH site.

Operation and maintenance costs for the downgradient extraction wells are based on an assumed operation period of 30 years. Operation and maintenance costs are assumed to include electrical power costs for the submersible pumps and submersible pump replacement approximately every 5 years. The estimate includes quarterly monitoring of the overburden groundwater for the first 5 years and semi-annual monitoring the following 25 years. Testing would be conducted for chlorinated VOCs and the metal contaminants of concern using six existing monitoring wells and NYSDEC Contract Laboratory Program (CLP) laboratory analytical methods and protocols and Level A data validation.

Ex-Situ Groundwater Pretreatment System for Discharge to Municipal Sanitary Sewer

The estimate assumes that the pretreatment system would consist of a shelter building, an equalization/sedimentation tank, an air stripper for VOC pretreatment, a flowmeter, and a gravity discharge line leading to an existing sanitary sewer manhole west of the site. The cost estimate assumes that a catalytic oxidation system would be needed for treatment of off-gas from the air stripper.

The estimate assumes that capital costs for the pretreatment system would include pre-design confirmatory testing, a shelter building, the pretreatment process equipment described above, and a gravity discharge line to the sanitary sewer.

Estimated operation and maintenance costs for the groundwater pretreatment system are based on an assumed remediation period of approximately 30 years. These costs are assumed to include: electrical power costs for the pretreatment system; monthly maintenance visits to change filters; maintain the air stripper and off-gas treatment system and to take flowmeter measurements; and sewer use fees based on an assumed average discharge rate of approximately 3 to 4 gallons per minute (gpm) from the three source area extraction wells for approximately 10 years, and inflow from the downgradient extraction wells and the Ruby-Gordon basement sumps assumed at an average inflow of 16 gpm for approximately 30 years.

Source Area Extraction Wells

For the remediation of the suspected source area, the comparative cost estimate for Sitewide Alternative No. 3 assumes that two 6-inch diameter extraction wells would be installed in the vicinity of OW-7S and that three wells (two new wells plus OW-7S) would be used for groundwater extraction. It is assumed that submersible pumps in the wells would pump the groundwater via buried force lines beneath the existing paved parking area to an above-ground pretreatment system inside a shelter building on the SOH site. It is assumed that a soil vapor extraction system would be installed near the extraction wells to supplement the source area remediation.

Capital costs for the source area extraction wells are assumed to include a pump test to obtain hydraulic parameters for design of the extraction wells, drilling and field monitoring costs to install the two extraction wells, three pneumatic submersible pumps and discharge lines leading to the pretreatment building, and the soil vapor extraction system. It is assumed that the pump test data will be used for design of both the source area and downgradient extraction wells. It is assumed that the water obtained during the short term pump test could be disposed directly into the sanitary sewer without pretreatment by agreement with the Monroe County Pure Waters District.

Estimated operation and maintenance costs for the source area extraction wells are based on an assumed source area remediation period of approximately 10 years. These costs are expected to include electrical power costs for the submersible pumps and soil vapor extraction system and replacement of submersible pumps approximately every 5 years.

Ruby-Gordon Basement Sumps

It is assumed that the basement water collected in the Ruby-Gordon sumps would be pumped to the pretreatment system on the SOH site for approximately 30 years for control of groundwater quality in the area south of the SOH site. After that time, it is assumed the basement water would be discharged to the existing storm drain system on the Ruby-Gordon property. For the Ruby-Gordon basement sumps, the comparative cost estimate assumes that the existing groundwater pretreatment system in the Ruby-Gordon basement would be taken off-line.

Capital costs for the Ruby-Gordon basement sumps are assumed to include costs to decommission the existing air stripper in the Ruby-Gordon basement, install a pump and pressure line leading to the SOH pretreatment system, upgrade and secure vapor barriers over the three basement sumps and install a system to divert storm water runoff from entering the basement drainage system from outside the Ruby-Gordon loading dock area.

Operation and maintenance costs for the Ruby-Gordon basement sumps are assumed to include electrical power for pumping of basement water to the SOH pretreatment system for 30 years.

Bedrock Groundwater

For the bedrock groundwater, capital costs for institutional controls are assumed to include disconnecting the two existing bedrock wells at the SOH facility, and, if required for adequate monitoring, the installation of two additional bedrock monitoring wells at depths of approximately 60 feet.

