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New York State
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FOCUSED FEASIBILITY STUDY
SPECTRUM FINISHING CORPORATION SITE
Site No. 1-52-029

Work Assignment Number
D003060-26

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FOCUSED FEASIBILITY STUDY
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1.0 INTRODUCTION

This report presents the results of the Focused Feasibility Study of alternatives for the environmental remediation of the Spectrum Finishing Corporation Site (Site) located in West Babylon, Suffolk County, New York. The Site is listed as a Class 2 site on the New York State Department of Environmental Conservation (NYSDEC) Registry of Inactive Hazardous Waste Sites, Site No. 1-52-029.

1.1 BACKGROUND

In response to apparent soil and groundwater contamination at the Site, the NYSDEC commissioned a Focused Remedial Investigation/Focused Feasibility Study (FRI/FFS) of the Site. The FRI and FFS were completed on behalf of the NYSDEC under Superfund Standby Contract Work Assignment # D003060-26 to TAMS Consultants, Inc. (TAMS). The FRI and FFS were completed by GZA GeoEnvironmental of New York (GZA) as a subconsultant to TAMS.

The objective of the FRI was to characterize the nature and extent of contamination at and associated with the Site, and to provide data for use in the FFS. The scope of the work for the FRI is described in work plan documents approved by the NYSDEC (see Section 1.3). The FRI 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 FRI were summarized in a separate report prepared by GZA entitled "Focused Remedial Investigation Report, Spectrum Finishing Corporation, West Babylon, New York", dated December 2001. Additionally, an Interim Remedial Measure (IRM) was conducted at the Site in April 2000.

This FFS report addresses contamination and remediation issues for the Site and off-Site areas potentially impacted by Site contamination. These areas include the Spectrum Finishing Corporation (SFC) property, and areas located near the Site (e.g., parking area north of the Site building up to the south edge of the former NTU buildings (60 Dale Street); the alleyway south of the Site building; hydraulically downgradient areas with impacted groundwater).

As described in the project work plan documents, the FFS is focused in nature, in that the feasibility of a select group of remedial alternatives is assessed. A preliminary list of such alternatives was originally presented in Section 1.3 of the Project Management Plan. During a meeting between TAMS/GZA and NYSDEC on October 17, 2001, a revised group of remedial alternatives was tentatively agreed upon, based on the results of the remedial investigation. Additionally, for the purposes of evaluating remedial alternatives specific to the contaminated Site media, NYSDEC separated the alternatives to address soil (subsurface and surface soil) and groundwater.

TAMS/GZA prepared a list of assumptions on which to base the remedial action alternatives. In addition, a technical review (preliminary screening) of applicable technologies was conducted by TAMS/GZA. The assumptions and applicable remedial technologies were discussed during a conference call between NYSDEC and GZA on December 3, 2001; presented in a letter from GZA to NYSDEC dated February 20, 2002 in response to NYSDEC comments on the draft report; and discussed in numerous times during the preparation of the FFS. These remedial alternatives and associated assumptions are included in Appendix A.

This focused study includes three remedial alternatives for both soil and groundwater, as presented below.

Soil:

Alternative No. 1: No Action;

Alternative No. 2: Excavation and Off-Site Disposal (Approach 1) – to address contaminated soil utilizing conventional earthwork equipment and standard construction methods;

Alternative No. 3: Excavation and Off-Site Disposal (Approach 2) – to address contaminated soil utilizing conventional earthwork equipment and standard construction methods, with consideration toward using means to address deeper soil (e.g., sheeting).

Groundwater:

Alternative No. 1: No Action;

Alternative No. 2: Monitored Natural Attenuation;

Alternative No. 3: Groundwater Extraction and Ex-Situ Treatment.

Additional details regarding the criteria used during preliminary screening and the components of the remedial alternatives are presented in Sections 4.0 and 5.0, respectively.

1.2 PURPOSE AND ORGANIZATION OF REPORT

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

1.3 SCOPE OF WORK

GZA completed the following scope of work for the FFS:

Identified Standards, Criteria and Guidelines (SCGs) that may apply to the specific conditions at the Site. These generally include State 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 (SCG 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 FRI.

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

Short-term impacts and effectiveness;
Long-term effectiveness and permanence;
Reduction of toxicity, mobility and volume;
Implementability;
Compliance with applicable or relevant and appropriate SCGs and Site remediation goals;
Overall protection of human health and the environment; and
Cost.

Compared the alternatives based on the seven criteria identified above.

Provided conclusions regarding the FFS.

Prepared this report summarizing the findings of the FFS.

The FFS study and report were conducted in general accordance with:

The scope of work described in the "Project Management Plan, Spectrum, Site No. 1-52-029" dated January 1999;

Procedures recommended in the NYSDEC Division of Hazardous Waste Remediation, TAGM 4025 Guidance, "Guidelines for Remedial Investigation/Feasibility Studies" dated March 1989;

NYSDEC Division of Hazardous Waste Remediation TAGM 4030 Guidance, "Selection of Remedial Actions at Inactive Hazardous Waste Sites" as revised May 1990;

USEPA Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA dated October 1988;

"Project Management Plan Amendment 1, Spectrum Finishing Corporation Site, Site No. 1-52-029" dated May 2000; and

"Project Management Plan Amendment 2, Spectrum Finishing Corporation Site, Site No. 1-52-029" dated February 2001.

The project Management Plan incorporates the following additional work plan documents:

"Field Activity Plan, Spectrum Finishing Corporation Site RI/FS, Site No. 1-52-029" dated April 1999.

"Quality Assurance Project Plan, Spectrum Finishing Corporation Site RI/FS, Site No. 1-52-029" dated April 1999; and

"Health and Safety Plan, Spectrum Finishing Corporation Site RI/FS, Site No. 1-52-029" dated April 1999.

2.0 SITE BACKGROUND

This section summarizes the findings of the Focused Remedial Investigation. The FRI report should be consulted for additional details.

2.1 SITE DESCRIPTION

The SFC Site property consists of approximately 0.9 acres of land, located at 50 Dale Street in West Babylon, New York (see Figure 2-1). For the purpose of the FRI, the Site study area was extended to the north to include the parking lot up to the southern edge of the buildings located at 60 Dale Street (approximately 1.3 acres). The Site includes the original on-Site building, approximately 60 feet by 320 feet (19,400 square feet). Areas not occupied by the building consist of paved parking to the north, an unpaved alleyway to the south, and grassy areas to the east and west of the building. Current tenants in the building include a machine shop, door manufacturer, and a restaurant/grocery store equipment salvage and storage facility. The Site study area also included downgradient areas (to the south) to Edison Avenue (about 400 feet south of the Site) with contaminated groundwater. As discussed with NYSDEC, evaluation of groundwater south of Edison Avenue was not conducted. The SFC Site and study area are depicted on Figure 2-2.

2.2 SITE HISTORY SUMMARY

SFC Site

The SFC began operations at the Site around 1968. Building department records indicate that the SFC building (50 Dale Street) was constructed in the late 1960s. Metal finishing operations at the Site included electroplating (in particular copper, cadmium, chromium and nickel) of high strength alloys (for the aerospace industry), chromium conversion coating (aluminum parts), and chemical cleaning. The facility was known to have specialized in descaling and chemical cleaning of titanium alloys. Painting was also reportedly conducted at the facility.

During the 1970s, the Suffolk County Department of Health Services (SCDHS) inspections revealed discharges of liquid plating wastes to the on-Site soil and drainage structures. Since about 1983, SFC discontinued discharge of wastewater into the on-Site drainage structures, and disposed the wastewater off-Site. In June 1994, SFC filed Chapter 7 bankruptcy and ceased operations.

The USEPA completed a removal action to address the on-Site wastes in August 1997 through March 1998. The removal action included the removal and disposal of a total of 25,767 gallons and 77 cubic feet of various hazardous wastes. Two concrete-lined sumps, various exterior sumps/drywells, various USTs, paint booths and several vats were observed inside the building during the EPA removal action. The removal action activities included the scraping and sweeping of the interior floors to remove accumulated wastes and pressure washing of the boiler room, wastewater treatment room, garage area, storage room, process rooms and paint booths.

Agency Involvement

The SFC Site is a NYSDEC Class 2 Inactive Hazardous Waste Site, Site Code 1-52-029. The Site was added to the NYSDEC registry in December 1983.

NTU Site

The NTU Site is a delisted NYSDEC Class 2a inactive hazardous waste disposal Site (registry number 1-52-086). This facility adjoins the Site to the north. NTU produced high-resolution printed circuit boards and its operations included drilling, cleaning and electroplating. Chemicals used at the NTU facility include ammonium persulfate, sulfuric acid, hydrochloric acid, copper plating solution, and etching solution (containing copper, lead and nickel).

No volatile organic chemicals were reportedly used at the NTU facility. Additionally, according to information contained in the Phase II Investigation Report, there was no documentation to verify that the organic compounds detected were ever used at the NTU Site. The Phase II report indicated it is possible that contamination from an outside source reached the leach pools via nearby facilities that use VOCs (including the SFC Site). The parking lot on the south side of the NTU building is considered to be part of the SFC Site.

Remediation (soil removal) of metal contaminated soil was completed in select drain pools around the Site. According to SCDHS, following the removal of contaminated soil, the remediated drain pools were abandoned by filling with a lime slurry, sealed and covered with asphalt.

2.3 SUMMARY OF FOCUSED REMEDIAL INVESTIGATION

Site activities conducted during the FRI study were performed in three phases between June 1999 and July 2001. The FRI study was conducted to evaluate surface and subsurface environmental conditions and to provide data pertaining to the nature and extent of contamination. The field explorations included: a geophysical survey; Geoprobe soil borings; test pit explorations; test boring and monitoring well installations; cesspool/storm drainage structure observations; groundwater level survey; hydraulic conductivity testing; water supply well inventory; existing monitoring well assessment; health and safety monitoring; and environmental sampling. Select results of analytical testing of environmental samples, which are considered pertinent and representative of Site conditions for the purposes of this FFS, are presented herein as Figures 2-3 through 2-5. The FRI report should be consulted for additional information concerning Site conditions.

Additionally, an Interim Remedial Measure (IRM) was conducted at the Site in April 2000. The IRM activities included liquid and soil/sediment removal from select cesspools and drainage structures at the Site and off-Site disposal.

2.3.1 Summary of Surface Features and Surface Water Hydrology

The ground surface elevation at the Site is approximately 63 feet, based on the National Geodetic Vertical Datum (NGVD); and the overall Site is generally flat. Site areas not occupied by the buildings consist of paved parking lots to the north, an unpaved alleyway to the south, and grassy areas to the east and west of the building. The surrounding area includes a mixture of industrial and commercial properties. The New Montefiore Cemetery is located immediately south of Edison Avenue, which bounds the industrial/commercial area (of which the Site is a part) to the South.

Natural surface water bodies (e.g., streams or ponds) do not exist near the Site. However, manmade drainage basins are located in the area. Asphalt and gravel areas surrounding the Site buildings direct surface water runoff at the Site. The stormwater from the parking areas, which also includes some run-off from the building roof, generally collects in several stormwater drainage structures located south of the former NTU building and north of the former SFC building. The drainage structures have perforated walls and, in most cases, no bottoms. Thus, drainage into subsurface soil occurs. Stormwater along Dale and Cabot Streets drains to catch basins that convey water toward Edison Avenue.

2.3.2 Site Geology and Hydrology

The geologic focus of the FRI study is the glacial outwash sands belonging to the Upper

Glacial Aquifer extending to the uppermost region of the Gardiners Clay layer.

The overburden deposits encountered at the Site generally consist of fill materials, glacial outwash, and clay soil. The fill deposit was generally encountered from the ground surface (at each of the subsurface explorations around the Site building) and to less than two feet below ground surface (bgs). The composition of the fill material varies depending on location at the Site and is also found at greater depths adjacent to underground structures (i.e., cesspools and USTs).

Glacial outwash deposits consisting primarily of gravelly sand underlie the fill at the Site. This material is the prevalent overburden at the Site study area. This glacial sediment (the Upper Glacial Aquifer) was observed up to depths of approximately 90 feet bgs. The Upper Glacial soil consists of fine to coarse sands and gravel. Occasional layers or seams of finer grained soil (fine sands and silts) were observed in the soil samples. The Upper Glacial sand is continuous across the study area and is the predominant water-bearing unit studied at this Site. During this study, the groundwater table was observed at approximately 18 feet bgs.

The Gardiners Clay was observed underneath the Upper Glacial sands at the Site during monitoring well installation. The clay was encountered at a depth of approximately 90 feet bgs and was encountered in the deep monitoring well borings. This clay layer was penetrated approximately one foot during this study. This clay layer is reported to be approximately 30 feet thick, and acts as a lower confining layer for the Upper Glacial Aquifer.

The groundwater flow direction in the study area is southeasterly based on the groundwater measurements made, as depicted on Figures 2-4 and 2-5. The southeasterly flow direction is generally consistent with the apparent regional groundwater flow and previous studies. The groundwater flow velocities at the Site were calculated and ranged from about 0.05 to 6 feet per day (fpd), with an average of 2 fpd or 700 feet per year.

<u>2.3.3 Nature and Extent of Contamination</u>

Based on historical information and previous studies conducted at and near the Site, several potential source areas of contamination were identified. Source areas identified include: cesspools, drainage structures, interior sumps, surficial spills, and upgradient groundwater.

Based on analytical testing of environmental media during the FRI, Site specific chemical classes of concern include VOCs and inorganic compounds (metals). Other chemical classes, including semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), and pesticides were analyzed for and detected at the Site, but appear to be less significant. The criteria (Recommended Soil Cleanup Objectives (RSCO)) used to assess whether the soil sample results represent a potential threat to human health or the environment is provided in NYSDEC TAGM 4046 dated January 1994. The New York State Class GA groundwater quality standards were used for comparison to the groundwater sample results.

As described below, the IRM was undertaken to remove heavily contaminated sediments/soil located in selected cesspools and drainage structures at the Site. For the purposes of evaluating the nature and extent of contamination, the pre-IRM analytical testing results were used to portray source area contaminant conditions at the Site; and post-IRM results were used to evaluate existing source area and soil quality.

Also, based on a review of the data collected (including the trends over time) for the three groundwater sample rounds conducted in July 1999, July 2000, and April 2001 (the 1999, 2000, and 2001 rounds, respectively), and considering the IRM was conducted in April 2000; TAMS/GZA generally consider the 1999 and 2000 rounds as representative of pre-IRM conditions and the 2001 round as post-IRM conditions.

2.3.3.1 Source Areas

The source areas include cesspools and drainage structures, surficial soil in the alleyway and the sump near the former rinsewater and treatment holding area. Other potential sources include the pipelines within the SFC Building and those interconnecting the cesspools and drainage structures. Upgradient groundwater also appears to be adding contamination (VOCs and metals) to the Site groundwater. The most significant contamination was found in the cesspools and drainage structures.

In general, the pre-IRM results from the cesspools and drainage structures indicated that VOCs, metals, SVOCs and PCBs exceeded subsurface soil RSCOs in one or more of the structures. Post-IRM results indicate that soil containing VOCs, PCBs, and SVOCs above RSCOs have been removed. Soil containing high concentrations of metals was also removed; however, lower/residual metals concentrations are above the RSCOs in soil remaining in many of the cesspools and drainage structures.

2.3.3.2 IRM Summary

Eleven cesspools, 12 drainage structures and two former well structures exist at the Site. In general, the cesspools and drainage structures are similar and are approximately eight-foot diameter, round concrete vaults with perforated sides and apparently no bottom. The primary difference is the cesspools have solid tops or are buried and collect sanitary wastes and the drainage structures have open grate tops for stormwater runoff collection, which also includes some run-off from the building roofs. The cesspools and drainage structures are located in the parking lot area north of the SFC building, with the exception of three cesspools located in the grassy areas proximate to Dale Street (two structures) and Cabot Street (one structure).

The IRM was undertaken to remove and dispose of heavily contaminated sediments/soil identified in selected cesspools and drainage structures. Eleven of these structures were selected by NYSDEC for remediation including: DS-4, DS-5, DS-8, DS-10, CP-3, CP-4, CP-5, CP-6, CP-7, CP-8, and CP-10 (refer to Figure 2-2). The IRM included the removal of 11,500 gallons of non-hazardous water; 3,950 gallons of impacted water; and 43 tons of soil/sediment identified as hazardous waste (Waste Code D006 Cadmium contaminated).

Post-IRM results indicate that soil containing VOCs, PCBs, and SVOCs above RSCOs have been removed. Soil containing high concentrations of metals was also removed; however, lower/residual metals concentrations are above the RSCOs in soil remaining in many of the cesspools and drainage structures.

2.3.3.3 Soil (Surface and Subsurface) Contamination

VOCs:

There were VOC detections and exceedances of RSCOs in surface soil at three locations in the alleyway. However, the VOC results from subsurface soil did not show exceedances of RSCOs.

Inorganics:

The levels of the four “indicator” metals (i.e., cadmium, chromium, copper, nickel) in soil are shown on Figure 2-3. This figure includes both surface soil and subsurface soil results. The highest levels of these metals are in the alleyway south of the SFC Building and from samples inside the SFC Building (TP-1, GP-40 and GP-47). It should be noted that the cesspools and drainage structures also contained high levels of metals in the soil, although these results are not shown on this figure.

PCBs/Pesticides:

There were three PCB exceedances of RSCOs in the surface soil and one exceedance of PCBs was detected in the subsurface soil. There were no exceedances of the pesticide RSCOs in surface soil, and ten exceedances of pesticide RSCOs in subsurface soil.

SVOCs:

There were SVOCs reported in surface and subsurface soil. The concentrations reported were generally below their respective RSCOs.

2.3.3.4 Groundwater Contamination

VOCs:

Twenty-four VOCs were detected in the groundwater samples. Twelve of the VOCs were detected in excess of groundwater standards. PCE was detected the most frequently in the groundwater and at the highest concentration (610 ug/L at GP-12). A plan view of the PCE distribution in shallow groundwater is included as Figure 2-4. This map displays the shallow PCE concentration contours. The higher levels of PCE are situated on the east portion of the Site. In general, PCE was not detected on the west side of the Site with the exception of GP-29 and MW-1D2.

The PCE plume indicates that upgradient groundwater is contaminated (e.g., MW-9S, 140 ug/L). Other sources of PCE are known to exist upgradient. Thus, a potential source area exists north and/or west of both the SFC and NTU Site. Other additional sources of PCE appear on Site. For example, CP-6 contained 12,000 ug/kg of PCE in the sediment sample.

The analytical test results indicate a trend of decreasing PCE concentrations in the central west part of the Site and increasing PCE concentration downgradient of the Site between the 1999/2000 and 2001 sample rounds.

Inorganics (Filtered and Low-Flow Results):

The inorganics from the filtered and low-flow sampling indicate that eleven inorganics exceed groundwater standards. They are antimony, cadmium, chromium, copper, iron, lead, manganese, nickel, sodium, thallium and cyanide.

The low-flow results indicate that the four significant Site metals include cadmium, chromium, copper, and nickel.

Cadmium: Cadmium was detected above the groundwater standard at 31 locations. It appears that cadmium becomes prevalent in the groundwater just south of the cesspools and drainage structures in the parking area between the NTU Site and the SFC Site. The cadmium exceedances appear to originate from east to west across the Site paralleling the line of cesspools and drainage structures. The highest levels of cadmium were detected at MW-4S (672 ug/L) and GP-2 (593 ug/L). Cadmium analytical results from the 2001 sample round are depicted on Figure 2-5.

Chromium: Chromium was detected above the groundwater standard at seven locations: MW-1S, MW-1D2, MW-2S, MW-3S, MW-3D, MW-4S, and MW-6S. The highest level of chromium was detected at MW-6S (3,180 ug/L). The other chromium levels were less than 100ug/L. It appears that chromium could be from the Site as high levels of chromium were detected in the source areas (e.g., cesspools). However, upgradient groundwater at well MW-1 cluster contained elevated chromium levels (62.9 to 71.7 ug/L).

Copper: Copper was detected in excess of the groundwater standard primarily in the eastern portion of the Site. Three groundwater sample locations contained elevated levels: GP-16 (205 ug/L), GP-4 (960 ug/L), and MW-4S (1910 ug/L). These data suggest that a source of copper exists or existed on Site. Upgradient copper concentrations ranged from 16.2 to 33.5 ug/L.

Nickel: Nickel was detected at concentrations exceeding the groundwater standard at 20 locations. Upgradient groundwater contained nickel concentrations in excess of the groundwater standard (100 ug/L). Specifically at well cluster MW-1 and well MW-9S the nickel concentration ranged between 189 to 313 ug/L. However, the nickel concentrations are significantly higher at several downgradient locations such as: GP-9 (1,770 ug/L); GP-4 (528 ug/L); MW-4S (916 ug/L); MW-6S (547 ug/L); MW-12S (501 ug/L); and GP-2 (999 ug/L). This suggests a source of nickel exists on Site.

PCBs/Pesticides:

Four pesticides were detected in the groundwater. Two pesticides, aldrin and heptachlor epoxide, exceed the groundwater standards at wells MW-10S, MW-3S, MW-4S, and MW-5D2. There does not appear to be a traceable pattern to the SFC Site. Samples were not tested for PCBs.

SVOCs

In general, SVOCs were not detected. The detected SVOC is bis (2-ethylhexyl) phthalate. However, the concentrations did not exceed the groundwater standard.

2.3.4 Contaminant Fate and Transport

Primary routes of migration from the Site are via groundwater and volatilization to soil gas/air. The groundwater at the Site in the glacial outwash deposits generally flows southeasterly. It is generally understood that the contamination will flow with the groundwater in a southeasterly direction. Volatilized contamination from soil and groundwater is expected to migrate in soil gas above the groundwater table. Migration of soil gas contaminated with VOCs is expected and is less predictable than groundwater migration due to subsurface heterogeneities and subsurface structures (e.g., utilities, building foundations). The source of the VOC contamination is expected to primarily be associated with contaminated groundwater.

Groundwater migration, under current conditions, is expected to spread the contamination to the south, with possible easterly components based on the direction of groundwater flow. Vertical spreading is also expected. The groundwater at the Site indicates upgradient groundwater contamination is present at well cluster MW-1 and well MW-9S. PCE, nickel and chromium were detected in the upgradient groundwater at concentrations exceeding groundwater quality standards. Higher concentrations of PCE, nickel and chromium were detected in the on-Site groundwater samples, suggesting that the Site is contributing to these plumes.

The VOCs and metals are expected to flow at rates less than groundwater. As the contamination migrates southerly, the natural organic carbon in the soil will adsorb the organics, thus slowing the advance of the VOC plume. Additionally, VOCs will be attenuated in the direction of groundwater flow in response to dispersion, volatilization, and degradation, among other factors.

VOC migration rates were calculated using a retardation factor of about 1.1 to 1.4 times slower than groundwater. The average groundwater velocity is estimated at 700 feet per year, and thus, the retarded VOC velocities are expected to range between 500 and 650 feet per year.

Metals migration is attenuated by adsorption to the soil, dispersion and precipitation among other factors. Based on the distance traveled and the assumed time the metals have been in groundwater, the inferred metal transport velocity would range between approximately 15 to 30 feet per year or more.

2.3.5 Water Well Inventory

According to the Suffolk County Water Authority, no public drinking water wells exist within a one-mile radius of the Site. The nearest public water supply well is located about 1.2 miles to the southeast. There are several private water supply wells in the area of the Site. The nearest well to the SFC Site appears to be an irrigation well, located about 1000 feet southwest of the Site. This well is reportedly used for watering lawns in the New Montefiore Cemetery. Additionally, according to NYSDEC and SCDOH, there are irrigation well(s) located in the New Montefiore Cemetery south of the Site. As discussed with NYSDEC, determination of the construction details and location of this well(s) was not conducted as part of our FRI study.

Also, various monitoring wells associated with the Babylon Landfill (located about 1,500 feet east of the Site) are located east and south of the Site. A leachate-enriched groundwater plume extends about 11,000 feet downgradient (south) of the landfill. The plume is reportedly about 1,900 feet wide.

2.3.6 Qualitative Risk Assessment

A qualitative baseline human health risk assessment was conducted based on the information and data obtained during the FRI study. The qualitative human health evaluation included an exposure assessment, an evaluation of Site occurrence, hazard identification and comparison to New York State SCGs.

A majority of the Site is paved and access is restricted, therefore, there is low exposure potential in these areas. However, the surface soil is exposed in the alleyway south of the SFC Building, and a greater exposure potential exists in that area.

There is a moderate exposure potential to subsurface soil due to leaching to groundwater. Access to subsurface Site soil is considered low, as it would likely be limited to future construction or maintenance of existing subsurface utilities including the cesspools and drainage structures.

The potential of exposure to overburden groundwater is moderate based on the current and anticipated future use of the Site and the presence of a public water supply in the area. (Refer to Section 2.3.5).

There is a low exposure potential for soil gas vapors due to the relatively low groundwater concentrations; monitoring requirements for cesspool and drainage structure confined space entry; and lack of basements in the local Site vicinity (where structures are primarily slab-on-grade construction).

There is a low exposure potential for dust particulate from the Site as the majority of the Site is paved, and the exposed soil in the alleyway is situated between two buildings limiting exposure to wind.

2.3.7 Conclusions

The FRI concluded that the following Site environmental media need to be addressed by this FFS.

Surface soil;

Subsurface soil, including cesspools and drainage structures and the piping that lead from the buildings to the structures or between structures;

Overburden groundwater.

In addition, off-Site concerns include the following.

Groundwater contamination located off-Site to the south and east resulting from on-Site sources. Upgradient groundwater contamination sources and possible downgradient sources may also exist (i.e., cesspools or drainage structures possibly impacted by runoff from the Site.)

Subsurface soil in the drainage structures in the parking area of the Building at 40 Dale Street.

3.0 IDENTIFICATION OF STANDARDS, CRITERIA AND GUIDELINES AND REMEDIAL ACTION OBJECTIVES

3.1 INTRODUCTION

Standards, Criteria and Guidelines (SCGs) are used at inactive hazardous waste sites to establish the locations where remedial actions are warranted and to establish cleanup goals. SCGs include State requirements. This section presents potentially applicable SCGs and other standards and criteria; and establishes cleanup goals and remedial action objectives for contaminated Site media.

3.2 POTENTIALLY APPLICABLE STANDARDS, CRITERIA AND GUIDELINES (SCGs) AND OTHER CRITERIA

Applicable Requirements are legally enforceable standards or regulations that have been promulgated under State law, such as groundwater standards for drinking water.

Relevant and Appropriate Requirements include those requirements, which have been promulgated under State law which may not be "applicable" to the specific contaminant released or the remedial action contemplated, but are sufficiently similar to 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 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 sections present the three categories of SCGs: chemical-specific, location-specific, and action-specific.

3.2.1 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 a 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 a site. Chemical-specific SCGs for surface and subsurface soil and groundwater at the SFC Site are identified in Tables 3-1 through 3-3. The SCGs include applicable TAGM 4046 RSCOs and NYSDEC Class GA groundwater criteria.

3.2.2 Location-Specific SCGs

Location-specific SCGs apply to sites that contain features such as wetlands, flood plains, sensitive ecosystems or historic buildings that are located on, or in close proximity to the Site. Based on the FRI, wetlands, flood plains, sensitive ecosystems or historic buildings are not located on, or in close proximity to the Site. Thus, location-specific SCGs were not identified for this Site.

3.2.3 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 identified for the Site are provided in Table 3-4. These SCGs may vary for remedial design, based on the remedy(s) selected for the Site.

3.3 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, TAMS/GZA conducted the following as part of the FRI and FFS.

Identified contaminants present in the environmental media at the Site study area.

Evaluated existing or potential exposure pathways in which the contaminants may effect human health and the environment.

Identified pathways having a moderate to high likelihood for exposure.

Identified chemical-specific SCGs that apply to the likely exposure routes to establish the contaminants of concern and proposed cleanup goals for purposes of remediation.

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 at the Site, based on the contaminants of concern and SCG Goals. Remedial action objectives are summarized at the end of this section.

3.3.1 Contaminants of Concern and SCG Goals

Tables 3-1 through 3-3 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 3.3.2. Proposed cleanup goals for each contaminant were developed in accordance with the procedures described below.

Chemical-Specific SCGs for soil (surface and subsurface soil) and groundwater were selected as described above in Section 3.2.1.

Contaminants of concern were identified for the environmental media 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.

Tables 3-1 through 3-3 identify the contaminants of concern for the purposes of remediation in the environmental media (i.e., surface soil, subsurface soil and groundwater), the maximum concentrations detected and location of these detections the proposed cleanup SCG, the number of samples that exceed the cleanup SCG and the number of samples analyzed.

3.3.2 Contaminated Media and Exposure Pathways

This subsection addresses the environmental media at the Site and describes the types of contaminants present, the potential exposure pathways, and the proposed remedial action objectives to reduce the potential for future exposure. Subsurface soil that was previously removed during the IRM activities is not included.

3.3.2.1 Surface and Subsurface Soil

Surface Soil:

The FRI data indicate that contamination is present in the surface soil at the Site. Table 3.1 lists the contaminants of concern detected in samples of the surface soil. Elevated levels of two VOCs, two PCB compounds, and various metals were identified at the Site.

Exposure to chemical substances within surface soil may occur via dermal contact or ingestion. The Site is accessible from the surrounding commercial areas during business hours. Portions of the Site are restricted by a gated chain link fence during evening hours. In addition, the majority of the Site is paved or covered with slab-on-grade building. Thus, exposure to surface soil via dermal contact or ingestion is considered low. However, surface soil in the alleyway is accessible to the public. The alleyway is not expected to be frequented by the public, considering it is blocked by vegetation and utility poles, is extremely, narrow and located on private property. However, the possibility does exist for the Site to be abandoned, whereby unrestricted access to the Site could occur.

Subsurface Soil:

The FRI data indicate that contamination is present in the subsurface soil at the Site. Table 3.2 lists the contaminants of concern detected in samples of the subsurface soil. VOC, SVOC, PCB and pesticide contaminants were not identified at elevated levels at the Site, with the exception of one SVOC compound and one pesticide compound. These two exceedences are considered to be relatively low. The primary contaminants of concern include metals (specifically cadmium, chromium, copper and nickel).

Exposure to chemical substances within on-Site subsurface soil (including those within cesspools and drainage structures) may occur via dermal contact, inhalation or ingestion under the hypothetical future scenario where on-Site intrusive work is performed and workers are unaware or not properly trained to work with potentially hazardous materials. If these materials are brought to the surface and not adequately secured, it is possible for exposure to local to occur.

It should be noted that the Site is currently recognized by the NYSDEC as an inactive hazardous waste disposal site. As such, intrusive work on the Site, including construction or maintenance work on cesspools and drainage structures, should be conducted in accordance with requirements that include health and safety monitoring. Therefore, the likelihood of this potential exposure is relatively low, if proper health and safety procedures are followed.

Contaminated subsurface soil also acts as a source of continuing groundwater contamination.

3.3.2.2 Groundwater

Overburden groundwater sampling and laboratory analyses were completed as part of the FRI. Table 3-3 identifies the contaminants of concern detected in the overburden groundwater samples. Based on qualitative risk assessment presented in the FRI study, the contaminants of concern for groundwater are VOCs and inorganics (cadmium, chromium, copper and nickel).

Exposure to overburden groundwater, if used as a water supply, includes ingestion, dermal contact and inhalation of vapors. There is sufficient overburden groundwater to serve as a water supply source, as evidenced by the groundwater supply wells located 1.2 miles southeast of the Site. However, these water supply wells reportedly extract groundwater from greater than 300 feet below ground surface. Therefore, threat to these wells from contamination at the Site is not expected.

