emcon

Wehran-New York, Inc.
1775 Baseline Road, Suite 220
Grand Island, New York 14072-1601
Tel: (716) 773-1801
Fax: (716) 773-1828
(716) 773-2285

December 23, 1997
Project 85740-100.000

Jaspal Walia, P.E.
New York State Department of
Environmental Conservation
Region 9
270 Michigan Avenue
Buffalo, New York 14203-2999

Re: Engineering Evaluation of Alternatives Report
Former GM-Saginaw Facility, Buffalo, NY
NYSDEC Site No. 915152

Dear Mr. Walia:

On behalf of General Motors Corporation (GM), Wehran-New York, Inc. (EMCON) is pleased to submit four (4) copies of the revised Engineering Evaluation of Alternatives (EEA) Report for the above-referenced site. This is the report required under I(B)(1)(b) - Operable Unit No. 1 (OU1) and I(B)(2)(c) - Operable Unit No. 2 (OU2) of the Consent Order.

The Report recommends the following:

Operable Unit 1: Alternatives 1S6, Excavation and Off-Site Disposal, and 1G1, No Action, to address the presence of PCBs in OU1. The excavation and off-site disposal of the LNAPL and PCB-impacted soils should address any potential PCB impacts to groundwater, particularly in view of the fact that PCB-impacted groundwater which is encountered in the course of the excavation will be treated and sent of-site for disposal to the Buffalo Sewer Authority.

Operable Unit 2: Alternatives 2S2, Limited Action, and 2G2, Limited Action, were selected to address the potential lead impacts for OU2. As noted in our letter of November 26, 1997 to Mr. Martin Doster of your office, these alternatives have been enhanced to provide for the addition of three monitoring wells, semiannual groundwater monitoring, and storm sewer sampling/inspections. The maintenance of the existing and new monitoring wells and storm sewers will continue during the monitoring period, the length of which will be determined on the basis of sampling conducted after the implementation of 1S6.

In addition, the scope of 2S2 has been modified to include evaluation and repair of the existing asphalt pavement. The modified scope should ensure that the pavement is in satisfactory condition to minimize infiltration and ensure that the RAOs are met.

In addition, the following responses apply to your comment letter dated October 28, 1997 on the original submittal of the EEA Report.

(1) General Comment 1

Addressed in Section 5.2.2.1 of the report. GM agrees to do limited inspections, monitoring and maintenance on the site storm sewers. However, the length of the monitoring/maintenance period will depend on the results of the sampling which is conducted after the site disturbance that will take place in the course of the excavation of the LNAPL and PCB-impacted soils. To this point, there has not been contaminant impacts associated with the presence of the lead-impacted fill material which was placed on the site approximately 60 years ago.

(2) General Comment 2

Agreed. The second paragraph of the Summary section was modified to reflect that the issue regarding the PCB contamination within the former Scajaquada Creek channel is still unresolved.

(3) General Comment 3

Addressed in the appropriate sections of the revised EEA Report.

(4) General Comment 4

Agreed. The monitoring wells will be maintained through the monitoring period. This is stated in the appropriate sections of the revised EEA Report.

(5) Specific Comments

The specific comments were addressed in the appropriate sections of the revised EEA Report.

Please contact us if you have any questions on the enclosed revised EEA report.

Sincerely,

EMCON

Katherine B. Galanti
Task Manager

Kenneth C. Malinowski, Ph.D.
Project Manager

Attachments

cc: M. Napolitan - GM
J. Braun - GM Legal
B. Kogut - Bond, Schoeneck & King, LLP
J. Ryan - NYSDEC
NYSDOH Albany (2)
NYSDEC Albany

ENGINEERING EVALUATION OF ALTERNATIVES REPORT FOR OPERABLE UNITS 1 AND 2

FORMER GM-SAGINAW BUFFALO FACILITY

NYSDEC SITE NO. 915152

Prepared for

General Motors Corporation
Worldwide Facilities Group - Remediation Team

Issued September 1997
Revised December 1997

Prepared by

emcon
1775 Baseline Road, Suite 220
Grand Island, New York 14072

Project 85740-100.000

CERTIFICATION OF PROFESSIONAL ENGINEER

DCOUMENT TITLE: **ENGINEERING EVALUATION OF ALTERNATIVES REPORT FOR OPERABLE UNITS 1 AND 2, FORMER GM-SAGINAW BUFFALO FACILITY, NYSDEC SITE NO. 915152**

To the best of my knowledge, information, and belief, the information contained in this document is factual and was developed in accordance with the approved PCB and Lead Work Plan for the former GM-Saginaw Buffalo Facility, dated November 1994.

WEHRAN NEW YORK, INC.

Dennis G. Fenn, P.E.
Vice President
NYS P.E. License No. 50131

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SUMMARY

An analysis of remedial alternatives was completed for General Motors Corporation (GM) for the former GM-Saginaw site located in Buffalo, New York. The site consists of a 14-acre paved parking area, Parking Lot No. 4. The site was sold to American Axle & Manufacturing, Inc. (AAM) on March 1, 1994, along with the main facility west of the Conrail right-of-way. As part of the conveyance, a deed restriction was placed on the property limiting it for industrial purposes only, and thereby precluding the use of groundwater for potable purposes.

A Site Investigation (SI) was initiated at the site in 1995 to evaluate the extent of PCB and lead contamination, which are being addressed as Operable Units (OU) 1 and 2, respectively. The risk assessment completed as part of the SI determined that there are no current human health or environmental hazards. Under a future hypothetical construction scenario, there is potential for non-carcinogenic toxicity from PCBs, mostly due to dermal exposure. Potential worker exposure to lead-impacted soils during future hypothetical construction activities would not result in an unacceptable hazard. The NYSDEC's review of the January 1997 Site Investigation Report concluded that environmental contamination attributable to the on-site source had been adequately investigated and the report was considered acceptable. The NYSDEC is pursuing further investigation of the PCB contamination within the former Scajaquada Creek channel with other off-site parties. As of the date of this report, this issue remains unresolved. The SI indicated that the detected PCBs within the former Scajaquada Creek channel are not migrating from the on-site source of PCBs.

The remedial action objectives for the site are as follows:

- To the extent practicable, reduce the potential for human contact with PCB and lead impacted soils.
- Prevent or greatly reduce the potential for migration of contaminants via surface run-off and on-site drain lines.
- Prevent or greatly reduce the migration of impacted groundwater to off-site receptors.
- To the extent practicable, provide for attainment of SCGs for groundwater.

Operable Unit 1 - PCBs

Alternatives evaluated to address PCB contamination in soil and their present value costs were:

1S1 — No Action ($0)

1S2 — Limited Action: maintenance of existing pavement ($29,000)

1S3 — Soil Containment/Capping: installation of hydraulic asphalt cap over existing pavement ($68,000)

1S4 — In-Situ Treatment: TerraTherm Thermal Desorption ($1.3 million)

1S5 — Excavation and On-Site Treatment: XTRAX Thermal Desorption ($3 million)

1S6 — Excavation and Off-Site Disposal ($1.19 million)

Alternative 1S6 is the recommended alternative as it would eliminate the source of PCBs (LNAPL and PCB-impacted soil), which prompted the placement of the Site on the Registry, and the potential for future impacts to groundwater.

Alternatives evaluated to address PCBs in groundwater were:

1G1 — No Action ($0)

1G2 — Limited Action: maintenance of existing pavement, semi-annual groundwater monitoring ($107,000)

1G3 — LNAPL Collection/Groundwater Pretreatment and Discharge to Buffalo Sewer Authority (BSA): groundwater pre-treatment by oil/water separation, off-site incineration of oil, filtration of residual oil and grease, and activated carbon for PCB removal ($1.2 million)

1G4 — LNAPL Collection/Groundwater Treatment and Direct Discharge: off-site oil disposal and treatment as in 1G3, plus filtration for particulate lead; discharge to surface water (Scajaquada Creek) via on-site manhole ($1.1 million)

The "No Action" alternative for groundwater (1G1) is protective of human health and the environment, because the on-site source of PCBs, the LNAPL and PCB-impacted soil, would be removed under the recommended alternative for soil (1S6), preventing any future impacts to groundwater. In addition, as part of the dewatering process conducted during the soil excavation, impacted groundwater would be collected, treated, and discharged to BSA. However, to confirm the effectiveness of Alternative 1S6, a modified

Alternative 1G2-Limited Action is recommended as the remedial alternative. This alternative requires groundwater monitoring of selected wells for a limited time to confirm that the presence of PCBs in shallow groundwater either remains constant or is decreasing after the implementation of Alternative 1S6. The reference to "maintenance of existing pavement" in Alternative 1G2 is deleted because the PCB source at issue will be removed under 1S6.

The presence of PCBs in storm sewer sediments has already been addressed by an IRM conducted in July 1996. At that time, the relevant storm sewer sections were cleaned and damaged sections of pipe were repaired. Future monitoring and maintenance of the site storm sewers will be addressed under the groundwater portion of OU2.

Operable Unit 2 - Lead

Alternatives evaluated to address lead in soil and their present value costs were:

2S1 — No action ($0)

2S2 — Limited Action: evaluation, repair, and maintenance of existing pavement ($634,000)

2S3 — Soil Containment/Capping: installation of a hydraulic asphalt cap over existing pavement ($1 million)

2S4 — In-situ Treatment: solidification/stabilization of impacted soil (over 1,000 ppm lead), replacement of pavement ($3.8 million)

2S5 — Excavation and On-site Treatment: impacted soil removal, solidification/stabilization on site, soil replacement, replacement of pavement ($3.6 million)

2S6 — Excavation and Off-site Disposal: impacted soil removal, addition of clean backfill, disposal in an approved facility ($5.6 million)

Based on the absence of current and future risk, the recommended alternative for soil is Alternative 2S2-Limited Action, because it maintains the current protectiveness and limits future development of the site to industrial purposes, as specified in the deed restriction.

Alternatives evaluated to address lead in groundwater and their present value costs were:

2G1 — No action ($0)

2G2 — Limited Action: addition of three monitoring wells, semi-annual groundwater monitoring and storm sewer sampling/inspections.

Maintenance of monitoring wells and storm sewers will occur over the life of the monitoring.($183,000)

2G3 — Collection, Pretreatment, Discharge to BSA: collection of perched groundwater via trench drains, filtration for lead, PCB removal, discharge to BSA ($853,000)

2G4 — Collection, On-site Treatment, Direct Discharge: collection of perched groundwater via trench drains, filtration for lead and PCB removal, discharge to surface water (Scajaquada Creek) via an on-site manhole ($795,000)

The selected alternative for groundwater is 2G2-Limited Action. This alternative, in conjunction with Alternative 2S2, is protective because it ensures that the existing cover will be maintained, thereby restricting infiltration, provides for long-term monitoring to indicate any changes in the existing conditions at the site, and provides for maintenance of the existing and new monitoring wells and site storm sewers during the monitoring period, the length of which will be determined on the basis of sampling which occurs after the implementation of 1S6.

1 INTRODUCTION

This analysis of engineering alternatives has been completed for General Motors Corporation (GM) for the former GM-Saginaw Buffalo Facility located in Buffalo, New York. The site has been listed in the Registry of Inactive Hazardous Waste Disposal Sites in New York State as Site No. 915152.

The Site, a portion of a former GM-Saginaw facility, is located at 1001 East Delavan Avenue in Buffalo, New York. The property and facility are currently owned and operated by American Axle & Manufacturing, Inc. (AAM), which purchased the property and facility from GM in March 1994. The area of investigation (the "Site") consists of Parking Lot No. 4, a 14-acre parcel located east of the main facility and separated from the main facility by a Conrail right-of-way (ROW). The original NYSDEC Registry listing was for a one-acre area contaminated with polychlorinated biphenyls (PCBs) around the Wastewater Treatment Plant (WWTP). This area is referred to as Operable Unit 1 (OU1). OU2 addresses the elevated lead concentrations in the fill materials found throughout the entire 14-acre parcel. The Site is shown on Drawing 1.