Operation and maintenance costs are assumed to include fees for services related to implementing deed restrictions. The estimate includes sampling costs and laboratory fees for bedrock groundwater monitoring on a quarterly basis the first 5 years and semi-annually monitoring the following 25 years. Testing would be conducted for chlorinated VOCs and the metal contaminants of concern using seven bedrock monitoring wells and NYSDEC CLP laboratory analytical methods and protocols and Level A data validation.

Soils and Surface Water Sediments

For the surface soils and sediments, the following assumptions were made to provide an approximation of cost until such time as additional data may be available to further characterize the soils and sediments.

It is assumed that the volume of contaminated surface soils is approximately 475 cubic yards (cy). This volume is based on an assumed depth of contaminated soil of 12 inches over the non-paved, contaminated areas of; the SOH site, the Ruby-Gordon property between the Ruby-Gordon building and the south SOH property line, and the 50-foot wide right-of-way owned by Dennis Petrisak west of the site from Commerce Drive south to the southwest corner of the Ruby-Gordon property, excluding areas within the right-of-way covered by surface water and surface water sediments. For the comparative cost estimate, it was assumed that the volume of hazardous surface soils would be the total volume of surface soils excavated from the site.

The volume of contaminated surface water sediments in the swale to the west of the SOH and Ruby-Gordon properties is assumed to be approximately 400 cy. This volume is based on the approximate limits of surface water sediments estimated from the site topographic map and an assumed depth of 12 inches of contaminated sediments. For the comparative cost estimate, it is assumed that the sediments would be classified as hazardous solid waste. Additional sampling and laboratory analyses would be needed to clarify the regulatory status of the surface water sediments.

It is assumed that hazardous on-site and off-site soils would be hauled off-site for treatment and disposal in a permitted hazardous waste facility. The disposal costs include loading, transportation, treatment and disposal costs assuming the material is classified as hazardous waste.

Capital costs are assumed to include the excavation, loading, hauling, treatment (as applicable) and disposal of the contaminated soils and sediments. The capital costs also include collection of 6 samples for supplemental analytical laboratory analyses, perimeter fencing from the SOH building along the north, west and south property lines, a construction of a paved drainage swale just north of the Ruby-Gordon basement. The estimate assumes that the excavated areas would be backfilled and regraded followed by placement of about 4 inches of topsoil and seed. Maintenance costs would include lawn care for the reseeded areas and maintenance of the paved drainage swale.

SOH Sump/Catch Basin Contents

For SOH sump/catch basin contents, it is assumed that the contents are hazardous waste. For the purposes of the comparative cost estimate, it is assumed that the volume of contaminated sump/catch basin contents on the SOH site is approximately 150 gallons of sump water and approximately 2 cy of sediments.

The estimate assumes that these materials would be loaded into a vacuum truck and hauled off-site for treatment and disposal as a hazardous waste in a permitted hazardous waste disposal facility. The estimate assumes that the available analytical data and previous experience with similar materials and NYSDEC TAGM 3028 would be used to establish the required treatment of these materials prior to disposal.

An allowance of $2000 has been made for decommissioning of lines entering the sumps and catch basins from the SOH facility and/or replacement of the sump/catch basin structures, if necessary.

Appendix A
Cost Estimates, Site Wide Remedial Alternatives

Feasibility Study
Stuart - Olver - Holtz
Site No. 8-28-079
Henrietta, New York

Sitewide Alternative No. 4:

Downgradient Extraction Wells with Air Stripper Pretreatment and Discharge to Municipal Sanitary Sewer,
Source Area Extraction Wells with Air Stripper Pretreatment and Discharge to Municipal Sanitary Sewer,
Soil vapor extraction system at the source area,
Off-Site Disposal of Hazardous Soils and Sediments.
Off-Site Treatment and Disposal of Hazardous Site Sump Contents.

Activities and Work Items are summarized on the attached assumptions.