Based on information from the SCDHS, active irrigation supply wells are located near and in the New Montefiore Cemetery, downgradient of the Site. These extraction wells are reportedly located in the Upper Glacial aquifer and are used to irrigate the cemetery and for other maintenance activities. These extraction wells are not located directly downgradient of the Site. There are no known irrigation extraction wells in the plume area. Therefore, the potential of exposure to Site-impacted overburden groundwater is expected to be low.

In addition, future development or utility repair proximate to or downgradient of the Site may expose workers to groundwater during excavation and/or dewatering. The likelihood for this exposure scenario is considered moderate. Therefore, exposure to Site-impacted groundwater could pose a significant risk based on the concentrations encountered; thus remediation of groundwater is warranted.

3.3.3 Remedial Action Objectives

3.3.3.1 Surface and Subsurface Soil

The remedial action objectives for the Site soil are:

1. Reduce the potential for direct human or animal contact with the contaminated soil.

2. Reduce the risk of contaminating groundwater by reducing the potential for leaching of contaminants into the groundwater.

3.3.3.2 Overburden Groundwater

The remedial action objectives for the overburden groundwater are:

1. Reduce further off-Site migration of contaminated overburden groundwater to the extent practical.

2. Reduce the levels of contamination in the overburden groundwater at the Site study area boundary (i.e., Edison Avenue) to the extent practical.

3. Attain the proposed cleanup goals for overburden groundwater quality at the Site boundary to the extent practical.

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.

It should be noted that contaminated groundwater identified from an upgradient source north of the Site is expected to continue to migrate in a southerly direction and would be remediated by the Site remedial system(s) for groundwater.

4.0 PRELIMINARY SCREENING OF REMEDIAL ACTIONS

4.1 INTRODUCTION

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. Potential remedial actions are evaluated during the preliminary screening on the basis of effectiveness, implementability, and relative cost. The purpose of the preliminary screening is to eliminate remedial actions that may not be effective based on anticipated Site conditions, or that cannot be implemented technically at the Site; and, to narrow the list of alternatives that will be evaluated in greater detail later in Sections 5.0 and 6.0 of this report.

The remedial actions include general response actions (e.g., containment, in-situ treatment) that may be accomplished using various remedial technologies. During the preliminary screening, the intent is to identify general response actions and remedial technologies that may be appropriate for Site conditions. The list of general response actions considered herein is intended to include those actions that are most appropriate for the Site. A select, focused group of general response actions and remedial technologies for groundwater is considered.

The results of the preliminary screening are summarized in Tables 4-1 and 4-2. The table identifies those general response actions and remedial technologies, which appear to meet the remedial action objectives for groundwater impacted with VOCs and metals contamination at the Site. Remedial actions that pass the preliminary screening are assembled into remedial alternatives in Section 5.0 (based on the assumptions included in Appendix A) and then evaluated in greater detail on the basis of environmental benefits and cost in Section 6.0.

4.2 REMEDIAL ACTION AREAS AND VOLUMES

This subsection presents the estimates of areas and volumes of contaminated soil and groundwater to assist in evaluating remedial alternatives later in this report. The estimates are based on the information presented in the FRI report, as summarized in Section 2.0 herein, and as depicted on Figures 2-3 through 2-5. Calculations of the estimated areas and volumes of contamination are presented in Appendix B.

4.2.1 Soil

The estimated volume of contaminated Site soil (above the water table) is approximately 8,341 cubic yards (see Figure 4-1). This estimate includes the soil associated with the following areas.

Western Alleyway: Contaminated soil is present in the western portion of the alleyway, located south of the Site building and adjacent to Major Rubber Products. Soil in this portion of the alleyway is assumed to be contaminated to a depth of four feet. The contaminated area is approximately 750 square feet (sf); and the contaminated soil volume is approximately 110 cubic yards (cy).

Eastern Alleyway: Contaminated soil is present in the eastern portion of the alleyway, located south of the Site building and adjacent to Art Tradition. Soil in this portion of the alleyway is assumed to be contaminated to a depth of eighteen feet (approximately to the groundwater table). The contaminated area is approximately 4,850 sf; and the contaminated soil volume is approximately 1,995 cy.

Southern Alleyway: Contaminated soil is present in the southern portion of the alleyway, located south of the Site building and between the Major Rubber Products and Art Tradition buildings. Soil in this portion of the alleyway is assumed to be contaminated to a depth of eighteen feet (approximately to the groundwater table). The contaminated area is approximately 500 sf; and the contaminated soil volume is approximately 330 cy.

SFC Building Interior (Eastern Portion): Contaminated soil is present inside the eastern portion of the Site building. Soil is assumed to be contaminated to a depth of eighteen feet (approximately to the groundwater table). The contaminated area is approximately 6,330 sf; and the contaminated soil volume is approximately 3,414 cy.

Cesspools/Drainage Structures: Contaminated soil remaining below the cesspools/drainage structures following IRM activities is assumed to extend to the groundwater table. Also, soil adjacent to some structures is assumed to be contaminated, based on the results of soil testing. The estimated volume of contaminated soil is approximately 2,421 cy.

Miscellaneous: Soil from two areas located inside the Site building (e.g., (1) area within a potential former sump; and (2) area potentially associated with surficial spillage) are assumed to be contaminated. This volume is estimated to be approximately 75 cy.

These areas are based on the results of analytical testing and assumptions concerning how the wastes were deposited on Site. However, based on available historical information, it is likely that additional overburden contamination associated with surface spillage(s), leaking pipes, etc. is present at additional Site areas, potentially even underneath on-Site and off-Site buildings (e.g., Art Tradition). Therefore, the extent of contamination may be greater than that identified during the FRI.

4.2.2 Groundwater

The estimated volume of contaminated groundwater associated with the Spectrum Finishing Corporation Site is approximately 23 million gallons. This estimate is based on the following.

The estimated area of contaminated Site groundwater. Based on an evaluation of FRI analytical data, the area of contaminated Site groundwater is generally that containing PCE concentrations greater than 5 ppb (in the shallow, intermediate, and deep portions of the aquifer, as defined by the screened zones of Site monitoring wells); and that containing cadmium concentrations greater than 5 ppm (primarily present in the shallow portion of the aquifer). The areal extent of shallow contaminated groundwater is approximately 231,000 sf. The areal extent of intermediate contaminated groundwater is 96,000 sf. The areal extent of deep contaminated groundwater is 228,000 sf. Refer to Appendix B for additional details.

The average saturated thickness of the Site plume. In general the contaminated Site groundwater covers the full saturated thickness of the aquifer (i.e., approximately 73 feet), based on water level measurements in Site monitoring wells (shallow, intermediate, and deep) and groundwater analytical results. The average thickness of the plume in shallow groundwater is approximately 13 feet (the upper portion of the aquifer). The average thickness of the plume in intermediate groundwater is approximately 32 feet. The average thickness of the plume in deep groundwater is approximately 28 feet.

Soil porosity. The effective porosity for the Upper Glacial Aquifer is reported to be approximately 0.20 to 0.30. A porosity value of 0.25 is used for the purposes of these calculations.

Contaminated groundwater was detected at elevated concentrations in monitoring wells installed adjacent to Edison Avenue. Therefore, it is expected that contaminated groundwater has migrated and is present in downgradient areas (e.g., New Montefiore Cemetery). The nature and extent of the downgradient plume has not been evaluated as part of this FRI/FFS.

Also, as further described in Section 2.0, based on historic regional and Site information and FRI analytical testing, upgradient groundwater also appears to be adding contamination (VOCs and certain metals) to the Site groundwater. Therefore, the volume of contaminated Site groundwater is not limited to that associated with historic Site usage and waste deposition.

4.3 GENERAL RESPONSE ACTIONS

To satisfy the remedial action objectives for the Site, remediation will be required for the soil and groundwater. General response actions that are available to meet the remedial action objectives and under consideration are identified below.

General response actions for soil include:

No Action:

The No Action alternative involves taking no further action to remedy soil at the Site. NYSDEC and USEPA guidance requires that the No Action alternative automatically pass through the preliminary screening

Institutional Controls:

Institutional controls (e.g., deed or access restrictions) could be used at the Site property to preclude contact with remaining contaminated soil.

Containment/Isolation:

The containment action for the Site soil could generally be used to reduce the potential for direct contact with contaminated materials; limit erosion and transport of contaminated surface soil; provide a surface seal for the soil vapors; and reduce infiltration of precipitation through contaminated soil and into the groundwater. A significant portion of the Site is currently contained by an asphalt pavement cover, which is one remedial technology option for containment.

Treatment (In-Situ and Ex-Situ):

The analytical data for soil samples collected during the RI indicate that soil with contaminants of concern is primarily located in the upper 18 feet of soil and in subsurface soil below the groundwater table. Removal and ex-situ treatment could be appropriate for soil above the groundwater table. In-situ treatment at the Site may not be applicable due to the limited space available due to buildings and utilities.

Excavation and Off-Site Treatment and/or Disposal:

Excavated contaminated soil could be treated on-Site or sent off-Site to at approved treatment or disposal facility. On-Site treatment could be difficult due to the limited available space at the Site.

General response actions for groundwater include:

No Action:

The No Action alternative involves taking no further action to remedy groundwater conditions at the Site. NYSDEC and USEPA guidance requires that the No Action alternative automatically pass through the preliminary screening.

Monitored Natural Attenuation:

Monitored natural attenuation is considered a passive remedial action. Monitored natural attenuation refers to the reliance on the natural attenuation processes to achieve proposed cleanup goals. Natural attenuation processes include a variety of physical, chemical and biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume or concentration of contamination in groundwater.

Institutional Controls:

Institutional controls (e.g., deed or access restrictions) could be used at the Site property to preclude contact or use of contaminated groundwater.

Containment/Isolation:

Containment technologies may be used 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.

Containment/Collection:

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, such as by pumping from extraction wells.

Treatment (Ex-Situ):

This general response action involves treating removed 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 a nearby water body or stormwater sewer in substantive conformance with the State Pollutant Discharge Elimination System (SPDES) permit requirements.

4.4 SCREENING OF REMEDIAL TECHNOLOGIES

4.4.1 Criteria for Preliminary Screening

In accordance with guidance documents issued by NYSDEC (TAGM HWR-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) is proven or reliable and how the proposed action may be in the long-term with respect to the contaminants and conditions at the site. Alternatives that 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.

Relative 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, moderate or low relative to other remedial actions based on knowledge of site conditions. A remedial action is eliminated during preliminary screening on the basis of cost if other remedial actions are comparably effective and implementable at a much lower cost.

4.4.2 Soil Remedial Technologies

The results of the preliminary screening of various remedial technologies that were considered for remediation of Site soil are presented in Table 4-1. The table identifies the remedial technologies that were subjected to preliminary screening by general response action, and describes the applicability of the technologies in terms of effectiveness, implementability and cost.

4.4.3 Groundwater Remedial Technologies

The results of the preliminary screening of various remedial technologies that were considered for remediation of Site groundwater are presented in Table 4-2. The table identifies the remedial technologies that were subjected to preliminary screening by general response action, and describes the applicability of the technologies in terms of effectiveness, implementability and cost.

4.5 RESULTS OF PRELIMINARY SCREENING

Based on the results of preliminary screening as summarized in Tables 4-1 and 4-2 and as discussed with NYSDEC, the following remedial actions/technologies will be considered further in the Development of Alternatives (Section 5.0) and Detailed Analysis of Alternatives (Section 6.0).

Soil:

No Action
Institutional Controls - Access Restrictions
Containment: Capping (Asphalt Pavement Cap and Concrete Cap)
Excavation and Off-Site Treatment/Disposal.

Groundwater:

No Action
Monitored Natural Attenuation
Institutional Controls - Access Restrictions

Institutional Controls - Water Use Restrictions
Containment: Capping (Asphalt Pavement Cap and Concrete Cap)
Containment/Collection: Extraction Wells On-Site, Ex-Situ Treatment (Chemical Precipitation, Ion Exchange, Granular Activated Carbon).

These technologies are grouped together to form remedial action alternatives, as described in Section 5.0.

5.0 DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES

This section presents a description of the three alternatives for both soil and groundwater that have been developed for this FFS.

Soil Alternative No. 1 – No Action
Soil Alternative No. 2 – Excavation and Off-Site Disposal (Approach 1)
Soil Alternative No. 3 – Excavation and Off-Site Disposal (Approach 2)
Groundwater Alternative No. 1 – No Action
Groundwater Alternative No. 2 – Monitored Natural Attenuation
Groundwater Alternative No. 3 – Groundwater Extraction and Ex-Situ Treatment.

The alternatives were developed using the general response actions and remedial technologies that pass the preliminary screening (Section 4.0), and the assumptions presented in Appendix A. A comparative analysis of the alternatives is presented in Section 6.0. Table 5-1 provides a summary of the three soil and three groundwater alternatives. Expanded descriptions of the alternatives are provided below.

5.1 SOIL

For surface and subsurface soil, metals are the primary class of contaminants requiring remediation. Metals contamination in the unsaturated soil is located at varying depths throughout the Site depending on the Site location (e.g., location of previous surface spills, cesspool/drainage structure discharges). The depth of contamination requiring remediation extends to the top of the groundwater table located about 18 feet bgs.

Excavated soil would be disposed of based on waste profiling analytical testing, as either hazardous impacted soil (disposal by landfill and/or treatment (e.g., incineration)) or as non-hazardous impacted soil (disposal by landfill).

5.1.1 Alternative No. 1 – No Action

The No Action alternative involves taking no further action to remedy soil conditions at the Site. NYSDEC 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 alternatives (Section 6.0).

5.1.2 Alternative No. 2 – Excavation and Off-Site Disposal (Approach 1)

Figure 5-1 presents a conceptual sketch of the remedial action for Alternative No. 2. (Approach 1). Surface and subsurface soil would be remediated by excavation of contaminated soil using conventional earthwork equipment and standard construction methods. Alternative No. 2 (Approach 1) would provide for the excavation (for off-Site disposal) of an approximate total of

1,580 cy of metals contaminated soil.

Soil excavation would be completed in several areas of the Site including: the western, southern and eastern alleyways; inside the SFC building; and inside cesspools and drainage structures identified with significant metals contamination. This remedial action would significantly reduce the volume of contaminated soil located at the Site.

It is assumed that the existing building would not be demolished or altered for the purposes of completing the Remedial Actions. Therefore, prior to the start of the Soil Remedial Actions a pre-construction building survey should be completed. This survey would include the SFC building and proximate buildings to the south (i.e., Major Rubber Products and Art Tradition Building). Costs for this survey have not been included in our cost estimate. As discussed with the NYSDEC, we have assumed that excavation activities would not be completed around existing utilities (e.g., utility poles, overhead wires, former ventilation stacks, underground fuel oil tanks, pipes, etc). Soil located proximate to these features would be left in place, with the exception of the natural gas service line located within the eastern alley that would be removed prior to the excavation work and reinstalled after backfill/compaction activities.

Excavated soil would be placed in roll-off boxes for disposal as either non-hazardous impacted waste or hazardous impacted waste depending on the results of analytical laboratory waste profile testing, visual field observation and field screening using portable instruments. Excavated soil would be screened for metals by means of x-ray fluorescence (XREF) technology to assist with waste characterization for off-Site disposal. Due to limited space and potential associated exposure issues, excavated soil would not be stockpiled on the Site for an extended duration.

Due to the limited access for earthwork equipment and limited space between building structures, soil in the alleyways would be excavated directly to the bottom of the building footers. However, below the footers a minimum excavation slope of 1:1 would be maintained to protect the structural integrity of the buildings. Soil would be excavated adjacent to the footers as far as the excavation slope allows. Additionally, in an effort to protect the surrounding structures, the excavations completed in the alleyways would be limited to 25-foot sections prior to backfill and compaction. Backfilling and compaction of the excavations would be completed in 12-inch lifts to specific depths below grade to accommodate asphalt paving (with polyethylene sheeting)/capping.

This alternative includes the placement of asphalt pavement (with polyethylene sheeting). An asphalt pavement/geosynthetic composite cap would be installed in the remediated alleyway areas and currently paved Site areas (e.g., parking lot) to reduce the infiltration of precipitation and potential for direct contact to remaining contaminated soil. The cap is assumed to be constructed to maintain current Site grades (sloped as necessary to promote adequate drainage) and includes the following:

Installation of a 40-mil Linear Low Density Polyethylene (LLDPE) geomembrane.

Installation of a Geosynthetic Drainage Layer (GDL) (a geosynthetic layer comprised of a geonet surrounded by geotextiles), one foot of drainage material, and a perimeter drainage system. The collected infiltration water is assumed to be directed to on-Site drainage structures.

Installation of an asphalt cap, including six inches of base course, and binder and top courses.

The excavations would be completed in the select areas as described below in greater detail specific to the area of remedial action.

Western Alley

Soil would be excavated from this alleyway, approximately 150 feet in length by 5 feet wide, to a depth of four feet bgs in six, 25-foot sections. A total volume of approximately 110 CY of soil would be excavated for disposal. Due to the limited access in the alleyway (e.g., due to narrowness, existing utility pole), small earthwork equipment (e.g., mini-excavator, motorized wheelbarrows) would be required to complete the remediation. For cost estimate purposes, this soil is assumed to be non-hazardous impacted waste.

Eastern and Southern Alley

The eastern alleyway, approximately 170 feet long by 8 feet wide, would be completed in six, 25-foot sections to a depth of 6.5 feet bgs (approximately 225 cy). The southern alleyway, approximately 25 feet long by 20 feet wide, would be completed in one section to a depth of 12.5 feet bgs (approximately 150 cy). Due to the limited access of the eastern alleyway (e.g., due to narrowness, existing utility pole), small earthwork equipment (e.g., rubber tire backhoe and bobcat style loaders) would be required to complete the excavation. Soil excavated from these two alleyways is assumed to be 2/3 non-hazardous impacted waste and 1/3 hazardous impacted waste, for the purposes of the cost estimate.

Interior SFC Building

The remedial action for the interior portion of the SFC building includes soil excavation of a 70 feet by 55 feet aerial extent to a depth of 4 feet bgs (with an excavation slope of 1:1) and excavation of the sump area (using sheeting) to about 8 feet below the bottom of the sump. A total volume of about 847 cy would be excavated for disposal, which (for cost purposes) is assumed to be 2/3 non-hazardous impacted waste and 1/3 hazardous impacted waste. One bay door is located along the northern side of the building where equipment and soil would have to enter and exit. The concrete in the interior of the building would be removed and replaced after soil excavation work. The sump pit will not be replaced following removal.

Cesspool and Drainage Structures

Twenty-three cesspools and drainage structures are located on Site, which would be remediated by excavating structure soil to the top of the groundwater table. The structures are generally 8-foot diameter, pre-cast and perforated concrete structures presumably with no bottom. The only known exception is the cesspool identified as CP-10, which was identified as having a concrete bottom during IRM activities as discussed in the FRI.

During remediation of these structures, the concrete domed upper section would be removed from the structure using typical earthwork equipment to expose the structure interior. A steel sleeve or caisson of diameter slightly smaller than the inside diameter of the structure would be lowered into the soil at the bottom. A vacuum truck would be utilized to remove the soil. As the bottom soils are removed, the steel sleeve would be lowered down below the structure and would prevent collapse of the soil below the structure. Soil would be removed to 18 feet bgs (top of the groundwater table), followed by backfilling with clean soil to the original invert elevation, with the exception of structures CP-3, CP-4 and CP-8 which would be abandoned. For cost purposes, the removed soil would be disposed of as hazardous impacted soil.

5.1.3 Alternative No. 3 – Excavation and Off-Site Disposal (Approach 2)

Figure 5-2 presents a conceptual sketch of the remedial action for Alternative No. 3. (Approach 2). Surface and subsurface soil would be remediated by excavation of contaminated soil using conventional earthwork equipment and standard construction methods with consideration toward using additional means to address deeper soil (e.g., sheeting, soil borings). Alternative No. 3 addresses the same areas requiring remediation as discussed in Alternative No. 2; however, due to different excavation techniques, greater volumes would be removed. An approximate total of 4,870 cy of metals contaminated soil would be excavated for off-Site disposal as part of Alternative No. 3 (Approach 2).

Soil excavation would be completed similar to Approach 1 (described above) in areas including: the western alleyway; the southern and eastern alleyway; inside the eastern portion of the SFC building; soil both inside and surrounding cesspools and drainage structures; and a few other select locations.

Also, this alternative includes the placement of an asphalt pavement (with polyethylene sheeting), as described for Approach 1.

Western Alley

The remedial action and volume of soil excavation for off-Site disposal would be conducted similar to Alternative No. 2 (Approach 1).

Eastern and Southern Alley

To address deeper soil in these areas, a drill rig equipped with an 18-inch diameter auger would be used to remove metals contaminated soil and replaced by a cement/bentonite grout. Multiple rows of borings (with some overlap) would be completed in the alleyways to 18 feet bgs with a row of smaller 12-inch diameter borings completed between the larger rows to the same depth. Due to the limited space of the eastern alley, the width of removed soil would be limited to two, 18-inch diameter borings and one row of 12-inch diameter borings would be completed between them. The southern alleyway would accommodate more borings per row (approximately ten, 18-inch and nine, 12-inch borings respectively) as the width of the alley is approximately 20 feet. It is assumed that about 25% of the contaminated soil in the area of auguring will be completed would be left in-place.

Remaining soil proximate to the buildings would be excavated using small earthwork equipment (e.g., mini-excavator). This soil would be excavated to the bottom of the building footers (approximately 3.5 feet bgs). As described in Alternative No. 2, this portion of remediation would be completed in 25-foot section lengths.

The volume of soil excavated for disposal from the eastern alleyway is approximately 405 cy and from the southern alleyway is approximately 245 cy. For the purposes of the cost estimate, soil excavated from these two alleyways is assumed to be 2/3 non-hazardous impacted waste and 1/3 hazardous impacted waste.

Interior SFC Building

The general areas requiring remediation as part of Alternative No. 3 (Approach 2) are the same as Alternative No. 2 (Approach 1). In the eastern portion of the building, soil excavation would initially be completed similar to Approach 1, to a depth of 5 feet below the building footers (maintaining the 1:1 excavation slope). From this depth, sheet piling would be installed to a minimum depth of 23 feet bgs. Soil within the sheeted area would be excavated to 18 feet bgs. The excavation would be backfilled with suitable fill material compacted in 12-inch lifts to the original grade. A new reinforced concrete floor would be installed at completion. Additionally, areas located within the SFC building identified having contaminated soil (possibly associated with historic surficial spills or former sumps) would require remediation using sheet pilling to a depth of about 18 feet bgs.

The volume of soil excavated for disposal from the SFC building interior is approximately 2,000 cy. For cost estimating purposes, this excavated soil is assumed to be 2/3 non-hazardous impacted waste and 1/3 hazardous impacted waste as shown on Figure 5-2.

Cesspool and Drainage Structures

Fourteen of the 23 cesspool/drainage structures would be remediated, similar to those described in Alternative No. 2 (Approach 1). Approximately 140 cy of contaminated soil would be excavated and disposed of as hazardous impacted soil from these 14 structures.

The remaining nine structures have metal contaminated soil outside of the structures in addition to the interior of the structures. The excavations to address this soil would include soil to a distance of approximately 5 feet surrounding the structures. The proximity of Site buildings, underground utilities, underground fuel tanks, etc. would limit the extent of remediation from some areas. For these areas, sheet piling would be installed to the required aerial extent for the specific locations (refer to Figure 5-2) to a minimum depth of 27 feet bgs. Following the installation of the sheet piling, the contaminated soil would be excavated and the cesspool or drainage structure removed and disposed. This would be done using standard construction equipment (e.g., backhoe). A new structure would be installed (six of the nine structures), connected and clean material would be backfilled. The remaining three structures (CP-3, CP-4 and CP-8) do not require replacement and would be abandoned.

The excavated soil (including the concrete structures) would be disposed of as 1/3 non-hazardous impacted soil (shallower soil) and 2/3 hazardous impacted soil (deeper soil) for an approximate total of 2,115 cy.

5.2 GROUNDWATER

For groundwater, metals and VOCs are the primary contaminates requiring remediation. Metals contamination in the groundwater was identified (during Phase 1, 2 and 3) in shallow and intermediate groundwater monitoring wells sampled (approximately 20 to 30 feet and 50 to 60 feet bgs respectively). VOCs (specifically PCE) were identified exceeding the respective groundwater standards in the three screened aquifer zones to a depth of approximately 90 feet bgs.

5.2.1 Alternative No. 1 – No Action

The No Action alternative involves taking no further action to remedy groundwater conditions at the Site. NYSDEC 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 alternatives (Section 6.0).

5.2.2 Alternative No. 2 – Monitored Natural Attenuation

Monitored Natural Attenuation (MNA) refers to the reliance on the natural attenuation processes (within the context of a controlled and monitored site cleanup approach) to achieve proposed cleanup goals within a timeframe that is reasonable, compared to that of other more active methods such as groundwater extraction and treatment or sparging. Natural attenuation processes include a variety of physical, chemical and biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume or concentration of contamination in groundwater. These processes include biodegradation, dispersion, dilution, sorption, volatilization, and/or chemical or biological stabilization, transformation, or destruction of constituents in groundwater.

Natural attenuation can be considered as a remedial technology for groundwater when one more of the following conditions are present at a site.

- Natural attenuation processes are observed or strongly expected to be occurring.
- There are no receptors that will be adversely impacted in the vicinity of the groundwater contamination.
- A continuing source that cannot be easily and cost-effectively removed will require a long-term remedial effort.
- Alternative remedial technologies are not cost effective or are technically impractical.
- Alternative remedial technologies pose added risk by transferring or spreading contamination.
- Minimal disruption of facility operations or infrastructure is desired.

Natural attenuation is generally evaluated using a "line of evidence" approach for MNA. This approach forms the basis for current protocols and guidance documents. The suggested lines of evidence include the following.

- Documentation of loss of contaminants through reviewing historical trends in contaminant concentration and distribution in conjunction with site geology and hydrogeology, to show the reduction in total mass of contaminants is occurring.

- Presence and distribution of geochemical and biological indicators that have been correlated to natural attenuation. This is done by evaluating change in concentration and distribution of geochemical and biochemical indicator parameters that have been shown to indicate natural attenuation.
- Direct microbiological evidence demonstrating the types of microorganisms responsible for the biodegradation (e.g. microcosm studies).

Figure 5-3 presents a conceptual sketch of the remedial actions for Groundwater Alternative No. 2. The primary component to MNA is groundwater sampling and testing. It is assumed that 13 wells (installed at various depths including shallow, intermediate and deep) will be sampled annually as described below. Two new well triplets (shallow, intermediate and deep) will be installed upgradient (one triplet) and downgradient (one triplets). These new well triplets will provide information regarding the concentration of upgradient and downgradient contamination and are needed to properly evaluate natural attenuation processes.

The initial annual groundwater sampling event would include the most extensive list of analytical laboratory test parameters (primarily VOCs, metals, cations and anions). Down hole natural attenuation parameters (including dissolved oxygen, pH, conductivity, oxidation reduction potential) would also be measured in the first groundwater sampling event.

The first event would be followed by a comprehensive evaluation to determine if processes supportive of natural attenuation are occurring using natural attenuation lines of evidence (as described above). Subsequent data evaluations and reports would be completed on an annual basis as the natural attenuation processes are monitored.

It is anticipated that the analytical parameter list can be reduced by about 25% following the first annual sample round. This alternative assumes that annual groundwater monitoring would be conducted in select wells for 30 years.

5.2.3 Alternative No. 3 – Groundwater Extraction and Ex-Situ Treatment

Figure 5-4 presents a conceptual sketch of the remedial action for Groundwater Alternative No. 3. Groundwater extraction and ex-situ treatment are the primary components of this alternative. A series of extraction wells located downgradient of the Site would be operated for the purposes of containment of the shallow and intermediate impacted groundwater with PCE concentrations greater than 5 ppb and metals that exceed their respective SCGs (primarily chromium, cadmium, copper and nickel). One shallow extraction well would be installed near well MW-6S (area of higher groundwater contamination) and would be operated for the purpose of removing groundwater from the area noted to generally have the highest level of contamination. For the purposes of this FFS, it is assumed that groundwater extracted by the wells would be combined and treated for VOCs and metals as described below. The extracted groundwater would be treated ex-situ in a system located on Site; and discharged to a stormwater management basin located off Site. Groundwater monitoring would also be performed as part of this Alternative to monitor the progress and effectiveness of the remediation.

The following is a description of the remedial components included in Groundwater Alternative No. 3.

Groundwater Extraction Wells:

It is assumed existing hydrogeologic information regarding the Upper Glacial Aquifer would be used to assess optimum pump rates and the extraction well layout. Therefore, a pump test pilot study would not be performed to design the groundwater extraction system.

Four groundwater extraction wells would be installed and operated to remediate and provide containment of downgradient contaminated groundwater. The three downgradient extraction wells would be screened across the shallow and intermediate portion of the aquifer for the treatment of VOCs and metals. The wells would be located within public right-of-ways along Dale Street and Edison Avenue, downgradient of the Site. The one shallow extraction well would be installed near well MW-6S (area of higher groundwater contamination) and would be combined with the extracted groundwater from the three downgradient extraction wells for treatment of VOCs and metals. These extraction wells are depicted on Figure 5-4.

The three downgradient extraction wells would extract water at approximately 20 to 30 gpm each, and the shallow extraction well near MW-6S would extract water at about 10 to 15 gpm, for a total extraction flow rate of approximately 90 to 120 gpm (a total of 100 gpm for the purposes of the cost estimate). It is estimated that the extraction wells would operate for approximately 30 years. This estimate is based on the assumption that on-Site contaminated soil would not be fully remediated resulting in continued leaching of metals to the groundwater (e.g., precipitation entering the unsaturated zones via cesspools, drainage structures) and due to the presence of an unknown, upgradient VOC and metals contamination source that is contributing to Site contamination.

Extraction wells would be constructed of 6-inch diameter stainless steel casing and screen. The shallow and intermediate aquifer (the three downgradient extraction wells) would be screened (stainless steel) from 20 to 65 feet bgs and the shallow well would be screened from 20 to 35 feet bgs.

Extracted groundwater would be pumped from the extraction wells via 6-inch diameter underground pipes to a treatment system on Site. Transfer piping would be installed within public right-of-ways (e.g., Dale Street and Edison Avenue roadways) to the Site. It is expected that public utility lines (e.g., water, gas, cable, etc.) would be encountered during installation of the wells and transfer piping. Thus, installation of the extraction system would require careful planning and coordination with the various utility companies.

A pilot test may be needed to obtain additional aquifer information for design of the extraction system.

Ex-Situ Groundwater Treatment:

Treatability testing for design of the on-Site groundwater treatment system would be completed to assess the applicability of treatment technologies.

As described above, it is assumed that treated water would be discharged to a nearby stormwater management basin located off-Site as there are no sanitary sewer lines in the vicinity of the Site available to receive the treated groundwater. A SPDES permit would be required for discharge to the stormwater sewer system.

The extracted groundwater waste streams would be treated for VOCs and metals. The extracted groundwater would first be treated to reduce the concentrations of hexavalent chromium to total chromium by means of chemical reduction. The pH of the groundwater would then be increased (via a pH 11 solution) for the precipitation of additional metals. These precipitated solids would pass through an ultrafiltration (UF) system, which would retain the precipitated solids. Liquid passing though the UF system would have the pH lowered (via pH 4 solution) and passed through a chelated resin for polishing, followed by a weak base anion resin to remove residual hexavalent chromium. Following treatment of the groundwater for metals the extracted water would be treated for VOCs using granular activated carbon. Finally, the treated groundwater would be stored in a temporary effluent holding tank where it could be sampled prior to discharge. It is assumed that the effluent holding tank would be needed primarily during the initial system operation when influent groundwater concentrations are less predictable.