The Engineering Evaluation of Alternatives (EEA) presented here was prepared by Wehran-New York, Inc. (EMCON) to evaluate the remedial alternatives applicable to the area of study. This work has been done in accordance with the June 1994 (Revised November 1994) PCB and Lead Work Plan for the site. An Interim Remedial Measure (IRM) was conducted at the site by EMCON in accordance with the PCB and Lead Work Plan to address PCB contamination found at the site. The IRM consisted of removal and off-site disposal of an underground clay tile pipe and associated bedding, suspected to be the source of PCB contamination. A second IRM was completed in July 1996 to remove impacted sediments from the site storm sewer system in accordance with EMCON's letter to the NYSDEC dated June 24, 1996. Damaged sections of the storm sewer were repaired in September 1996 in accordance with EMCON's letter dated August 27, 1996 to the NYSDEC.

A Site Investigation (SI) was performed at the site that provided the data used to form the basis of the analysis conducted herein. This report provides an analysis of remedial alternatives for OU1 related to PCB contamination, and for OU2 related to lead contamination. Section 2 — Existing Conditions and Remedial Action Objectives, includes a review of the extent of contamination, a risk assessment summary, a summary of New York State Standards, Criteria, and Guidelines (SCGs), the remedial action objectives (RAOs), and remediation volumes. Section 3 — Technology Screening, includes a review and screening of the applicable technologies for remediating the areas of concern. Section 4 — Detailed Evaluation of Alternatives - OU1, includes the development and analysis of remedial alternatives to address the PCB contamination. Section 5 — Detailed Evaluation of Alternatives - OU2, includes the development and analysis of remedial alternatives to address the lead contamination. Section 6 contains the recommended alternatives.

1.1 Site Background

The Site was sold to AAM on March 1, 1994, along with the main facility west of the Conrail ROW. As part of this conveyance, a deed restriction was placed on the property limiting it for use for industrial purposes only. A copy of the deed restriction is provided as Appendix A. Under the New York State Uniform Fire Prevention and Building Code (9 NYCRR Part 902.1(a)), buildings other than a one or two family dwelling in which plumbing fixtures are installed, must hook into a public water supply system if one is available. Consequently, the existing deed restriction precluding residential use of the site will prevent the use of on-site groundwater for potable purposes.

During November 1994, AAM initiated construction of the parts coating facility on the northern portion of the Site. Due to concerns by GM about the presence of "hot spot" lead concentrations, a remedial program was completed during November 1994 to be protective of construction worker health. The remediation entailed the removal of lead-impacted materials associated with borings BH-9 and BH-17. EMCON developed a risk-based action level for worker exposure to lead based on the OSHA permissible exposure limit. It was assumed that worker exposure might occur through incidental ingestion and inhalation of airborne lead (soil suspended as dust). Based on wind erosion of exposed soils during excavation, a maximum concentration of 20,000 ppm lead in soil was determined to provide an acceptable level of exposure to workers. Details of this derivation are provided in Appendix B. As a conservative measure, EMCON selected 5,000 ppm as a cleanup goal for this construction project. Subsurface materials with total lead concentrations in excess of this threshold were excavated and disposed of off-site as discussed in EMCON's Site Investigation Report dated October 1995 and revised January 1997.

2 EXISTING CONDITIONS AND REMEDIAL ACTION OBJECTIVES

2.1 Extent of Contamination

The SI assessed the extent of lead and PCB contamination within the soil, groundwater, and storm sewers at the site. Alternatives to address the soil and groundwater contamination are evaluated in this EEA. Based on previous investigations conducted by EMCON, the only contaminants of concern for the site were lead and PCBs.

EMCON began the SI in February 1995. Investigations were performed in accordance with NYSDEC protocols and the agency's concurrence on the scope of work. Activities included review of historical data and reports, preparation of a supplemental site history report, excavation of a clay tile pipe (suspected to be the source of the PCB contamination) and surrounding soils as part of an IRM, installation of soil borings and collection of subsurface samples, sampling and testing of pre-existing and newly installed groundwater monitoring wells, water and sediment sampling from the site storm sewers, and evaluation of data.

Based on the results of this first phase of investigation, further investigation was conducted in 1996 at the request of the NYSDEC in their letter dated December 27, 1995. These additional activities included installation of soil borings and collection of subsurface samples, sampling and testing of pre-existing and newly installed groundwater monitoring wells, congener-specific PCB analysis of select soil and groundwater samples, surface water and sediment sampling of the Scajaquada Creek Drain, water and sediment sampling from the site storm sewers, and evaluation of data.

The site is covered by asphalt pavement which acts as a cap. The asphalt is underlain by bedding material to a depth of approximately one foot. Below this is a layer of fill. Ash, a component of the fill, is the source of the lead at the site. The ash layer is typically about two feet thick. Below the fill is an organic silt layer, generally about 0.5 to 1 foot in thickness. A silty clay layer is generally encountered from approximately 5 to 6.5 feet below ground surface. The silty clay layer acts as a confining layer, mitigating the vertical migration of contaminants into the bedrock. Bedrock is typically encountered from 17 to 19 feet below ground surface.

Shallow groundwater is perched within the overburden fill materials above the clay, approximately four to five feet below ground surface. The hydraulic conductivity of the fill material is on the order of 2.3×10^{-3} cm/sec. Groundwater flow direction is generally to the south toward the former Scajaquada Creek channel. The bedrock aquifer has not been impacted by the PCB and lead contamination detected at the site.

A total of 19 soil samples were collected for PCB analysis. Of these, only six had detectable PCBs. Five of these samples came from the sidewalls of the IRM excavation. The concentrations ranged from 0.027 to 180 parts per million (ppm). The sixth sample was obtained from the former Scajaquada Creek channel at the east property line of the Site. Total PCBs were detected in this sample at 12.1 ppm. PCB contamination of soil attributable to the on-site source (OU1) is primarily localized in the area around the IRM excavation. The PCB contamination identified in the former Scajaquada Creek channel has been attributed to a potential source area located east of the site on property owned by parties other than GM.

During the first phase of investigation conducted in 1995, PCBs were not detected in groundwater from the bedrock monitoring well. PCBs were detected on several occasions in only one of the seven perched (overburden) groundwater monitoring wells at a maximum concentration of 0.49 parts per billion (ppb). Due to the absence of PCBs in monitoring wells closer to the IRM area, as well as a previously identified "clean line" between the IRM area and the impacted well, it was determined that the contamination in this well was not a result of the known source area and indicated a second source area impacting the site. Additional wells were installed in the former Scajaquada Creek channel and between the impacted well and the IRM area as part of the second phase of investigation conducted in 1996. PCBs were not detected in the well located between the IRM area and the impacted well. A maximum concentration of 3.8 ppb PCBs in groundwater was detected in a monitoring well located in the channel at the east property line. No PCBs were detected in the channel west of the Site on AAM property. Based on this further investigation, it is suspected that the PCB contamination of groundwater in the former Scajaquada Creek channel is the result of an off-site source migrating onto the site via the former Scajaquada Creek channel.

PCBs were detected in one water sample from the on-site storm sewers at a concentration of 0.19 ppb and in the sediments from the storm sewers at concentrations of 2.3 ppm and 31 ppm. No PCBs were detected in water or sediment from the Scajaquada Creek Drain.

Lead was detected in all of the 54 subsurface soil samples analyzed. Concentrations ranged from 3 ppm to 14,000 ppm. Concentrations were randomly distributed across the site.

Total (unfiltered) lead was detected in 9 of the 10 perched (overburden) groundwater monitoring wells at concentrations ranging from 5 ppb to 250 ppb. Only 5 of the 10 wells had detections of dissolved (filtered) lead, with concentrations ranging from 1 ppb to 5 ppb. Dissolved (filtered) lead was not detected in groundwater from the bedrock well, although total (unfiltered) lead was detected at 1 ppb. Due to the nature and extent of lead contamination in groundwater at the site, that is, as a result of the suspended particulate matter within the perched groundwater, the potential for migration of lead is limited to the potential for solids to migrate through the fill matrix. This is considered to be minimal. As a result, the extent of lead-impacted groundwater is limited to the extent of the fill materials.

Lead was detected in water samples collected from the on-site storm sewers at concentrations ranging from 1 ppb to 27 ppb. Lead was present in the sediment samples at concentrations ranging from 34.6 ppm to 360 ppm. Lead was also detected in the Scajaquada Creek Drain at concentrations ranging from 1.4 ppb to 2.7 ppb in the water and from 51.1 ppm to 178 ppm in the sediment.

As part of a second IRM conducted in July 1996 and monitored by NYSDEC personnel, the storm sewers were cleaned of sediments in accordance with EMCON's letter to the NYSDEC dated June 24, 1996. Collected sediments and washwater were disposed of at Chemical Waste Management's Model City, New York facility. During the course of the sewer cleaning activities, a damaged section of sewer line was discovered adjacent to Manhole 1. This section was replaced in September 1996 in accordance with EMCON's letter to the NYSDEC dated August 27, 1996 to prevent any future infiltration into the storm sewers.

2.2 Risk Assessment Summary

The current site conditions, specifically the asphalt pavement, provide minimal opportunity for everyday contact with impacted materials. Additionally, because the site is a fenced and patrolled industrial facility, access by the general public is restricted. As a result, risks were evaluated under a future hypothetical construction scenario. Contact during excavation was assumed to occur in the areas of soil containing the maximum PCB concentrations, where total PCBs averaged 129 ppm, and the maximum lead concentrations, where total lead averaged 7,012ppm (based on current and historical sampling).

Exposure was assumed to occur via direct contact with PCB-impacted soil resulting in incidental ingestion, dermal absorption and inhalation. To calculate inhalation exposure, a dust model was used to estimate ambient airborne PCB concentrations. Overall carcinogenic risk was calculated at 9×10^{-6}, primarily attributable to dermal contact. This risk is within the typical acceptable risk range for Superfund remedial projects of 10^{-6} to 10^{-4}. Non-carcinogenic hazard was estimated at 60, mostly due to dermal exposure. This hazard is above the acceptable maximum of 1, indicating the potential for non-carcinogenic toxicity. However, because the only exposure pathway that is theoretically complete is a hypothetical occupational exposure, commonly available personal protective equipment and other engineering controls would be used to address this hypothetical hazard.

With regard to lead, exposure was assumed to occur via direct contact with soil resulting in incidental ingestion and inhalation. To calculate inhalation exposure, a dust model was used to estimate ambient airborne lead concentrations. Overall risk was calculated by developing a ratio between estimated total intake and the daily intake that would occur at the OSHA Permissible Exposure Limit (PEL) of 50 ug/m^3. The ratio was estimated at 0.4 (less than 1), indicating the absence of any significant lead exposure.

Groundwater, including bedrock groundwater, is not used for potable purposes, as the area is serviced by public water. Furthermore, the perched water table that has been impacted is not capable of providing adequate yield for use as a groundwater supply. Bedrock groundwater shows no evidence of contamination associated with the contaminant sources detected at the site. Therefore, the groundwater use pathway is incomplete and does not present a public health risk. Additionally, as discussed in Section 1.1, the existing deed restriction precludes the use of the site for residential purposes, and in turn, prevents the use of groundwater at the site for potable purposes.