Item No.	Description	Capital Cost	O&M Present Worth
1	Extraction wells	$184,000	$485,600
2	Source Area Extraction Wells/Soil Vapor Ext.	$88,000	$58,100
3	Ruby-Gordon Basement Sumps	$6,000	$2,500
4	Ex-Situ Pretreatment of Groundwater	$78,000	$686,200
5	Bedrock Groundwater Institutional Controls	$42,000	$369,100
6	Soils and Surface Water Sediments	$331,000	$53,400
7	SOH Sump/Catch Basin Contents	$8,000	$000
Subtotal		$737,000	$1,654,900
Engineering (25%)		$184,250	
Contingency (15%)		$110,550	
Administration (10%)		$73,700	
TOTAL		$1,105,500	$1,654,900

Net Present Worth

Capital Cost	$1,105,500
Present worth of annual O&M Cost	$1,654,900

TOTAL NET PRESENT WORTH = $2,760,400

Notes:

(1) Total Costs (Capital, Present Worth) are rounded to the nearest $1,000.
(2) Cost of money (Interest Rate) set at 8%, Inflation rate at 4%, Net Cost Rate is 4%.
(3) Present Worth (P&W) of annual O&M cost = (Annual O&M Cost) * (P/A, 4%, n years).

APPENDIX A

SITEWIDE ALTERNATIVE NO. 4
ASSUMPTIONS FOR COMPARATIVE COST ESTIMATE

Downgradient Extraction Wells

For the purposes of developing the comparative cost estimate for Sitewide Alternative No. 4, it is assumed that the downgradient groundwater containment system would consist of a single row of overburden extraction wells spaced approximately 50 feet on centers over a length of approximately 650 feet near the north and west property lines. It is assumed that this would involve installation of 12 additional overburden extraction wells and use of 3 existing monitoring wells for groundwater extraction.

Capital costs for the downgradient extraction wells in the estimate include: mobilization and demobilization of the drilling contractor; soil test borings for the wells; 6-inch diameter well screens and risers with protective casings; well development; field oversight of the drilling contractor during well installation and development; supplemental analytical laboratory testing of 4 composite samples of the drill cuttings and development water; disposal of the drill cuttings and development water assuming approximately half of the materials will be classified as hazardous waste and approximately half of the materials as non-hazardous waste; 15 submersible pumps, power supply and wiring for the pumps; and pressure discharge lines leading to the pretreatment system building on the SOH site.

Operation and maintenance costs for the downgradient extraction wells are based on an assumed operation period of 30 years. Operation and maintenance costs are assumed to include electrical power costs for the submersible pumps and submersible pump replacement approximately every 5 years. The estimate includes quarterly monitoring of the overburden groundwater for the first 5 years and semi-annual monitoring the following 25 years. Testing would be conducted for chlorinated VOCs and the metal contaminants of concern using six existing monitoring wells and NYSDEC Contract Laboratory Program (CLP) laboratory analytical methods and protocols and Level A data validation.

Ex-Situ Groundwater Pretreatment System for Discharge to Municipal Sanitary Sewer

The estimate assumes that the pretreatment system would consist of a shelter building, an equalization/sedimentation tank, an air stripper for VOC pretreatment, a flowmeter, and a gravity discharge line leading to an existing sanitary sewer manhole west of the site. The cost estimate assumes that a catalytic oxidation system would be needed for treatment of off-gas from the air stripper.

The estimate assumes that capital costs for the pretreatment system would include pre-design confirmatory testing, a shelter building, the pretreatment process equipment described above, and a gravity discharge line to the sanitary sewer.

Estimated operation and maintenance costs for the groundwater pretreatment system are based on an assumed remediation period of approximately 30 years. These costs are assumed to include electrical power costs for the pretreatment system, monthly maintenance visits to change filters, maintain the air stripper and off-gas treatment system and to take flowmeter measurements, and sewer use fees based on an assumed average discharge rate of approximately 3 to 4 gallons per minute (gpm) from the three source area extraction wells for approximately 10 years, and inflow from the downgradient extraction wells and the Ruby-Gordon basement sumps assumed at an average inflow of 16 gpm for approximately 30 years.

Source Area Extraction Wells

For the remediation of the suspected source area, the comparative cost estimate for Sitewide Alternative No. 4 assumes that two 6-inch diameter extraction wells would be installed in the vicinity of OW-7S and that three wells (two new wells plus OW-7S) would be used for groundwater extraction. It is assumed that submersible pumps in the wells would pump the groundwater via buried force lines beneath the existing paved parking area to an above-ground pretreatment system inside a shelter building on the SOH site. It is assumed that a soil vapor extraction system would be installed near the extraction wells to supplement the source area remediation.