Treated water would be discharged to a 6-inch discharge pipe, which is assumed to be located within the same trench as the 6-inch transfer pipes from the extraction wells; for ultimate discharge to a nearby storm water management basin.

Portions of the groundwater treatment system would be installed inside a building to be erected at the Site. The building would consist of a pre-engineered metal building and slab-on-grade concrete foundation, and would be approximately 3,600 square feet in size. The building would include a concrete floor and curbing to provide secondary containment. An internal sump would also be installed for liquid removal (if needed). In addition, electrical and instrumentation and control systems for the extraction well and treatment system would be housed within the building. The treatment building may be constructed over existing/active cesspool or drainage structures. Accommodations would be made to ensure there is suitable access to the structures for typical maintenance purposes and if necessary, drainage structures would need to be relocated to an area outside of the building. Costs for drainage structure relocation have not been included in this FFS.

Groundwater Monitoring Wells:

Three additional downgradient groundwater monitoring wells would be installed at locations downgradient of the groundwater extraction wells. The proposed wells would consist of one set of wells consisting of a shallow, an intermediate and a deep aquifer screened monitoring well (i.e., approximately 30, 50 and 90 feet respectively). These wells are identified on Figure 5-4.

Operation and Maintenance Activities:

This alternative assumes that annual groundwater monitoring would be conducted in existing and proposed off-Site wells for 30 years. During each monitoring event, 13 existing wells and 3 proposed wells would be purged and sampled. Water levels from 30 existing Site wells and the 3 proposed wells would be measured. Groundwater samples would be analyzed for VOCs and metals to monitor the effectiveness and progress of the groundwater extraction and treatment remediation. However, it is assumed that quarterly (i.e., four times per year) groundwater monitoring would be conducted in Site monitoring wells in years 1 and 2; and annual monitoring in years 3 through 30.

Operation and maintenance (O&M) activities are necessary for the extraction and treatment systems (e.g., cleaning, repairs, changing out carbon, etc.). This work is necessary to maintain treatment performance and life span.

6.0 DETAILED ANALYSIS OF ALTERNATIVES

6.1 INTRODUCTION

The purpose of the detailed analysis of Site remedial alternatives is to present the relevant information to select a Site remedy. During the detailed analysis, the alternatives established in Section 5.0 are compared on the basis of environmental benefits and costs using criteria established by NYSDEC in TAGM HWR-4030. This approach is intended to provide needed information to compare the merits of each alternative and select an appropriate remedy that satisfies the remedial action objectives for the Site.

This section first presents a summary of the seven evaluation criteria (six environmental criteria and cost) in TAGM HWR-4030 to be used to compare the alternatives, plus State and Community Acceptance. In addition, this section includes a comparison of the four alternatives, based on the seven evaluation criteria. Comparisons of the alternatives in terms of State and Community Acceptance are not included, because such evaluations will be performed following review of this FFS by NYSDEC and solicitation of public comments.

6.2 DESCRIPTION OF EVALUATION CRITERIA

Each remedial alternative is evaluated with respect to the seven criteria outlined in TAGM HWR-4030, as summarized below. State and Community Acceptance criteria are also described.

Short-Term Impacts and 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. Several alternatives described within the following sections may not be effective in meeting remedial action objectives in less than 30 years. Therefore, references to short-term impacts and effectiveness may include discussions of impacts/effectiveness over a period of 30 years.

Long-Term Effectiveness and Permanence: 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.

Reduction of Toxicity, Mobility, and Volume: This criterion addresses NYSDEC's preference for selecting "remedial technologies that permanently and significantly reduce the toxicity, mobility and volume" of the contaminants of concern at the Site. This evaluation consists of assessing 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.

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.

Compliance with Applicable or Relevant and Appropriate SCGs and Remediation 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 developed in Section 3.0.

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.

Cost: The estimated capital costs, long-term operation and maintenance costs, and environmental monitoring costs are evaluated. The estimates included herein assume Engineering costs would equal 15% of the capital costs; and, Contingency/Administrative costs would equal 10% of the capital costs. A present worth analysis is made to compare the remedial alternatives on the basis of a single dollar amount for the base year. For the present worth analysis, assumptions are made regarding the interest rate applicable to borrowed funds and the average inflation rate. It is also assumed that a 30-year operational period would be necessary for groundwater control systems and Study Area monitoring. The comparative cost estimates are intended to reflect actual costs with an accuracy of +50 percent to -30 percent.

6.3 DETAILED ANALYSIS OF ALTERNATIVES

Alternatives No. 1 through 3 for soil and groundwater are evaluated individually in terms of the seven environmental and cost criteria described above. Descriptions of the remedial alternatives are provided in Section 5.0.

6.3.1 Soil

6.3.1.1 Alternative No. 1 – No Action

Remedial actions taken as part of the selected groundwater alternative is not expected to change the condition associated with the soil alternatives.

Short-Term Impacts and Effectiveness: No short-term impacts (other than those existing) are anticipated during the implementation of this alternative since there are no construction activities involved.

This alternative does not include source removal or treatment, and will not meet the on-Site remedial action objectives in a reasonable or predictable timeframe. Human health and the environment would not be protected under this alternative. The duration of natural cleanup would depend on the natural attenuation rate in soil. There are uncertainties in the rate and interaction of the various natural attenuation processes. Therefore, it is recognized that the length of time required for natural cleanup or attenuation of soil contamination is unknown, but expected to be greater than 30 years to reach the remedial action objectives. Consequently, in accordance with USEPA guidance, duration of 30 years (the maximum time period specified for evaluation) is assumed for this alternative.

2. Long-Term Effectiveness and Permanence: Because this alternative does not involve removal or treatment of the contaminated soil, the risks involved with the migration of contaminants and direct contact with contaminants would remain essentially the same. Given the mass of on-Site contaminants, reduction in risk associated with natural attenuation is not expected in a reasonable or predictable timeframe. Therefore, this alternative is not expected to provide long-term protection to human health and the environment.

3. Reduction of Toxicity, Mobility, and Volume: This alternative does not involve the removal or treatment of the source of contamination. Therefore, neither the toxicity, nor mobility, nor volume of contamination is expected to be reduced significantly. Natural attenuation of contaminants may reduce the concentrations in soil over time. However, this reduction is not expected to be significant within a reasonable amount of time (i.e., 30 years).

4. Implementability: This alternative is readily implementable on a technical basis, in that it involves no actions. There may be administrative difficulties associated with implementing this alternative as a result of community acceptance to No Action based on the nature and extent of soil contamination. Also, institutional controls (e.g., deed or access restrictions) would be required for the on-Site property to preclude contact with contaminated media.

5. Compliance with Applicable or Relevant and Appropriate SCGs and Remediation Goals: This alternative will not comply with the chemical-specific SCGs for the Site. The contaminant levels in soil are not expected to decrease appreciably over time. Natural attenuation is not expected to significantly reduce the levels of contamination.

6. Overall Protection of Human Health and the Environment: This alternative is not protective of human health and the environment, since the Site would remain in its present condition. As identified as part of the qualitative exposure assessment, subsurface soil will serve as a continuing impact to groundwater. Uncontrolled

excavations could lead to high exposure levels; and vapor migration could impact underground structures, surface structures and future excavations within contaminated area.

7. Cost: The cost associated with this Alternative is $0.

6.3.1.2 Alternative No. 2 – Excavation and Off-Site Disposal (Approach 1)

Short-Term Impacts and Effectiveness: There are several potential short-term impacts associated with this alternative.

The potential for exposure to the contaminated soil is expected to increase during excavation of contaminated soil at the Site. It is assumed that contaminated excavated soil would not be staged on Site for extended periods of time. Contaminated excavated soil would be placed immediately into roll-off boxes and covered prior to removal from the Site for disposal. There is potential for impacts to human health (e.g., for the public and construction personnel) due to potential particulate releases during the handling of soil. Therefore, particulate or dust suppression would be required to reduce the potential for impact due to exposure to contaminated particulate. Field construction personnel would wear appropriate personal protective equipment during remedial activities in order to limit health risks due to exposure to contaminants and physical hazards.

During excavation of contaminated soil (particularly cesspool and drainage structure remediation) moderate disruptions (e.g., closure of portions of the parking lot) are expected to occur affecting the commercial facilities at the Site and potentially to the facilities proximate to the south.

Equipment used for excavation remediation could carry contamination off-Site. Therefore, equipment would be decontaminated prior to leaving the Site, as necessary, in order to avoid the transport of contaminants. Additionally, contamination of equipment used for excavation purposes could carry contamination beyond the construction work zones. Therefore, equipment would be decontaminated prior to leaving the work zones, as necessary, in order to avoid the transport of contaminants.

It is estimated that implementation of this alternative (i.e., excavation, backfilling, re-paving, and application of the remedial actions; not including remedial design, procurement of design or construction contracts, or negotiation with responsible parties) would require approximately 5 to 6 months.

On-Site human health would be protected under this alternative and the environment (in terms of affecting habitat or vegetation) would be moderately protected. This alternative is expected to reduce the volume of metals contamination significantly for surface soil and moderately for subsurface soil by excavation and replacement with “clean” soil. However, considering that contaminated soil is present and expected under some areas of the Site and off-Site buildings (including under building foundations) and around subsurface utilities, it is assumed that the entire extent of contaminated soil can not be removed. The placement of asphalt (with polyethylene sheeting) pavement over these areas would limit the exposure to the residual contaminated soil providing the cover is properly maintained (seal coating and yearly patching).

It is expected that remaining metals contaminated soil could leach to the groundwater by means precipitation infiltration but would be reduced by the asphalt pavement cover (with polyethylene sheeting). The potential contamination impacting the groundwater would be addressed by one of the three alternatives that address groundwater.

Long-Term Effectiveness and Permanence: This alternative is considered an adequate, reliable and permanent remedy for Site contaminated soil as a moderate portion of the metals contaminated soil would be removed from the Site. However, due to the limited nature of the soil excavation (primarily due to some contaminated soil being located in accessible areas) contaminated soil would remain on-Site indefinitely. This alternative is considered an adequate and reliable remedy for mitigating human health (due to surface soil excavation coupled with surficial capping). However, only a moderately adequate and reliable remedy for mitigating environmental impacts associated with subsurface soil as contamination would continue to impact the groundwater.

Reduction of Toxicity, Mobility, and Volume: The toxicity, mobility and volume of on-Site contaminated soil are expected to be reduced significantly by means of excavation and off-Site disposal. Additionally, the closure of three Site cesspool structures would assist in the reduction of additional leaching of contaminants to groundwater. However, contaminated soil would remain on-Site and continue to provide an ongoing source of groundwater contamination.

Implementability: This alternative is implementable on a technical basis, however is complicated by the limited space in the areas of contaminated soil. Surface and subsurface soil would be remediated by excavation of contaminated soil using conventional earthwork equipment and standard construction methods. The materials and services necessary for this remediation are readily available. Operation in spaces with limited access such as the alleyway and inside the Site building will slow work progress. With regard to operation and maintenance, the materials and services required for paved surfaces are also readily available.

In terms of administrative concerns, this alternative is also considered to be implementable. Implementation of this alternative would require coordination and approval by Town and Suffolk County agencies (e.g., Building Department) and utility companies as well as Site occupants. However, there are no anticipated, specific problems associated with obtaining permits or approvals from the various agencies and other concerns.

Institutional controls (e.g., deed or access restrictions) would be required for the Site property to preclude contact with remaining contaminated media.

Compliance with Applicable or Relevant and Appropriate SCGs and Remediation Goals: It is expected that this alternative would meet the chemical-specific SCGs for the portion of the Site (shallower soil) where contaminated soil would be removed. However, chemical-specific SCGs would not be met for soil that can not be removed under certain areas of the building and utilities. Contaminated soil that is not removed would continue to contaminate the groundwater by leaching of soil contamination. However, the installation of asphalt pavement cover (with polyethylene sheeting) is expected to reduce leaching of contamination to groundwater.

No location-specific SCGs were identified. Action-specific SCGs (e.g., OSHA regulations) would be met during construction and operation and maintenance activities.

Overall Protection of Human Health and the Environment: This Site alternative is considered to be protective of human health and moderately protective of the environment (in terms of affecting habitat or vegetation), however residual contamination is expected to remain on-Site and would continue to impact the groundwater. Implementation of this alternative would result in a moderate volume reduction of contaminated Site soil even through contaminated soil would remain on Site. Although the alternative would not meet the SCGs due to remaining contamination, this alternative is considered to be protective of human heath since the shallow contaminated soil would be excavated and disposed of off Site. The installation of a surficial asphalt cap (with polyethylene sheeting) would reduce the potential for contact remaining subsurface contaminated soil.

Cost: The quantities, unit costs, and subtotal costs and associated assumptions for this Alternative, estimated for comparative purposes, are presented in Table C-2 (Appendix C). Capital costs are estimated to total approximately $2,605,000; and, the total present worth of operation and maintenance (O&M) costs are estimated to be approximately $17,000. The present worth of this alternative is based on a 30-year period and a discount rate of five percent. The total estimated present worth cost of this alternative is $2,622,000.

6.3.1.3 Alternative No. 3 – Excavation and Off-Site Disposal (Approach 2)

Short-Term Impacts and Effectiveness: There are several potential short-term impacts associated with this alternative.

The potential for exposure to the contaminated soil is expected to increase during excavation of contaminated soil at the Site. It is assumed that contaminated excavated soil would not be staged on Site for extended periods of time. Contaminated excavated soil would be placed immediately into roll-off boxes and covered prior to removal from the Site for disposal. There is potential for impacts to human health (e.g., for the public and construction personnel) due to potential particulate releases during the handling of soil. Therefore, particulate or dust suppression would be required to reduce the potential for impact due to exposure to contaminated particulate. Field construction personnel would wear appropriate personal protective equipment during remedial activities in order to limit health risks due to exposure to contaminants and physical hazards.

During excavation of contaminated soil (particularly cesspool and drainage structure remediation) moderate disruptions (e.g., closure of portions of the parking lot) are expected to occur affecting the commercial facilities at the Site and potentially to the facilities proximate to the south.

Equipment used for excavation remediation could carry contamination off-Site. Therefore, equipment would be decontaminated prior to leaving the Site, as necessary, in order to avoid the transport of contaminants. Additionally, contamination of equipment used for excavation purposes could carry contamination beyond the construction work zones. Therefore, equipment would be decontaminated prior to leaving the work zones, as necessary, in order to avoid the transport of contaminants.

It is estimated that implementation of this alternative (i.e., excavation, backfilling, re-paving, and application of the remedial actions; not including remedial design, procurement of design or construction contracts, or negotiation with responsible parties) would require approximately 5 to 6 months.

On-Site human health would be protected under this alternative and the environment (in terms of affecting habitat or vegetation) would be moderately protected. This alternative is expected to reduce the volume of metals contamination significantly for surface soil and moderately for subsurface soil by excavation and replacement with "clean" soil. However, considering that contaminated soil is present and expected under some areas of the Site and off-Site buildings (including under building foundations) and around subsurface utilities, it is assumed that the entire extent of contaminated soil can not be removed. The placement of asphalt pavement (with polyethylene sheeting) over these areas would limit the exposure to the residual contaminated soil providing the cover is properly maintained (seal coating and yearly patching).

It is expected that remaining metals contaminated soil could leach to the groundwater by precipitation infiltration but would be reduced by the asphalt pavement cover (with polyethylene sheeting). The potential contamination impacting the groundwater would be addressed by one of the three alternatives that address groundwater.

Long-Term Effectiveness and Permanence: This alternative is considered an adequate, reliable and permanent remedy for Site contaminated soil as a significant portion of the metals contaminated soil would be removed from the Site. However, due to the limited nature of the soil excavation (primarily due to some contaminated soil being located in accessible areas) contaminated soil would remain on-Site indefinitely. This alternative is considered an adequate and reliable remedy for mitigating human health (due to surface soil excavation coupled with surficial capping) however only moderately adequate and reliable remedy for mitigating environmental impacts associated with subsurface soil as contamination would continue to impact the groundwater.

Reduction of Toxicity, Mobility, and Volume: The toxicity, mobility and volume of on-Site contaminated soil are expected to be reduced significantly by means of excavation and off-Site disposal. Additionally, the closure of three Site cesspool structures would assist in the reduction of additional leaching of contaminants to groundwater. However, contaminated soil would remain on Site and continue to provide an ongoing source of groundwater contamination.

Implementability: This alternative is implementable on a technical basis, however is complicated by the limited space in the areas of contaminated soil. Surface and subsurface soil would be remediated by excavation of contaminated soil using conventional earthwork equipment and standard construction methods. The materials and services necessary for this remediation are readily available. Operation in spaces with limited access such as the alleyway and inside the Site building will slow work progress. With regard to operation and maintenance, the materials and services required for paved surfaces are also readily available.

In terms of administrative concerns, this alternative is also considered to be implementable. Implementation of this alternative would require coordination and approval by Town and Suffolk County agencies (e.g., Building Department) and utility companies as well as Site occupants. However, there are no anticipated, specific problems associated with obtaining permits or approvals from the various agencies and other concerns.

Institutional controls (e.g., deed or access restrictions) would be required for the Site property to preclude contact with remaining contaminated media.

Compliance with Applicable or Relevant and Appropriate SCGs and Remediation Goals: It is expected that this alternative would meet the chemical-specific SCGs for the portion of the Site (shallower soil) where contaminated soil would be removed. However, chemical-specific SCGs would not be met for soil that can not be removed under certain areas of the building and utilities. Contaminated soil that is not removed would continue to contaminate the groundwater by leaching of soil contamination. However, the installation of asphalt pavement cover (with polyethylene sheeting) is expected to reduce leaching of contamination to groundwater.

No location-specific SCGs were identified. Action-specific SCGs (e.g., OSHA regulations) would be met during construction and operation and maintenance activities.

Overall Protection of Human Health and the Environment: This Site alternative is considered to be protective of human health and moderately protective of the environment (in terms of affecting habitat or vegetation), however residual contamination is expected to remain on-Site and would continue to impact the groundwater. Implementation of this alternative would result in a significant volume reduction of contaminated Site soil even through contaminated soil would remain on Site. Although the alternative would not meet the SCGs due to remaining contamination, this alternative is considered to be protective of human heath since the shallow contaminated soil would be excavated and disposed of off Site. The installation of a surficial asphalt cap (with polyethylene sheeting) would reduce the potential for contact remaining subsurface contaminated soil.

7. Cost: The quantities, unit costs, and subtotal costs and associated assumptions for this Alternative, estimated for comparative purposes, are presented in Table C-3 (Appendix C). Capital costs are estimated to total approximately $5,300,400; and, the total present worth of operation and maintenance (O&M) costs are estimated to be approximately $17,000. The present worth of this alternative is based on a 30-year period and a discount rate of five percent. The total estimated present worth cost of this alternative is $5,317,400.

6.3.2 Groundwater

6.3.2.1 Alternative No. 1 – No Action

Short-Term Impacts and Effectiveness:

No short-term impacts (other than those existing) are anticipated during the implementation of this alternative since there are no construction activities involved.

This alternative does not include treatment and would not meet the remedial action objectives in a reasonable timeframe. The environment (in terms of affecting habitat or vegetation) would therefore not be protected under this alternative. The duration of natural cleanup would depend on the natural attenuation rate in the groundwater. There are uncertainties in the rate and interaction of the various natural attenuation processes. Therefore, the length of time required for natural cleanup or attenuation of groundwater contamination is unknown, but expected to be on the order of 30 years to reach the remedial action objectives. This cleanup rate is expected in spite of remedial action that could be conducted, as Alternatives 2 or 3. Consequently, in accordance with USEPA guidance, a 30-year duration (the maximum time period specified for evaluation) is assumed for this alternative.

Additionally, contamination associated with the Site may have impacted downgradient receptors (e.g., irrigation well in the New Montefiore Cemetery). The potential human exposures include ingestion, dermal contact and inhalation of vapors from irrigation waters.

Long-Term Effectiveness and Permanence:

Because this alternative does not involve removal or treatment of the contaminated groundwater, the risks involved with the migration of contaminants and direct contact with contaminants would remain essentially the same. Given the mass of contaminants, reduction in risk associated with natural attenuation is not expected in a reasonable timeframe. Therefore, this alternative is not expected to provide long-term protection to the environment.

Reduction of Toxicity, Mobility, and Volume:

This alternative does not involve the removal or treatment of contamination. Therefore, neither the toxicity, nor mobility, nor volume of contamination is expected to be reduced significantly. Natural attenuation of contaminants is expected to reduce the concentrations in groundwater over time. However, this reduction is not expected to be significant within a reasonable amount of time, given the high concentrations of contamination detected in the groundwater plume.

Implementability:

This alternative is readily implementable on a technical basis, in that it involves no actions. There may, be administrative difficulties associated with implementing this alternative as a result of community acceptance to No Action based on the nature and extent of groundwater contamination. Institutional controls (e.g., water use restrictions) would be required to preclude contact with potentially contaminated groundwater in the irrigation well(s) at the New Montefiore Cemetery.

Compliance with Applicable or Relevant and Appropriate SCGs and Remediation Goals:

This alternative would not comply with the chemical-specific SCGs for the groundwater. The contaminant levels in the groundwater are not expected to decrease appreciably over time, as natural attenuation is not expected to significantly reduce the levels of contamination.

No location-specific SCGs were identified. Action-specific SCGs (e.g., OSHA regulations) would be met during sampling activities.

Overall Protection of Human Health and the Environment:

This alternative is not protective of the environment, since contaminated groundwater would remain in its present condition and continue to harm the aquifer.

As identified as part of the qualitative exposure assessment, groundwater can migrate further off Site, to impact downgradient receptors (e.g., New Montefiore Cemetery). This alternative is not protective of human health.

Cost:

The cost associated with this alternative is $0.

6.3.2.2 Alternative No. 2 –Monitored Natural Attenuation

Short-Term Impacts and Effectiveness:

No short-term impacts (other than those existing) are anticipated during the implementation of this alternative, since there are no construction activities involved with the exception of installation of monitoring wells located off-Site to the south of Edison Avenue and north of the Site. Field personnel would wear appropriate personal protective equipment during groundwater sampling to limit health risks due to exposure to contaminants and physical hazards. In addition, equipment used for sampling purposes would be decontaminated prior to being removed from the Site, as necessary, in order to avoid the transport of contaminants.

This alternative does not include treatment. The alternative depends on the natural processes rather than treatment for cleanup. The duration of natural cleanup would depend on the natural attenuation rate. There are uncertainties in the rate and interaction of the various natural attenuation processes. Considering the items listed below, the length of time required for natural cleanup (attenuation of groundwater contamination to the proposed cleanup goals) is unknown and difficult to predict, but is expected to be on the order of 30 years (the maximum time period specified for evaluation by USEPA guidance).

Upgradient groundwater contamination is present above proposed cleanup goals.
The source of the upgradient contamination is not known.
It is assumed that some contaminated soil (that will continue to provide an ongoing source of contamination) will remain in-place on-Site (in inaccessible areas) following possible soil remedial action.

Long-Term Effectiveness and Permanence:

Because this alternative does not involve removal or treatment of the contaminated groundwater, the risks involved with the migration of contaminants and direct contact with contaminants would remain essentially the same. Annual collection of groundwater samples and an evaluation of the natural attenuation processes would be performed to assess the long-term effectiveness of the natural attenuation processes. The number and location of groundwater sample locations should be evaluated further during remedial design. Given the mass of contamination present, reduction in risk associated with contaminate reduction by natural attenuation is not expected in a reasonable timeframe. Therefore, this alternative not expected to provide long-term protection to the environment.

Reduction of Toxicity, Mobility, and Volume:

This alternative does not involve the removal or treatment of contamination. The natural attenuation processes are expected to reduce toxicity, mobility, and volume of contamination gradually over time. However, this reduction is not expected to be significant within a reasonable amount of time, given the high concentrations of metals and VOCs detected in the groundwater.

Implementability:

This alternative is readily implementable on a technical basis, in that it involves no actions other than annual groundwater monitoring (with the addition of natural attenuation parameters) and a MNA evaluation. Groundwater sampling can be performed without sophisticated equipment, and the necessary services and equipment are readily available. Considering that MNA does not involve active remediation, there may be administrative difficulties associated with implementing this alternative as a result of community acceptance of MNA as a remedial action. Institutional controls (e.g., water use restrictions) may be required for downgradient irrigation well (s) that may be present in the New Montefiore Cemetery.

Compliance with Applicable or Relevant and Appropriate SCGs and Remediation Goals:

This alternative would not comply with the chemical-specific SCGs for the groundwater. The contaminant levels in the groundwater are expected to decrease slowly over time but are not expected to comply with the SCGs in less than 30 years.

No location-specific SCGs were identified. Action-specific SCGs (e.g., OSHA regulations) would be met during sampling activities.

Overall Protection of Human Health and the Environment:

This alternative is not protective of the environment, since the groundwater would remain in its present condition and continue to harm the aquifer. This alternative would be slightly protective of human health because the contaminant level, the extent of contamination and natural attenuation processes would be monitored and evaluated over time.

As identified as part of the qualitative exposure assessment, groundwater can migrate further off Site, to potentially impact downgradient receptors (e.g., irrigation wells in the New Montefiore Cemetery). The specific location and intake zone depth of the New Montefiore Cemetery irrigation well (s) and whether the wells have been impacted from Site contamination is not known. Considering that there is no know use of contaminated groundwater associated with the Site, exposures associated with contaminated groundwater are not expected with the exception of the potential irrigation wells in the cemetery.

Cost:

The quantities, unit costs, and subtotal costs and associated assumptions for this Alternative, estimated for comparative purposes, are presented in Table C-1 (Appendix C). Capital costs are estimated to total approximately $91,000; and, the total present worth of operation and maintenance (O&M) costs are estimated to be approximately $277,000. The present worth of this alternative is based on a 30-year period and a discount rate of five percent. The total estimated present worth cost of this alternative is $368,000.

6.3.2.3 Alternative No. 3 –Groundwater Extraction and Ex-Situ Treatment

Short-Term Impacts and Effectiveness: There are several potential short-term impacts associated with this alternative.

During installation of extraction and monitoring wells and extraction forcemain piping in downgradient areas, disruptions to the areas are expected. Such disruptions could include street and sidewalk closure and temporary disruption of utility service in the neighborhood proximate to Dale Street and Edison Avenue and disruptions of on-Site commercial activities.

This alternative is assumed to be implemented after the soil on Site have been addressed (Soil Alternatives), therefore, exposure to metals contaminated soil during construction activities (e.g., trenching) is assumed to be low. Regardless, particulate (dust) suppression may be required in order to mitigate potential adverse conditions. Field construction personnel would wear appropriate personal protective equipment during installation in order to limit health risks due to exposure to contaminants and physical hazards. Installation of the groundwater extraction and monitoring wells is not expected to generate significant vapor releases.

Contamination of equipment used for well installation purposes could carry contamination beyond the off-Site and on-Site work zones. Therefore, equipment would be decontaminated prior to leaving the work zones, as necessary, in order to avoid the transport of contaminants.

Field personnel would wear appropriate personal protective equipment during implementation of this alternative in order to limit health risks due to potential exposure to contaminants and physical hazards. In addition, equipment used for sampling purposes would be decontaminated before leaving the work zones, as necessary, in order to avoid the transport of contaminants.

It is estimated that implementation of this alternative (i.e., construction, installation, and application of the remedial actions; not including remedial design, procurement of design or construction contracts, or negotiation with responsible parties) would require approximately six to nine months.

The extraction of groundwater downgradient of the Site, using a series of extraction wells (screened at different depths to remediate different waste streams), would serve to contain and remediate the shallow aquifer metals and PCE plume and the deep aquifer PCE plume. It is expected that this alternative would meet the remedial action objective of 5 ppb (PCE) in groundwater and metals (chromium (50 ppb), cadmium (5 ppb), copper (200 ppb) and nickel (100 ppb)). These remedial objectives would be met within 30-year timeframe for the majority of Site areas. However, contamination from potential upgradient sources (VOC and metal) and from metals contamination leaching from Site soil is assumed to add to the Site groundwater contamination. This additional contamination could extend the groundwater treatment beyond 30 years. Consequently, in accordance with USEPA guidance, a duration of 30 years (the maximum time period specified for evaluation) is assumed for this alternative.

Based on the proposed extraction well locations, rate and duration of operation, the entire extent of the Site groundwater plume (with PCE and metals greater than the SCG) may not be captured and remediated. It is assumed that groundwater contamination located downgradient of these areas exists and would continue to naturally attenuate (e.g., volatilization, precipitation, adsorption). Groundwater sampling would be performed to monitor system effectiveness.

The ex-situ treatment of PCE and metals contaminated groundwater via carbon adsorption (VOCs), precipitation (metals) and ion exchange (metals) is expected to be effective.

In the event that the Site groundwater extraction and ex-situ treatment systems fail to operate, it may be possible for the further migration of contaminated groundwater to reach receptors. In order to limit this potential, monthly maintenance and inspections of the groundwater treatment system would be performed. Also, control systems could be automated with remote access capabilities.

Long-Term Effectiveness and Permanence: This alternative is considered an adequate, reliable and permanent remedy for Site contaminated groundwater. This alternative is considered an adequate and reliable remedy for mitigating human health and environmental impacts (in terms of affecting habitat or vegetation) due to groundwater. However, portions of the outermost downgradient PCE and metals plume is not expected to be captured by the extraction system. These areas of contamination would be expected to continue to naturally attenuate. Annual collection of groundwater samples would be performed to assess the long-term effectiveness of the natural attenuation processes. The number and location of groundwater sample locations should be evaluated further during remedial design.

Reduction of Toxicity, Mobility, and Volume: The toxicity, mobility and volume of groundwater contamination are expected to be reduced significantly through the use of the extraction wells and subsequent ex-situ treatment. Residual wastes would be generated through groundwater treatment, and would be disposed of off-Site. These wastes (i.e., spent carbon and filter cake) are expected to be hazardous, but this assumption would be confirmed as part of the on-Site treatment system treatability study.

Implementability: This alternative is readily implementable on a technical basis. Construction and installation of the groundwater extraction and ex-situ treatment system would involve standard construction methods and equipment; and materials and services necessary for construction are readily available. With regard to operation and maintenance, the materials and services required for the systems are also readily available. The instrumentation and control systems could be automated with remote access capabilities, such that the effect of possible system shutdowns would be minimized. Confirmatory groundwater sampling would be performed to monitor the effectiveness of the remedial system.

In terms of administrative concerns, this alternative is also considered to be implementable through the required coordination and approval by numerous Town of Babylon and Suffolk County agencies (e.g., Storm Sewer Department, Building Department) and utility companies. However, there are no anticipated, specific problems associated with obtaining permits or approvals from the various agencies and other concerns.

Institutional controls (e.g., water use restrictions) may be required for the area of off-Site contaminated groundwater (i.e., irrigation wells potentially associated with the Montefiore Cemetery) to prevent uncontrolled use of potentially impacted water.

Compliance with Applicable or Relevant and Appropriate SCGs and Remediation Goals: Due to the unknown nature of a potential upgradient VOC and metal contaminant source and with the potential leaching of metal contamination to Site groundwater from remaining contaminated soil on Site, it is expected that this alternative may not meet the chemical-specific SCGs in a reasonable and predictable timeframe (i.e., greater than 30 years). The PCE and metals contaminant plumes downgradient of the extraction wells (the area south of Edison Ave) are not expected to be captured and remediated by the extraction and treatment system. As such, SCGs may not be met in that area in a reasonable and predictable timeframe. Contamination south of Edison Ave is expected to continue to naturally attenuate.

No location-specific SCGs were identified. Action-specific SCGs (e.g., OSHA regulations) would be met during construction and operation and maintenance activities.