Ecological risk was determined to be negligible due to the absence of wildlife in the area and the limited potential for contact during any excavation activities. Sediments could potentially transport contamination downstream, but due to removal of the sediments during the sewer cleaning, as well as the distance downstream to an area where there is a biological community, there is minimal potential for impact. Samples of water and sediment collected from the Scajaquada Creek Drain showed no detectable concentrations of PCBs and only trace levels of lead.

2.3 Summary of SCGs

Under the New York State superfund program (Article 27, Title 13 of the New York State Environmental Conservation Law), a remedial program must not be inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (NCP) and must be selected upon the consideration of standards, criteria, and guidance (SCGs). SCGs include both those of the State and those of the United States to the extent they are more stringent than those of the State. A remedial program should also be designed with consideration being given to guidance determined, after the exercise of engineering judgment, to be applicable on a site-specific basis (See 6 NYCRR 375-1.10(c)).

Definition of SCGs

SCGs or Standards, Criteria and Guidelines, are the New York State version of ARARs (Applicable or Relevant and Appropriate Requirements) which are used for remedial actions undertaken under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended. SARA defines a potential ARAR for a given site as:

- Any standard, requirement, criterion, or limitation under any Federal environmental law.

- Any promulgated standard, requirement, criterion, or limitation under a State environmental or facility siting law that is more stringent than any Federal standard, requirement, criterion, or limitation.

These two types of ARARs/SCGs may be further divided into three types of classifications: chemical-specific, location-specific, or action-specific. These classifications are defined as follows:

- Chemical-specific requirements are usually health- or risk-based numerical values or methodologies which, when applied to site-specific conditions, result in the establishment of numerical values. These values establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment. Table 1a and the text below summarize the potential chemical-specific standards, criteria, and guidelines applicable to each medium of concern at the site.

  A site-specific, risk-based action level of 20,000 ppm for lead in soil was developed. This value appears as a chemical-specific SCG in Table 1a. The basis of the action level was protection of human health in a construction scenario. Acceptable intake was set to equal exposure that would occur over the OSHA permissible exposure limit of 50 ug/m^3. A scenario was developed in which workers were assumed to be exposed through both incidental soil ingestion and inhalation of dust. The lead level that could exist in soils without exceeding acceptable intake is based on the anticipated ambient dust level. The target lead concentration was 20,000 ppm for the modeled on-site dust level. Details of the derivation appear in Appendix B.

  At lead concentrations above 20,000 ppm in soil, workers would need to don appropriate personal protective equipment in accordance with an approved health and safety plan and additional health and safety controls would need to be implemented. If the nature of the work would indicate the risk to be greater (i.e., due to the length of exposure time), this action level would need to be reevaluated.

  For purposes of this EEA, a site cleanup goal of 1,000 ppm of lead in subsurface soil has been established. This concentration is considered to be background for this site. Data from previous investigations conducted at this site (Environmental Engineering Services, Parts Coating Facility, EMCON, January 1996) have shown that samples with total lead concentrations less than 1,000 ppm have consistently had analytical TCLP lead concentrations less than 5.0 ppm, indicating that the material is non-hazardous.

- Location-specific requirements are restrictions placed on the concentration of hazardous substances or the conduct of activities solely because they occur within special, regulated locations. Alternatives evaluated in this study, shown in relation to location-specific SCGs, are identified in Table 1b.

- Action-specific requirements are usually technology performance, design, or activity-based limitations taken with respect to hazardous wastes. Potential action-specific SCGs for the site are also identified in Table 1b.

In addition, when SCGs do not exist for a particular chemical or remedial activity, other criteria, advisories, and guidance known in CERCLA remediation efforts as "to be considered" (TBC) material may be useful in the selection of a remedial alternative. For New York cleanups, the cleanup objectives set forth in NYSDEC TAGM 4046 are to be considered.

Potential chemical-specific SCGs were utilized to develop the remedial action objectives for the GM-Saginaw site. Potential action-specific and location-specific SCGs were identified for each remedial alternative to facilitate screening and detailed evaluation of each alternative. The potential chemical-, location-, and action-specific SCGs for each remedial alternative are also presented in conjunction with the description of these alternatives in Sections 4 (for OU1) and 5 (for OU2).

The potential chemical-specific, action-specific, and location-specific SCGs included in Tables 1a and 1b, have been identified based on a review of both Federal and New York State environmental regulations and guidance documents.

2.4 Remedial Action Objectives

The following RAOs have been developed for the site:

- To the extent practicable, reduce the potential for human contact with PCB and lead impacted soils.

- Prevent or greatly reduce the potential for migration of contaminants via surface run-off and on-site drain lines.

- Prevent or greatly reduce the migration of impacted groundwater to off-site receptors.
- To the extent practicable, provide for attainment of SCGs for groundwater.

2.5 Remediation Volumes

2.5.1 OU1

PCBs were detected at the site in excess of the 10 ppm subsurface cleanup goal for soil and above the 0.1 ppb New York State Groundwater Standard. The estimated limits of PCB contamination in soil and groundwater were determined as described below. The combined contamination areas for OU1 are shown on Drawing 1.

Soil

The volume of material having PCB concentrations greater than 10 ppm at depths greater than one foot below ground surface is delineated in Figure 1. PCBs were not detected within one foot of the ground surface. The area delineated in Figure 1 is located west and south of the existing aboveground tanks. This corresponds with the area that showed oil or light, non-aqueous phase liquid (LNAPL) contamination. Elevated PCB levels are primarily located between the west arm of the collection trench and the former clay tile pipe location. Impacted soil exists from approximately two feet below the surface down to the top of clay, or approximately 6.5 feet below existing grade. This corresponds to approximately 2450 cubic yards (CY) of material based on this area and depth. The oil plume is assumed to have a thickness of 6 inches. Based on an assumed porosity for fill described as cinder/ash/slag, the volume of LNAPL is estimated to be approximately 24,000 gallons. The estimated extent of PCBs in soil and LNAPL is plotted on Figure 1.

Groundwater

Groundwater contamination attributable to the site was only observed within the arms of the existing groundwater collection trench. Groundwater contamination is attributed to the presence of PCB-contaminated oil within the soils in this area. The area that showed evidence of groundwater contamination is shown on Figure 2. The thickness of impacted groundwater was assumed to be 1.5 feet. Based on an assumed porosity for fill described as cinder/ash/slag, the in-place volume of impacted groundwater was estimated to be approximately 50,000 gallons.

2.5.2 OU2

Lead was detected in soils and groundwater at the site. The estimated limits of lead in soil and groundwater were determined as described below. The combined areas are plotted in Drawing 2.

Soil

The volume of material having lead concentrations greater than the site-specific cleanup goal of 1,000 ppm is delineated in Figure 3. Lead concentrations greater than 1,000 ppm were found at 34 locations at the site. To determine volume of soil removal required, lead concentrations were interpolated between sample locations. Excavation to approximately 5 feet below ground surface was included for the estimate. Based on these assumptions, the removal of approximately 28,270 cubic yards (CY) of material would be required.

Groundwater

The in-place volume of groundwater having lead concentrations greater than the New York State Part 703 GA water quality standard of 25 ppb was delineated as shown in Figure 4. To determine the groundwater contamination limit, groundwater lead concentrations were interpolated between sample locations. As discussed in Section 2.1, lead contamination in groundwater above the 25 ppb standard is not believed to extend beyond the limits of the fill. The thickness of impacted groundwater was assumed to be 1.5 feet. Based on an assumed porosity for fill described as cinder/ash/slag, the in-place volume of impacted groundwater was estimated to be approximately 524,000 gallons.

3 TECHNOLOGY SCREENING

3.1 Screening Criteria

The technology screening performed for the selection of appropriate remedial technologies for the site is divided into media of concern. The goal of the screening process is to identify one or more technically feasible remedial technologies which alone or in combination would achieve the remedial objectives for the site. The criteria employed to determine the applicability of the technologies selected for evaluation in the screening presented include:

Effectiveness

- The effectiveness of the technology in treating the contaminants of concern.

Implementability

- Technical requirements associated with implementation of the technologies at the site, including operations and maintenance requirements and constructability.

Relative Cost

- Costs associated with capital and operations and maintenance, on a relative basis.

3.2 OU1 Screening Evaluation

Concentrations of PCBs were detected at the site in excess of the SCGs for soil and groundwater. Additionally, PCBs were identified in the LNAPL that was previously targeted for collection and removal from the site. Technologies applicable to remediation of the soil and groundwater are identified below.

3.2.1 Soil Containment

Containment to isolate the soils impacted with PCBs above the remediation goals could be accomplished by capping or vertical barrier containment.

Capping involves the installation of an impermeable barrier over the impacted soils to restrict access and reduce infiltration and soil erosion. Caps are designed and constructed to provide long-term minimization of migration of liquids through the site, function with minimum maintenance, promote drainage, minimize erosion, and have a permeability less than or equal to the permeability of natural soils.

Several cap configurations are applicable as a means of reducing human contact and infiltration of surface runoff into impacted soil. Caps consist of soil layer covers; single layer caps of a synthetic membrane, clay, hydraulic asphalt, or concrete; and composite caps that utilize both membrane and clay liners.

Asphalt and concrete caps are applicable in sites where soils are not subject to settlement, and industrial sites where the cap may be subject to vehicular traffic. This site, which is an industrial site parking area, is an appropriate area for these types of caps. The asphalt cap would be effective and easily implementable. Since the contaminants are already overlain by existing asphalt pavement, the asphalt cap would be the most cost-effective and is the preferred alternative from the soil containment options. Therefore, hydraulic asphalt along with the existing asphalt pavement will be utilized for the capping technology to be incorporated into the remedial alternatives in Section 4.

Vertical barriers, which could be utilized around the limits of impacted soils, are primarily used for the control of groundwater and to reduce the potential for off-site migration of contaminants. Because groundwater contamination attributable to the site is currently contained within the arms of the existing groundwater collection trench, vertical barriers will not be included in the containment alternative.

3.2.2 In-Situ Soil Treatment

In-situ treatment technologies employ mobilization of treatment equipment to the site for treatment of the impacted medium in place. Bioremediation, soil washing, and in-situ thermal desorption were evaluated for used at this site.

Bioremediation for in-situ treatment of soils impacted with PCBs has been demonstrated to be effective by Detox Industries, Inc. However, an important consideration is the form of PCBs present. PCBs are actually a mixture of many chlorinated biphenyl compounds. Total PCB concentrations represent the sum of different PCB Aroclor concentrations. Each Aroclor is made up of a mixture of many chlorinated biphenyls, with each chlorinated biphenyl in turn having a number of isomers. Aroclors 1248 and 1254 are the predominant Aroclors found at the site. The Aroclor indicates the total percent chlorine of the mixture. For example, Aroclor 1248 is 48 percent chlorine and consists of 2 percent Cl_2 biphenyls, 18 percent Cl_3 biphenyls, 40 percent Cl_4 biphenyls, 36 percent Cl_5 biphenyls, and 4 percent Cl_6 biphenyls. In general, it has been found that Aroclors with a high percentage of chlorobiphenyls Cl_3 and higher (such as 1248 and 1254, at

98 percent and 99 percent, respectively) are extremely resistant to biodegradation. Aerobic and anaerobic mechanisms of biological dechlorination have been studied. Of note is General Electric's efforts to develop a process that utilizes anaerobic dechlorination of the highly-chlorinated biphenyls, followed by aerobic degradation of the lower-chlorinated biphenyls. However, no reliable method has been developed that can be used to bioremediate the Aroclors present at the site. Therefore, bioremediation is not considered potentially applicable.