Capital costs for the source area extraction wells are assumed to include: a pump test to obtain hydraulic parameters for design of the extraction wells; drilling and field monitoring costs to install the two extraction wells; three pneumatic submersible pumps and discharge lines leading to the pretreatment building; and the soil vapor extraction system. It is assumed that the pump test data will be used for design of both the source area and downgradient extraction wells. It is assumed that the water obtained during the short term pump test could be disposed directly into the sanitary sewer without pretreatment by agreement with the Monroe County Pure Waters District.

Estimated operation and maintenance costs for the source area extraction wells are based on an assumed source area remediation period of approximately 10 years. These costs are expected to include electrical power costs for the submersible pumps and soil vapor extraction system and replacement of submersible pumps approximately every 5 years.

Ruby-Gordon Basement Sumps

It is assumed that the basement water collected in the Ruby-Gordon sumps would be pumped to the pretreatment system on the SOH site for approximately 30 years for control of groundwater quality in the area south of the SOH site. After that time, it is assumed the basement water would be discharged to the existing storm drain system on the Ruby-Gordon property. For the Ruby-Gordon basement sumps, the comparative cost estimate assumes that the existing groundwater pretreatment system in the Ruby-Gordon basement would be taken off-line.

Capital costs for the Ruby-Gordon basement sumps are assumed to include costs to decommission the existing air stripper in the Ruby-Gordon basement, install a pump and pressure line leading to the SOH pretreatment system, upgrade and secure vapor barriers over the three basement sumps and install a system to divert storm water runoff from entering the basement drainage system from outside the Ruby-Gordon loading dock area.

Operation and maintenance costs for the Ruby-Gordon basement sumps are assumed to include electrical power for pumping of basement water to the SOH pretreatment system for 30 years.

Bedrock Groundwater

For the bedrock groundwater, capital costs for institutional controls are assumed to include disconnecting the two existing bedrock wells at the SOH facility, and if required for adequate monitoring, the installation of two additional bedrock monitoring wells at depths of approximately 60 feet.

Operation and maintenance costs are assumed to include fees for services related to implementing deed restrictions. The estimates includes sampling costs and laboratory fees for bedrock groundwater monitoring on a quarterly basis the first 5 years and semi-annual monitoring the following 25 years. Testing would be conducted for chlorinated VOCs and the metal contaminants of concern using seven bedrock monitoring wells and NYSDEC CLP laboratory analytical methods and protocols Level A data validation.

Soils and Surface Water Sediments

For the surface soils and sediments, the following assumptions were made to provide an approximation of cost until such time as additional data may be available to further characterize the soils and sediments.

It is assumed that the volume of contaminated surface soils is approximately 475 cubic yards (cy). This volume is based on an assumed depth of contaminated soil of 12 inches over the non-paved, contaminated areas of; the western portion of the SOH site, the Ruby-Gordon property between the Ruby-Gordon building and the south SOH property line, and the 50-foot wide right-of-way owned by Dennis Petrisak west of the site from Commerce Drive south to the southwest corner of the Ruby-Gordon property, excluding areas within the right-of-way covered by surface water and surface water sediments. For the comparative cost estimate, it is assumed that the approximate volume of hazardous surface soils would be the total volume of excavated surface soils.

It is assumed that the Ruby-Gordon drainage swale will be covered with a multi-layer cover system 60-mil HDPE geomembrane; non-woven geotextile; 6 inches of drainage layer soil; and 4 inches of topsoil and seed.

The volume of contaminated surface water sediments in the swale to the west of the SOH and Ruby-Gordon properties is assumed to be approximately 400 cy. This volume is based on the approximate limits of surface water sediments estimated from the site topographic map and an assumed depth of 12 inches of contaminated sediments. For the comparative cost estimate, it is assumed that the sediments would be classified as hazardous solid waste. Additional sampling and laboratory analyses would be needed to clarify the regulatory status of the surface water sediments.

It is assumed that hazardous on-site and off-site soils would be hauled off-site for treatment and disposal in a permitted hazardous waste facility. The disposal costs include loading, transportation, treatment and disposal costs assuming the material is classified as an F-listed hazardous waste.

Capital costs are assumed to include the excavation, loading, hauling, treatment (as applicable) and disposal of the contaminated off-site soils and sediments. The estimate assumes that the excavated off-site areas would be backfilled and regraded followed by placement of about 4 inches of topsoil and seed. The capital costs for on-site areas are assumed to include labor, equipment and materials and the placement of the geomembrane cover system in the Ruby-Gordon swale. Maintenance costs include lawn care for the reseeded areas and maintenance of new and existing paved parking areas.