Overall Protection of Human Health and the Environment: This alternative is considered to be protective of human health and the environment (in terms of affecting habitat or vegetation). Implementation of this alternative would result in containment and remediation of a significant amount of contaminated Site and upgradient groundwater. However, the downgradient contamination south of Edison Ave would not be treated and is expected to continue to naturally attenuate.

Cost: The quantities, unit costs, and subtotal costs and associated assumptions for this Alternative, estimated for comparative purposes, are presented in Table C-5 (Appendix C). Capital costs are estimated to total approximately $1,835,000; and, the total present worth of operation and maintenance (O&M) costs are estimated to be approximately $6,037,000. The present worth of this alternative is based on a 30-year period and a discount rate of five percent. The total estimated present worth cost of this alternative is $7,872,000.

7.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

Based on the detailed analysis contained in Section 6.0, the remedial alternatives are compared to the six environmental and one cost criteria. Alternatives No. 1 through 3 are compared in the following subsections for soil (surface and subsurface soil) and groundwater.

7.1 Soil

7.1.1 Short-Term Impacts and Effectiveness

Alternatives No. 2 and 3 involve intrusive construction work, which could cause releases of contamination during excavation activities. Alternative No. 1 is not expected to generate contaminant releases. Alternatives No. 2 and 3 are expected to pose significant disruptions to current Site activities and operations.

Alternative No. 3 would be considered more disruptive to current Site activities than Alternative No. 2, due to greater extent of excavation work proposed. Alternative No. 2 would be completed in about 5 to 6 months and Alternative No. 3 would require about one year to complete.

Alternatives No. 2 and 3 are expected to achieve the remedial action objectives for a significant portion of Site areas. For Alternative No. 3, about 90% of contaminated soil would be removed. For Alternative No. 2, about 20% of the contaminated soil would be removed. However, Alternatives No. 2 and 3 would not remediate the entire area of contaminated soil due to areas where it is assumed that excavation can not be completed (such as under building footings). Remaining soil contamination would continue to naturally attenuate. Alternative No. 1 is not expected to achieve these objectives in a reasonable timeframe. Alternative No. 2 and 3 would remove and/or cover near surface contaminated soil, thus reducing the potential for human exposures to contamination.

7.1.2 Long-Term Effectiveness and Permanence

Alternatives No. 2 and 3 are considered to be adequate, reliable and permanent remedies for Site contaminated soil as a significant portion of the metals contaminated soil would be removed from the Site. However, due the limited nature of the soil excavations (primarily due to some contaminated soil being located in inaccessible areas) contaminated soil would remain on-Site and would naturally attenuate. Contamination from remaining existing contaminated soil would continue to provide an ongoing source of groundwater contamination. However, ongoing contamination from remaining contaminated soil is expected to be reduced by installing asphalt pavement cover (with polyethylene sheeting).

Alternative No. 1 is not considered an adequate, reliable, or permanent long-term Site remedy for contaminated soil.

7.1.3 Reduction of Toxicity, Mobility and Volume

Alternatives No. 2 and 3 provide for the greatest reduction of toxicity, mobility and volume of contaminants in soil, as a significant portion of the contamination would be removed from the Site (Alternative No. 3 more so than Alternative No. 2). Additionally, the closure of three cesspool structures would assist in the reduction of additional leaching of contaminants to the groundwater. However, contaminated soil would remain on-Site and continue to provide an ongoing source of groundwater contamination. This effect would most likely be reduced by the installation of asphalt cover (with polyethylene sheeting).

Alternative No. 1 would not reduce the toxicity, mobility and volume of soil contaminants, as metal contaminated soil would remain on-Site indefinitely.

7.1.4 Implementability

Alternatives No. 2 and 3 are implementable on a technical basis, however they are complicated by the limited space available for equipment to remove the contaminated soil. Alternatives No. 2 and 3 would remediate surface and subsurface soil by excavation of contaminated soil using conventional earthwork equipment and standard construction methods. However, Alternative No. 3 would also utilize additional methods to excavated deeper soil (e.g., sheeting). The materials and services necessary for this remediation are readily available. Operation in spaces with limited access such as the alleyway and inside the Site building are expected to be difficult and result in slow work progress. With regard to operation and maintenance, the materials and services required for paved surfaces are also readily available.

In terms of administrative concerns, these alternatives are also considered to be implementable. Implementation of these alternatives would require coordination and approval by Town of Babylon and Suffolk County agencies (e.g., Building Department) and utility companies as well as Site occupants. However, there are no anticipated, specific problems associated with obtaining permits or approvals from the various agencies and other concerns.

Institutional controls (e.g., deed or access restrictions) would be required for the Site property to preclude contact with remaining contaminated media.

Alternative No. 1 is both technically implementable with readily available methods, equipment, materials and services and administratively implementable.

7.1.5 Compliance with Applicable or Relevant and Appropriate SCGs and Remediation Goals

It is expected that Alternatives No. 2 and 3 would meet the chemical-specific SCGs for the portion of the Site (shallower soil) where contaminated soil would be removed. However, chemical-specific SCGs would not be met for soil that can not be removed under certain areas of the building and around utilities. Contaminated soil that is not removed would continue to contaminate the groundwater by leaching of soil contamination. However, the installation of asphalt pavement cover (with polyethylene sheeting) is expected to reduce leaching of contamination to groundwater.

No location-specific SCGs were identified for Alternatives No. 2 and 3. Action-specific SCGs (e.g., OSHA regulations) would be met during construction and operation and maintenance activities.

Alternative No. 1 will not meet the chemical-specific SCGs for the contaminated soil.

7.1.6 Overall Protection of Human Health and the Environment

Site Alternatives No. 2 and 3 are considered to be protective of human health and moderately protective of the environment (in terms of affecting habitat or vegetation), however residual contamination is expected to remain on-Site which could continue to impact the groundwater. Alternative No. 3 is expected to be more protective of the environment than Alternative No. 2 because less contaminated soil would remain that could provide an ongoing source of contamination to the groundwater. Implementation of these alternatives would result in a moderate to significant volume reduction of contaminated Site soil even through contaminated soil would remain on Site. Although these alternatives would not meet the SCGs due to remaining contamination, they are considered to be protective of human heath since the shallow contaminated soil would be excavated and disposed of off Site. Additionally, the installation of a surficial asphalt cap (with polyethylene sheeting) would reduce the potential for contact remaining subsurface contaminated soil.

Alternative No. 1 does not provide for adequate protection of human health and the environment with regard to contaminated soil, because the Site would remain contaminated for an indefinite period of time.

7.1.7 Cost

Alternative No. 1 does not include remedial actions for soil and thus the cost for this Alternative is $0.

Alternative No. 2, which includes soil excavation of contaminated soil (about 20% of the existing contaminated on Site soil would be removed) using conventional earthwork equipment and standard construction methods, is estimated to cost approximately $2,662,000. This total present worth estimate assumes a 30-year period and a discount rate of five percent.

Alternative No. 3, which also includes excavation of contaminated soil (about 90% of the existing contaminated on Site soil would be removed) using conventional earthwork equipment and standard construction methods with consideration toward using additional means to address deeper soil (e.g., sheeting, soil borings), is estimated to cost approximately $5,317,400. This total present worth estimate assumes a 30-year period and a discount rate of five percent.

7.2 Groundwater

7.2.1 Short-Term Impacts and Effectiveness

Alternative 3 involve intrusive construction work, which could cause releases of contamination during excavation activities. Alternatives No. 1 and 2 are not expected to generate contaminant releases. Alternative No. 3 is expected to pose significant disruptions to current Site activities and operations. Alternatives No. 2 is expected to potentially pose minor disruptions to off-

Site areas (installation of several upgradient and downgradient wells). Alternative No. 1 would not cause disruptions since no action would be taken.

Alternative No. 3 is expected to achieve the remedial action objectives for a significant portion of the contaminated groundwater. However, contamination from potential upgradient sources (VOC and metal) and from metals contamination leaching from Site soil is expected to provide an ongoing source of groundwater contamination. Additionally, it is assumed that groundwater contamination located in the deeper part of the aquifer and downgradient of Edison Ave would not meet SCGs as they would not be captured for remediation and would continue to naturally attenuate.

Alternative No. 2 is not expected to be effective for remediation of contaminated groundwater, as groundwater treatment is not part of this alternative. The natural attenuation processes would monitored and evaluated over an extended over time.

Alternatives No. 1 would is not expected to have any short-term impacts or effectiveness for the groundwater contaminants since no construction or remedial activities would be involved.

7.2.2 Long-Term Effectiveness and Permanence

Alternative No. 3 is considered an adequate, reliable and permanent remedy for Site contaminated groundwater and an adequate and reliable remedy for mitigating human health and environmental impacts (in terms of affecting habitat or vegetation) due to groundwater. Alternative No. 3 would establish long term effectiveness for the shallow and intermediate portion of the aquifer related to VOC and metals because those areas of the plume would be captured and treated. However portions of the downgradient contaminant plume would not be captured for treatment and Alternative No. 3 does not address VOC groundwater contamination in the deeper part of the aquifer. These portions of the plume would continue to naturally attenuate.

Alternatives No. 1 and 2 are not considered an adequate, reliable, or permanent long-term Site remedy for contaminated groundwater. Alternative No. 2 would include monitoring the progress (effectiveness over time) of natural attenuation including the contamination levels, the extent of contamination and the natural processes.

7.2.3 Reduction of Toxicity, Mobility and Volume

Alternative No. 3 provides for the greatest reduction of toxicity, mobility and volume of contaminants in groundwater, as a significant portion of the contamination would be captured and treated. Additionally, any residual waste generated on Site as part of the treatment process would be disposed of off-Site.

Alternatives No. 1 and 2 would not reduce the toxicity, mobility and volume of groundwater contaminants, as treatment of the contaminants is not part of these alternatives. However, Alternative No. 2 includes monitoring the reduction of contamination as the plume naturally attenuates.

7.2.4 Implementability

Alternatives No. 1, 2 and 3 are implementable on a technical basis. The implementability of Alternative No. 3 would be more complicated than Alternatives No. 1 and 2 due to the limited space on Site. The materials and services necessary for these remedial alternatives are readily available. With regard to operation and maintenance, the materials and services required for Alternatives No. 2 and 3 are readily available.

In terms of administrative concerns, these alternatives are also considered to be implementable through the required coordination and approval by numerous Town of Babylon and Suffolk County agencies (e.g., Sewer Department, Building Department) and utility companies. However, there are no anticipated, specific problems associated with obtaining permits or approvals from the various agencies and other concerns.

7.2.5 Compliance with Applicable or Relevant and Appropriate SCGs and Remediation Goals

It is expected that Alternative No. 3 would meet the chemical-specific SCGs for the captured and treated groundwater. However, due to the presence of suspected upgradient contaminant sources adding to Site groundwater contamination and considering the downgradient plume (south of Edison Ave) would not be captured for treatment, this alternative may not meet the chemical-specific SCGs for the overall project in a reasonable and predictable timeframe (i.e., less than 30 years). Additionally, the deeper part of the aquifer would not achieve SCGs in a reasonable and predicable timeframe.

Alternatives No. 1 and 2 are not expected to meet the chemical-specific SCGs for the contaminated groundwater, as treatment is not part of these alternatives.

No location-specific SCGs were identified for Alternatives No. 1, 2 and 3. Action-specific SCGs (e.g., OSHA regulations) would be met during construction, operation and maintenance activities for Alternatives No. 2 and 3.

7.2.6 Overall Protection of Human Health and the Environment

Site Alternative No. 3 is considered to be protective of human health and the environment (in terms of affecting habitat or vegetation). Implementation of this alternative would result in a significant volume reduction of contaminated groundwater. However, downgradient contaminated groundwater that would not be captured for treatment and the deeper part of the aquifer that will not be treated would be expected to naturally attenuate and is not considered protective of human health and the environment in those areas.

Alternatives No. 1 and 2 do not provide for adequate protection of human health and the environment with regard to contaminated groundwater since groundwater would remain in its present condition and continue to harm the aquifer.

7.2.7 Cost

Alternative No. 1 does not include remedial actions for groundwater and thus the cost for this Alternative is $0.

Alternative No. 2, which includes a monitored natural attenuation evaluation/study of Site groundwater and the installation of nine groundwater-monitoring wells (to monitor upgradient and downgradient (south of Edison Ave) contamination), is estimated to cost approximately $368,000. This total present worth estimate assumes a 30-year period and a discount rate of five percent.

Alternative No. 3, which includes groundwater extraction and ex-Situ treatment in addition to the installation of six groundwater-monitoring wells (to monitor upgradient and downgradient (south of Edison Ave) contamination), is estimated to cost approximately $7,872,000. This total present worth estimate assumes a 30-year period and a discount rate of five percent.

8.0 SUMMARY AND CONCLUSIONS

This report presents the results of the FFS for the Spectrum Finishing Corporation Site, as a companion document to the FRI. The FRI/FFS was undertaken in 1999 through 2001 to evaluate the nature and extent of Site contamination; and to identify and evaluate technologies that are available to remediate media and areas requiring remedial action.

During the FRI, metals (specifically chromium, cadmium, copper and nickel) were identified as the primary compounds of concern for the Site surface and subsurface soil. VOCs (specifically PCE) and metals were identified as the primary compounds of concern for the Site groundwater. These compounds were found most frequently and in the highest concentrations for the parameters analyzed. Results of the FRI also confirmed the presence of PCE and metals contamination in groundwater migrating downgradient of the Site. It appears that the contamination detected in downgradient samples is associated with the historic migration of contaminants from on-Site source areas, as well as from unknown upgradient sources.

SOIL

Contaminated surface and subsurface soil was encountered from the ground surface to 18 feet bgs (the water table) on Site. Approximately 8,350 cy of metals contaminated soil are estimated to be located at the Site. Remedial actions for Site surface and subsurface soil are proposed in this FFS to reduce the potential for direct human or animal contact with contaminated soil, and to reduce the risk of contaminating groundwater by reducing the potential for further leaching of contaminants into the groundwater.

Traditional and innovative technologies were screened to address the soil contamination including excavation and off-site treatment/disposal; in-situ and ex-situ treatment including thermal remediation, soil flushing; and others. Most of these technologies would cause extensive disruption to the Site and/or are not considered to be implementable due to the limited access (due to current operations at the Site) and limited available space on-Site. Considering the Site limitations (e.g., buildings, narrow alleyways, parking areas), excavation and off-Site treatment/disposal is considered the most viable active approach to Site cleanup of the technologies screened. Excavation and off-Site treatment/disposal is a traditional, reliable technology to remediate contaminated soil. Thus, excavation and off-Site treatment/disposal were considered the primary technologies for the Site and were evaluated together in the detailed analysis. Two alternatives were developed using the excavation and off-Site treatment/disposal approach. The following paragraphs present the primary assumptions associated with the development of the soil alternatives.

As discussed with NYSDEC, it is assumed that the Site building would remain in place, as well as underground and overhead utilities, with the exception of the gas service line in the alleyway. The gas line in the alleyway would be relocated prior to remedial activities. However, under this assumption, contaminated soil located in areas near and under the Site building and utilities would be left in-place and allowed to naturally attenuate. Therefore, due to the difficulty and expected high costs for removal of contaminated soil in the inaccessible areas previously described, the three soil alternatives do not include the complete removal of contaminated on-Site soil. Also, because the majority of the soil contamination is expected to have occurred from surface spills, leaking underground structures (including sump pits, drainage structures and cesspools) and utilities (including piping), contamination is expected off-Site under nearby buildings to the south and in the immediate area surrounding the drainage structures and cesspools. Based on discussions with the NYSDEC, it is also assumed that the disruption of Site operations must be kept to minimum.

As discussed with NYSDEC, the contaminated cesspools and drainage structures were evaluated for potential closure. Based on conversations with the Town of Babylon building/planning department (which regulates/ manages commercial/industrial drainage structures), the number of drainage structures located at the Site reflects the designed numbers required for proper Site drainage. No drainage structures are proposed for closure as part of the FFS. It should be noted that the Site treatment building may interfere with some of these drainage structures. It is assumed that provisions for trench drains and/or relocation of these drainage structures would be further evaluated during remedial design.

However, according to NYSDOH (which regulates/manages cesspool structures/sanitary structures), a minimum of one cesspool per leased space should be provided for properties similar to SFC. There are three cesspools that could therefore be closed (assumed to be CP-3, CP-4 and CP-8), considering that one will have to remain in service per leased space. These three cesspool closures are included in Alternatives No. 2 and 3. Cesspools would be closed in accordance with SCDHS and USEPA requirements.

Many of the cesspools and drainage structures located in the paved Site area between the Site building and the building to the north (including the former NTU building) may provide discharge points not just for the Site building but also for the other buildings. Therefore, it is assumed that during remedial design the closure and/or replacement of cesspools and drainage structures would be more comprehensively evaluated.

The 23 cesspool and drainage structures identified on Site contain one or more metal compounds exceeding TAGM RSCOs. Therefore, as part of soil Alternatives No. 2 and 3, the 23 structures are proposed to have soil removed to the groundwater table (at about 18 feet bgs) for off-Site disposal. We have assumed remediation to the water table based on the expected distribution of contamination (i.e., leaching from inside the chamber down to the water table).

Three remedial alternatives were assembled for remediating contaminated Site soil, based on the assumptions provided in Appendix A. The alternatives are discussed below.

<u>Alternative No. 1 – No Action</u>

The No Action alternative involves taking no further action to remedy the condition of the Site.

<u>Alternative No. 2 – Excavation and Off-Site Disposal (Approach 1)</u>

Surface and subsurface soil (including soil inside the cesspools/drainage structures) would be remediated by excavation of contaminated soil using conventional earthwork equipment and standard construction methods. Alternative No. 2 (Approach 1) would provide for an approximate total of 1,600 cy of metals contaminated soil (or 20% of the of the estimated 8,350 cy of contaminated soil present on Site) to be excavated for off-Site treatment/disposal (e.g., incineration and/or landfilling). Excavated soil would be screened using XRF technology to assist in identifying the limits of contaminated soil removal.

<u>Alternative No. 3 – Excavation and Off-Site Disposal (Approach 2)</u>

As in Alternative No. 2, excavation and off-Site disposal are the primary components of this alternative. However, surface and subsurface soil would be remediated by excavation of contaminated soil using conventional earthwork equipment and standard construction methods with consideration toward using additional means to address deeper soil (e.g., sheeting, auger borings). This alternative would provide for an approximate total of 7,500 cy of metal contaminated soil (or about 90 % of the estimated 8,350 cy of contaminated soil present on Site) to be excavated for off-Site treatment/disposal (e.g., incineration and/or landfilling). Excavated soil would be screened using XRF technology, to assist in identifying the limits of contaminated removal.

Alternatives No. 2 and 3 would be protective of human health and moderately protective of the environment. Within the majority of affected Site areas, both alternatives are expected to reduce the volume, toxicity and mobility of the metals contamination; Alternative 3 more so than Alternative 2. However, it is expected that contaminated soil would remain in inaccessible areas as described above (e.g., outside of cesspool/drainage structures, underneath building slabs and footers).

The primary difference between Alternatives No. 2 and 3 lies in the volume of soil to be excavated and removed from the Site for disposal. Alternative No. 2 would cause less disruption to the Site areas, since the excavations would be done using standard construction equipment with standard excavation side slopes (1:1 slope); however the volume of contaminated soil removed would be less than one-quarter of that removed by Alternative No. 3 (Approach 2). Additionally, Alternative No. 2 (Approach 1) would be completed in half the time and at half the cost as that of Alternative No. 3 (Approach 2).

Due to the volume of contaminated soil excavated from the Site, Alternative No. 3 would be more protective of human health and the environment than Alternative No. 2 because of the greater volume of contaminated soil excavated for the Site. However, as discussed, contaminated soil would remain on Site regardless of which Alternative is implemented. Implementation of either alternative would not result in the complete containment or remediation of the identified contaminated soil at the Site. Contaminated soil could potentially continue to leach to the groundwater. However, the areas above most of the remaining contaminated soil would be covered by buildings or asphalt pavement cover (with polyethylene sheeting) that would limit infiltration of water from precipitation.

Alternative No. 1 does not provide for adequate protection of human health and the environment, as neither containment nor remediation of surface or subsurface soil would be performed. Contamination in soil would remain to naturally attenuate. However, it is not anticipated that natural attenuation would significantly reduce the levels of contamination in soil in a reasonable amount of time and the contamination would continue to further contaminate the aquifer.

A summary of the estimated costs for Alternatives No. 1 through 3 is presented in Table 8-1. The total estimated costs for Alternatives No. 1 is $0, Alternative No. 2 is $2,622,000 and Alternative No. 3 $5,317,400. Refinement of the estimated costs for these alternatives would be conducted during remedial design. A summary of the estimated total project remedial costs, as further described in Section 7.0, is presented in Table 8-1.

<u>GROUNDWATER</u>

The groundwater plume with PCE and metal concentrations greater than their respective guidance values is extensive and generally encompasses the entire Site and downgradient area to Edison Avenue (the extent of the groundwater study). Contamination was identified both originating from the Site and also from an unknown upgradient source area. The total volume of the upgradient contamination entering the Site from upgradient areas is not well defined. Additionally, the extent of contamination downgradient of the study area (south of Edison Avenue) is not known. However, there is no known use of groundwater for drinking purposes directly downgradient of Edison Ave (in the area expected to contain contaminated groundwater) associated with the Site other than the potential use for irrigation at the New Montefiore Cemetery. Groundwater sampling has not been conducted for areas south of Edison Ave.

PCE groundwater contamination was detected in samples collected from shallow (20 to 30 feet bgs), intermediate (30 to 50 feet bgs) and deep (50 to 90 feet bgs) depths. The water table at the Site is about 18 to 20 feet bgs. Metals contamination was detected in samples collected from primarily the shallow portion of the aquifer, with concentration slightly to moderately exceeding the SCGs in the intermediate depth. The concentration of PCE in groundwater was detected at 610 ppb in shallow groundwater. The peak indicator metals (identified in the shallow portion of the aquifer) were: cadmium at 17,200 ppb, chromium at 123,000 ppb, copper at 9,520 ppb and nickel at 7,310 ppb.

Remedial actions for Site groundwater are proposed in this FFS to reduce further off-Site migration of contaminated overburden groundwater (shallow and intermediate part of the aquifer only) to the extent practical; reduce the levels of contamination in the overburden groundwater (shallow and intermediate part of the aquifer only) at the Site study area boundary (i.e., Edison Avenue) to the extent practical; attain the proposed cleanup goals for overburden groundwater quality (shallow and intermediate part of the aquifer only) at the Site boundary to the extent practical; and reduce the risk of exposure to overburden groundwater (shallow and intermediate part of the aquifer only) by reducing the potential for inhalation of organic vapors, ingestion of contaminated groundwater and dermal contact with contaminated groundwater.

Traditional and innovative technologies were screened to address the groundwater contamination including: groundwater extraction and ex-situ treatment; in-situ air sparging; reactive barrier wall; in-situ chemical oxidation; in-situ thermal remediation; bioremediation and others. Most of these technologies would cause disruption to the areas of groundwater contamination, (which primarily include private industrial and commercial properties located downgradient of the Site) and/or would not be implementable due to the extensive installation depths (i.e., 90 feet to clay) that require cleanup.

Groundwater extraction and ex-situ treatment is a traditional, reliable coupling of technologies to remediate contaminated groundwater. Thus, groundwater extraction and ex-situ treatment (the traditional approach for VOC-metal contaminated groundwater remediation) were considered the primary technologies for the area and were evaluated in the detailed analysis. Additionally, considering that there is no known use of contaminated groundwater associated with the Site for drinking water, MNA was also evaluated in the detailed analysis.

Three remedial alternatives were assembled for remediating groundwater, based on the assumptions provided in Appendix A. The alternatives are discussed below.

<u>Alternative No. 1 – No Action</u>

The No Action alternative involves taking no further action to remedy the condition of the Site. This alternative allows for natural attenuation of impacted groundwater.

<u>Alternative No. 2 – Monitored Natural Attenuation</u>

Monitored Natural Attenuation (MNA) refers to the reliance on the natural attenuation processes (within the context of a controlled and monitored site cleanup approach) to achieve proposed cleanup goals within a timeframe that is reasonable. Natural attenuation processes include a variety of physical, chemical and biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume or concentration of contamination in groundwater. These processes include biodegradation, dispersion, dilution, sorption, volatilization, and/or chemical or biological stabilization, transformation, or destruction of constituents in groundwater.

Alternative No. 3 – Groundwater Extraction and Ex-Situ Treatment

Groundwater extraction and ex-situ treatment are the primary components of this alternative. Groundwater would be extracted from the shallow and intermediate part of the aquifer for the purpose of containment and remediation of impacted groundwater with PCE concentrations greater than 5 ppb, and for metals exceeding their respective SCGs (primarily chromium, cadmium, copper and nickel). It is assumed that groundwater would be extracted at locations downgradient from the Site (e.g., along Edison Avenue and Dale Street) via a series of wells and near an area of higher groundwater contamination adjacent to monitoring well MW-6S. The location for the extraction wells (along Edison Avenue and Dale Street) is based on several factors including the following.

The majority of groundwater contamination is located downgradient of the Site between the Site and Edison Ave.

Private industrial and commercial properties are located between the Site and Edison Ave (the area of highest groundwater contamination). Buildings primarily cover these properties and limited space is available for placement of an extraction system.

Considering the properties are privately owned, access for placement of an extraction system could be difficult and could cause project delays.

Consideration could be given to placement of additional extraction well (s) in location (s) closer to or on the Site (i.e., the east end of the southern alleyway) during remedial design.

A total of four wells would be installed; three screened across the shallow and intermediate aquifer depths for the capture of PCE and metals contamination and one wells screened at shallow depths for the capture of contaminated groundwater near MW-6S. The extracted groundwater would be transferred to an on-Site treatment facility and discharged to municipally owned drainage basins and/or drainage structures. Wells and piping would be positioned within public right-of-ways.

Alternative No. 3 would be protective of human health and the environment. Within the majority of affected Site areas, assuming an approximate 30-year timeframe, this alternative is expected to provide for containment and remediation of the shallow and intermediate contaminant plume. However, because upgradient contamination and the leaching of contaminated soil (located above the water table) is expected, the timeframe for cleanup of the groundwater is not predictable but expected to be 30 years (the longest time allowable by EPA guidance). This alternative is also not expected to capture the entire downgradient plume (areas south of Edison Ave) or the deeper VOC contaminated groundwater. Contaminated groundwater that is not captured by the extraction wells is expected to naturally attenuate as it continues to migrate to the south.

Alternatives No. 1 and 2 would be less protective of human health and the environment than Alternative No. 3 because implementation of these alternatives would not result in containment or remediation of a significant amount of contaminated groundwater. Alternatives No. 1 and 2 would allow contaminated groundwater to further migrate and continue to impact potential downgradient receptors and harm the aquifer; although with Alternative No. 2, the progress of natural attenuation would be monitored. Implementation of Alternative No. 3 would serve to contain and remediate the contaminated groundwater downgradient of the Site to Edison Ave in the shallow and intermediate part of the aquifer. Remaining contamination south of the extraction wells at Edison Ave and in the deeper part of the aquifer would be allowed to naturally attenuate.

Alternative No. 1 does not provide for adequate protection of human health and the environment, as neither containment nor remediation of groundwater with PCE and metal concentrations above the groundwater standard would be achieved in a predictable time period. Alternative No. 2 is more protective of human health than Alternative No. 1 because the contamination levels, the extent of contamination over time and the processes associated with natural attenuation are monitored. Exposure to contaminated groundwater is less likely when monitored (as described above). Also, it is assumed groundwater use restriction/administrative controls would be applied if a known use of contaminated groundwater attributable to the Site is discovered.

A summary of the estimated costs for Alternatives No. 1 through 3 is presented in Table 8-1. The total estimated cost for Alternative 1 is $0; Alternative 2 is $ 368,000; and Alternative No. 3 is $7,872,000. Refinement of the estimated costs for these alternatives would be conducted during remedial design.

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TABLES

Table 3-1
Summary of New York State Criteria for Surface Soil
Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No. 1-52-029

Parameter	Number of Samples Detected	Maximum	NYSDEC TAGM 4046	Number of Samples Exceeding	Number of Samples Tested
Volatile Organics (ug/kg)					
1,1,2-Trichloroethane	1	5	NV	0	8
Chloroethane	1	6	1,900	0	8
1,1-Dichloroethene	1	5	400	0	8
1,1-Dichloroethane	2	2,200	200	1	8
1,1,1-Trichloroethane	2	2,400	800	2	8
Trichloroethene	2	22	700	0	8
Tetrachloroethene	3	150	1,400	0	8
Toluene	2	15	1,500	0	8
Semi-Volatile Organics (ug/kg)					
Dimethyl phthalate	2	420	2,000	0	8
Di-n-Butylphthalate	1	110	8,100	0	8
Fluoranthene	1	35	50,000	0	8
Pyrene	2	86	50,000	0	8
Butylbenzylphthalate	6	5,800	50,000	0	8
Bis (2-Ethylhexyl) Phthalate	8	5,000	50,000	0	8
Di-n-Octyl Phthalate	1	82	50,000	0	8
Benzo (b) Fluoranthene	2	100	1,100	0	8
Indeno (1,2,3-cd) Pyrene	1	140	3,200	0	8
Benzo(g,h,i) Perylene	2	350	50,000	0	8
Pesticides and PCBs (ug/kg)					
Heptachlor	1	1.4	100	0	2
Beta-BHC	1	1.5	200	0	2
Gamma-BHC (Lindane)	1	0.36	60	0	2
Dieldrin	2	4.7	44	0	2
4,4'-DDE	2	18	2,100	0	2
4,4'-DDD	2	8.6	2,900	0	2
4,4'-DDT	2	29	2,100	0	2
Endosulfan sulfate	1	2	1,000	0	2
alpha-Chlordane	1	23	NV	0	2
gamma-Chlordane	1	2.3	540	0	2
PCB-1254	8	6,100	1,000	2	8
PCB-1260	4	1,600	1,000	1	8
Metals (mg/kg)					
Aluminum	8	7,610	SB	0	8
Antimony	5	10.2	SB	0	8
Arsenic	8	10.9	7.5	1	8
Barium	8	220	300	0	8
Beryllium	8	0.8	0.16	7	8
Cadmium	8	1,670	1	8	8
Calcium	8	22,600	SB	0	8
Chromium	8	3,130	10	8	8
Cobalt	8	27.8	30	0	8
Copper	8	1,970	25	7	8
Iron	8	13,100	2,000	8	8
Lead	8	188	200-500	0	8
Magnesium	8	3,790	SB	0	8
Manganese	8	613	SB	0	8
Mercury	7	0.7	0.1	2	8
Nickel	8	21,100	13	7	8
Potassium	8	365	SB	0	8
Selenium	3	1.9	2	0	8
Silver	3	18.1	SB	0	8
Sodium	3	242	SB	0	8
Thallium	8	3.3	SB	0	8
Vanadium	8	15.7	150	0	8
Zinc	8	1190	20	8	8
Cyanide	7	66.5	NV	0	8

NOTES:
1. Site occurrence includes maximum detected values of the respective test parameters.
2. SB = Site Background
3. TAGM 4046 = "Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives Levels", prepared by NYSDEC, are adjusted for inorganic compounds based on background Site soil samples. See Table 4-1.
4. NV = No Value
5. ug/kg = parts per billion, mg/kg = parts per million.