Soil washing/chemical extraction involves eluting impacted soil with a solvent or surfactant solution to increase the solubility of the PCBs and accelerate leaching from the soil matrix. Extraction wells or some other collection system would be installed to recover the impacted groundwater, and the extract would be treated. Treatability studies would have to be done to evaluate this process. This process would not be effective on lead because different solvents would be required (i.e., more acidic).

Thermal desorption of PCBs is a demonstrated technology available through several vendors. Although most thermal desorption processes require excavation of the impacted soils for on-site treatment, the TerraTherm process developed by Shell Technology Ventures, Inc., treats the soil in-situ. This technology is a thermal process that uses heating modules in the form of thermal blankets (surface application) or thermal wells (subsurface application) to continuously volatilize organic contaminants from soil. Contaminant gases and volatile decomposition products are convected to the surface by a vacuum extraction system and are exhausted to a process trailer to undergo secondary and tertiary treatment. A flameless thermal oxidizer (secondary treatment) is used to destroy the contaminants. The effluent gas is then cooled before undergoing carbon adsorption (tertiary treatment). The technology does require dewatering of the soil in perched water table conditions to maintain optimum effectiveness of the system.

Both in-situ thermal desorption and soil washing would potentially be effective and would be implementable for PCBs. Neither alternative would be effective for lead. Because soil washing is a more complex technology to implement, in-situ thermal desorption will be considered in the development of alternatives in Section 4.

3.2.3 On-Site Soil Treatment

On-site treatment technologies involve mobilization of treatment equipment to the site to treat excavated soils. Solvent extraction, dechlorination and thermal desorption were considered for remediating PCB-impacted soils above the remedial goals.

Solvent extraction is a process in which soil is washed with a solvent which extracts the contaminant of concern. The solvent is typically reclaimed and the washed soil is dried for replacement in the excavated area. The contaminant is concentrated 1,000 to 10,000 times and disposed off-site. This process would not be effective on lead because different solvents would be required (i.e., more acidic).

On-site alkaline polyethylene glycol (APEG) dechlorination is a process in which PCBs in impacted sediments can be dechlorinated by a reagent consisting of potassium hydroxide in a solution of mixed polyethylene glycol and dimethyl sulfoxide (DMSO). The reagent mixture dehalogenates the PCBs to form a glycol ether that may further degrade to form a totally dechlorinated species. Spills can be treated to contain less than 2 ppm PCBs. This process has been named in Records of Decision at multiple Superfund sites. This process is potentially applicable to dechlorinate PCBs in soils, but treatability studies would be required to determine actual applicability. This technology would not be effective for lead.

Chemical Waste Management's XTRAX process is an ex-situ or on-site thermal desorption process that has been demonstrated. This technology is a thermal process that uses an indirectly heated rotary dryer to continuously volatilize water and organic contaminants from soil, sludges, and sediments in a sealed system. The hot, treated solids are cooled and de-dusted using the condensed water removed from the feed. An inert carrier gas (nitrogen) transports the volatilized components to a gas treatment train. The gas treatment train removes the entrained particulate solids with a scrubber, and then cools the entire gas stream to condense the volatilized organics. The condensed organic liquid removed from the soil is drummed for off-site disposal. As with the other technologies, ex-situ thermal desorption would be ineffective for lead since lead would not volatilize at the relatively low temperatures (i.e., 850°F).

Dechlorination is considered least implementable since it is more complicated to operate. The process is much more sensitive to changes in PCB concentration, Aroclor mix, and soil/fill characteristics of individual batches than other technologies. These factors can potentially increase the time to implement and cost of the technology. Solvent extraction is estimated to produce a larger volume of residual waste than the thermal desorption process at this site, and offers no significant advantage over the thermal technology. Therefore, solvent extraction and dechlorination will not be considered further as viable on-site treatments. Thermal desorption will be included in the development of alternatives in Section 4 for on-site treatment.

3.2.4 Soil Removal

Removal includes the excavation of impacted soil and stockpiling for on-site treatment or off-site disposal. The contaminated LNAPL would also be removed with the soil, thereby eliminating the potential for future impacts to soil and groundwater. Soil removal will be included in the development of remedial alternatives in Section 4.

3.2.5 Soil Disposal

Soil disposal includes the transportation and disposal of the excavated soil at an approved disposal facility. Soil disposal will be included in the development of alternatives presented in Section 4.

Soils impacted with 50 ppm or greater PCBs must be disposed at a facility permitted under the federal Toxic Substances Control Act (TSCA). In New York, soils with PCB concentrations equal to or greater than 50 ppm are also considered listed hazardous wastes. For the purposes of this study, the soils to be removed from the site are estimated to be in the range of 50-500 ppm PCBs. Although some soils will have PCB concentrations in the 10 to 50 ppm range, for purposes of this report, we are assuming the worst-case scenario (i.e., that all soils are greater than 50 ppm) because estimating quantities at this time would be difficult. Consequently, for the analysis presented in Section 4, the assumption that PCB-impacted soils will be disposed at a TSCA permitted PCB landfill will apply for all alternatives that include off-site disposal.

3.2.6 Groundwater/LNAPL Collection

Collection of the LNAPL or free product at the site could be accomplished by product recovery wells combined with groundwater reduction wells, or passive/active trench drains. A passive collection trench system was selected previously as the remedial alternative at the site to collect the oil plume that was originally identified by EMCON (Wehran Engineering at that time) during a hydrogeologic investigation in August 1987. Construction commenced and the trench drains and collection manhole were installed. The remedial effort was suspended when PCBs were detected in the free product. This technology is still considered effective and can be implemented. Because it is in place, this technology would be the most cost-effective. Therefore, the passive collection trench will be retained as the remedial technology for LNAPL collection in the remedial alternatives presented in Section 4.

3.2.7 Groundwater/LNAPL Separation

The LNAPL collected would be discharged from the collection trench with groundwater. The LNAPL would be separated from the groundwater by either an American Petroleum Institute (API) gravity-type oil and water separator or a mechanical separator. The mechanical separator includes a coalescing section and provides greater separation efficiency than the gravity separator. The mechanical separator would provide the greatest degree of effectiveness and would enhance the implementability of filtration equipment. Therefore, a mechanical oil and water separator will be included in the development of alternatives in Section 4.

3.2.8 LNAPL/Water Filtration

Several types of filtration units are available to remove oil and grease from the water. A filtration system consisting of an oil and grease filter unit followed by two granular activated carbon (GAC) filters in series for PCB removal would be applicable to the groundwater collected along with the LNAPL at this site. Filtration will be included in the alternatives in Section 4. Discharge criteria for disposal of groundwater to the Buffalo Sewer Authority (BSA) and surface water discharge (SPDES) are presented in Table 2.

3.2.9 LNAPL Disposal

Based upon the concentrations of PCBs anticipated in the LNAPL at the site, it is assumed that PCB concentration in the LNAPL collected will probably exceed 50 parts per million (ppm). The waste would then be considered hazardous under 6 NYCRR Part 371. Incineration is the recommended technology for disposal of the LNAPL.

For the analysis conducted in Section 4, the assumption that LNAPL disposal will be by off-site incineration will apply to OU1 disposal alternatives.

3.3 OU2 Screening Evaluation

3.3.1 Soil Containment

Human and environmental exposure to soils impacted with lead above the remediation goals can be eliminated by capping or vertical barriers. Both of these alternatives eliminate any mobility of the contaminants.

Capping, which would prevent contact with the contaminants and greatly reduce or eliminate the infiltration of precipitation into the areas of contamination, will be evaluated as the alternative for containment. There are several configurations that are applicable as a capping alternative. Since the contaminants are already overlain and contained by an existing asphalt pavement, hydraulic asphalt to seal the existing asphalt will be selected along with the existing pavement as the capping technology to be incorporated into the remedial alternatives in Section 5.

Vertical barriers, which could be utilized around the limits of impacted soils, as discussed previously, are primarily used to control groundwater and reduce the potential for off-site migration of contaminants. Due to the minimal potential for off-site migration of lead (as discussed in Section 2.1), vertical barriers will not be included as a containment alternative for OU2.

3.3.2 In-Situ Soil Treatment

In-situ treatment could be accomplished by soil washing or stabilization/solidification. The soil washing/chemical extraction process involves eluting impacted soil with a solvent or surfactant solution to increase the solubility of the inorganic of concern and accelerate leaching from the soil matrix. Extraction wells or some other collection system would be installed to recover the impacted groundwater, and a wastewater treatment system would treat the extract. Treatability studies would have to be done to evaluate this process. This process would not be effective on PCBs because different solvents would be required (i.e., less acidic).

In-situ stabilization/solidification (S/S) is recognized as a demonstrated treatment for soils impacted with metals, however is not generally effective with organics. The process involves in-situ mixing of a stabilizing agent with the soil to form a structurally sound matrix that physically, or chemically, binds the contaminants. S/S is generally applied to media containing inorganic contaminants and not organic contaminants. Organics generally interfere with the cementitious or pozzolanic bonding; therefore, organic constituents in the soil may have to be reduced or removed prior to stabilization. Typically, the reagent is cementitious (similar to Portland cement) or pozzolanic (consisting of silicate materials such as fly ash). Treatability studies would have to be performed.

Both soil washing and S/S are potentially implementable at this site. Because soil washing is a more complex technology to implement, in-situ S/S will be incorporated into the development of remedial alternatives in Section 5.

For the analysis presented in Section 5, the assumption that PCB-impacted soil would be treated separately will apply to all alternatives utilizing in-situ S/S.

3.3.3 On-Site Soil Treatment

Similar to the in-situ application technologies, both on-site soil washing and stabilization/solidification (S/S) are potentially applicable to treating lead in soils at this site. As discussed in Section 3.2.3, neither technology is effective for PCBs.

On-site soil washing is similar to in-situ soil washing except that the soil would be removed and stockpiled on site for treatment.

On-site S/S is similar to the in-situ S/S described above. Mixing of the reagent with the impacted materials would be performed in an on-site plant after excavation of the soils. Treated soils would be replaced in the excavation.

On-site S/S is considered more applicable to remediation for the lead in soils at this site. Therefore, it will be utilized in the development of alternatives in Section 5.

For the analysis presented in Section 5, the assumption that PCB-impacted soil would be treated separately will apply to all alternatives utilizing on-site S/S.

3.3.4 Soil Removal

Removal includes the excavation of the impacted soil and stockpiling for on-site treatment or off-site disposal. Soil removal will be included in the development of remedial alternatives in Section 5.

3.3.5 Soil Disposal

Soil disposal includes the transportation and disposal of the excavated soil at an approved disposal facility. Soil disposal will be included in the development of alternatives presented in Section 5.

A review of the historical lead soil data provided in Table 4-7 of the SI was performed. Based upon the data review it appears that, due to the high concentrations of lead in soil, the 5 ppm Toxicity Characteristic Leaching Procedure (TCLP) test limit could be exceeded in several areas. Therefore, the disposal alternatives for OU2 soil will assume a need for disposal in an approved hazardous waste facility. Based on previous work conducted at the site, soil with total lead concentrations below 1,000 ppm consistently passed the TCLP test (leaching <5 ppm). Above 1,000 ppm total lead, it is difficult to estimate the volume of material that would exceed the TCLP limit due to the heterogeneity of the material. As a result, for estimating purposes, it is assumed that soil with total lead concentrations greater than 1,000 ppm will need to be disposed of at an approved hazardous waste facility.

3.3.6 Groundwater Collection

Groundwater collection could be accomplished by pumping wells or trench drains. Pumping wells may be installed for pumping areas of contamination at any depth. The wells may be driven and screened into the strata of concern. Pumps would be installed to discharge the groundwater to the surface. This alternative is advantageous when a large area of groundwater collection is required in a hydraulically conductive formation, because the wells can be distributed throughout the site with minimal surface disruption.