<u>SOH Sump/Catch Basin Contents</u>

For SOH sump/catch basin contents, it is assumed that the contents are hazardous waste. For the purposes of the comparative cost estimate, it is assumed that the volume of contaminated sump/catch basin contents on the SOH site is approximately 150 gallons of sump water and approximately 2 cy of sediments.

The estimate assumes that these materials would be loaded into a vacuum truck and hauled off-site for treatment and disposal as a hazardous waste in a permitted hazardous waste disposal facility. The estimate assumes that the available analytical data and previous experience with similar materials and NYSDEC TAGM 3028 would be used to establish the required treatment of these materials prior to disposal.

An allowance of $2000 has been made for decommissioning of lines entering the sumps and catch basins from the SOH facility and/or replacement of the sump/catch basin structures, if necessary.

Appendix A
Cost Estimates, Site Wide Remedial Alternatives

Feasibility Study
Stuart - Olver - Holtz
Site No. 8-28-079
Henrietta, New York

Sitewide Alternative No. 5:

Passive Collection Trench with Zero Valence Iron Pretreatment , Discharge to Municipal Sanitary Sewer,
Source Area Extraction Wells, Zero Valence Iron Pretreatment, Discharge to Municipal Sanitary Sewer,
Off-Site Disposal of Hazardous Soils and Sediments.
Off-Site Treatment and Disposal of Hazardous Site Sump Contents.

Activities and Work Items are summarized on the attached assumptions.

Item No.	Description	Capital Cost	O&M Present Worth
1	Passive Collection Trench with Zero Valence Iron Pretreatment	$524,000	$301,500
2	Source Area Extraction Wells	$53,000	$34,000
3	Ruby-Gordon Basement Collection Trench	$42,000	$30,700
4	In-Situ Pretreatment of Groundwater	$275,000	$89,700
5	Bedrock Groundwater Institutional Controls	$42,000	$351,800
6	Soils and Surface Water Sediments	$334,000	$53,400
7	SOH Sump/Catch Basin Contents	$8,000	$000
Subtotal		$1,278,000	$861,100
Engineering (25%)		$319,500	
Contingency (15%)		$191,700	
Administration (10%)		$127,800	
TOTAL		$1,917,000	$861,100

Net Present Worth

Capital Cost	$1,917,000
Present worth of annual O&M Cost	$861,100

TOTAL NET PRESENT WORTH = $2,778,100

Notes:

(1) Total Costs (Capital, Present Worth) are rounded to the nearest $1,000.
(2) Cost of money (Interest Rate) set at 8%, Inflation rate at 4%, Net Cost Rate is 4%.
(3) Present Worth (P&W) of annual O&M cost = (Annual O&M Cost) * (P/A, 4%, n years).

APPENDIX A

SITEWIDE ALTERNATIVE NO. 5
ASSUMPTIONS FOR COMPARATIVE COST ESTIMATE

Shallow Barrier Wall/Collection Trench

For the purposes of developing the comparative cost estimate for Sitewide Alternative No. 5, it is assumed that a vertical barrier wall with shallow collection trench and relief wells would be installed along the north and west property boundaries approximately 650 feet long. It is assumed that the barrier wall would consist of a single row of permanent sheet piles. The shallow collection trench would be constructed using a combination of open cut excavation and temporary shoring, and the relief wells would be 18 inch diameter borings. The relief wells would be drilled in a row parallel to the upgradient side of the barrier wall. The shallow collection trench would be installed over the top of the relief wells so that the wells and collection trench are hydraulically connected. It was assumed that supplemental analytical testing would be conducted on the soils that would be excavated. The laboratory test results would be compared with NYSDEC TAGM 3028 guidance levels. The excavated soils, if hazardous would be transported to an a permitted hazardous waste disposal facility, and if non-hazardous, would be hauled to a permitted solid waste facility. For cost estimating, it was assumed that the excavation spoils would be non-hazardous solid waste that would be hauled to a permitted solid waste facility.

Capital costs for the barrier wall and shallow collection trench in the estimate include: mobilization and demobilization of the contractor; installation of permanent sheet piling to an average depth of 23 feet and at completion, cutoff 5-feet below ground surface; 18 inch diameter borings every 10 feet to an average depth of 23 feet; temporary shoring and excavation for the collection trench; installation of bedding stone; installation of perforated pipe; installation of high permeability stone approximately 6 feet wide and in the lower 10 feet of the excavation with the remainder of the trench backfilled with soil; five manholes used as cleanouts and monitoring points; supplemental analytical laboratory testing of 4 composite samples of the excavation spoils; off-site disposal at a solid waste landfill; and on-site pretreatment of water collected during the excavation dewatering with discharge to the sanitary sewer.