Table 3-2
Summary of New York State Criteria for Subsurface Soil
Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No. 1-52-029

Parameter	Number of Samples Detected	Maximum	NYSDEC TAGM 4046	Number of Samples Exceeding	Number of Samples Tested
Volatile Organics (ug/kg)					
Chloromethane	1	1	NV	0	155
Bromomethane	1	3	NV	0	155
Methylene Chloride	9	37	100	0	155
Acetone	36	90	200	0	155
Carbon Disulfide	3	4	2,700	0	155
1,1-Dichloroethane	2	6	200	0	155
2-Butanone	3	7	300	0	155
1,1,1-Trichloroethane	9	78	300	0	155
1,1,2-Tricholoro-1,2,2-trifluoroethane	12	4	6,000	0	155
1,2-Dibromo-3-chloropropane	1	1	NV	0	155
1,2,4-Trichlorobenzene	2	1	3,400	0	155
Trichloroethene	12	28	700	0	155
4-Methyl-2-Pentanone	3	3	1,000	0	155
2-Hexanone	2	1	NV	0	155
Tetrachloroethene	27	480	1,400	0	155
Toluene	21	280	1,500	0	155
Ethylbenzene	3	170	5,500	0	155
Styrene	1	14	NV	0	155
Xylene (total)	3	360	1,200	0	155
Semi-volatile Organics (ug/kg)					
2-Methylnaphthalene	1	1,000	36,400	0	21
Phenanthrene	1	1,400	50,000	0	21
Di-n-Butyl phthalate	3	550	8,100	0	21
Fluoranthene	1	480	50,000	0	21
Pyrene	1	1,100	50,000	0	21
Butylbenzylphthalate	2	14,740	50,000	0	21
Benzo (a) Anthracene	1	190	224	0	21
Chrysene	1	340	400	0	21
Phenol	1	75	30	1	21
Bis (2-ethylhexyl) phthalate	12	4,100	50,000	0	21
Di-n-Octyl Phthalate	1	320	50,000	0	21
Benzo (b) Fluoranthene	1	260	1,100	0	21
Benzo (k) Fluoranthene	1	330	1,100	0	21
PCBs and Pesticides (ug/kg)					
Aldrin	10	13	41	0	19
Alpha-BHC	11	4.2	110	0	19
Beta-BHC	11	6.1	200	0	19
Delta-BHC	10	5.7	300	0	19
Gamma-BHC (Lindane)	11	3.8	60	0	19
4,4'-DDD	7	1.1	2,900	0	19
4,4'-DDE	10	170	2,100	0	19
4,4'-DDT	6	3.8	2,100	0	19
Dieldrin	10	5.2	44	0	19
Endosulfan I	12	110	900	0	19
Endosulfan II	10	130	900	0	19
Endosulfan sulfate	12	140	1,000	0	19
Endrin	11	15	100	0	19
Endrin aldehyde	11	230	NV	0	19
Heptachlor	10	13	100	0	19
Heptachlor epoxide	12	56	20	1	19
p,p'-Methoxychlor	11	78	NV	0	19
Aroclor - 1254	18	1500	10,000	0	98
Aroclor - 1260	1	12	10,000	0	98
Endrin ketone	10	40	NV	0	19
alpha-Chlordane	11	38	540	0	19
gamma-Chlordane	8	23	540	0	19

NOTES: (See Page 2.)

Table 3-2
Summary of New York State Criteria for Subsurface Soil
Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No. 1-52-029

Parameter	Number of Samples Detected	Maximum	NYSDEC TAGM 4046	Number of Samples Exceeding	Number of Samples Tested
Metals (mg/kg)					
Aluminum	155	15400	SB	0	155
Antimony	24	14.6	SB	0	155
Arsenic	73	13.7	7.5	1	155
Barium	155	469	300	1	155
Beryllium	107	1	0.16	42	155
Cadmium	93	5500	1	70	155
Calcium	155	74000	SB	0	155
Chromium	155	19600	10	72	155
Cobalt	155	6.7	30	0	155
Copper	155	3610	25	36	155
Iron	155	16200	2,000	124	155
Lead	150	1170	200-500	6	155
Magnesium	155	42400	SB	0	155
Manganese	150	350	SB	0	155
Mercury	43	0.52	0.1	11	155
Nickel	155	4900	13	47	155
Potassium	155	1520	SB	0	155
Selenium	16	2.4	2	3	155
Silver	16	3.3	SB	0	155
Sodium	97	1350	SB	0	155
Thallium	52	4.3	SB	0	155
Vanadium	152	24.8	150	0	155
Zinc	111	2980	20	37	155
Cyanide	48	950	NV	0	107

NOTES:
1. Site occurrence includes maximum detected values of the respective test parameters.
2. SB = Site Background
3. TAGM 4046 = "Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives Levels", prepared by NYSDEC, are adjusted for inorganic compounds based on background Site soil samples. See Table 4-1.
4. NV = No Value
5. ug/kg = parts per billion, mg/kg = parts per million.

Table 3-3
Summary of New York State Criteria for Overburden Groundwater
Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No. 1-52-029

Parameter	Samples Detected	Maximum	NYSDEC Class GA	Number of Samples Exceeding	Samples Tested
Volatile Organics (ug/l)					
Chloroethane	1	2	5 (GV)	0	85
Chloroform	3	2	7 (std.)	0	85
Chlorobenzene	2	17	1 (std.)	2	85
1,1,2-Trichloro-1,2,2-trifluoroethane	2	3	5 (std.)	0	85
Methylene chloride	1	29	5 (std.)	1	85
Carbon disulfide	4	2	60 (GV)	0	85
Acetone	13	41	50 (GV)	0	85
Methyl tert-butyl ether	4	14	10 (GV)	1	85
4-Methyl-2-pentanone	2	2	NV	0	85
1,1 -Dichloroethane	12	22	5 (std.)	1	85
1,1-Dichloroethene	9	90	5 (std.)	4	85
1,2-Dichloroethene (total)	25	51	5 (std.)	8	85
1,1,1-Trichloroethane	28	17	5 (std.)	12	85
1,2,4-Trimethylbenzene	5	5	5 (std.)	0	85
Trichloroethene	47	64	5 (std.)	26	85
Tetrachloroethene	59	610	5 (std.)	48	85
Benzene	2	16	1 (std.)	2	85
Ethylbenzene	1	2	5 (std.)	0	85
1,3-Dichlorobenzene	5	2	3 (std.)	0	85
1,4-Dichlorobenzene	5	2	3 (std.)	0	85
1,2-Dichlorobenzene	5	2	3 (std.)	0	85
1,2-Dibromo-3-chloropropane	5	2	0.04 (std)	5	85
Toluene	8	18	5 (std.)	4	85
Xylene (total)	4	2	5 (std.)	0	85
Semi-Volatile Organics (ug/l)					
Bis(2-ethylhexyl)phthalate	2	4	5 (std.)	0	20
Pesticides and PCBs (ug/l)					
Aldrin	2	0.034	0.002 (GV)	2	21
Alpha-BHC	6	0.081	NV	0	21
Heptachlor	4	0.015	0.04 (Std)	0	21
Heptachlor epoxide	6	0.18	0.03 (Std)	3	21

NOTES: (See Page 2.)

Table 3-3
Summary of New York State Criteria for Overburden Groundwater
Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No. 1-52-029

Parameter	Samples Detected	Maximum	NYSDEC Class GA	Number of Samples Exceeding	Samples Tested
Unfiltered Metals (ug/l)					
Aluminum	81	305,000	NV	0	84
Antimony	68	292	3 (std.)	55	84
Arsenic	61	139	25 (std.)	34	84
Barium	74	2,060	1,000 (std.)	6	84
Beryllium	64	15	3 (GV)	39	84
Cadmium	53	17,200	5 (std.)	36	84
Calcium	80	381,000	NV	0	84
Chromium	75	123,000	50 (std.)	57	84
Hexavalent Chromium	9	914	50	2	30
Cobalt	83	380	NV	0	84
Copper	65	9,520	200 (std.)	32	84
Iron	83	426,000	300 (std.)	74	84
Lead	58	4,940	25 (std.)	41	84
Magnesium	80	53,400	35,000 (GV)	2	84
Manganese	68	47,200	300 (std.)	55	84
Mercury	45	5.2	0.7 (std.)	10	84
Nickel	83	7,310	100 (std.)	58	84
Potassium	82	49,700	NV	0	84
Selenium	34	22	10 (std.)	18	84
Silver	16	819	50 (std.)	2	84
Sodium	83	120,000	20,000 (std.)	12	84
Thallium	53	48.2	0.5 (GV)	53	84
Vanadium	81	326	NV	0	84
Zinc	69	14,200	2,000 (GV)	1	84
Cyanide	51	5,490	200 (std.)	9	75
Filtered Metals (ug/l)					
Aluminum	20	2,930	NV	0	70
Antimony	69	6.5	3 (std.)	68	70
Arsenic	1	4.3	25 (std.)	0	70
Barium	70	256	1,000 (std.)	0	70
Beryllium	22	1.3	3 (GV)	0	70
Cadmium	55	672	5 (std.)	27	70
Calcium	70	36,700	NV	0	70
Chromium	23	48.1	50 (std.)	0	70
Cobalt	60	23.5	NV	0	70
Copper	39	1910	200 (std.)	3	70
Iron	57	10,400	300 (std.)	48	70
Lead	3	8.6	25 (std.)	0	70
Magnesium	70	6,880	35,000 (GV)	0	70
Manganese	70	3,150	300 (std.)	34	70
Nickel	62	1,770	100 (std.)	9	70
Potassium	70	15,900	NV	0	70
Sodium	70	104,000	20,000 (std.)	8	70
Vanadium	41	3.3	NV	0	70
Zinc	64	199	2,000 (GV)	0	70

NOTES:
1. Site occurrence includes maximum detected values of the respective test parameters.
2. NYSDEC Class GA Groundwater Standards as promulgated in 6 NYCRR 703, dated June 1998.
3. NV = No Value, std. = Standard, GV = Guidance Value.
4. ug/l = parts per billion.

Table 3-4
Potentially Applicable SCGs
Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No. 1-52-029

ACT/AUTHORITY	CRITERIA/ISSUES	CITATION	BRIEF DESCRIPTION	STATUS	COMMENTS
LOCAL CHEMICAL-SPECIFIC SCGs					
None Identified.					
STATE CHEMICAL-SPECIFIC SCGs					
	Determination of Soil Cleanup Objectives and Cleanup Levels	NYSDEC TAGM HWR-94-4046 (January 1994)	Establishes Recommended Soil Cleanup Objectives (RSCOs) for soil.	Applicable	RSCOs are based on residential exposure assumptions and may be conservative since the Spectrum Finishing Corporation Site is located in a commercial zoned area.
	Determination of Groundwater Cleanup Objectives and Guidance Values	NYSDEC TOGS 1.1.1 (Reissue Date June 1998); 6 NYCRR 706	Establishes Groundwater Effluent Limitations for Class GA Groundwater.	Applicable	
FEDERAL CHEMICAL-SPECIFIC SCGs					
Comprehensive Environmental Responsibility Cleanup and Liability Act (CERCLA)	Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities	USEPA OSWER Directive #9355.4-12, Response, July 1994	USEPA-recommended residential screening level for lead (400 ppm, based on permissible exposure to children).	Applicable	USEPA (1996) also suggests somewhat higher levels (750 to 1500 ppm) are acceptable for adults.
National Primary and Secondary Regulations	USEPA Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs)	USEPA OSWER Directive #9355.4-12, Response, July 1994; 40 CFR 141, November 24, 1999.	National primary drinking water regulations are legally enforceable standards that apply to public water systems. National secondary drinking water regulations are non-enforceable guidelines regulating contaminants that may cause cosmetic or aesthetic effects.	Applicable	
USEPA Office of Water	Drinking Water Regulations and Health Advisories	USEPA, EPA/822/B/96/002, October 1996	USEPA health advisories are nonregulatory concentrations of drinking water contaminants considered protective of adverse noncarcinogenic health effects.	Applicable	
USEPA Region 9	Preliminary Remediation Goals	USEPA, dated October 1, 1999.	USEPA Region 9 PRGs are used for evaluating contaminated sites in terms of exposure pathways (for ingestion of tap water and inhalation/dermal contact/ingestions of soil).	Applicable	
USEPA Region 3 Risk Assessment Guidance	Risk-Based Concentrations (RBCs) Table	USEPA, dated October 7, 1999.	USEPA Region 3 RBCs are based on adult occupational exposure (ingestion of) commercial/industrial soil; for use with "Selecting Exposure Routes and Contaminants of Concern by Risk-Based Screening" (EPA/903/R-93/001).	Applicable	
LOCAL ACTION-SPECIFIC SCGs					
Suffolk County Department of Health Services	Effluent Discharge/Connection to Sanitary Sewer System	Article 12 of Sanitary Code	A permit must be filed with the County for any new connection to the Suffolk County Sewer System.	Potentially Applicable	Public sanitary sewer systems are not currently available for Site area. The area is primarily serviced by sanitary cesspools.
Suffolk County Department Health Services/Pollution Control Office	Closure/remediation of cesspools	SOP No. 9-95	Establishes procedures for properly abandoning a former cesspool. However, the SCDH indicated several cesspools would be required to remain open due to continued use of the facility.	Potentially Applicable	Discharge of liquid and/or sludge may be acceptable for disposal at Bergen point Sewage Treatment facility with approval from the SCDPW prior to disposal.
Suffolk County Department of Health Services	Registration of toxic and hazardous materials storage facilities	Article 12 of Sanitary Code	Permits are required for holding tanks and drum storage areas.	Potentially Applicable	Chemical tanks greater than 80 gallons or a combination of containers which total more than 250 gallons of toxic or hazardous material need to be registered.

Table 3-4
Potentially Applicable SCGs
Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No. 1-52-029

ACT/AUTHORITY	CRITERIA/ISSUES	CITATION	BRIEF DESCRIPTION	STATUS	COMMENTS
Town of Babylon Planning Department	Remediation and closure of Site storm drainage cesspools		A permit would not be required for the closure or construction of a new on-site drainage cesspool, however notification of activities to the Town is recommended.	Potentially Applicable	For every drainage structure closed, a new structure of like volume must be constructed.
Town of Babylon Highway Department	Effluent discharge to a Town stormwater system/detention basin		Discharge must meet New York State SPDES requirements.	Potentially Applicable	Discharge of treated groundwater is generally not permitted to the Town storm drainage system, however exceptions have been made.
Town of Babylon Highway Department	Road Opening Permit		A permit must be filed with the Town before excavation with a local right-of-way.	Potentially Applicable	
Town of Babylon Planning and Development	Building/Plumbing/Electrical Permits	Building Zone Ordinance	A permit must be filed with the town for construction of any new buildings; interior plumbing and electrical work also must be approved.	Potentially Applicable	Only one structure per lot is allowed in the area surrounding the Site. Any additional structure would require a variance from the Town.
	Building/Plumbing/Electrical Permits	Building Zone Ordinance	Permits are required for any trailers or containers located at the Site.	Potentially Applicable	Only one structure per lot is allowed in the area surrounding the Site. Any additional structure would require a variance from the Town.
Town of Babylon Planning and Development	Sheds and/or fences	Building Zone Ordinance	Requirements for sheds and fences	Potentially Applicable	Only one structure per lot is allowed in the area surrounding the Site. Any additional structure would require a variance from the Town.
Town of Babylon	Permissible Sound Levels	Building Zone Ordinance	Establishes allowable noise emissions from construction equipment and property line noise limits.	Potentially Applicable	
Town of Babylon Fire Commission			Establishes requirement for fire alarms and sprinkler systems.	Potentially Applicable	For systems required in treatment buildings.
STATE ACTION-SPECIFIC SCGs					
	Transportation of Hazardous Materials	6 NYCRR 364	Regulates transportation of hazardous materials.	Potentially Applicable	Relevant to off-site transport of remediation derived wastes.
New York State Vehicle and Traffic Law, Article 386; Environmental Conservation Law Articles 3 and 19.	Noise from Heavy Motor Vehicles	6 NYCRR 450	Defines maximum acceptable noise levels.	Potentially Applicable	Marginally applicable; appears to apply to over-the-road vehicles, not construction equipment.
Environmental Conservation law, Articles 3, 15, 17, 19 and 70; Administrative Procedures Act, Article 301	Uniform Procedures	6 NYCRR 621	Establishes the procedures used in the processing of applications for permits.	Applicable	
Environmental Conservation Law, Articles 3, 15, and 17	New York State Pollution Discharge Elimination System	6 NYCRR 750 - 758	Establishes permit requirements for point source discharges into state waters.	Potentially Applicable	Supercedes need to obtain NPDES permits since New York has an approved SPDES program. New York SPDES program does not require a permit for discharge of uncontrolled stormwater runoff as per 6 NYCRR 751.3(a)(7). Discharge to municipal sewers appears to be under local jurisdiction.
Environmental Conservation Law, Articles 3 and 19.	Prevention and Control of Air Contaminants and Air Pollution	6 NYCRR 200 - 202	Establishes general provisions and requires construction and operation permits for emission of air pollutants.	Potentially Applicable	2001 - Identifies NYC Metropolitan Area as non-attainment area for ozone; Nassau County as non-attainment area for CO.
Environmental Conservation Law, Article 15; also Public Health Law Articles 1271 and 1276 (Part 288 only)	Air Quality Classifications and Standards	6 NYCRR 256, 257, and 288	Establishes air quality classification system and air quality standards for various pollutants including particulates and non-methane hydrocarbons.	Potentially Applicable	
Environmental Conservation Law, Articles 3, 19, 23, 27, and 70	Hazardous Waste Management System - General	6 NYCRR 370	Provides definition of terms and general standards applicable to 6 NYCRR 370 - 374, 376.	Potentially Applicable	
	Identification and Listing of Hazardous Waste	6 NYCRR 371	Identifies characteristic hazardous waste and lists specific wastes.	Potentially Applicable	

Table 3-4
Potentially Applicable SCGs
Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No. 1-52-029

ACT/AUTHORITY	CRITERIA/ISSUES	CITATION	BRIEF DESCRIPTION	STATUS	COMMENTS
	Hazardous Waste Manifest System and Related Standards	6 NYCRR 372	Establishes manifest system and record keeping standards for generators and transporters of hazardous waste and for treatment, storage, and disposal facilities.	Potentially Applicable	Relevant to transportation and off-site treatment of hazardous waste
	Hazardous Waste Treatment, Storage, and Disposal Facility Permitting Requirements	6 NYCRR 373	Regulates treatment, storage, and disposal of hazardous waste.	Potentially Applicable	Relevant to off-site treatment/disposal of hazardous waste
	Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities	6 NYCRR 374	Subpart 374-1 establishes standards for the management of specific hazardous wastes. (Subpart 374-2 establishes standards for the management of used oil.)	Potentially Applicable	
Environmental Conservation Law, Articles 1, 3, 27, and 52; Administrative Procedures Act Articles 301 and 305.	Inactive Hazardous Waste Disposal Site	6 NYCRR 375	Identifies process for investigation and remedial action at state funded Registry site; provides exception from NYSDEC permits.	Potentially Applicable	
Environmental Conservation Law, Articles 3 and 27.	Land Disposal Restrictions	6 NYCRR 376	Identifies hazardous wastes which are restricted from land disposal. Defines treatment standards for hazardous waste.	Potentially Applicable	
Environmental Conservation Law, Articles 1, 3, 8, 19, 23, 27, 52, 54, and 70.	Solid Waste Management Facilities	6 NYCRR 360	360-1: General provisions; includes identification of "beneficial use" potentially applicable to non-hazardous oily waste/soil (360-1.15). 360-2: Regulates construction and operation of landfills, including construction & demolition (C&D) debris landfills	Potentially Applicable	May be applicable for establishing off-site treatment and disposal options for excavated contaminated non-hazardous soil and debris.
FEDERAL ACTION-SPECIFIC SCGs					
Comprehensive Environmental Response, Compensation, and Liability Act of 1980 and Superfund Amendments and Reauthorization Act of 1986 (SARA)	National Contingency Plan	40 CFR 300, Subpart E	Outlines procedures for remedial actions and for planning and implementing off-site removal actions.	Potentially Applicable	
Occupational Safety and Health Act	Worker Protection	29 CFR 1904, 1910, and 1926	Specifies minimum requirements to maintain worker health and safety during hazardous waste operations. Includes training requirements and construction safety requirements.	Potentially Applicable	Under 40 CFR 300.38, requirements of OSHA apply to all activities which fall under jurisdiction of the National Contingency Plan.
Executive Order	Delegation of Authority	Executive Order 12316 and Coordination with Other Agencies	Delegates authority over remedial actions to Federal Agencies		
Clean Water Act	National Pollution Discharge Elimination System (NPDES)	40 CFR 122 and 125	Issues permits for discharge into navigable waters. Establishes criteria and standards for imposing treatment requirements on permits.	Potentially Applicable	New York SPDES program incorporates the NPDES program by reference.
Safe Drinking Water Act	Underground Injection Control Program	40 CFR 144	Establishes performance standards, well requirements, and permitting requirements for groundwater re-injection wells.	Potentially Applicable	Potentially applicable for remedial alternatives utilizing Fenton's reagent chemistry in which non-hazardous reagents are introduced to the subsurface via injection wells.
	Underground Injection Control Program: Technical Criteria and Standards	40 CFR 146	Establishes technical criteria and standards that must be met in groundwater re-injection permits for Class V wells. Class V wells include wells used in experimental technologies.	Potentially Applicable	
Clean Air Act	National Primary and Secondary Ambient Air Quality Standards	40 CFR 50	Establishes emission limits for six pollutants (SO_2, PM_{10}, CO, O_3, NO_2, and Pb).	Potentially Applicable	

Table 3-4
Potentially Applicable SCGs
Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No. 1-52-029

ACT/AUTHORITY	CRITERIA/ISSUES	CITATION	BRIEF DESCRIPTION	STATUS	COMMENTS
	National Emission Standards for Hazardous Air Pollutants	40 CFR 61	Provides emission standards for 8 contaminants. Identifies 25 additional contaminants, including PCE, as having serious health effects but does not provide emission standards for these contaminants.	Potentially Applicable	
Resource Conservation and Recovery Act	Criteria for Municipal Solid Waste Landfills	40 CFR 258	Establishes minimum national criteria for management of non-hazardous waste.	Potentially Applicable	Applicable for remedial alternatives which involve generation of non-hazardous waste. Non-hazardous waste must be hauled and disposed of in accordance with RCRA.
	Hazardous Waste Management System - General	40 CFR 260	Provides definition of terms and general standards applicable to 40 CFR 260 - 265, 268.	Potentially Applicable	Applicable for remedial alternatives which involve generation of a hazardous waste (*e.g.* , contaminated soil). Hazardous waste must be handled and disposed of in accordance with RCRA.
	Identification and Listing of Hazardous Waste	40 CFR 261	Identifies solid wastes which are subject to regulation as hazardous wastes.	Potentially Applicable	
	Standards Applicable to Generators of Hazardous Waste	40 CFR 262	Establishes requirements (e.g., EPA ID numbers and manifests) for generators of hazardous waste.	Potentially Applicable	
	Standards Applicable to Transporters of Hazardous Waste	40 CFR 263	Establishes standards which apply to persons transporting manifested hazardous waste within the United States.	Potentially Applicable	
	Standards Applicable to Owners and Operators of Treatment, Storage, and Disposal Facilities	40 CFR 264	Establishes the minimum national standards which define acceptable management of hazardous waste.	Potentially Applicable	
	Standards for owners of hazardous waste facilities	40 CFR 265	Establishes interim status standards for owners and operators of hazardous waste treatment, storage and disposal facilities.	Potentially Applicable	
	Land Disposal Restrictions	40 CFR 268	Identifies hazardous wastes which are restricted from land disposal.	Potentially Applicable	
	Hazardous Waste Permit Program	40 CFR 270, 124	USEPA administers hazardous waste permit program for CERCLA/Superfund Sites. Covers basic permitting, application, monitoring, and reporting requirements for off-site hazardous waste management facilities.	Potentially Applicable	

Note: No location specific SCGs identified.

Table 4-1
Summary of Remedial Technologies for Soil
Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No. 1-52-029

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	TECHNOLOGY OPTIONS	APPLICABILITY
No Action	No Further Action Taken (to remedy soil conditions)	N/A	Required by USEPA/NYSDEC RI/FS Guidance to pass through preliminary screening, for comparison to other alternatives.
Institutional Controls	Access Restrictions	Fencing, Cesspool/Drainage Structure Closure	Effective at reducing human contact with contaminants. Will not reduce toxicity, mobility or volume of contaminants.
	Deed Restrictions	N/A	Effective at reducing human contact with contaminants. Will not reduce toxicity, mobility or volume of contaminants.
Containment/Isolation	Capping/Surface Sealing	Clay Cap Geosynthetic Cap Asphalt Pavement/Concrete Cap	Effective at reducing potential for human contact with contaminants and transport of contaminants by infiltration. Does not reduce volume or toxicity of contamination. Installation of clay or geosynthetic cap may interfere with current Site operations. Costs range from low to high.
	Vertical Barriers	Slurry Cutoff Wall Grout/Sheet Pile Wall	Effective at reducing transport of contamination. Does not reduce volume or toxicity of contamination. Unproven technology to depths of 90 feet (i.e., depth to clay). Generally moderate to high costs.
	Horizontal Barriers	Liners Grouting	Effective at isolation and reducing transport of contaminants. Does not reduce volume or toxicity of contamination. Not implementable. Generally moderate to high costs.

Table 4-1
Summary of Remedial Technologies for Soil
Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No. 1-52-029

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	TECHNOLOGY OPTIONS	APPLICABILITY
Treatment	Traditional Technologies (In-Situ)	Soil Vapor Extraction	Proven effective for VOC treatment. Not effective for metals treatment. Readily implementable. Causes minimal Site disruption. Capital and O&M costs are moderate.
	Traditional Technologies (Ex-Situ)	Low and High Thermal Treatment	Effective for VOCs removal. Not effective for metals removal. Cost effective thermal technology; thermal technologies have relatively high costs.
		Pyrometallurgical Extraction	Effective ex-situ at removing volatile metals from the solid phase. Excavation is required. High cost.
	Traditional Technologies (In-Situ or Ex-Situ)	Soil Flushing (In-Situ) Soil Washing (Ex-Situ)	Effective for water-soluble metals treatment. Not effective on most VOCs. Wash solution is flushed through or applied to source area soils. May not be uniformly effective. Capture and treatment/disposal of resulting solution required; difficult to implement. Moderate to high costs.
		Solidification/Stabilization	Effective to immobilize most metals and a broad range of VOCs. Energy intensive process; may not be cost effective. Difficult to implement if limited Site space is available.
	Innovative Technologies (In-Situ)	Chemical Oxidation	Includes application/injection of ozone, Fenton's Reagent, or potassium or sodium permanganate. Effective for chlorinated VOCs treatment. Not effective for metals treatment. Generally cost effective for source areas only.
		Surfactant Injection	Effective for chlorinated VOCs treatment. Not effective for metals treatment. Capture and treatment/disposal of resulting solution is required; difficult to implement.

Table 4-1
Summary of Remedial Technologies for Soil
Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No. 1-52-029

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	TECHNOLOGY OPTIONS	APPLICABILITY
Treatment (Continued)	Innovative Technologies (In-Situ) (Continued)	Electrokinetics	Effective for removal of inorganics. Ineffective for VOCs removal in soils. Considered an emerging technology. Most applicable to saturated soils with low groundwater flow rates and moderate to low permeability. Implementation difficult for large treatment area.
		Phytoremediation	May be effective for metals treatment, especially Cu, Co, Zn, Ni, Mn. at lower concentrations. Emerging technology for VOCs treatment. Difficult to implement to remediate at deep depths and in multi-seasonal climates. Long remediation timeframes required. Low cost.
		Steam Injection/Stripping	Steam may be used to enhance SVE system for VOCs treatment. Not effective for metals treatment. Difficult to implement because must recapture steam. Moderate to high costs.
	Innovative Technologies (Ex-Situ)	Chemical Reduction/Oxidation	Effective for remediation of Chromium (VI), arsenic, and cyanides. Careful selection of agents required, if multiple metals present. May not be cost effective for high contaminant concentrations due to amount of agents required.
		Chemical Leaching/Extraction	Effective for reclamation of chromium, nickel, copper, zinc, cadmium, and other metals. Excavation would be required, and therefore difficult to implement. High costs.
		Separation	Effective for removal of metals. Gravity separation, magnetic separation, and physical separation are available processes. Excavation would be required, and therefore difficult to implement. High costs.
	Innovative Technologies (In-Situ or Ex-Situ)	Enhanced Biodegradation	Marginally effective for VOCs and metals treatment. Likely not effective for long-term, given upgradient contamination. Moderate costs.

Table 4-1
Summary of Remedial Technologies for Soil
Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No. 1-52-029

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	TECHNOLOGY OPTIONS	APPLICABILITY
Excavation and Off-Site Treatment/Disposal	Removal	Excavation	Effective at reducing volume of on-Site contaminants. May not be feasible or cost effective for all areas, due to (1) required excavation depths (e.g., below the water table) and (2) proximity to Site buildings, utilities, cesspools/drainage structures. Costs may be lower or higher, when coupled with off-Site disposal, than other remedial actions, depending on scope of work.
	Chemical Treatment	Oxidation/Reduction/ Neutralization	Effective for metals treatment to allow landfilling.
	Thermal Treatment	Low and High Temperature Oxidation	Effective for lowering VOCs to allow landfilling.
		Incineration	Effective for lowering VOCs to allow landfilling.
	Disposal	Landfilling	Hazardous wastes exceeding LDRs require treatment to satisfy standards prior to disposal. Nonhazardous wastes can be landfilled. Costs may be lower or higher, when coupled with excavation, than other remedial actions.

Table 4-2
Summary of Remedial Technologies for Groundwater
Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No. 1-52-029

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	TECHNOLOGY OPTIONS	APPLICABILITY
No Action	No Further Action Taken (to remedy groundwater conditions)	N/A	Required by USEPA/NYSDEC RI/FS Guidance to pass through preliminary screening, for comparison to other alternatives.
Monitored Natural Attenuation	Monitored Natural Attenuation	N/A	Under certain circumstances, effective at reducing toxicity, mobility and volume of contaminants (e.g., PCE, metals). Materials, equipment and labor available for MNA. Low costs.
Institutional Controls	Access Restrictions	N/A	Effective at reducing human contact with contaminants. Will not reduce toxicity, mobility or volume of contaminants.
	Deed Restrictions	N/A	Effective at reducing human contact with contaminants. Will not reduce toxicity, mobility or volume of contaminants.
	Water Use Restrictions	N/A	Effective at reducing human contact with contaminants. Will not reduce toxicity, mobility or volume of contaminants.
Containment/Isolation	Capping/Surface Sealing	Clay Cap Geosynthetic Cap Asphalt Pavement/Concrete Cap	Effective at reducing potential for human contact with contaminants and transport of contaminants by infiltration. Does not reduce volume or toxicity of contamination. Installation of clay or geosynthetic cap may interfere with current Site operations. Costs range from low to high.
	Vertical Barriers	Slurry Cutoff Wall Grout/Sheet Pile Wall	Effective at reducing transport of contamination. Does not reduce volume or toxicity of contamination. Unproven technology to depths of 90 feet (i.e., depth to clay). Generally moderate to high costs.
	Horizontal Barriers	Liners Grouting	Effective at isolation and reducing transport of contaminants. Does not reduce volume or toxicity of contamination. Not implementable. Generally moderate to high costs.