Pumping wells are not applicable for OU2 groundwater collection due to the shallow depth of groundwater to be collected. Many closely spaced wells would be required to achieve the capture of the groundwater because only 1.5 to 5 feet of perched groundwater exist at the site.

Trench drains for collection of groundwater would be applicable due to the shallow depth of groundwater to be collected. Trench drains are typically constructed by excavation of a trench into the stratum of concern, placement of a perforated drainage pipe, and backfilling with highly permeable material. Collection sumps and pumping systems are also required as part of the trench drain collection system.

Trench drains would be effective, are implementable, and will be utilized in the development of remedial alternatives for lead.

3.3.7 Groundwater Treatment

Dissolved lead could be removed by chemical precipitation and particulate lead could be removed by filtration. Carbon adsorption would be used to remove any residual PCBs in the groundwater. Treatment would have to meet discharge requirements for the Buffalo Sewer Authority (BSA) or for surface water (see Table 2). Discharge to surface water of BSA would be via a force main to the receiving storm or sanitary sewer, respectively.

Chemical precipitation would consist of mixing, pH adjustment and settling to remove dissolved (soluble) lead. The precipitate (sludge) would be removed as part of operations and maintenance and disposed of off site. Filtration would consist of liquid filter cartridge of bag systems.

A review of the groundwater data was conducted to determine the treatment requirements. The maximum dissolved (soluble) lead concentration detected was 5 ppb (see Drawing 11 in the SI). The discharge criteria for discharge to the BSA and direct discharge to an on-site storm sewer leading to surface water (Scajaquada Creek) are 430 ppb and 25 ppb, respectively (see Table 2). Therefore, chemical precipitation is not required and filtration alone would be effective in treating the groundwater before discharge to surface water. Filtration will assist in removing particulates which the SI has identified to be the source of the lead in groundwater. Filtration will therefore be included in the development of alternatives in Section 5 for direct discharge. Discharge to BSA would not require any treatment for lead. In addition, carbon adsorption would be included to remove any residual PCBs to either BSA or surface water discharge limits as shown in Table 2.

Treatability studies would need to be performed to determine filtration equipment requirements.

3.3.8 Groundwater Disposal

Groundwater could be discharged to the BSA or to surface water. The discharge to the BSA would be accomplished by discharging the groundwater into the on-site treatment plant effluent pump station. The discharge would be required to meet the BSA discharge criteria presented in Table 2. The discharge to surface water would be via an on-site catch basin. The on-site catch basin discharges to the Scajaquada Creek, which is classified by NYSDEC as a Class C stream in the vicinity of the site. Downstream, the classification changes to a Class B designation. Therefore, the requirement that discharge from the site meet the surface water criteria for a B stream, as shown in Table 2, has been assumed.

Both discharge to the BSA and direct discharge can be made effective and implementable through sufficient treatment. Therefore, both options will be considered in development of the remedial alternatives presented in Section 5.

4 DETAILED EVALUATION OF ALTERNATIVES - OU1

4.1 Development and Evaluation of Alternatives

4.1.1 Development of Alternatives

The recommended technologies presented in Section 3 were utilized to develop remedial alternatives. The limit of contamination for OU1 is plotted on Drawing 1. The limits of contamination for each medium of concern are plotted on Figures 1 and 2. The alternatives are presented below in Sections 4.2 and 4.3

4.1.2 Evaluation Criteria

A detailed analysis of each alternative developed here is presented following the description of the alternative. The evaluation criteria for the analysis of alternatives is in accordance with NYSDEC Technical and Administrative Guidance Memorandum HWR-90-4030. The detailed analysis consists of an evaluation with respect to the following criteria:

Overall protection of human health and the environment — the reduction in risk to human health and the environment provided by the alternative.

Compliance with SCGs — the degree to which the alternative is successful in achieving the SCGs specified in Section 2.3 and Tables 1a and 1b.

Long-term effectiveness and permanence — the magnitude of residual risk, the adequacy and reliability of controls, and permanence; i.e., destruction of hazardous materials associated with each alternative.

Reduction of toxicity, mobility, and volume of source through treatment — ability of the alternative to reduce toxicity, mobility, and volume of hazardous materials through treatment of sources of contamination.

Short-term effectiveness — an evaluation of the following criteria is used to determine an alternative's short-term effectiveness:

- Protection of the community during remedial actions
- Protection of workers during remedial actions
- Environmental impacts of the remedial actions
- Time until the remedial action objectives are achieved

Implementability — an evaluation of the following criteria is used to determine an alternative's implementability:

- Ability to construct and operate the technology
- Reliability of the technology
- Ease of undertaking additional remedial actions, if necessary
- Ability to monitor the effectiveness of the remedy
- Ability to obtain approvals from other agencies
- Coordination with other agencies
- Availability of off-site treatment, storage, and disposal services and capacity
- Availability of necessary equipment and specialists
- Availability of prospective technologies

Cost — each alternative is assessed for the following criteria:

- Capital costs
- Operating and maintenance costs
- Total present worth cost, based on a 30-year operation and maintenance time-frame at 5 percent interest. The 30-year term was used because it represents the worst case scenario. Alternatives involving monitoring and maintenance are not anticipated to be required for this period of time. Monitoring will be conducted for a limited period of time to demonstrate that current conditions either persist or improve.

4.2 Soil Alternatives

The limits of contamination for PCBs in soil are presented in Figure 1.

4.2.1 Alternative 1S1 — No Action

4.2.1.1 Description

No remedial action would be performed under this alternative for either source control or management of migration. The existing asphalt pavement at the site would act as a cover source to prevent infiltration into the PCB-impacted soils and aid in the control of horizontal mobility. Any decrease in contaminant levels would be solely the result of natural processes. The existing deed restriction would prevent use of the site for anything other than industrial purposes.

4.2.1.2 Evaluation

Overall Protection of Human Health and the Environment

There are no impacts as long as the existing pavement stays intact to prevent human and wildlife contact with impacted soils. This alternative would be protective of human health and the environment under current conditions because the potential for contact with impacted soil is limited by the asphalt. This alternative would not remain protective in the long term, because no maintenance of the pavement is proposed. The environmental condition would remain in the present form; therefore, this alternative would not be protective of the environment in the long term.

Compliance with SCGs

Location- and action-specific SCGs would not apply, as there would be no remedial activities associated with this alternative. The 1 ppm surface goal is not contravened. Based upon the site-specific conditions, the 10 ppm subsurface cleanup goal for PCBs would not be met.

Long-Term Effectiveness and Permanence

Alternative 1S1 provides no additional environmental controls and no long-term management measures. All potential future risks would remain under this alternative. This alternative would therefore not be effective in the long term. It would not provide permanent remediation because it does not treat or remove the source of contamination.

Reduction of Source Toxicity, Mobility, and Volume

This alternative does not meet this criterion, which applies only to reduction of toxicity, mobility, and volume of impacted soils through treatment.

Short-Term Effectiveness

The no-action alternative would be readily implementable and involve no construction activities. There would be no associated worker or community impacts. This alternative would be effective in the short term in maintaining overall protectiveness as long as the existing pavement is kept in place. However, any reduction in contaminant concentrations would be solely a function of natural processes, which would not be effective in the short term.

Implementability

The no-action alternative could be considered to be easily implemented since no construction activities are included.

Cost

There will be no capital or annual O&M costs associated with the no action alternative. A summary of the costs, including present value costs, are provided in Table 3a. The total present value cost would be $0.

4.2.2 Alternative 1S2 — Limited Action: Maintenance of Existing Pavement

4.2.2.1 Description

No remedial action would be performed under this alternative for either source control or management of migration. The existing deed restriction would prevent use of the site for anything other than industrial purposes. The existing asphalt pavement at the site would act as a cover source to prevent infiltration into the PCB-impacted soils. This alternative, which is similar to Alternative 1S1, would also include routine annual maintenance of the existing pavement. Maintenance would be performed as necessary to maintain the integrity of the parking lot. Any decrease in contaminant levels would be solely the result of natural processes.

4.2.2.2 Evaluation

Overall Protection of Human Health and the Environment

Alternative 1S2 would not provide improvements to existing or future site conditions unless by natural processes, since the source would remain on site. There would be no potential human or environmental exposure with this alternative. The deed restriction and maintenance would keep the existing pavement intact in order to prevent contact with impacted soils by humans and the environment. However, the contaminants could migrate off-site through the LNAPL and impacted groundwater. Therefore, this alternative would be protective of human health and the environment if implemented in conjunction with a groundwater technology such as Alternative 1G3 or 1G4.

Compliance with SCGs

Action- and location-specific SCGs would not apply as there would be no remedial activities associated with this alternative. The 1 ppm surface goal is not contravened. Based on the site-specific conditions, the 10 ppm subsurface cleanup goal for PCBs would not be met, but is being addressed because subsurface areas over 10 ppm PCBs are covered by the existing pavement, thereby meeting the RAOs.

Long-Term Effectiveness and Permanence

Alternative 1S2 would provide no additional environmental controls and no long-term management measures. However, as long as the existing pavement remains intact via deed restriction and annual maintenance, protection would be maintained. This alternative would be considered effective in the long term if implemented in conjunction with a groundwater technology such as Alternative 1G3 or 1G4 because the LNAPL and impacted groundwater would be collected and treated.

Reduction of Source Toxicity, Mobility, and Volume

No treatment of soils is proposed for Alternative 1S2. Therefore, evaluation of reduction of toxicity, mobility, and volume is not applicable.

Short-Term Effectiveness

The limited-action alternative would be readily implementable and involve no construction activities, other than annual maintenance on the existing pavement. There would be no associated worker or community impacts since no construction activity is included. This alternative would be effective in the short term in maintaining overall protectiveness because the existing pavement is kept in place. However, any reduction in contaminant concentrations would be solely a function of natural recovery, which would not be effective in the short term.

Implementability

There are no issues related to the implementability of this remedial alternative. Routine maintenance on the existing pavement would continue annually and the deed restriction is already in place.

Cost

There is only an annual O&M cost, which consists of annual pavement maintenance. A summary of the costs, including present value cost, is provided in Table 3b. The total present value cost is estimated to be $29,000.

4.2.3 Alternative 1S3 — Soil Containment/Capping: Installation of Hydraulic Asphalt Cap Over Existing Pavement

4.2.3.1 Description

Alternative 1S3 would include the evaluation of the existing asphalt pavement as part of the capping configuration, replacement of all deteriorated pavement to the existing depth and grade, and the construction of a thin-layer hydraulic asphalt cap over the existing pavement as the control for the impacted soils. The existing deed restriction is reflected in this alternative.

The hydraulic asphalt cap would provide a barrier to infiltration over impacted soils. Hydraulic asphalt materials can be formulated to produce in-place permeabilities on the order of 1×10^{-7} cm/sec.

The cap would consist of a 1.5-inch layer of hydraulic asphalt underlain by the existing pavement. All areas of the existing asphalt pavement that require replacement would receive a 4-inch layer of hydraulic asphalt. The 4-inch depth of pavement replacement has been assumed for the purpose of developing the cost of this alternative.

The capping limit would extend 10 feet beyond the limits of contamination, shown in Figure 1, to assure coverage of the impacted soil.

4.2.3.2 Evaluation

Overall Protection of Human Health and the Environment

This alternative would be protective of human health and the environment through prevention of direct contact with impacted soils by humans or wildlife; protection would be equivalent to Alternative 1S2 (limited action). The hydraulic asphalt cap would also aid in reducing the potential for mobility of the contaminants by further reducing infiltration. However, the contaminants could still migrate off-site through the LNAPL and impacted groundwater. Therefore, this alternative would be protective of human health and the environment if implemented in conjunction with a groundwater technology such as Alternative 1G3 or 1G4.