Operation and maintenance costs include quarterly monitoring of the overburden groundwater for the first 5 years and semi-annual monitoring for another 25 years. Testing would be conducted for chlorinated VOCs and the metal contaminants of concern using six existing monitoring wells and NYSDEC Contract Laboratory Program (CLP) analytical methods and protocols and Level A data validation.

In-Situ Groundwater Pretreatment System for Discharge to Municipal Sanitary Sewer

The estimate assumes that the pretreatment system would consist of two subsurface vaults filled with iron filings that will use the zero valence iron process to pretreat the groundwater prior to discharge to the municipal sanitary sewer. The estimate includes a treatability study, a shelter building to house the compressor for the source area extraction wells, two underground storage vaults to contain the iron filings, a flowmeter, and a gravity discharge line leading to an existing manhole for the sanitary sewer system to the west of the site and license fees for the zero valence iron treatment technology.

Estimated operation and maintenance costs for the groundwater pretreatment system are based on an assumed operation period of 30 years. These costs are assumed to include rejuvenation of the iron every 5 years, and sewer fees based on the assumed average discharge rate of approximately 3 to 4 gallons per minute (gpm) from the three source area extraction wells and approximately 8 gpm from the downgradient collection system.

Source Area Extraction Wells

For the remediation of the suspected source area, the comparative cost estimate for Sitewide Alternative No. 5 assumes that two 6-inch diameter extraction wells would be installed in the vicinity of OW-7S and that three wells (two new wells plus OW-7S) would be used for groundwater extraction. It is assumed that submersible pumps in the wells would pump the groundwater via buried force lines beneath the existing paved parking area to an underground pretreatment vault filled with iron filings that use the zero valence iron process for pretreatment followed by discharge to the municipal sanitary sewer.

Capital costs for the source area extraction wells are assumed to include a pump test to obtain hydraulic parameters for design of the extraction wells, drilling and field monitoring costs to install two new extraction wells, three pneumatic submersible pumps and discharge lines leading to the zero valence iron pretreatment vaults. It is assumed that the water obtained during the short term pump test could be disposed directly into the sanitary sewer without pretreatment by agreement with the Monroe County Pure Waters District.

Estimated operation and maintenance costs for the source area extraction wells are based on an assumed source area remediation period of approximately 10 years. These costs are expected to include electrical power costs for the submersible pumps and submersible pump replacement approximately every 5 years.

Ruby-Gordon Basement Sumps

For the purposes of developing the comparative cost estimate, it is assumed that a collection trench be installed along the south property boundary approximately 200 feet long and to a depth approximately 3 to 4 feet below the existing basement slab elevation. It is assumed this collection system will differ from the collection system along the north and west property boundaries in that it will not contain a barrier wall and relief columns. It is assumed that the collection trench would be constructed using a combination of open cut excavation and temporary shoring. It was assumed that supplemental analytical testing would be conducted on the soils that would be excavated. The laboratory test results would be compared with NYSDEC

TAGM 3028 guidance levels. The excavated soils, if hazardous would be transported to an a permitted hazardous waste disposal facility, and if non-hazardous, would be hauled to a permitted solid waste facility. For cost estimating, it was assumed that the excavation spoils would be non-hazardous solid waste that would be hauled to a permitted solid waste facility.

Capital costs for the Ruby-Gordon collection trench in the estimate include mobilization and demobilization of the contractor, temporary shoring and excavation for the collection trench, installation of bedding stone, installation of perforated pipe, installation of high permeability stone approximately 4 feet wide and in the lower 10 feet of the excavation, backfill of the remainder of the trench with soil, one manhole used as a cleanout, analytical laboratory testing of 1 composite sample of the excavation spoils, off-site disposal of excavated soils at a solid waste landfill, and installation of a system to divert stormwater runoff from entering the basement drainage system from outside the Ruby-Gordon loading dock area.