Table 4-2
Summary of Remedial Technologies for Groundwater
Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No. 1-52-029

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	TECHNOLOGY OPTIONS	APPLICABILITY
Containment/Collection	Subsurface Drains	Trench Drains	Effective for collection of shallow groundwater. Treatment of collected groundwater would be required. Difficult to implement if limited available space and large depth to confining layer.
	Extraction	Extraction Wells	Effective at reducing transport of shallow and deep groundwater contamination. Does not reduce volume or toxicity of contamination. Readily implementable. Causes minimal disruption to Site. Extracted groundwater would require treatment.
On-Site Treatment	Traditional Technologies (In-Situ)	Air Sparging	Effective for highly-volatile VOCs removal. Not effective for metals removal. Effectiveness is dependent on Site geology, although removal efficiencies are generally high in coarse-grained aquifers. Readily implementable. Moderate costs compared to other groundwater, VOC treatment technologies.
	Traditional Technologies (Ex-Situ)	Air Stripping	Effective for VOC removal. Not effective for metals treatment. Treated VOCs emissions may require treatment. Implementable. Low to moderate capital and O&M costs; depending on natural inorganics content and flow rate.
		Adsorption	Effective for VOCs and metals removal from groundwater. Different media required for both. Implementable. Low to moderate capital and O&M costs; depending on natural inorganics content and flow rate.
		Ion Exchange (Anion/Cation)	Effective for metals removal. Not effective for VOC treatment. Implementable. Moderate to high capital and O&M costs; depending on natural inorganics content and flow rate.
		Precipitation	Effective for metals treatment. Generally ineffective for VOCs treatment. Moderate to high capital and O&M costs; depending on inorganics content
		Ultraviolet Oxidation	Effective for VOCs removal. Moderate to high capital and O&M costs; depending on VOCs concentration and natural inorganics content and flow
		Coagulation/Flocculation/ Clarification	Effective for metals removal. Not effective for VOCs removal. Moderate to high capital and O&M costs; depending on inorganics content and flow rate.

Table 4-2
Summary of Remedial Technologies for Groundwater
Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No. 1-52-029

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	TECHNOLOGY OPTIONS	APPLICABILITY
On-Site Treatment (Continued)	Traditional Technologies (Ex-Situ) (Continued)	Chemical Oxidation/Reduction/ Neutralization	Effective for chlorinated VOCs treatment and select metals treatment. Moderate to high capital and O&M costs; depending on VOCs and inorganics content and flow rate.
		Membrane Processes	Effective for metals removal (reverse osmosis, electrodialysis). Not effective for VOCs removal. Moderate to high capital and O&M costs; depending on inorganics content and flow rate.
	Innovative Technologies (In-Situ)	Chemical Oxidation/Reduction/ Neutralization	Effective for chlorinated VOCs treatment and select metals treatment. Includes application/injection of ozone, hydrogen peroxide/Fenton's Reagent, potassium/sodium permanganate, hypochlorite, chlorine gas, alkali metals, sulfur dioxide, sulfite salts, and ferrous sulfate. Nonspecific nature of chemical reagents can be problem for metals treatment, as agents used to treat one metal can make other target metals more toxic or mobile. Generally cost effective for highly contaminated groundwater proximate to source areas, if source is remediated.
		Permeable Reactive Wall	Effective for treatment of chlorinated VOCs and select inorganics (Cd, Cr, Ni); however, multiple walls/materials may be required to treat Site contaminants. Periodic rejuvenation may be required to obtain long-term effectiveness. Unproven technology to depths of 90 feet (i.e., depth to clay). Moderate capital costs; low O&M costs.
		Steam Injection/Stripping	Steam may be used to enhance SVE system for VOCs treatment. Not effective for metals treatment. VOC vapor extraction/treatment system would be required. Subsurface heterogeneities may limit effectiveness. Difficult to implement because must recapture steam. Moderate to high costs.
		Electrokinetics	Effective for removal of inorganics. Ineffective for VOCs removal. Considered an emerging technology. Most applicable to saturated soils with low groundwater flow rates and moderate to low permeability. Implementation difficult for large treatment area.
On-Site Treatment	Innovative Technologies	Phytoremediation	Rhizofiltration effective for metals treatment in groundwater, especially Cu,

Table 4-2
Summary of Remedial Technologies for Groundwater
Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No. 1-52-029

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	TECHNOLOGY OPTIONS	APPLICABILITY
(Continued)	(In-Situ)		Co, Zn, Ni, Mn at lower concentrations. Emerging technology for VOCs treatment. Long remediation timeframes required.
Off-Site Treatment	POTW Treatment	N/A	Practical method for dealing with treated water. Effective for metals and VOCs. Implementable by means of discharge to sewer, or transportation to POTW (costly).
	RCRA Facility Treatment	N/A	Effective for metals and VOCs. Transportation to facility required (costly).

Table 5-1
Summary of Remedial Action Alternatives
Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No. 1-52-029

Potential Remedial Actions	SOIL REMEDIATION			GROUNDWATER REMEDIATION		
	Alternative No. 1: No Action	Alternative No. 2: Excavation and Off-Site Disposal (Approach 1)	Alternative No. 3: Excavation and Off-Site Disposal (Approach 2)	Alternative No. 1: No Action	Alternative No. 2: Monitored Natural Attenuation	Alternative No. 3: Groundwater Extraction and Ex-Situ Treatment
SOIL						
No Action	x					
Cesspool/Drainage Structure Closure		x	x			
Soil Excavation		x	x			
Off-Site Disposal (Incineration/Landfill)		x	x			
Capping (Asphalt Pavement (in Alleyway and Parking Lot) and Concrete Slab (Inside Site Building))		x	x			
GROUNDWATER						
No Action				x	x	
Annual Groundwater Monitoring					x	x
Extraction (immediately downgradient/off Site)						x
Ex-Situ Treatment (Chemical Precipitation, Ion Exchange (Cation) or Reverse Osmosis)						x
Ex-Situ VOC Treatment (GAC or Air Stripping)						x

NOTES:
1. Assume on-Site building to remain undisturbed (roof may need removal)
2. For Soil Remediation, Alternative No. 2 (Excavation and Off-Site Disposal (Approach 1)) would address contaminated soil utilizing conventional earthwork equipment and standard construction methods.
3. For Soil Remediation, Alternative No. 3 (Excavation and Off-Site Disposal (Approach 2)) would address contaminated soil utilizing conventional earthwork equipment and standard construction methods, with consideration toward using additional means to address deeper soils (e.g., sheeting).

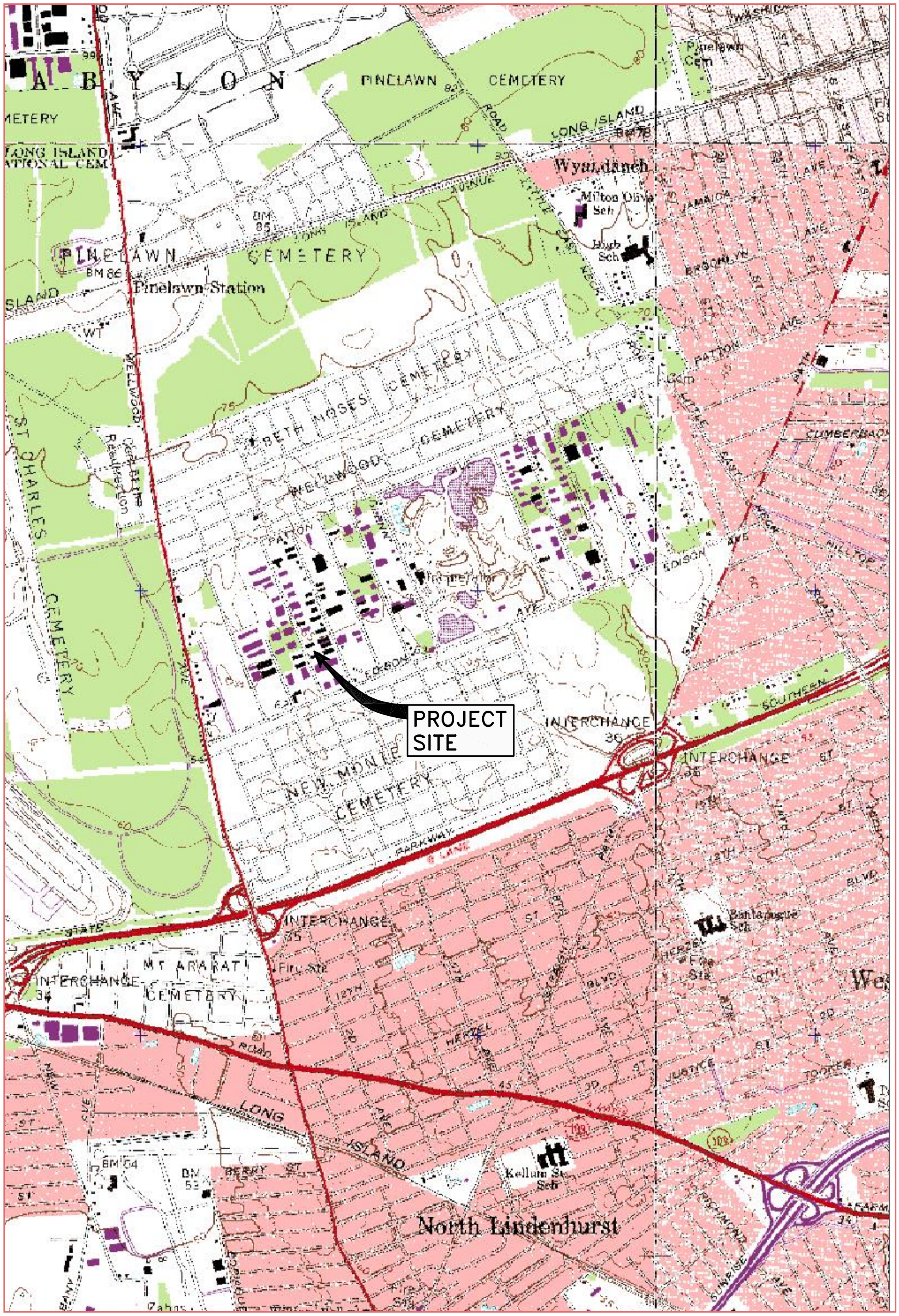
TABLE 8-1

Summary of Estimated Costs for Remedial Alternatives
Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No. 1-52-029

REMEDIAL ALTERNATIVES	Estimated Costs		
	Capital Cost	Total Present Worth O&M Costs	Total Present Worth (Capital and O&M)
SOIL REMEDIATION			
1. No Action	$0	$0	$0
2. Soil Excavation and Off-Site Disposal (Approach 1)	$2,605,000	$17,000	$2,622,000
3. Soil Excavation and Off-Site Disposal (Approach 2)	$5,300,400	$17,000	$5,317,400
GROUNDWATER REMEDIATION			
1. No Action	$0	$0	$0
2. Monitored Natural Attenuation	$91,000	$277,000	$368,000
3. Groundwater Extraction and Ex-Situ Treatment	$1,835,000	$6,037,000	$7,872,000

Notes:
(1) Cost estimate assumptions for Remedial Alternatives are presented herein in Section 5.0, Appendix A, and Appendix C.
(2) Costs are rounded to the nearest $1,000.
(3) The estimated total present worth of O&M costs were calculated for a 30-year timeframe and a 5% discount rate (i.e., interest rate = 9%, inflation rate = 4%).
(4) Alternatives No. 1 for soil and groundwater remediation are the No Action alternatives.
(5) Capital Costs include cost markup for Engineering (15%) and Contingency/Administration (10%).

FIGURES



SCALE IN FEET

0 1000 2000 4000

NOTE:
BASE MAP ADAPTED FROM
U.S.G.S. QUADRANGLE MAPS
AMITYVILLE, N.Y. – 1978 AND
BAY SHORE WEST, N.Y.–1979.

SPECTRUM FINISHING CORPORATION
50 DALE STREET
WEST BABYLON, NEW YORK

SITE LOCATION MAP

N

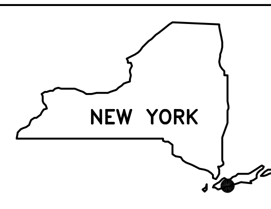


FIGURE No.

1

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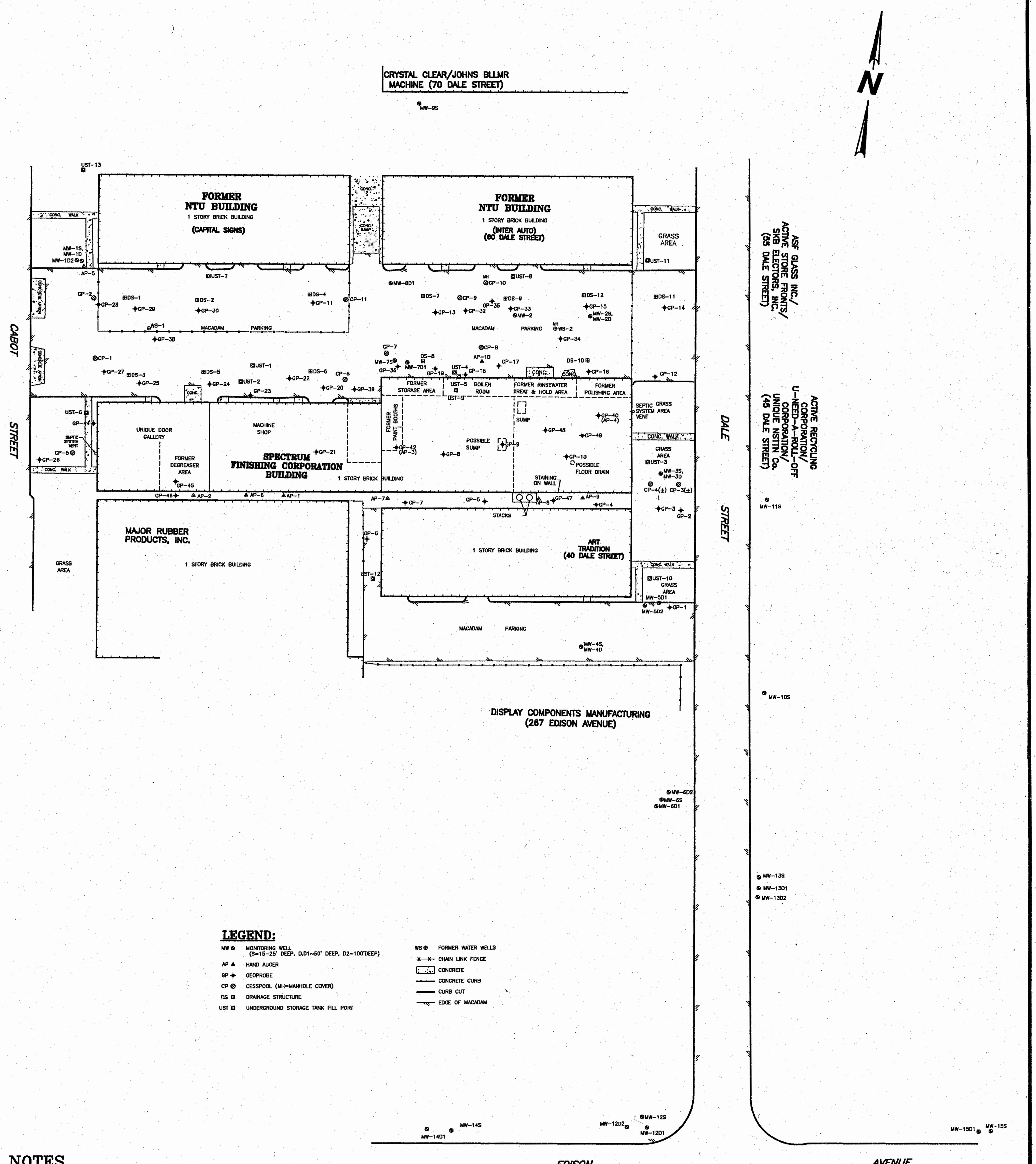

NOTES

1. BASE MAP ADAPTED FROM A PLAN PROVIDED BY YEC, INC. IN AUTOCAD FORMAT DATED AUGUST 1999. DATES OF SURVEY; JUNE 4, 1999 (WELL ELEVATIONS ONLY); JULY 20–21, 1999. ADDITIONAL SURVEY SEPTEMBER 12, 2000 OF MONITORING WELLS MW-6S, MW-9S, MW-10S, MW-11S, MW-12S, AND CESSPOOL CP-11. ADDITIONAL SURVEY MAY 10, 2001 OF MONITORING WELLS MW-12D1, MW-12D2, MW-12S, MW-13D1, MW-13D2, MW-13S, MW-14D1, MW-14S, MW-15D1, MW-15S.

2. HORIZONTAL DATUM: ASSUMED; VERTICAL DATUM: NGVD 1929.

3. THE SIZE AND LOCATION OF EXISTING FEATURES SHOULD BE CONSIDERED APPROXIMATE.

FIGURE No. 2

PROJECT No. 55291

SPECTRUM FINISHING CORPORATION
50 DALE STREET
WEST BABYLON, NEW YORK

FOCUSED REMEDIAL INVESTIGATION/FEASIBILITY STUDY

SITE PLAN

REV No.	DESCRIPTION	BY	DATE

SCALE IN FEET
0 30 60 120

DRAWN BY: BWS
DATE: NOVEMBER 2001

GZA GeoEnvironmental of New York

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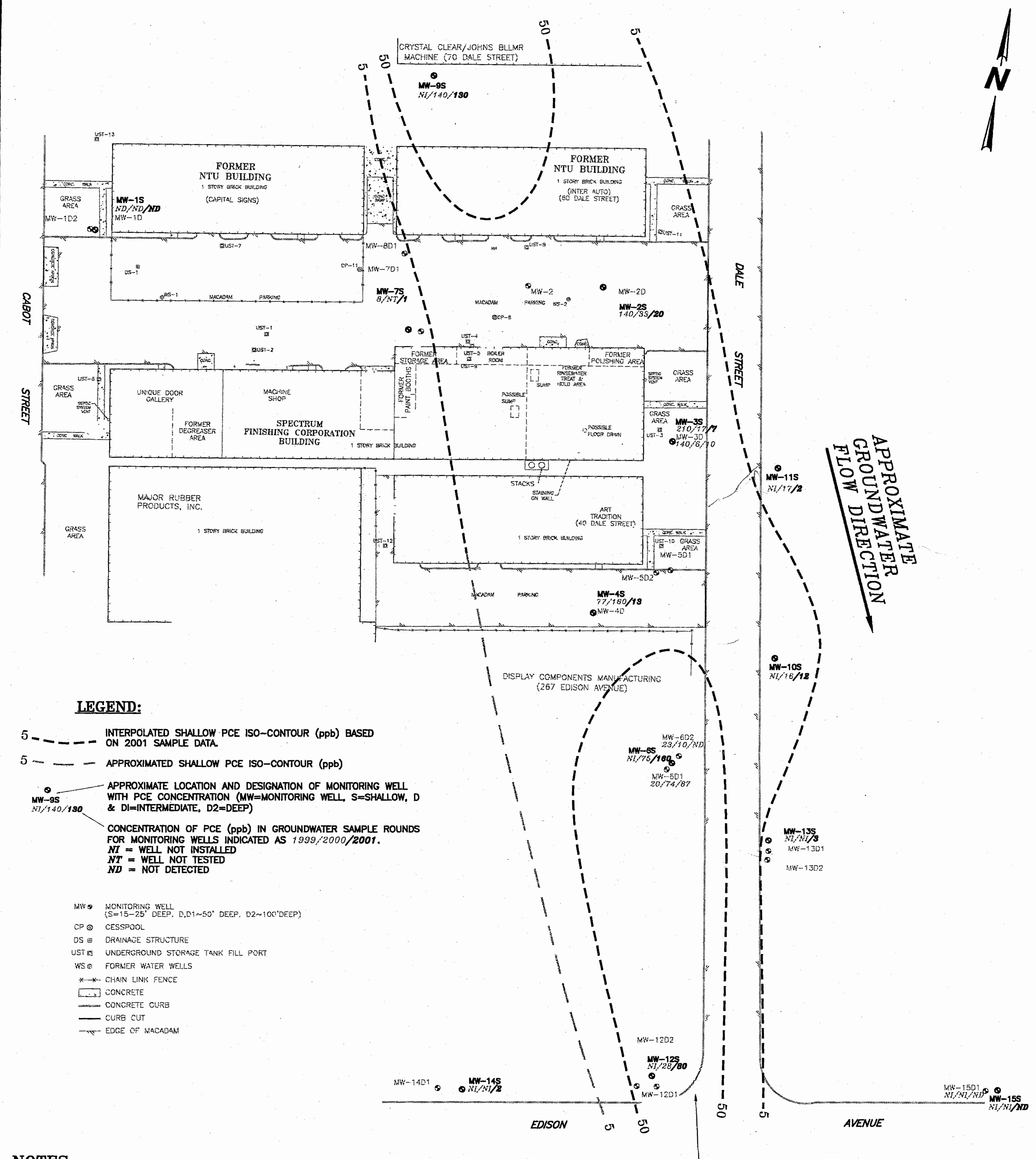

NOTES

1. BASE MAP ADAPTED FROM A PLAN PROVIDED BY YEC, INC. IN AUTOCAD FORMAT DATED AUGUST 1999. DATES OF SURVEY; JUNE 4, 1999 (WELL ELEVATIONS ONLY); JULY 20-21, 1999. ADDITIONAL SURVEY SEPTEMBER 12, 2000 OF MONITORING WELLS MW-6S, MW-9S, MW-10S, MW-11S, MW-12S, AND CESSPOOL CP-11. ADDITIONAL SURVEY MAY 10, 2001 OF MONITORING WELLS MW-12D1, MW-12D2, MW-12S, MW-13D1, MW-13D2, MW-13S, MW-14D1, MW-14S, MW-15D1, MW-15S.

2. HORIZONTAL DATUM: ASSUMED; VERTICAL DATUM: NGVD 1929.

3. THE SIZE AND LOCATION OF EXISTING FEATURES SHOULD BE CONSIDERED APPROXIMATE.

4. THE APPROXIMATE SOUTHEASTERLY GROUNDWATER FLOW DIRECTION SHOWN IS BASED ON GROUNDWATER ELEVATION MEASUREMENTS MADE IN SITE MONITORING WELLS DURING FOCUSED REMEDIAL INVESTIGATION FIELD WORK IN 1999, 2000 AND 2001.

5. THE DISTRIBUTION OF PCE IN INTERMEDIATE AND DEEP GROUNDWATER IS DEPICTED ON FIGURES AND TABLES IN THE FOCUSED REMEDIAL INVESTIGATION REPORT.

FIGURE No. 2-4

PROJECT No. 55291

SPECTRUM FINISHING CORPORATION
50 DALE STREET
WEST BABYLON, NEW YORK

FOCUSED FEASIBILITY STUDY

SHALLOW GROUNDWATER PCE CONTOURS (MONITORING WELLS)

REV No.	DESCRIPTION	BY	DATE

SCALE IN FEET: 0 30 60 120

DRAWN BY: BWS

DATE: JANUARY 2002

GZA GeoEnvironmental of New York

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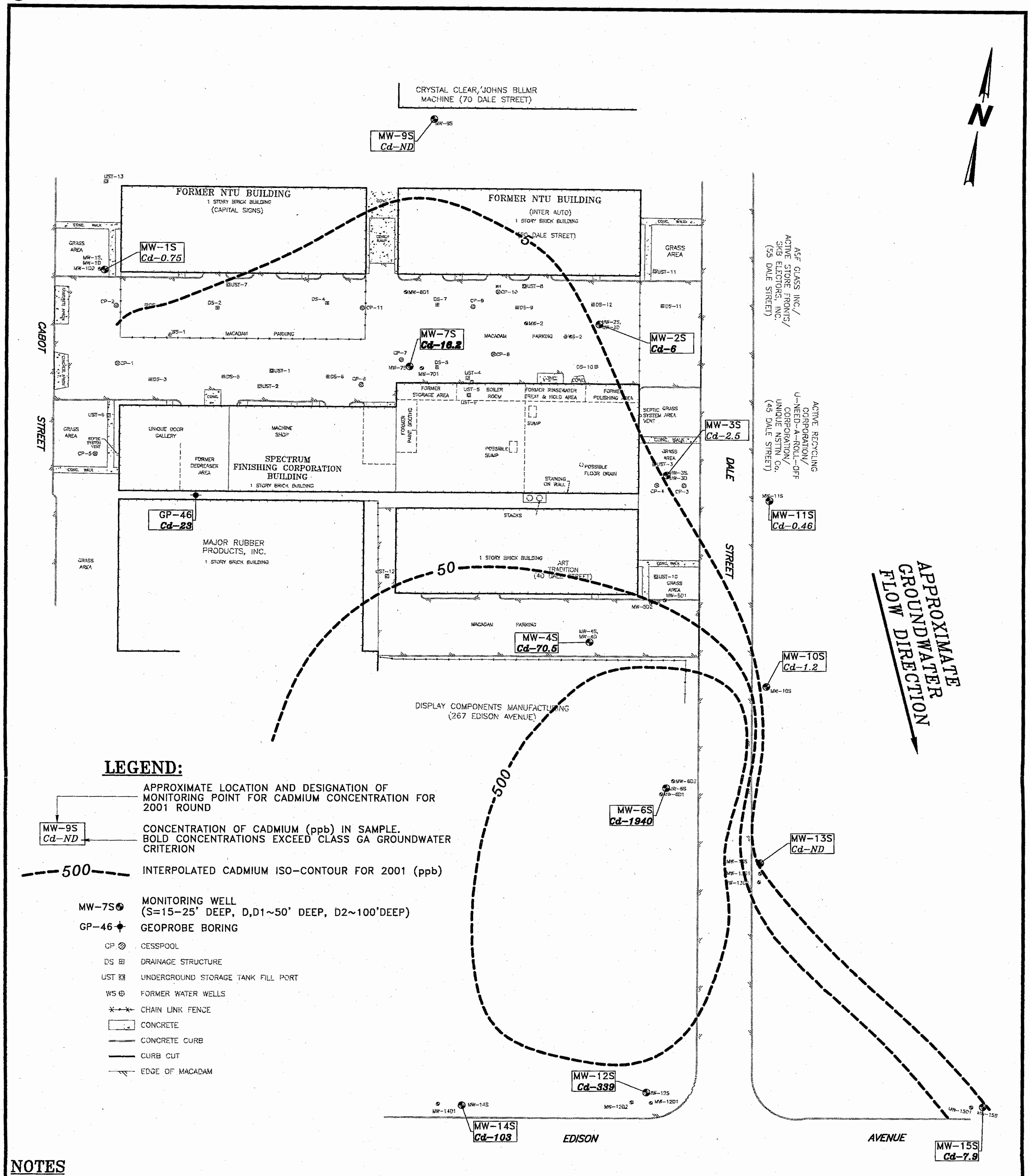


NOTES

1. BASE MAP ADAPTED FROM A PLAN PROVIDED BY YEC, INC. IN AUTOCAD FORMAT DATED AUGUST 1999. DATES OF SURVEY; JUNE 4, 1999 (WELL ELEVATIONS ONLY); JULY 20-21, 1999. ADDITIONAL SURVEY SEPTEMBER 12, 2000 OF MONITORING WELLS MW-6S, MW-9S, MW-10S, MW-11S, MW-12S, AND CESSPOOL CP-11. ADDITIONAL SURVEY MAY 10, 2001 OF MONITORING WELLS MW-12D1, MW-12D2, MW-12S, MW-13D1, MW-13D2, MW-13S, MW-14D1, MW-14S, MW-15D1, MW-15S.

2. HORIZONTAL DATUM: ASSUMED; VERTICAL DATUM: NGVD 1929.

3. THE SIZE AND LOCATION OF EXISTING FEATURES SHOULD BE CONSIDERED APPROXIMATE.

4. THE APPROXIMATE SOUTHEASTERLY GROUNDWATER FLOW DIRECTION SHOWN IS BASED ON GROUNDWATER ELEVATION MEASUREMENTS MADE IN SITE MONITORING WELLS DURING FOCUSED REMEDIAL INVESTIGATION FIELD WORK IN 1999, 2000 AND 2001.

5. ADDITIONAL INFORMATION CONCERNING THE CONCENTRATIONS OF CADMIUM AND OTHER METALS IS PROVIDED ON FIGURES AND TABLES IN THE FOCUSED REMEDIAL INVESTIGATION REPORT.

FIGURE No. 2-5

PROJECT No. 55291

SPECTRUM FINISHING CORPORATION
50 DALE STREET
WEST BABYLON, NEW YORK

FOCUSED FEASIBILITY STUDY

TOTAL (LOW FLOW) CADMIUM CONCENTRATIONS (ppb) CONTOURS IN SHALLOW GROUNDWATER (2001 ROUND)

DESCRIPTION	BY	DATE

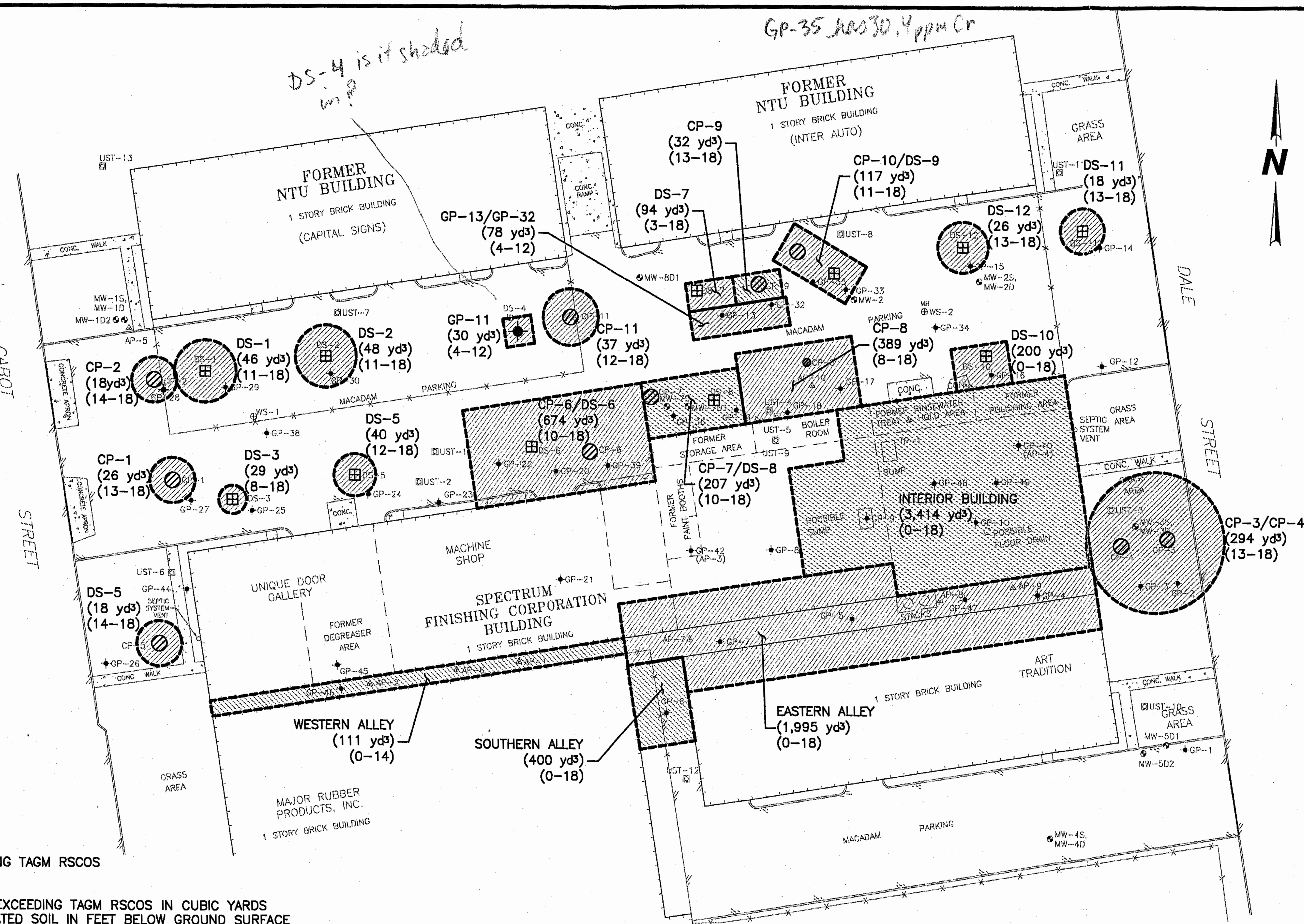
SCALE IN FEET

0 30 60 120

DRAWN BY: BWS

DATE: JANUARY 2002

GZA GeoEnvironmental of New York



LEGEND:

ASSUMED SOIL AREA EXCEEDING TAGM RSCOS

DS-3 –SAMPLE POINT
(29 yd3) –ASSUMED VOLUME OF SOIL EXCEEDING TAGM RSCOS IN CUBIC YARDS
(8–18) –DEPTH RANGE OF CONTAMINATED SOIL IN FEET BELOW GROUND SURFACE

- CP – CESSPOOL (MH=MANHOLE COVER)
- DS – DRAINAGE STRUCTURE
- UST – UNDERGROUND STORAGE TANK FILL PORT
- WS – FORMER WATER WELLS
- GP – GEOPROBE
- AP – HAND AUGER
- MW – MONITORING WELL (S=15–25' DEEP, D,D1~50' DEEP, D2~100'DEEP)
- CHAIN LINK FENCE
- CONCRETE
- CONCRETE CURB
- CURB CUT
- EDGE OF MACADAM

TOTAL VOLUME OF SOIL EXCEEDING TAGM RSCOS:

WESTERN ALLEY SOIL	~111 CU. YDS.
EASTERN ALLEY SOIL	~1,995 CU. YDS.
SOUTHERN ALLEY SOIL	~400 CU. YDS.
INTERIOR BUILDING SOIL	~3,414 CU. YDS.
CESSPOOLS & DRAINAGE STRUCTURE SOIL	~2,421 CU. YDS.
	CU. YDS.
TOTAL	~8,341 CU. YDS.