Compliance with SCGs

Action- and location-specific SCGs would not apply as there would be no remedial activities associated with this alternative. The 1 ppm surface goal is not contravened. Based on the site-specific conditions, the 10 ppm subsurface cleanup goal for PCBs would not be met, but is being addressed because subsurface areas over 10 ppm PCBs would be covered by the hydraulic asphalt cap, thereby meeting the RAOs.

Long-Term Effectiveness and Permanence

This alternative would utilize proven technology and would be effective in the long term. It would not be considered permanent because it would not treat or reduce PCBs in the source.

Reduction of Source Toxicity, Mobility, and Volume

No treatment of soils is proposed for Alternative 1S3. Therefore, reduction of toxicity, mobility, and volume is not applicable.

Short-Term Effectiveness

Due to the existence of the asphalt paved parking area which overlies the impacted soils, no impact to workers will occur if the existing asphalt is not removed. If the existing asphalt pavement needs to be repaired or replaced, potential impacts would be insignificant due to health and safety precautions.

All construction activities would be performed in accordance with the Occupational Health and Safety Standards for Construction (OSHA 29 CFR 1926). A health and safety program would be developed and implemented during construction. Potential effects on the local community (i.e., dust) would be mitigated using standard construction practices.

Time to implement this alternative, from design through completion of construction, is estimated to be 3 to 4 months.

This alternative would be effective in the short term in maintaining overall protectiveness because there would be pavement in place. However, any reduction in contaminant concentrations would be solely a function of natural processes, which would not be effective in a short period of time.

Implementability

The equipment and resources are readily available for capping the contaminants at the site with a thin-layer hydraulic asphalt cover. Capping is easily implementable since the entire site is covered with an existing asphalt pavement. In addition, special care would only be required during construction of the cap where pavement replacement is required.

Cost

The capital cost associated with Alternative 1S3 includes the construction of the hydraulic asphalt cover, the replacement of any existing asphalt pavement that is insufficient, erosion and sedimentation controls, dust controls, and engineering and permitting. The annual O&M cost includes cap maintenance and groundwater monitoring over a limited period of time to be determined by the results of the sampling. A summary of the costs, including present value cost, is provided in Table 3c. The total present value cost is estimated to be $68,000.

4.2.4 Alternative 1S4 — In-Situ Treatment: In-Situ Thermal Desorption

4.2.4.1 Description

Alternative 1S4 consists of in-situ treatment by TerraTherm thermal desorption. This alternative would require dewatering, on-site treatment of dewatered groundwater, discharge of treated groundwater to BSA, installation of thermal wells, and in-situ treatment by the TerraTherm thermal desorption process. PCBs would be desorbed and destroyed by the process's heating elements. Vapors would be extracted using a vacuum system for treatment by thermal oxidation and carbon adsorption before discharge. Pollution control equipment would be utilized to minimize air impacts. Confirmatory sampling would be performed to ensure that all soil above the cleanup goal was remediated. The treated area would be restored to its original condition.

4.2.4.2 Evaluation

Overall Protection of Human Health and the Environment

This alternative would provide protection of human health and the environment by eliminating the potential for contact with contaminants in soils. Dewatering will result in improvement to groundwater quality. Elimination of the source will prevent future impact to groundwater. Downgradient surface water has not been impacted by PCBs. Long-term protection would not be anticipated to be appreciably greater than under the "no action" or "limited action" remedial alternatives, because risks are only associated with soil contact under future hypothetical construction conditions.

Compliance with SCGs

This alternative would comply with the 10 ppm subsurface cleanup goal for PCBs. The 1 ppm surface goal is not contravened. The off-site disposal of treatment system waste materials would be accomplished by utilizing appropriately permitted haulers and treatment facilities; and preparing and transporting wastes in accordance with the proper manifesting and recordkeeping requirements.

Long-Term Effectiveness and Permanence

This alternative would be effective in the long term because the source would be treated. It would be considered permanent because the treatment would be irreversible.

Reduction of Source Toxicity, Mobility, and Volume

Thermal desorption would be effective in reducing the toxicity, mobility, and volume of contamination through treatment. The treatment would be irreversible.

Short-Term Effectiveness

Remedial activities that would potentially disturb the impacted media would be limited to the installation of the pumping and thermal wells. Protection of the community would be provided by temporary fencing. Worker protection would be adequately provided by readily available personal protection equipment. Environmental impacts during implementation would be minimal since the only disturbance would occur during the well installation. A treatability study would be necessary to determine the effectiveness of this technology on the site materials. The time required to remediate the site is estimated to be on the order of 6 to 8 months, including design through completion.

This alternative would be effective in the short term because the contaminant source would be treated.

Implementability

Since in-situ thermal desorption (TerraTherm) is a new technology and has only proven effective at a limited number of sites, a treatability study would be required to determine the implementability of this process under the site-specific conditions. In-situ thermal desorption could be constructed using readily available construction means and materials.

Costs

The costs for implementing Alternative 1S4 are presented in Table 3d. The total present value cost is estimated to be $1.3 million.

4.2.5 Alternative 1S5 — Excavation and On-Site Treatment: On-Site Thermal Desorption

4.2.5.1 Description

Alternative 1S5 consists of dewatering, on-site treatment of dewatered groundwater, discharge of treated groundwater to BSA, excavation of the impacted soil to the top of clay, and on-site treatment by thermal desorption. Excavated material would be stockpiled on-site before treatment. Confirmatory sampling would be performed to ensure that all soil above the cleanup goal was remediated. After treatment, the soil would be placed back in the excavation. The excavated area would be restored to its original condition.

4.2.5.2 Evaluation

Overall Protection of Human Health and the Environment

This alternative would provide protection of human health and the environment by eliminating the potential for contact with contaminants in soils. Dewatering will result in immediate improvement to groundwater quality. Elimination of the source will prevent future impact to groundwater. Downgradient surface water has not been impacted by PCBs. Protectiveness would be equivalent to that under Alternative 1S4 (in-situ thermal desorption). However, this level of protectiveness would not be anticipated to be appreciably greater than under the "no action" or "limited action" remedial alternatives.

Compliance with SCGs

This alternative would provide compliance with the 10 ppm PCB cleanup goal. Action- and location- specific SCGs would require compliance with the requirements for air monitoring and dust suppression during remedial activities (NYSDEC Technical and Administrative Guidance Memorandum HWR-89-4031). The off-site disposal of treatment plant waste materials would be accomplished by utilizing appropriately permitted haulers and treatment facilities; and preparing and transporting wastes in accordance with the proper manifesting and recordkeeping requirements.

Long-Term Effectiveness and Permanence

This alternative would be effective in the long term because the source would be treated. It would be considered permanent because the treatment would be irreversible.

Reduction of Source Toxicity, Mobility, and Volume

Alternative 1S5 would employ thermal desorption treatment to remediate soils containing PCBs in excess of 10 ppm. Residual waste equivalent to 0.5 percent be weight of material processed would be collected. Thermal desorption would be effective in reducing the toxicity, mobility, and volume of PCBs in soil through treatment.

Short-Term Effectiveness

Excavation, stockpiling, and material handling during treatment would potentially impact the community, workers, and the environment during the remedial activities. Community and worker impacts would be mitigated by normal dust control methods and monitoring and limiting access to the site. Limiting the hours of operation and using mufflers/silencers on construction equipment would mitigate any impacts associated with noise. Potential environmental impacts would be mitigated by standard sediment and erosion control technologies. The time to remediate the site, from design through completion of the remedial activities, is estimated to be 6 to 8 months.

This alternative would be effective in the short term because the contaminant source would be treated.

Implementability

Thermal desorption has been demonstrated to be effective in removing PCBs from impacted soil. Construction of the on-site treatment equipment and removal of the soil can be accomplished with readily available construction equipment and practices. Confirmatory sampling would be performed to verify that all soils impacted above the remediation standards are removed.

Costs

The costs associated with implementing on-site treatment are presented in Table 3e. The total present value cost is estimated to be $3 million.

4.2.6 Alternative 1S6 — Excavation and Off-Site Disposal

4.2.6.1 Description

Alternative 1S6 would involve dewatering, on-site treatment of dewatered groundwater, discharge of treated groundwater to BSA, and the excavation of impacted soils with PCB concentrations greater than 10 ppm to the top of clay for off-site disposal. Dewatering will remove the impacted groundwater and LNAPL. LNAPL will be separated from the collected groundwater by means of an oil/water separator, collected, and disposed at a permitted off-site facility. Remaining LNAPL not collected during dewatering will be removed together with the excavated soil and disposed at a permitted off-site facility. Impacted excavated materials would be loaded directly into lined rail cars and transported for off-site disposal. The excavated material would be tested and shipped to an approved

PCB disposal facility. For the purpose of the analysis conducted here, it is assumed that disposal in an approved PCB landfill would be acceptable (see Section 3.2.9). Upon completion of the removal activity, confirmatory sampling would be performed in the excavations to ensure that the remaining soils are below the remediation goals. The site would be backfilled with clean fill, and the surface restored to its original surface condition.

4.2.6.2 Evaluation

Overall Protection of Human Health and the Environment

This alternative would provide equivalent protection of human health and the environment as Alternatives 1S4 and 1S5 by eliminating the potential for contact with contaminants in soils. Dewatering will result in immediate improvement to groundwater quality. Elimination of the source will prevent future impact to groundwater. Downgradient surface water has not been impacted by PCBs. Protectiveness would be equivalent to that under Alternatives 1S4 (in-situ thermal desorption) and 1S5 (on-site thermal desorption). However, risk reduction would not be anticipated to be appreciably greater than under the "no action" or "limited action" remedial alternatives because unacceptable risks are only associated with soil contact under future hypothetical conditions.

Compliance with SCGs

This alternative would provide compliance with the cleanup objective of 10 ppm in subsurface soils. Effectiveness in chemical-specific SCG compliance would be equivalent to Alternative 1S5. Action-specific SCGs would require compliance with the requirements for handling and management of the impacted soils including: NYSDEC Technical and Administrative Guidance Memorandum HWR-89-4031 (air monitoring and dust suppression), 6 NYCRR Part 371 (including 371.4(e) wastes containing PCBs); and 40 CFR Part 761.60 (PCB disposal requirements). In addition, appropriately permitted haulers and treatment facilities would be employed for disposal and the preparation and transport of impacted soils would be accomplished in accordance with proper manifesting and recordkeeping requirements.

Long-Term Effectiveness and Permanence

This alternative would be effective in the long term because the source would be removed. It would not meet the criterion of permanence, however, because the source would only be removed, not treated.

Reduction of Source Toxicity, Mobility, and Volume

Since the impacted soil would be excavated and disposed of off-site, there would be a reduction of source toxicity, mobility, and volume.

Short-Term Effectiveness

Potential impacts from excavation and storing the soil on-site would be mitigated by dust control during remedial activities and placement of the soil directly into lined holding containers. Standard sediment and erosion control methods would be employed during construction. Limiting the hours of operation and using mufflers/silencers on construction equipment would mitigate any impacts associated with noise. The time to remediate the site from remedial design through completion of the surface restoration is estimated to be 2 to 3 months.

This alternative would be effective in the short term because the contaminant source would be removed.

Implementability

Excavation and off-site disposal is a common method of site remediation. The equipment and labor would be available to implement the removal and disposal of the impacted soil. Existing disposal facilities are readily available for disposal of the soils removed. There are no site constraints which would adversely hinder the removal of the material. Source removal is a reliable remedy. Disposal capacity should be readily available.

Costs

The costs associated with implementing excavation and disposal are presented in Table 3f. The total present worth cost is estimated to be $1.19 million.