It is assumed that the groundwater collected in the Ruby Gordon basement sumps will continue to be pretreated using the existing Ruby Gordon treatment system until the collection system becomes effective (assumed to be approximately 3 years). After that time, it is assumed the basement water would be discharged to the existing storm drain system on the Ruby-Gordon property. For the Ruby-Gordon basement sumps, the comparative cost estimate assumes the installation of vapor barriers over the existing sumps.

Operation and maintenance costs for the Ruby-Gordon basement sumps include operation and maintenance costs for the existing pretreatment system for approximately 3 years. These costs include electrical power, monthly maintenance visits for the treatment system, monthly sampling and analysis of effluent water samples, and sewer use fees based on an average flow rate of 2 gpm for 3 years.

Bedrock Groundwater

For the bedrock groundwater, capital costs for institutional controls are assumed to include disconnecting the two existing bedrock wells at the SOH facility, and if required for adequate monitoring, the installation of two additional bedrock monitoring wells at depths of approximately 60 feet.

Operation and maintenance costs are assumed to include fees for services related to implementing deed restrictions. The estimate includes sampling costs and laboratory fees for bedrock groundwater monitoring on a quarterly basis the first 5 years and semi-annually the following 25 years. Testing would be conducted for chlorinated VOCs and the metal contaminants of concern using seven bedrock monitoring wells and NYSDEC CLP laboratory analytical methods and protocols and Level A data validation.

Soils and Surface Water Sediments

For the surface soils and sediments, the following assumptions were made to provide a rough approximation of cost until such time as additional data are available to characterize the soils and sediments.

It is assumed that the volume of contaminated surface soils is approximately 475 cubic yards (cy). This volume is based on an assumed depth of contaminated soil of 12 inches over the non-paved, contaminated areas of; the western portion of the SOH site, the Ruby-Gordon property between the Ruby-Gordon building and the south SOH property line, and the 50-foot wide right-of-way owned by Dennis Petrisak west of the site from Commerce Drive south to the southwest corner of the Ruby-Gordon property, excluding areas within the right-of-way covered by surface water and surface water sediments. For the comparative cost estimate, it is assumed that the approximate volume of hazardous surface soils is the total volume of excavated surface soils.

The volume of contaminated surface water sediments in the swale to the west of the SOH and Ruby-Gordon properties is assumed to be approximately 400 cy. This volume is based on the approximate limits of surface water sediments estimated from the site topographic map and an assumed depth of 12 inches of contaminated sediments. For the comparative cost estimate, it is assumed that the sediments would be classified as hazardous solid waste. Additional sampling and laboratory analyses may be needed to clarify the regulatory status of the surface water sediments.

It is assumed that hazardous on-site and off-site soils would be hauled off-site for treatment and disposal in a secure permitted hazardous waste facility. The disposal costs include loading, transportation, treatment and disposal costs assuming the material is classified as a hazardous waste.

It is assumed that non-hazardous excavation soils and sediments would be hauled to a permitted solid waste facility within one hour drive of the site. The disposal costs include loading, transportation and tipping fees at the landfill.

It is assumed that the Ruby-Gordon swale area will be covered with a multi-layer system including 60-mil HDPE geomembrane; non-woven geotextile; 6 inches of drainage layer soil; and 4 inches of topsoil and seed.

Capital costs are assumed to include the excavation, loading, hauling, treatment (as applicable) and disposal of the contaminated off-site soils and sediments. The estimate assumes that the excavated off-site areas would be backfilled and regraded followed by placement of about 4 inches of topsoil and seed. The capital costs for on-site areas are assumed to include labor, equipment and materials for placement of the drainage swale geomembrane cover system. Maintenance costs include lawn care for the reseeded areas and maintenance of new and existing paved parking areas.

SOH Sump/Catch Basin Contents

For SOH sump/catch basin contents, it is assumed that the contents are hazardous waste until such time as additional data are available to characterize the materials. For the purposes of the comparative cost estimate, it is assumed that the volume of contaminated sump/catch basin contents on the SOH site is approximately 150 gallons of sump water and approximately 2 cy of sediments.

The estimate assumes that these materials would be loaded into a vacuum truck and hauled off-site for treatment and disposal as a hazardous waste in a permitted hazardous waste disposal facility. The estimate assumes that the available analytical data and previous experience with similar materials and NYSDEC TAGM 3028 would be used to establish the required treatment of these materials prior to disposal.

An allowance of $2000 has been made for decommissioning of lines entering the sumps and catch basins from the SOH facility and/or replacement of the sump/catch basin structures, if necessary.