NOTES:

1. BASE MAP ADAPTED FROM A PLAN PROVIDED BY YEC, INC. IN AUTOCAD FORMAT DATED AUGUST 1999. DATES OF SURVEY; JUNE 4, 1999 (WELL ELEVATIONS ONLY); JULY 20–21, 1999. ADDITIONAL SURVEY SEPTEMBER 12, 2000 OF MONITORING WELLS MW-6S, MW-9S, MW-10S, MW-11S, MW-12S, AND CESSPOOL CP-11. ADDITIONAL SURVEY MAY 10, 2001 OF MONITORING WELLS MW-12D1, MW-12D2, MW-12S, MW-13D1, MW-13D2, MW-13S, MW-14D1, MW-14S, MW-15D1, MW-15S.
2. HORIZONTAL DATUM: ASSUMED; VERTICAL DATUM: NGVD 1929.
3. THE SIZE AND LOCATION OF EXISTING FEATURES SHOULD BE CONSIDERED APPROXIMATE.
4. REFER TO APPENDIX B – "CALCULATIONS OF ESTIMATED AREAS AND VOLUMES OF CONTAMINATED GROUNDWATER & SOILS" FOR SOIL EXCAVATION CROSS SECTIONAL AREAS.
5. AREAS OF CONTAMINATION SHOWN INCLUDE LIMITS OF ASSUMED LATERAL EXTENT OF CONTAMINATION EXCEEDING TAGM RSCOS WITH DEPTH.

REV No.	DESCRIPTION	BY	DATE

DRAWN BY: BWS
DATE: JANUARY 2002

SCALE IN FEET: 0 20 40 80

GZA GeoEnvironmental of New York

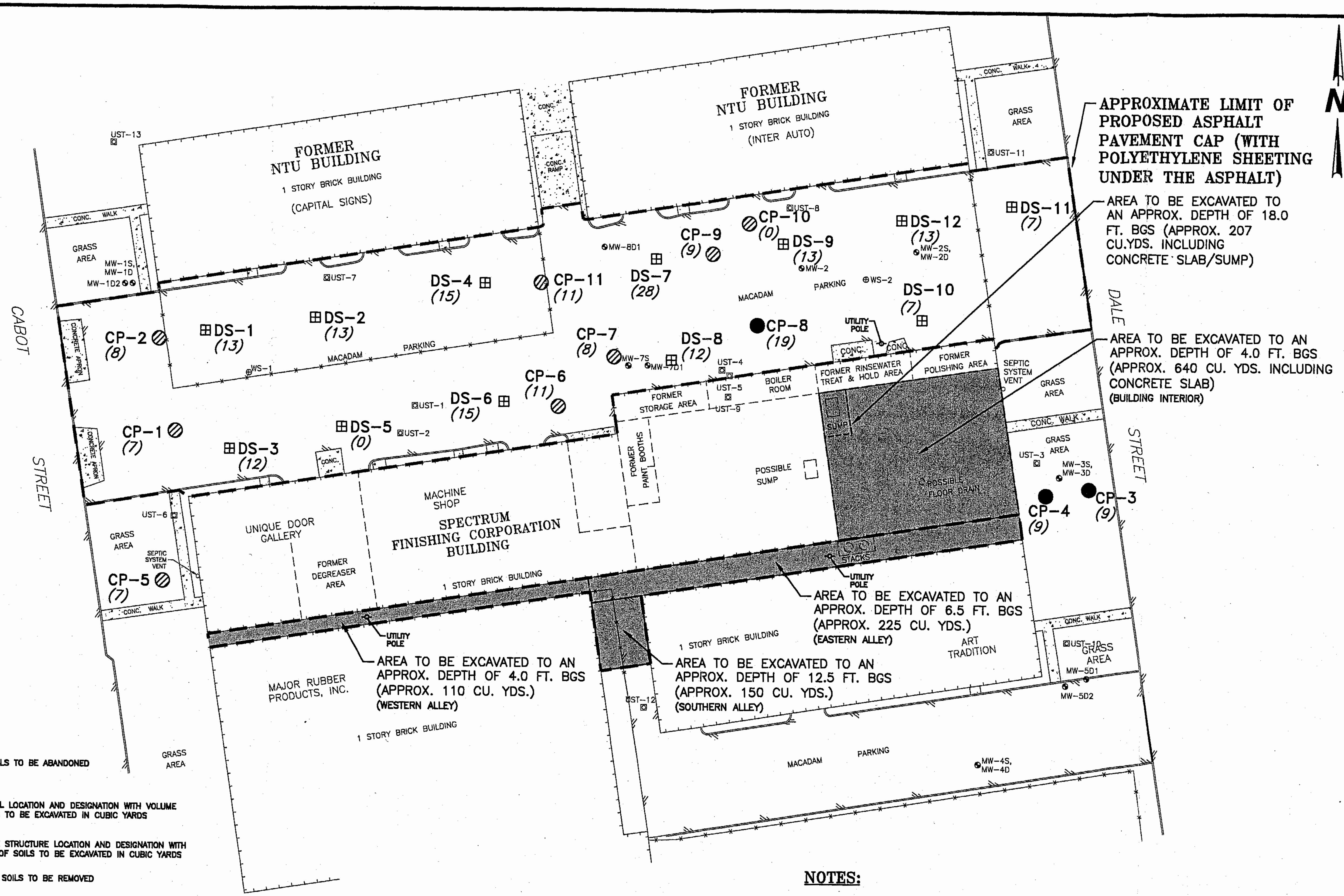
SPECTRUM FINISHING CORPORATION
50 DALE STREET
WEST BABYLON, NEW YORK

FOCUSED FEASIBILITY STUDY

CONTAMINATED SOIL VOLUMES EXCEEDING TAGM RSCOS

PROJECT No. 55291

FIGURE No. 4-1



LEGEND:

- CP-8 (19) ● CESSPOOLS TO BE ABANDONED
- CP-2 (8) ⊘ CESSPOOL LOCATION AND DESIGNATION WITH VOLUME OF SOILS TO BE EXCAVATED IN CUBIC YARDS
- DS-1 (13) ⊞ DRAINAGE STRUCTURE LOCATION AND DESIGNATION WITH VOLUME OF SOILS TO BE EXCAVATED IN CUBIC YARDS
- AREA OF SOILS TO BE REMOVED
- INDICATES APPROXIMATE LIMIT OF PROPOSED ASPHALT PAVEMENT AND GEOMEMBRANE LINERTO BE PLACED
- MW MONITORING WELL (S=15-25' DEEP, D,D1~50' DEEP, D2~100'DEEP)
- UST UNDERGROUND STORAGE TANK FILL PORT
- WS FORMER WATER WELLS
- CHAIN LINK FENCE
- CONCRETE
- CONCRETE CURB
- CURB CUT
- EDGE OF MACADAM

TOTAL VOLUME OF SOILS TO BE EXCAVATED:

WESTERN ALLEY SOILS	~110 CU. YDS.
EASTERN ALLEY SOILS	~225 CU. YDS.
SOUTHERN ALLEY SOILS	~150 CU. YDS.
INTERIOR BUILDING (INCLUDING SUMP) SOILS	~847 CU. YDS.
CESSPOOLS & DRAINAGE STRUCTURE SOILS	~250 CU. YDS.
TOTAL	~1582 CU. YDS.

NOTES:

1. BASE MAP ADAPTED FROM A PLAN PROVIDED BY YEC, INC. IN AUTOCAD FORMAT DATED AUGUST 1999. DATES OF SURVEY; JUNE 4, 1999 (WELL ELEVATIONS ONLY); JULY 20–21, 1999. ADDITIONAL SURVEY SEPTEMBER 12, 2000 OF MONITORING WELLS MW-6S, MW-9S, MW-10S, MW-11S, MW-12S, AND CESSPOOL CP-11. ADDITIONAL SURVEY MAY 10, 2001 OF MONITORING WELLS MW-12D1, MW-12D2, MW-12S, MW-13D1, MW-13D2, MW-13S, MW-14D1, MW-14S, MW-15D1, MW-15S.
2. HORIZONTAL DATUM: ASSUMED; VERTICAL DATUM: NGVD 1929.
3. THE SIZE AND LOCATION OF EXISTING FEATURES SHOULD BE CONSIDERED APPROXIMATE.
4. SOIL REMEDIATION APPROACH No. 1 UTILIZES CONVENTIONAL EARTHWORK EQUIPMENT AND STANDARD CONSTRUCTION METHODS.
5. REFER TO APPENDIX B – "CALCULATIONS OF ESTIMATED AREAS AND VOLUMES OF CONTAMINATED GROUNDWATER & SOILS" FOR SOIL EXCAVATION CROSS SECTIONAL AREAS.

REV No.	DESCRIPTION	BY	DATE

SCALE IN FEET: 0 20 40 80

DRAWN BY: BWS

DATE: JANUARY 2002

GZA GeoEnvironmental of New York

SPECTRUM FINISHING CORPORATION
50 DALE STREET
WEST BABYLON, NEW YORK

FOCUSED FEASIBILITY STUDY

SOIL ALTERNATIVE No. 2
SOIL REMEDIATION AREAS AND VOLUMES
APPROACH 1

PROJECT No. 55291

FIGURE No. 5-1

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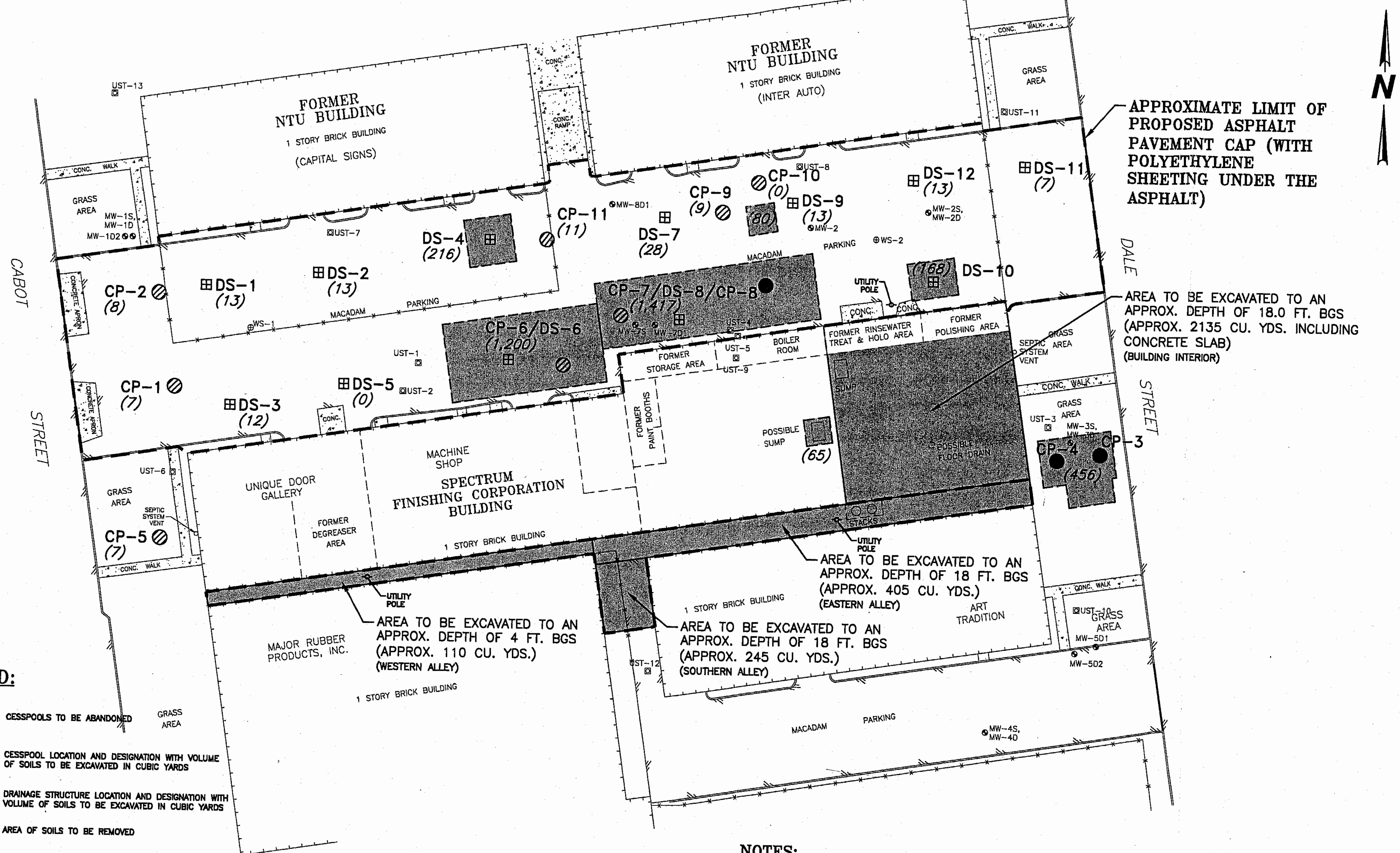

LEGEND:

- CP-8 (19) ● CESSPOOLS TO BE ABANDONED
- CP-2 (8) ⊘ CESSPOOL LOCATION AND DESIGNATION WITH VOLUME OF SOILS TO BE EXCAVATED IN CUBIC YARDS
- DS-1 (13) ⊞ DRAINAGE STRUCTURE LOCATION AND DESIGNATION WITH VOLUME OF SOILS TO BE EXCAVATED IN CUBIC YARDS
- AREA OF SOILS TO BE REMOVED
- INDICATES APPROXIMATE LIMIT OF PROPOSED ASPHALT PAVEMENT AND GEOMEMBRANE LINER TO BE PLACED
- MW ⊗ MONITORING WELL (S=15-25' DEEP, D,D1~50' DEEP, D2~100'DEEP)
- UST ⊠ UNDERGROUND STORAGE TANK FILL PORT
- WS ⊕ FORMER WATER WELLS
- CHAIN LINK FENCE
- CONCRETE
- CONCRETE CURB
- CURB CUT
- EDGE OF MACADAM

TOTAL VOLUME OF SOILS TO BE EXCAVATED:

WESTERN ALLEY SOILS	~110 CU. YDS.
EASTERN ALLEY SOILS	~405 CU. YDS.
SOUTHERN ALLEY SOILS	~245 CU. YDS.
INTERIOR BUILDING SOILS	~2135 CU. YDS.
CESSPOOLS & DRAINAGE STRUCTURE SOILS	~4602 CU. YDS.
TOTAL	~7497 CU. YDS.

NOTES:

1. BASE MAP ADAPTED FROM A PLAN PROVIDED BY YEC, INC. IN AUTOCAD FORMAT DATED AUGUST 1999. DATES OF SURVEY: JUNE 4, 1999 (WELL ELEVATIONS ONLY); JULY 20-21, 1999. ADDITIONAL SURVEY SEPTEMBER 12, 2000 OF MONITORING WELLS MW-6S, MW-9S, MW-10S, MW-11S, MW-12S, AND CESSPOOL CP-11. ADDITIONAL SURVEY MAY 10, 2001 OF MONITORING WELLS MW-12D1, MW-12D2, MW-12S, MW-13D1, MW-13D2, MW-13S, MW-14D1, MW-14S, MW-15D1, MW-15S.
2. HORIZONTAL DATUM: ASSUMED; VERTICAL DATUM: NGVD 1929.
3. THE SIZE AND LOCATION OF EXISTING FEATURES SHOULD BE CONSIDERED APPROXIMATE.
4. SOIL REMEDIATION APPROACH No. 2 UTILIZES CONVENTIONAL EARTHWORK EQUIPMENT AND STANDARD CONSTRUCTION METHODS WITH ADDITIONAL MEANS TO ADDRESS DEEPER EXCAVATION OF SOILS (e.g. SHEETING).
5. REFER TO APPENDIX B - "CALCULATIONS OF ESTIMATED AREAS AND VOLUMES OF CONTAMINATED GROUNDWATER & SOILS" FOR SOIL EXCAVATION CROSS SECTIONAL AREAS.

REV No.	DESCRIPTION	BY	DATE

DRAWN BY: BWS

DATE: JANUARY 2002

SCALE IN FEET: 0 20 40 80

SPECTRUM FINISHING CORPORATION
50 DALE STREET
WEST BABYLON, NEW YORK

FOCUSED FEASIBILITY STUDY

SOIL ALTERNATIVE No. 3
SOIL REMEDIATION AREAS AND VOLUMES
APPROACH 2

GZA GeoEnvironmental of New York

PROJECT No. 55291

FIGURE No. 5-2

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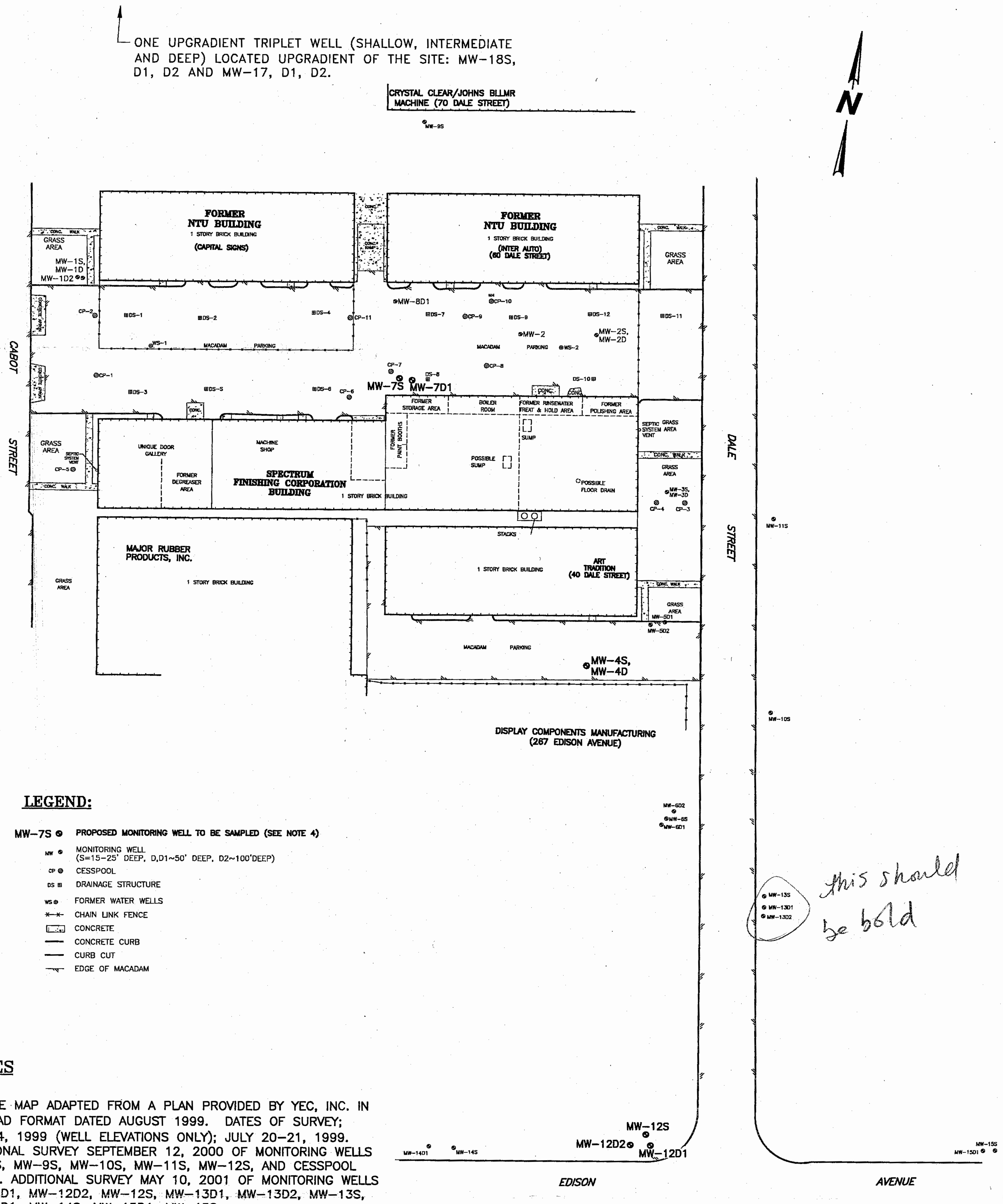

NOTES

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2. HORIZONTAL DATUM: ASSUMED; VERTICAL DATUM: NGVD 1929.

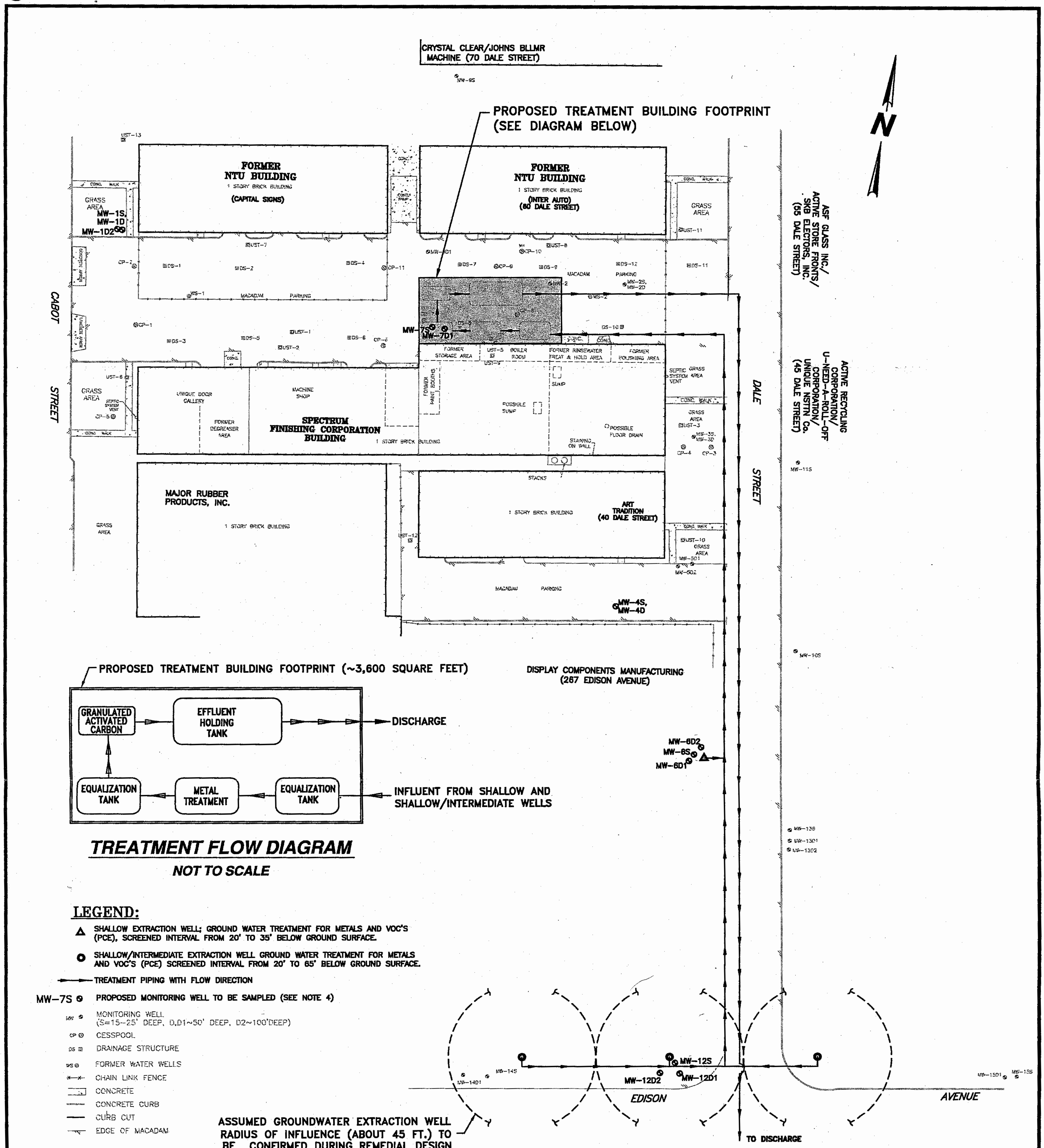
3. THE SIZE AND LOCATION OF EXISTING FEATURES SHOULD BE CONSIDERED APPROXIMATE.

4. MONITORED NATURAL ATTENUATION PROGRAM: GROUNDWATER SAMPLES SHALL BE COLLECTED FROM 7 EXISTING SITE WELLS (SHOWN AS BOLD) AND SIX PROPOSED WELLS (3 UPGRADIENT AND 3 DOWN GRADIENT) ANNUALLY. WATER LEVELS TO BE MEASURED IN SITE WELLS. ANALYSIS TO INCLUDE VOC'S, METALS, ANIONS, CATIONS, AND NATURAL ATTENUATION PARAMETERS.

ONE TRIPLET WELL (SHALLOW, INTERMEDIATE AND DEEP) TO BE LOCATED DOWNGRADIENT OF EDISON AVENUE: MW-16S, D1, D2.

FIGURE No.	PROJECT No.		REV No.	DESCRIPTION	BY	DATE
5-3	55291	SPECTRUM FINISHING CORPORATION 50 DALE STREET WEST BABYLON, NEW YORK FOCUSED FEASIBILITY STUDY	SCALE IN FEET 0 30 60 120	DRAWN BY: BWS DATE: JANUARY 2002		
		GROUNDWATER ALTERNATIVE No. 2 GROUNDWATER MONITORING LOCATIONS FOR MONITORED NATURAL ATTENUATION		GZA GeoEnvironmental of New York		

(C)2002 GZA GeoEnvironmental of New York



NOTES

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2. HORIZONTAL DATUM: ASSUMED; VERTICAL DATUM: NGVD 1929.

3. THE SIZE AND LOCATION OF EXISTING FEATURES SHOULD BE CONSIDERED APPROXIMATE.

4. GROUNDWATER MONITORING WELL PROGRAM: GROUNDWATER SAMPLES SHALL BE COLLECTED FROM 13 EXISTING SITE WELLS (SHOWN AS BOLD) AND THREE PROPOSED DOWNGRADIENT WELLS ANNUALLY. WATER LEVELS TO BE MEASURED IN SITE WELLS. ANALYSIS TO INCLUDE VOC'S AND METALS.

5. THE GROUNDWATER EXTRACTION WELL RADIUS OF INFLUENCE FOR THE EXTRACTION WELL NEAR MONITORING WELL MW–6S IS EXPECTED TO BE GREATER THAN 10 FT. AND WILL BE DETERMINED DURING REMEDIAL DESIGN.

ONE TRIPLET WELL (SHALLOW, INTERMEDIATE AND DEEP) TO BE LOCATED DOWNGRADIENT OF EDISON AVENUE: MW–16S, D1, D2.

FIGURE No. 5–4

PROJECT No. 55291

SPECTRUM FINISHING CORPORATION
50 DALE STREET
WEST BABYLON, NEW YORK

FOCUSED FEASIBILITY STUDY

GROUNDWATER ALTERNATIVE No. 3
GROUNDWATER EXTRACTION WELLS AND
EX–SITU TREATMENT BUILDING LOCATION

REV No.	DESCRIPTION	BY	DATE

SCALE IN FEET: 0 30 60 120

DRAWN BY: BWS

DATE: JANUARY 2002

GZA GeoEnvironmental of New York

APPENDIX A

REMEDIAL ACTION ALTERNATIVE ASSUMPTIONS

Remedial Action Alternative Assumptions

Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No. 1-52-029

The following assumptions are based on discussions with NYSDEC, NYSDOH and Town of Babylon Agencies.

It is assumed that groundwater would be extracted at locations downgradient from the Site (e.g., along Edison Avenue and Dale Street) via a series of wells. The locations for the extraction wells is based on several factors including the following.

The majority of groundwater contamination is located downgradient of the Site between the Site and Edison Avenue.

Private industrial and commercial properties are located between the Site and Edison Avenue (the area of highest groundwater contamination). Buildings primarily cover these properties and limited space is available for placement of an extraction system.

Considering the properties are privately owned, access for placement of an extraction system could be difficult and could cause project delays.

Disruption of Site operations must be kept to minimum; and existing Site grades (topography) should be maintained, following implementation of remedial actions.

Based on conversations with the Town of Babylon building/planning department (which regulates and manages commercial/industrial drainage structures), the number of drainage structures located at the Site reflects the designed numbers required for proper Site drainage. No drainage structures are proposed for closure as part of the FFS. It should be noted that the Site treatment building may interfere with some of these drainage structures. It is assumed that provisions for trench drains and/or relocation of these drainage structures would be further evaluated during remedial design.

According to NYSDOH (which regulates/manages cesspool structures/sanitary structures), a minimum of one cesspool per leased space should be provided for properties similar to SFC. There are three cesspools at the Site that could be closed, considering that one would have to remain in service per leased space. These three cesspool closures are included in Alternatives No. 2 and 3.

Many of the cesspools and drainage structures located in the paved Site area between the Site building and the building to the north (including the former NTU building) may provide discharge points not just for the Site building, but also for the other buildings. Therefore, it is assumed that during remedial design the closure and/or replacement of cesspools and drainage structures would be more comprehensively evaluated.

Contaminated soil removal from cesspools and drainage structures would be required to the water table (18 feet bgs) based on the expected distribution of contamination (i.e., leaching from inside the chamber down to the water table).

It is assumed that the existing building would not be demolished or altered for the purposes of conducting the remedial actions. Therefore, prior to the start of the Soil Remedial Actions, a pre-construction building survey should be completed. This survey would include the SFC building and proximate buildings to the south (i.e., Major Rubber Products and Art Tradition Building). Costs for this survey have not been included in our cost estimate.

Excavation activities would not be completed around existing utilities (e.g., utility poles, overhead wires, former ventilation stacks, underground fuel oil tanks, pipes, etc). Soils located proximate to these features would be left in place with the exception of the natural gas service line located within the eastern alley that would be removed prior to the excavation work and reinstalled after backfill/compaction activities. Contaminated soil located in areas near and under the Site building and utilities would be left in-place and allowed to naturally attenuate.