4.3 Groundwater Alternatives

The limits of the groundwater contamination and LNAPL are presented in Figure 2.

4.3.1 Alternative 1G1 — No Action

4.3.1.1 Description

No remedial action would take place for Alternative 1G1 for either source control or management of migration. The existing asphalt at this site would act as a cap to prevent infiltration into the PCB-impacted soils. Any decrease in contaminant levels would be solely the result of natural processes. The existing deed restriction prevents the use of groundwater for potable purposes.

4.3.1.2 Evaluation

Overall Protection of Human Health and the Environment

No unacceptable risks specifically associated with the groundwater or LNAPL have been identified. Protection of human health and the environment under existing conditions is maintained by the deed restriction, which prevents the use of groundwater as a potable water source, and the existing asphalt pavement, which reduces the potential for infiltration. The LNAPL would not remediate through natural recovery in the foreseeable future. This alternative would not remain protective over a long period of time because no maintenance of the pavement is proposed. The environmental condition would remain in the present form; therefore, this alternative would not be protective of the environment in the long term.

Compliance with SCGs

This alternative would not result in compliance with the 0.1 ppb groundwater standard for PCBs. There are no chemical-specific SCGs for LNAPL. Action- and location-specific SCGs would not apply as there would be no remedial activities associated with this alternative.

Long-Term Effectiveness and Permanence

Alternative 1G1 would not provide additional environmental controls or long-term management measures. All existing and potential future risks would remain under this alternative. This alternative would not be effective in the long term and does not provide permanent remediation because it does not treat or remove the source of contamination.

Reduction of Source Toxicity, Mobility, and Volume

No treatment is proposed for Alternative 1G1. Therefore, evaluation of reduction of toxicity, mobility, and volume is not applicable.

Short-Term Effectiveness

The no-action alternative would be readily implementable and include no construction activities. There would be no associated worker or community impacts. Environmental impacts during implementation would not exist since no site disturbance would occur. This alternative can be implemented immediately. However, any reduction in contaminant concentrations would be solely a function of natural processes, which would not be effective in the short term.

Implementability

The no-action alternative would be easily implemented since no construction or remedial activities are included.

Cost

There would be no capital or annual O&M. A summary of the costs, including present value costs, are provided in Table 3g. The total present value cost would be $0.

4.3.2 Alternative 1G2 — Limited Action: Maintenance of Existing Pavement and Groundwater Monitoring

4.3.2.1 Description

The existing asphalt at this site would be maintained to act as a cover to prevent infiltration into the PCB-impacted soils. Any decrease in contaminant levels would be solely the result of natural processes. The existing deed restriction prevents the use of groundwater at the site for potable purposes.

Semi-annual groundwater quality monitoring of selected on-site wells, as well as maintenance of the wells, would be performed for a limited time period to be determined based on the results of the sampling. Samples would be analyzed for PCBs. Existing monitoring wells MW-5, MW-205, MW-203, and MW-206 and proposed monitoring wells MW-208, MW-209, and MW-210 (along the southern property line) would be utilized. The monitoring well locations are shown on Drawing 1.

4.3.2.2 Evaluation

Overall Protection of Human Health and the Environment

This alternative would provide protection of human health and the environment under existing conditions, as the asphalt pavement reduces the potential for infiltration, reducing leaching of PCBs from soil to the LNAPL. However, the LNAPL would not be anticipated to remediate through natural recovery in the foreseeable future. The existing deed restriction eliminates the potential for exposure through use of the groundwater.

Compliance with SCGs

This alternative would not comply with the 0.1 ppb groundwater standard for PCBs. There are no chemical-specific SCGs for LNAPL.

Long-Term Effectiveness and Permanence

Alternative 1G2 would provide additional environmental controls or long-term management measures through the deed restriction. Potential future risks would therefore be reduced under this alternative. This alternative would not be effective in meeting SCGs in the long-term and does not provide permanent remediation because it does not treat or remove the source of contamination.

Reduction of Source Toxicity, Mobility, and Volume

No treatment of waste is proposed for Alternative 1G2. Therefore, evaluation of reduction of toxicity, mobility, and volume is not applicable.

Short-Term Effectiveness

The limited-action alternative would be readily implementable and include no construction activities other than annual maintenance on the existing pavement. There would be no associated worker or community impacts. However, any reduction in contaminant concentrations would be solely a function of natural processes, which would not be effective in the short term.

Implementability

There are no limitations associated with monitoring and maintenance. Periodic water quality sampling and analysis to monitor natural recovery would be performed as described above. Routine maintenance on the existing pavement would continue annually.

Cost

The annual O&M activities associated with this alternative would include pavement maintenance and groundwater monitoring for a limited time period based on the results of the sampling. A summary of the costs, including the present value cost, is provided in Table 3h. The total present value cost is estimated to be $107,000.

4.3.3 Alternative 1G3 — LNAPL Collection/Groundwater Pretreatment, Discharge to BSA

4.3.3.1 Description

Alternative 1G3 would include containment by collection of the groundwater and LNAPL. In order to collect the groundwater and LNAPL, the previously installed collection trench system would be utilized. Flow of the LNAPL to the collection trench and manhole would be induced by lowering the groundwater elevation at the collection trench by pumping. Portions of the LNAPL that have migrated beyond the existing trench are within the zone of influence and should therefore be collected by the trench. LNAPL and groundwater would be collected and treatment of the mixture would consist of a mechanical oil/water separator, a filter to remove residual oil and grease and particulate lead (see discussion in Section 3.3.7), and activated carbon for removal of PCBs. The collection flowrate will be determined in the remedial design; however, for the purpose of this evaluation, it is assumed the collection flowrate will be 5 gallons per minute. Alternatively, oil and groundwater could be collected separately from within the sump in the collection system; this detail would be resolved during the remedial design. The separated LNAPL would be collected and sent off-site for disposal.

Treated groundwater would be discharged to the BSA via the on-site treatment plant effluent pump station. Effluent testing would be required to monitor compliance with BSA's requirements. Semi-annual groundwater monitoring, as well as maintenance of the wells, would be provided as described in Section 4.3.2.1.

4.3.3.2 Evaluation

Overall Protection of Human Health and the Environment

This alternative would provide greater protection of human health and the environment than Alternatives 1G1 and 1G2 by removing the LNAPL and impacted groundwater, thus preventing the potential for off-site migration and ultimate discharge to downstream surface water.

Compliance with SCGs

This alternative would comply with the 0.1 ppb groundwater standard for PCBs in the long term. There are no chemical-specific SCGs for LNAPL. For the disposal option of discharge to BSA, the BSA pre-treatment discharge limit of no detectable PCBs would be met through the treatment described. This would mean that PCBs would be below the detection limit of USEPA Method 608 for PCBs, or less than 0.065 ppb. The off-site disposal of the PCB wastes would be accomplished by using appropriately permitted haulers and treatment facilities, and preparing and transporting wastes in accordance with the proper manifesting and recordkeeping requirements.

Long-Term Effectiveness and Permanence

This alternative would be effective in the long term, because the impacted material and source (LNAPL) would be removed. Improvements in site conditions would be permanent.

Reduction of Source Toxicity, Mobility, and Volume

Alternative 1G3 would employ separation and filtration technology to remove the subsurface LNAPL and PCBs from the discharge stream. Alternative 1G3 would be effective in reducing toxicity, mobility, and volume of impacted groundwater through treatment. The collected LNAPL would be transported off-site for destruction.

Short-Term Effectiveness

Remedial activities would not disturb the impacted media. Protection of the community would be provided by temporary fencing. Any noise impacts from equipment during construction can be mitigated by limiting the work hours and using mufflers/silencers on construction equipment. Worker protection would be adequately provided by readily available personal protection equipment. Environmental impacts during implementation would be minimal since the only site disturbance would occur on the surface and away from the contamination. The time required to remediate the site is estimated to be on the order of five to ten years, including design through completion.

This alternative would be effective in the short term in eliminating the potential for migration of impacted groundwater and LNAPL.

Implementability

The unit operations and processes described are commonly utilized and are therefore implementable.

Costs

The costs for implementing Alternative 1G3 are presented in Table 3i. The total present value cost is estimated to be $1.2 million.

4.3.4 Alternative 1G4 — LNAPL Collection/Groundwater Treatment, Direct Discharge

4.3.4.1 Description

Alternative 1G4 would include LNAPL collection and disposal, as under Alternative 1G3. Groundwater would be treated and discharged to surface water (Scajaquada Creek) via an on-site manhole. Collection and treatment would be accomplished as described in Section 4.3.3.1. Based upon the concentrations presented in Table 2, treatment for removal of lead would also be required for direct discharge. Therefore, solids filtration for removal of particulate lead would be provided as well as the treatment train described in

Section 4.3.3.1 (also see discussion in Section 3.3.7). Effluent testing would be required to monitor compliance with NYSDEC discharge limits.

Groundwater monitoring, as well as maintenance of the wells, would be performed as described in Section 4.3.3.1.

4.3.4.2 Evaluation

Overall Protection of Human Health and the Environment

This alternative would provide greater protection of human health and the environment than Alternatives 1G1 and 1G2 because the LNAPL and impacted groundwater would be removed. Protection would be equivalent to Alternative 1G3.

Compliance with SCGs

This alternative would comply with the 0.1 ppb groundwater standard for PCBs in the long term. There are no chemical-specific SCGs for LNAPL. The surface water discharge limit of non detect (ND) at a detection limit of 0.065 ppb for PCBs would be met through the treatment described.

Long-Term Effectiveness and Permanence

This alternative would be effective in the long term because the impacted material and source (LNAPL) would gradually be removed. Improvements in site conditions would be permanent.

Reduction of Source Toxicity, Mobility, and Volume

Alternative 1G4 would employ separation and filtration technology to remove the subsurface LNAPL and PCBs from the discharge stream. Alternative 1G3 would be effective in reducing toxicity, mobility, and volume of impacted groundwater through treatment. The collected LNAPL would be transported off-site for destruction.

Short-Term Effectiveness

Remedial activities would not disturb the impacted media. Protection of the community would be provided by temporary fencing. Any noise impacts from equipment during construction can be mitigated by limiting the work hours and using mufflers/silencers on construction equipment. Worker protection would be adequately provided by readily available personal protection equipment. Environmental impacts during implementation would be minimal since the only site disturbance would occur on the surface and away from the contamination. The time required to remediate the site is estimated to be on the order of five to ten years, including design through completion.

This alternative would be effective in the short term in eliminating the potential for migration of impacted groundwater and LNAPL.

Implementability

Pumping is a common technology utilized in remediation of sites contaminated with LNAPL. Construction of the on-site treatment equipment can be accomplished with readily available construction equipment and practices.

Costs

The costs for implementing Alternative 1G4 are presented in Table 3j. The total present value cost is estimated to be $1.12 million.

4.4 Comparative Analysis of Alternatives

A detailed analysis of alternatives was performed using the evaluation criteria presented in Section 4.1. The analysis presented below in Sections 4.4.1 and 4.4.2 was performed separately for each medium of concern.

4.4.1 Soil Alternatives

Overall Protection of Human Health and the Environment

All of the alternatives would be protective of human health and the environment due to the restrictions on site use associated with the existing deed restriction precluding site development. Alternative 1S1 is protective to the extent that the site remains in the current condition. Protection under alternatives 1S2, 1S3, 1S4, 1S5, and 1S6 would not be any greater than under 1S1, because there is only unacceptable risk associated with future excavation.