Waste profile testing (i.e., TCLP testing) has not been completed for the areas of contaminated soil requiring removal. Therefore, assumptions are made regarding the percent of soil anticipated to be hazardous waste vs. contaminated non-hazardous waste based on the total concentration of contamination present in soil.

For the purposes of this FFS, it is assumed that groundwater extracted by the wells would be treated for VOCs and metals. The extracted groundwater would be treated ex-situ in a system located on Site; and discharged to a stormwater management basin located off Site, since there are no sanitary sewer lines in the vicinity of the Site available to receive the treated groundwater.

It is assumed existing hydrogeologic information regarding the Upper Glacial Aquifer would be used to assess optimum pump rates and the extraction well layout. Therefore, a pump test pilot study would not be performed to design the groundwater extraction system.

It is assumed that an effluent holding tank would be needed only during the initial stages of the groundwater treatment operation when influent groundwater concentrations are less predictable.

A natural attenuation study has not been completed as part of the FRI/FFS. A natural attenuation study would be conducted as part of Groundwater Alternative No. 2. The length of time required for natural attenuation would be more predictable once the study is complete. Therefore, the length of time required for natural cleanup is unknown and expected to be greater than 30 years to reach the remedial action objectives. Consequently, in accordance with USEPA guidance, a duration of 30 years (the maximum time period specified for evaluation) is assumed.

It is assumed that contaminated excavated soil can not be staged on Site for extended periods of time or treated on Site. Contaminated excavated soil would be placed directly into roll-off boxes (as applicable), and covered prior to removal from the Site for off-Site disposal.

Contaminated groundwater was detected at elevated concentrations in monitoring wells installed adjacent to Edison Avenue during the FRI. Therefore, it is expected that contaminated groundwater has migrated and is present in downgradient areas (e.g., New Montefiore Cemetery) south of the Site study area boundary (i.e., Edison Avenue). The nature and extent of the downgradient plume has not been evaluated as part of this FRI/FFS, and remedial actions for groundwater do not specifically address the downgradient plume.

Based on historic regional and Site information and FRI analytical testing, upgradient groundwater sources appear to be adding contamination (VOCs and certain metals) to the Site groundwater. This groundwater is expected to continue to migrate in a southerly direction and would be remediated by the Site remedial system(s) for groundwater.

The No Action alternative is required by guidance and is included to address both soil and groundwater. Monitoring activities are not included in these alternatives.

Estimated costs of remedial alternatives should include cost markups for Engineering (15% of capital costs) and Contingency/Administration (10% of capital costs). O&M costs should be calculated based on a 5% discount rate (i.e., interest rate = 9%, inflation rate = 4%).

Further delineation of the extent of contaminated soil and groundwater could be completed associated with remedial design.

Additional monitoring wells may be needed to adequately monitor natural attenuation groundwater conditions. It is assumed that the number and location of monitoring wells will be evaluated further during remedial design.

For the purposes of the FFS it is assumed that the plume is in a stable condition (i.e., the contaminant concentrations at critical areas of the plume are not changing significantly).

Evaluation of the natural attenuation of metals is more complex than for VOCs. Additionally, the regulatory evaluation protocol for metals is not well established. Natural attenuation of metals occurs primarily by the process of dilution and sorption. Generally these processes for metals are not associated with contaminant destruction, as compared to the destruction of VOCs by biochemical degradation. For the purpose of this FFS, it is assumed that the passive remediation by natural attenuation is a viable approach. However, considering that no natural attenuation study has been completed, it is also assumed that further evaluation of natural attenuation would be completed as part of remedial design.

APPENDIX B

CALCULATIONS OF ESTIMATED AREAS AND VOLUMES OF CONTAMINATED SOIL AND GROUNDWATER

AND

APPENDIX C

COST ESTIMATE AND BACKUP CALCULATIONS

Cost Estimate Assumptions
Soil and Groundwater Alternative 1
No Action

Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No.1-52-029

Item No. 1: No Action

Assume no remedial action or monitoring would be conducted for Soil and Groundwater at the Site.

Total Cost = $0

NOTE:

GZA GeoEnvironmental of New York

Table C-1
Cost Estimate Summary
Soil and Groundwater Alternative No. 1
No Action

Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No. 1-52-029

Item No.	Description	Capital Costs	Present Worth of O&M Costs
1	No Action	$ -	$ -
Subtotal		$ -	$ -
Engineering (15%)		$ -	
Contingency/Administration (10%)		$ -	
TOTAL		$ -	$ -

Net Present Worth

Capital Costs	$ -
Present Worth of Annual O&M Costs	$ -
TOTAL NET PRESENT WORTH =	$ -

Notes:
1.) Refer to the attached pages for descriptions of the cost estimate assumptions.

Cost Estimate Assumptions
Soil Alternative No. 2
Excavation and Off-Site Disposal: Approach 1

Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No.1-52-029

Item No. 1: Soil Remediation Excavation and Off-Site Disposal

This Alternative would address contaminated soil to the extent practical utilizing conventional earthwork equipment and standard construction methods.

- Remediation of Alleyway and Interior Areas:
It is assumed that excavation work would be performed around existing utility poles and overhead electrical lines; however, a natural gas service line located in the eastern alleyway would be removed and replaced. Remediation of soil includes excavation (for off-Site disposal) followed by backfill and compaction (12 inch lifts) with clean fill soils.

- Western alleyway: Assume approx. 110 cubic yards (CY) of soil could be excavated to a depth of 4.0 feet bgs. The soil would be disposed of as non-hazardous impacted material estimated at 190 tons. Due to limited access to the alleyway, a mini excavator, two motorized carts, a small front-end loader, 2 plate compactors and operators/laborers would be used to excavate soil in 25 foot length sections (total of 6 sections). The time to remediate this area is assumed to be 15 days (or approx. 2.5 days per section).

- Eastern and Southern alleyway: Assume approx. 225 CY of soil could be excavated to a depth of 6.5 feet bgs from the eastern alleyway and approx. 150 CY soil could be excavated to a depth of 13.5 feet bgs from the southern alleyway. It is assumed that 1/3 of soil would be classified as hazardous material and 2/3 non-hazardous impacted material (210 tons and 425 tons respectively). Equipment for this area would include a larger backhoe/excavator, 2 small front-end loaders, plate compactors and operators/laborers to remediate soils in 25-foot length sections (total of 8 sections). The time to remediate this area is assumed to be 25 days (or approx. 3 days per section).

- Interior Portion of Spectrum Building: Assume approx. 777 CY of soil and concrete could be excavated to a depth of 4 feet bgs while maintaining a 1:1 slope below the building footers. It is assumed that excavated soil would be classified as 1/3 hazardous material and 2/3 non-hazardous impacted material (approximately 440 tons and 880 tons respectively). Equipment for this area would include a large backhoe/excavator, both large and small front-end loaders, plate compactors and operators/laborers to remediate soils inside the building. It is assumed that sufficient room exists inside the building for larger equipment to operate, thus excavation costs are based on volume of materials.

- Remediation of Cesspool and Drainage Structure Areas: Soils beneath twenty three cesspool and drainage structures would be removed. The insertion of a steel sleeve inside the 8-foot diameter structures and vacuum excavation of soil to 18 feet bgs. Assume the excavated soil (approximately 250 CY) would be disposed of as hazardous impacted material (assumed 425 tons). Clean soils would be backfilled inside structure in 12 " lifts for compaction. Steel sleeve would be eased out in 12" increments. Assume each structure would require approx. 1.5 days to remediate. The time to remediate all of the cesspool/drainage structures is approx. 35 days. Cesspools CP-3, -4 and -8 would be abandoned in place after soil remediation.

- Assume a field engineer would be on Site during remedial activities to monitor air, dust and to screen excavated soils for metals via x-ray fluorescence (XREF) technology. XREF would also assist in characterizing wastes.

- Cost Summary:
  - Eastern, western and southern alleyway remediation: $ 374,000
  - Interior building soil remediation: $ 281,000
  - Cesspool/drainage structure remediation: $282,000

  Excavated soil waste disposal costs (included in the above subtotals):
  - Total hazardous impacted material = 1077 ton @ $200/ton = $215,400
  - Total non-hazardous impacted material = 1,500 ton @ $120/ton = $180,000

See Figure 5-2 for excavated contaminated soil areas and volumes. (continued on page 2)

Cost Estimate Assumptions
Soil Alternative No. 2
Excavation and Off-Site Disposal: Approach 1

Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No.1-52-029

Item No. 2: Asphalt Pavement/Geosynthetic Composite Cap and Concrete Pavement

CAPITAL COSTS:
Assume installation of new concrete floor inside the building and an asphalt pavement/geosynthetic composite cap in exterior areas not currently paved (e.g., alleyways) and areas of the existing parking lot. The geosynthetic composite cap includes a 40-mil linear low density polyethylene (LLDPE) geomembrane covered by a geosynthetic drainage layer (i.e., geotextile attached to both sides of geonet).

- Interior:
  Assume construct reinforced concrete slab (approx.430 SY) to be installed inside building.

- Alleyways:
  Assume a geosynthetic composite cap could be installed in the alleyways with a 0.5% grade sloping from east to west. An approx. 6-inch layer of drainage/subbase stone would be placed on top of the geosynthetic followed by asphalt cover. The asphalt pavement would consist of 3-inch base (3/4-inch crushed stone), 1-1/2-inch binder, and 1-1/2-inch wearing course. An additional 15% cost is included due to limited access of the western alleyway.

- Parking Lot Areas:
  Assume asphalt pavement in existing parking areas would have an average 3 feet of soil excavated prior to installation of geosynthetic cap (i.e. to accommodate a 1% grade sloping from the center of the property to the east and west). Assume 20% of soil is classified as hazardous impacted material; assume 80% of soil is classified as non-hazardous impacted material. Assume drainage/subbase stone could be placed and compacted over the geosynthetic cap followed by asphalt paving. Assume perforated collection pipes would be located on the eastern and western areas of the geosynthetic composite cap for discharge of drainage water to CP-1 and DS-11, respectively. Assume asphalt paving would consist of 4-inch binder and 1-1/2 inch top stone.

- Assume the existing chain link fence would be removed and repaired.

  - Area to receive new asphalt pavement/geosynthetic composite cap: Approximately 3,650 square yards
  - Cost of new asphalt pavement/geosynthetic composite cap: $356,500
  - Cost of new reinforced concrete pavement inside building: $12,500
  - Cost of removal and repair of chain-link fence: $6,000

  Excavated soil waste disposal costs:
  - Total hazardous impacted material = 1,135 ton @ $200/ton = $227,000
  - Total non-hazardous impacted material = 4,540 ton @ $120/ton = $545,000

O&M COSTS:
- Assume entire asphalt paved portion of the Site to be maintained over a 30-year time period, for purposes of maintaining a consistent surface treatment. O&M would include:

  - annual patching (over localized areas, as necessary; assume 20 sy per year): $350/year (years 1-30)
  - sealcoat entire paved area every 5 years: $4,400 (once every 5 years)

Refer to Figure 5-1 for location of new asphalt pavement cover.

NOTE:
See backup calculations following this description page. Above costs are based on similar projects completed in the area and 2001 Means.

GZA GeoEnvironmental of New York

Table C-2
Cost Estimate Summary
Soil Alternative No. 2
Excavation and Off-Site Disposal (Approach 1)

Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No. 1-52-029

Item No.	Description	Capital Costs	Present Worth of O&M Costs
1	Soil Excavation and Off-Site Disposal	$ 937,000	$ -
2	Asphalt Pavement / Geosynthetic Composite Cap	$ 1,147,000	$ 17,000
Subtotal		$ 2,084,000	$ 17,000
Engineering (15%)		$ 313,000	
Contingency/Administration (10%)		$ 208,000	
TOTAL		$ 2,605,000	$ 17,000

Net Present Worth

Capital Costs	$ 2,605,000
Present Worth of Annual O&M Costs	$ 17,000
TOTAL NET PRESENT WORTH =	$ 2,622,000

Notes:
1.) Refer to the attached pages for descriptions of the cost estimate assumptions.
2.) Present Worth of O&M costs were calculated for a 30-year duration, using a 5% discount rate (i.e., interest rate = 9%, inflation rate = 4%).
3.) Total costs are rounded to the nearest $1,000.

Cost Estimate Assumptions
Soil Alternative No. 3
Excavation and Off Site Disposal: Approach 2

Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No.1-52-029

Item No. 1: Excavation and Off-Site Disposal

This Alternative would address contaminated soils utilizing conventional earthwork equipment and standard construction methods with consideration toward using additional means to address deeper soils (e.g., sheeting).

Remediation of Alleyway and Interior Areas:
It is assumed that excavation work would be performed around existing utility poles and overhead electrical lines; however, a natural gas service line located in the eastern alleyway would be removed and replaced. Remediation of soil includes excavation (for off-Site disposal) followed by backfill and compaction (12 inch lifts) with clean fill soils.

- Western alleyway: Assume approx. 110 cubic yards (CY) of soil could be excavated to a depth of 4.0 feet bgs. The soil would be disposed of as non-hazardous impacted material estimated at 190 tons. Due to limited access to the alleyway, a mini excavator, two motorized carts, a small front-end loader, 2 plate compactors and operators/laborers would be used to excavate soil in 25 foot length sections (total of 6 sections). The time to remediate this area is assumed to be 15 days (or approx. 2.5 days per section).

- Eastern and Southern alleyway: Assume approx. 405 CY of soil could be excavated from the eastern alley and approx. 245 CY soil could be excavated from the southern alleyway. Both excavations couuld be completed to a depth of 18 feet bgs. It is assumed that 1/3 of soil would be classified as hazardous material and 2/3 non-hazardous impacted material (210 tons and 425 tons respectively). Equipment for this area would include a drill rig (capable of making an 18 inch boring for soil excavation and filling with grout), mini-excavator, 2 small front-end loaders, plate compactors and operators/laborers to remediate soils in 25-foot length sections (total of 8 sections). The time to remediate the eastern area is assumed to be 60 days and the southern alley would require approx. 50 days. (Assume the drill rig can complete approx. 6 borings per day).

- Interior Portion of Spectrum Building: Assume approx. 2,070 CY of soil and concrete could be excavated to a depth of 18 feet bgs while maintaining a 1:1 slope below the building footers. Assume steel sheeting could be installed five feet from the building footers to a depth of approx. 23 feet bgs around the interior. Excavated soil (to 18 feet bgs) could be classified as 1/3 hazardous material and 2/3 non-hazardous impacted material (approx. 1,160 tons and 2,320 tons respectively). Equipment for this area would include a large backhoe/excavator, both large and small front-end loaders, plate compactors and operators/laborers to remediate soils inside the building. It is assumed that sufficient room exists inside the building for larger equipment to operate, thus excavation costs are based on volume of materials. Assume 30 days to complte interior remediation.

- Remediation of Cesspool and Drainage Structure Areas: Soils beneath 14 of the 23 cesspool and drainage structures would be removed. The insertion of a steel sleeve inside the 8-foot diameter structures and vacuum excavation of soil to 18 feet bgs. Assume the excavated soil (approximately 140 CY) would be disposed of as hazardous impacted material (assumed 240 tons). Clean soils would be backfilled inside structure in 12 " lifts for compaction. Steel sleeve would be eased out in 12" increments. Assume each structure would require approx. 1.5 days to remediate (approx. 21 days to complete).

- Additional Contaminated Areas: Asume locations of contaminated soils associated with several cesspools, drainage structures, sumps or surface spills throughout the site would be remediated. Sheet piling could be installed to 27 feet bgs surrounding each specific area for excavation of soils to a depth of 18 feet bgs. Approx. 1,975 CY of soils would be excavated. Select cesspool and/or drainage structures would have to be remopved and replaced along with surrounding impacted soils. The excavated soils would be disposed of as 2/3 hazardous impacted material and 1/3 non-hazardous impacted material (approx. 2,238 tons and 1,119 tons respectively).

(continued on Page 2)

Cost Estimate Assumptions
Soil Alternative No. 3
Excavation and Off Site Disposal: Approach 2

Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No.1-52-029

Item No. 1: Soil Remediation Approach 1 (continued)

- Assume three cesspool structures (i.e., CP-3,-4 and -8) be abandoned and backfilled. Equipment used for this remedial action include; sheet piling, excavator, front end loader, compaction equipment, required operators and laborers.

- Assume a field engineer would be on Site during remedial activities to monitor air, dust and to screen the excavated soils for metals via x-ray fluorescence technology.

Costs for remedial action:
- Eastern, western and southern alleyway remediation: $ 1,181,000
- Interior building soil remediation: $ 697,000
- Cesspool/drainage structure remediation: $156,000
- Cesspool/drainage structure with surrounding impacted soils: $ 1,150,000

Excavated soil waste disposal costs (included in the above):
- Total hazardous impacted material = 2,804 ton @ $200/ton = $561,000
- Total non-hazardous impacted material = 4,054 ton @ $120/ton = $486,000

See Figure 5-4 for excavated contaminated soil areas and volumes.

Item No. 2: Asphalt Pavement/Geosynthetic Composite Cap and Concrete Pavement

CAPITAL COSTS:
Assume installation of new concrete floor inside the building and asphalt pavement/geosynthetic composite cap in exterior areas not currently paved (e.g., alleyways) and areas of the existing parking lot. The geosynthetic composite cap includes a 40-mil linear low density polyethylene (LLDPE) geomembrane covered by a geosynthetic drainage layer (i.e., geotextile attached to both sides of geonet).

- <u>Interior:</u>
Assume construct reinforced concrete slab (approx.430 SY) to be installed inside building.

- <u>Alleyways:</u>
Assume a geosynthetic composite cap could be installed in the alleyways with a 0.5% grade sloping from east to west. An approx. 6-inch layer of drainage/subbase stone would be placed on top of the geosynthetic followed by asphalt cover. The asphalt pavement would consist of 3-inch base (3/4-inch crushed stone), 1-1/2-inch binder, and 1-1/2-inch wearing course. An additional 15% cost is included due to limited access of the western alleyway.

- <u>Parking Lot Areas:</u>
Assume asphalt pavement in existing parking areas would have an average 3 feet of soil excavated prior to installation of geosynthetic cap (i.e. to accommodate a 1% grade sloping from the center of the property to the east and west). Assume 20% of soil is classified as hazardous impacted material; assume 80% of soil is classified as non-hazardous impacted material. Assume drainage/subbase stone could be placed and compacted over the geosynthetic cap followed by asphalt paving. Assume perforated collection pipes would be located on the eastern and western areas of the geosynthetic composite cap for discharge of drainage water to CP-1 and DS-11, respectively. Assume asphalt paving would consist of 4-inch binder and 1-1/2 inch top stone.

(continued on Page 3)

Cost Estimate Assumptions
Soil Alternative No. 3
Excavation and Off Site Disposal: Approach 2

Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No.1-52-029

- Assume the existing chain link fence would be removed and repaired.

  - Area to receive new asphalt pavement/geosynthetic composite cap: Approximately 3,650 square yards
  - Cost of new asphalt pavement/geosynthetic composite cap: $356,500
  - Cost of new reinforced concrete pavement inside building: $12,500
  - Cost of removal and repair of chain-link fence: $6,000

  Excavated soil waste disposal costs:
  - Total non-hazardous impacted material = 5675 ton @ $120/ton = $681,000

O&M COSTS:

- Assume entire asphalt paved portion of the Site to be maintained over a 30-year time period, for purposes of maintaining a consistent surface treatment. O&M would include:

  - annual patching (over localized areas, as necessary; assume 20 sy per year): $350/year (years 1-30)
  - sealcoat entire paved area every 5 years: $4,400 (once every 5 years)

Refer to Figure 5-1 for location of new asphalt pavement cover.

NOTE:
See backup calculations following this description page. Above costs are based on similar projects completed in the area and 2001 Means.

GZA GeoEnvironmental of New York

Table C-3
Cost Estimate Summary
Soil Alternative No. 3
Excavation and Off-Site Disposal (Approach 2)

Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No. 1-52-029

Item No.	Description	Capital Costs	Present Worth of O&M Costs
1	Soil Excavation and Off-Site Disposal	$ 3,184,000	$ -
2	Asphalt Pavement / Geosynthetic Composite Cap	$ 1,056,400	$ 17,000
Subtotal		$ 4,240,400	$ 17,000
Engineering (15%)		$ 636,000	
Contingency/Administration (10%)		$ 424,000	
TOTAL		$ 5,300,400	$ 17,000

Net Present Worth

Capital Costs	$ 5,300,400
Present Worth of Annual O&M Costs	$ 17,000
TOTAL NET PRESENT WORTH =	$ 5,317,400

Notes:
1.) Refer to the attached pages for descriptions of the cost estimate assumptions.
2.) Present Worth of O&M costs were calculated for a 30-year duration, using a 5% discount rate (i.e., interest rate = 9%, inflation rate = 4%).
3.) Total costs are rounded to the nearest $1,000.

Cost Estimate Assumptions
Groundwater Alternative No. 2
Monitored Natural Attenuation

Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No.1-52-029

Item No. 1: Installation of Six Monitoring Wells and Monitored Natural Attenuation Evaluation/Study

CAPITAL COSTS:
Assume two additional well triplets are installed. One well triplet would be installed upgradient and one well triplet would be installed downgradient. Each triplet consists of a shallow (30 feet bgs), an intermediate (50 feet bgs), and a deep (90 feet bgs) monitoring well.

Assume the well triplets include:
- Installation and materials for 2-inch Schedule 40 PVC wells, including a 10-foot well screen.
- Drums for containerization of soils generated from auger spoils, staging, and off-Site disposal.
- Well development, drum staging and off-Site disposal.
- Total estimated cost: $38,000

Assume Monitored Natural Attenuation Study would include sampling 7 existing site wells and 6 proposed wells in year 0.

Assume purging of wells of 3 to 5 well volumes and collecting data with down-hole meter would occur as part of sampling event.

Assume surveying of monitoring well elevations including project management and drafting: $5,000.

Estimated cost of sampling effort includes field labor, equipment, consumables and expenses: $6,700.

Estimated cost of analytical testing includes:
- Laboratory Analysis of 13 groundwater samples plus QA/QC samples (1 duplicate, 1 rinsate blank, 2 MS/MSDs 1 trip blank), for TCL VOCs, metals, anion/cations, and other natural attenuation parameter.
- Validation of the laboratory data.
- Estimated cost: $13,000.

Assume fixed Engineering Cost for first sample round of natural attenuation evaluation. $10,000

O&M COSTS:
Assume collect 75% of samples for testing in years 1 - 30; analytical tesing costs = $10,000
Estimated cost of sampling effort includes field labor, equipment, consumables and expenses: $6,700.
Add costs for Groundwater Sampling Data Report: $1,500

Above monitoring costs are based on 2001 rates as presented in the Project Management Plan and amended 2.11 forms.
Fixed fee of 8% is also included in total sampling event cost.

SUMMARY:

Capital Costs: $73,000 (year 0)

O & M Cost: $18,000/year (years 1 - 30)

Refer to Figure 5-3 for location of proposed existing and proposed monitoring wells to be sampled.

NOTE:
See backup calculations following this description page.

GZA GeoEnvironmental of New York

Table C-4
Cost Estimate Summary
Groundwater Alternative No. 2
Monitored Natural Attenuation

Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No. 1-52-029

Item No.	Description	Capital Costs	Present Worth of O&M Costs
1	Installation of Monitoring Wells and Monitored Natural Attenuation Evaluation/Study	$ 73,000	$ 277,000
Subtotal		$ 73,000	$ 277,000
Engineering (15%)		$ 11,000	
Contingency/Administration (10%)		$ 7,000	
TOTAL		$ 91,000	$ 277,000

Net Present Worth

Capital Costs	$ 91,000
Present Worth of Annual O&M Costs	$ 277,000
TOTAL NET PRESENT WORTH =	$ 368,000

Notes:
1.) Refer to the attached pages for descriptions of the cost estimate assumptions.
2.) Present Worth of O&M costs were calculated for a 30-year duration, using a 5% discount rate (i.e., interest rate = 9%, inflation rate = 4%).
3.) Total costs are rounded to the nearest $1,000.

Cost Estimate Assumptions
Groundwater Alternative No. 3
Groundwater Extraction and Ex-Situ Treatment

Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No.1-52-029

Item No. 1: Groundwater Extraction Wells

CAPITAL COSTS:
Includes installation of a groundwater extraction system to remediate shallow/intermediate Site plume with PCE > 5 ppb, cadmium > 5 ppb, chromium > 50 ppb, copper > 200 ppb and nickel >100 ppb.

Assumes flow rate from 4 downgradient extraction wells to pump from 10 to 30 gpm (totaling approximately 100 gpm); from wells located within the public right of ways within Dale Street and Edison Avenue and one source well closer to Site.

Assume three Edison wells would be screened from 15 to 65 feet bgs (shallow/intermediate zone) and one source well screened from 15 to 35 feet bgs (shallow zone).

Assume published information concerning the aquifer is available and, therefore, no costs included for pump test.

Assumes the extraction system would operate for thirty years.

Assumes four extraction wells would be installed which include:

- Installation and materials for four, 6-inch diameter stainless steel extraction wells.
- The wells would be screened from 15 feet bgs to their respective bottom depths.
- Estimated well cost: $86,000

Extraction and transfer equipment (cost includes piping, trenching, pumps, protective vaults, etc.): $ 73,000.

O&M COSTS:
Assumes annual cost for Operation and Maintenance of Groundwater Extraction System: $ 12,000/year

- costs include monitoring of system, electricity, labor, parts and repair, etc.

Assumes groundwater extraction wells would be refurbished and select pumps and accessories would be replaced every 5 years: $15,000

Refer to Figure 5-4 for locations of extraction wells and forcemain piping.

Cost Estimate Assumptions
Groundwater Alternative No. 3
Groundwater Extraction and Ex-Situ Treatment

Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No.1-52-029

Item No. 2: Ex-Situ Groundwater Treatment

CAPITAL COSTS:
Includes treatment system to treat extracted groundwater from three shallow/intermediate and one shallow extraction systems (see above). Assumes the combined flow rate from the shallow and shallow/intermediate extraction wells to range from approximately 90 to 110 gpm (20 to 30 gpm for each shallow/intermediate well, and 10 to 20 gpm for the shallow well). Assumes the extracted groundwater to be treated for 30 years.

Assumes flow from extraction wells would be treated for metals, followed by treatment of VOCs via GAC system. The metal treatment system can accommodate a flow rate of 100 gpm, and the GAC system can accommodate a flow rate of 120 gpm. Assumes the following average influent concentrations for metals in ppb (Cd: 794, Ni 517, Cr: 279, Cr(VI): 310, Cu: 212, Fe: 123, Mn:111).

Assumes average initial influent concentration of PCE for combined flow from shallow and shallow/intermediate wells to be approximately 300 ppb.
Assumes effluent concentrations would satisfy NYSDEC Class GA limitations and required SPDES permits.
Assumes treatability study is included in metals treatment system capital costs.

Assumes treatment building (approximately 3600 SF) is fabricated and constructed which includes:
- prefabricated metal structure with epoxy-coated paint, a concrete foundation with secondary containment, and insulation: $450,000
- instrumentation and controls, electrical and process plumbing systems: $113,000

Assumes the following equipment is used for the treatment system:
- two 10,000-gallon equalization tanks: $30,000
- three centrifugal pumps and a spare pump to move groundwater throughout the system: $16,000
- metals precipitation, ultrafiltration, and a polishing unit (chelating resin and weak base anion resin) $540,000
- GAC system for removal of organics from groundwater: $70,000
- additional piping: $2,000
- flow and equalization tank level control: $15,000
- 21,000-gallon discharge holding tank: $1,140 rental for one month.

Assumes a cost for startup for the treatment system: $30,000
Assumes utilities would have to be connected to the treatment building: $20,000

Costs for piping, trenching, clean bedding, and backfilling needed to discharge treated groundwater to the stormwater management system are including Item 1.

O&M COSTS:
Assumes annual Operation and Maintenance cost for system: $345,000/year (years 1 through 30)
- for monitoring and maintenance of system, GAC replacement, metals precipitation system sludge disposal,
- chemical costs, replacement and disposal of non-regenerable ion exchange, electricity costs, repairs,

Assumes replacement of 10,000 lbs of carbon per year: $10,000 (years 1-30).

Assumes pumps, compressor and select accessories to be replaced every 5 years: $25,000

Refer to Figure 5-4 for location of treatment building and effluent discharge.

Cost Estimate Assumptions
Groundwater Alternative No. 3
Groundwater Extraction and Ex-Situ Treatment

Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No.1-52-029

Item No. 3: Installation of Three Monitoring Wells and Groundwater Sampling

CAPITAL COSTS:
Assume one additional well triplet is installed downgradient of Edison Avenue.
Assume the triplet consists of a shallow (30 feet bgs), an intermediate (50 feet bgs), and a deep (90 feet bgs) monitoring wells.

Assume the well triplet includes:
- Installation and materials for 2-inch Schedule 40 PVC wells, including a 10-foot well screen.
- Drums for containerization of soils generated from auger spoils, staging, and off-Site disposal.
- Well development, drum staging and off-Site disposal.
- Total estimated cost: $19,000

Assume surveying of monitoring well elevations including project management and drafting: $2,500.

O&M COSTS:
Assume groundwater sampling would be conducted quarterly for first two years and annually for remainder of project.

Assume purging of wells of 3 to 5 well volumes prior to sample collection.

Estimated cost of sampling effort includes field labor, equipment, consumables and expenses: $7,400.

Estimated cost of analytical testing includes:
- Laboratory Analysis of 16 groundwater samples plus QA/QC samples (1 duplicate, 1 rinsate blank, 2 MS/MSDs 1 trip blank), for TCL VOCs and metals.
- Validation of the laboratory data.
- Estimated cost: $5,000.

Add costs for Groundwater Sampling Data Report: $1,500

Above monitoring costs are based on 2001 rates as presented in the Project Management Plan and amended 2.11 forms.
Fixed fee of 8% is also included in total sampling event cost.

SUMMARY:

Capital Costs: $22,000 (year 0)

O & M Costs: Total Annual Groundwater Quarterly Monitoring Cost = $56,000 per year (year 1 and 2)
Total Annual Groundwater Monitoring Cost = $14,000 per year (years 3 - 30)

Refer to Figure 5-4 for location of proposed existing and proposed monitoring wells to be sampled.

NOTE:
See backup calculations following this description page.

Table C-5
Cost Estimate Summary
Groundwater Alternative No. 3
Groundwater Extraction and Ex-Situ Treatment

Focused Feasibility Study
Spectrum Finishing Corporation Site
West Babylon, New York
Site No. 1-52-029

Item No.	Description	Capital Costs	Present Worth of O&M Costs
1	Groundwater Extraction Wells	$ 159,000	$ 223,000
2	Ex-Situ Groundwater Treatment	$ 1,287,000	$ 5,521,000
2	Installation of Monitoring Well and Groundwater Monitoring	$ 22,000	$ 293,000
Subtotal		$ 1,468,000	$ 6,037,000
Engineering (15%)		$ 220,000	
Contingency/Administration (10%)		$ 147,000	
TOTAL		$ 1,835,000	$ 6,037,000

Net Present Worth

Capital Costs	$ 1,835,000
Present Worth of Annual O&M Costs	$ 6,037,000
TOTAL NET PRESENT WORTH =	$ 7,872,000

Notes:
1.) Refer to the attached pages for descriptions of the cost estimate assumptions.
2.) Present Worth of O&M costs were calculated for a 30-year duration, using a 5% discount rate (i.e., interest rate = 9%, inflation rate = 4%).
3.) Total costs are rounded to the nearest $1,000.