Compliance with SCGs

The site would continue to meet the 1 ppm cleanup goal for surficial PCBs under all alternatives. Based on the site-specific conditions, Alternatives 1S1, 1S2, and 1S3 would not meet the 10 ppm subsurface cleanup goal for PCBs, but Alternatives 1S2 and 1S3 would meet the RAOs in that the impacted material is covered by the existing asphalt pavement. Alternatives 1S4 through 1S6 would attain the cleanup goal. The compliance would be slightly greater with 1S6 than 1S4 and 1S5 since the removal of the material would ensure that no residual contamination above the cleanup goal would remain in place.

Long-Term Effectiveness and Permanence

All alternatives would be effective in the long term in protecting human health and the environment due to the existing deed restriction precluding site development. However, only Alternatives 1S4 and 1S5 would be considered permanent because impacted material would be treated.

Reduction of Source Toxicity, Mobility, and Volume

Only Alternatives 1S4 and 1S5 employ treatment technologies. Both of these alternatives would involve thermal desorption, in-situ and ex-situ, respectively. In-situ treatment is preferable because of the limited site disruption and potential exposure involved. Therefore, Alternative 1S4 would be the preferable means of obtaining reduction in toxicity, mobility, and volume of contaminants through treatment.

Short-Term Effectiveness

All alternatives would be effective in the short term in protecting human health and the environment due to the existing deed restriction precluding site development for non-industrial purposes. Alternative 1S6 would achieve the remedial action objectives in the shortest time frame. All alternatives would have minimal impact to workers and the community during implementation. The impacts could be mitigated using standard practices such as limiting the hours of construction, using mufflers/silencers on construction equipment, and using techniques such as grading, hay bales/silt fences, and dewatering to control run-on/runoff from the site.

Implementability

Alternatives 1S1, 1S2, and 1S3 are the most implementable since no remedial activity would occur. Alternatives 1S4, 1S5, and 1S6 are all implementable, although Alternative 1S4 would require a treatability study. Of these, Alternative 1S6 would be the most reliable and available.

Cost

Table 3 summarizes the costs for all the remedial alternatives. Costs for Alternatives 1S2 and 1S3 are under $100,000, while implementation of Alternatives 1S4 through 1S6 would cost between $1.19 million and $3 million. There is no cost associated with Alternative 1S1.

4.4.2 Groundwater Alternatives

Overall Protection of Human Health and the Environment

Alternative 1G1 is protective of human health and the environment due to the existing deed restriction which limits development of the site and in turn prohibits the use of groundwater for potable purposes. Alternative 1G2 provides a somewhat greater protection through long term monitoring. Alternatives 1G3 and 1G4 provide the greatest level of protection by collection to prevent further off-site contaminant migration.

Compliance with SCGs

None of the alternatives would achieve the 0.1 ppb groundwater standard in the short term. There are no SCGs for LNAPL; therefore, this criterion does not apply. Alternatives 1G3 and 1G4 would comply with the surface water discharge criteria of non detect (ND) for PCBs at a detection limit of 0.065 ppb.

Long-Term Effectiveness and Permanence

Only Alternatives 1G3 and 1G4 would be effective in the long term. These two alternatives would also be considered permanent, because they would provide for destruction of the LNAPL.

Reduction of Source Toxicity, Mobility, and Volume

Alternatives 1G3 and 1G4 employ treatment for groundwater. They would be equivalent in reducing toxicity, mobility, and volume through treatment. The collected LNAPL would be transported off-site for destruction under these alternatives.

Short-Term Effectiveness

Alternatives 1G1 and 1G2 would not meet the groundwater standards. Alternatives 1G3 and 1G4 would both meet the SCGs in the short term. All alternatives would have minimal impact to workers and the community during implementation. The impacts could be mitigated using standard practices such as limiting the hours of construction, using mufflers/silencers on construction equipment, and using techniques such as grading, hay bales/silt fences, and dewatering to control run-on/runoff from the site.

Implementability

Alternatives 1G1 and 1G2 are the most implementable since no remedial activities would occur. Alternatives 1G3 and 1G4 are equally implementable.

Cost

Alternatives 1G3 and 1G4, with costs in the $1.1 million range, are substantially more expensive than 1G2 (estimated at $107,000). There would be no cost associated with Alternative 1G1.

5 DETAILED EVALUATION OF ALTERNATIVES - OU2

5.1 Development and Evaluation of Alternatives

The recommended technologies presented in Section 3 were utilized to develop remedial alternatives. The limit of contamination is plotted on Drawing 2. The limits of contamination for each medium of concern are plotted on Figures 3 and 4. The alternatives are presented below in Sections 5.2 through 5.3. A detailed evaluation of each alternative developed here is presented following the description of the alternative as discussed in Section 4.1.2.

5.2 Soil Alternatives

The limits of contamination for lead in soil are presented in Figure 3. The northern portion of the site, that area identified as the Parts Coating Facility, was addressed during the building construction, and therefore, will not be evaluated further. All alternatives would apply to the southern seven-acre portion of the site.

5.2.1 Alternative 2S1 — No Action

5.2.1.1 Description

No remedial action would be performed under this alternative for either source control or management of migration. The existing asphalt pavement at the site would act as a cover source to prevent infiltration into the lead-impacted soils and aid in the control of horizontal mobility. Furthermore, the existing deed restriction would prevent use of the site for anything other than industrial purposes.

5.2.1.2 Evaluation

Overall Protection of Human Health and the Environment

This alternative would be protective of human health and the environment under current conditions because the potential for contact with impacted soil is limited by the asphalt, providing the asphalt pavement remains intact. This alternative would not be protective in the long term, because no maintenance of the pavement is proposed. Although the potential for contact with soil by humans and wildlife during future hypothetical construction activities remains, the lead intake associated with such exposures is below what would be experienced under acceptable occupational conditions. Therefore, there is no unacceptable health impact associated with lead under no action. The environmental condition would remain in the present form; therefore, this alternative would not be protective of the environment.

Compliance with SCGs

Location- and action-specific SCGs would not apply, as there would be no remedial activities associated with this alternative. Lead concentrations above the site-specific cleanup goal of 1,000 ppm exist at 34 locations at the site. The no-action alternative would not meet the chemical-specific SCGs.

Long-Term Effectiveness and Permanence

This alternative would provide no additional environmental controls and no long-term management measures. Since no unacceptable health or environmental impacts have been identified, this alternative would be effective in the long term and would meet the RAOs. However, it does not provide permanent remediation because it does not treat or remove the source of contamination.

Reduction of Source Toxicity, Mobility, and Volume

This alternative does not meet this criterion, which applies only to reduction of toxicity, mobility, and volume of impacted soils through treatment.

Short-Term Effectiveness

The no action alternative would be readily implementable and involve no construction activities. There would be no associated worker or community impacts. This alternative would be effective in the short term in maintaining overall protectiveness due to the absence of risk. However, it would not be effective in the short term in meeting remedial objectives because there would be no reduction in contaminant concentrations.

Implementability

This alternative could be considered easily implementable, as no action is required.

Cost

There would be no capital or annual O&M costs associated with no action. A summary of the costs, including present value costs, is provided in Table 4. Costs for Alternative 2S1 would be $0, as shown in Table 4a.

5.2.2 Alternative 2S2 — Limited Action: Maintenance of Existing Pavement

5.2.2.1 Description

No remedial action would be performed under this alternative for either source control or management of migration. The existing asphalt pavement at the site would act as a cover to prevent infiltration into the lead-impacted soils and aid in the control of mobility of contaminants to the groundwater and of groundwater itself. This alternative, which is similar to Alternative 2S1, would also include an evaluation of the existing pavement, repair of the pavement, where necessary, and routine annual maintenance on the pavement. Figure 5 shows the area of asphalt to be evaluated. The north portion of the site around the Parts Coating Facility was newly installed in 1995 and will not be evaluated. The existing deed restriction for the site limits future use of the site to industrial purposes.

5.2.2.2 Evaluation

Overall Protection of Human Health and the Environment

There would be no unacceptable potential human health or environmental impacts with this alternative as none are associated with baseline (unremediated) site conditions. The source of the lead contamination, the ash fill material, has been in place for 60 years and has not had a negative impact on environmental conditions at the site. The asphalt maintenance would keep the existing pavement intact in order to prevent any future contact with impacted soils.

Compliance with SCGs

Action- and location-specific SCGs would not apply, as there would be no remedial activities associated with this alternative. Lead concentrations above the site-specific cleanup goal of 1,000 ppm exist at 34 locations at the site. Based on the site-specific conditions, the cleanup goal would not be met, but is being addressed because subsurface areas with lead concentrations greater than 1,000 ppm are covered by the existing pavement which will be maintained, thereby meeting the RAOs.

Long-Term Effectiveness and Permanence

Alternative 2S2 would provide no additional environmental controls. However, as long as the existing pavement remains intact via deed restriction and annual maintenance, protection would be maintained and the RAOs would be met.

Reduction of Source Toxicity, Mobility, and Volume

This alternative does not meet this criterion, which applies only to reduction of toxicity, mobility, and volume of impacted soils through treatment.

Short-Term Effectiveness

The limited action alternative would be readily implementable and effective in the short term in maintaining overall protectiveness. However, short-term effectiveness in reducing soil contaminant concentrations would not be achieved.

The potential impact on workers associated with construction activities would be insignificant due to the existing asphalt-paved parking area overlying the impacted soils. Impacts associated with this alternative would be related to dust generation and possible contact with contaminants during repair/replacement of any existing asphalt pavement. To mitigate these impacts, all construction activities would be performed in accordance with OSHA regulations (29 CFR Part 1926). A health and safety program would be developed and implemented during construction. Potential effects on the local community would be mitigated using standard construction practices.

Implementability

There are no limitations associated with the implementability of this remedial alternative. Routine maintenance on the existing pavement would continue annually.

Cost

The annual O&M activity associated with this alternative would consist of pavement maintenance. A summary of the costs, including present value cost for Alternative 2S2, is provided in Table 4b. The total present value cost is estimated to be $634,000.

5.2.3 Alternative 2S3 — Soil Containment/Capping: Installation of Hydraulic Asphalt Cap Over Existing Pavement

5.2.3.1 Description

This alternative includes the evaluation of the existing asphalt pavement as part of the capping configuration, replacement of all faulty or deteriorated asphalt to the existing depth and grade, and the construction of a thin layer hydraulic asphalt cap over the existing pavement as the control of the impacted soils. The hydraulic asphalt cap would provide a barrier to infiltration over the lead-impacted soils in the same manner as described in Alternative 2S2.

This cap would consist of a 1.5-inch layer of hydraulic asphalt underlain by the existing pavement after repair. All areas of existing pavement that require replacement would receive a 4-inch layer of hydraulic asphalt. This depth of pavement replacement has been assumed for the purpose of developing the cost of this alternative. The capping limit would be 10 feet beyond the limits of contamination shown in Figure 3 to assure coverage of all impacted soils.

This alternative would also include routine annual maintenance on the pavement. The existing deed restriction for the site limits future use of the site to industrial purposes.

5.2.3.2 Evaluation

Overall Protection of Human Health and the Environment

There would be no unacceptable potential human health or environmental impacts with this alternative, as none are associated with baseline (unremediated) site conditions. However, due to the absence of unacceptable risk under no action, only limited additional protectiveness would be attained compared with Alternatives 2S1 (no action), and 2S2 (asphalt maintenance).

Compliance with SCGs

Action- and location-specific SCGs would not apply. Lead concentrations above the site-specific cleanup goal of 1,000 ppm exist at 34 locations at the site. Based on the site-specific conditions, the cleanup goal would not be met, but is being addressed because subsurface areas with lead concentrations greater than 1,000 ppm are covered by the existing pavement and hydraulic asphalt cap which will be maintained, thereby meeting the RAOs.

Long-Term Effectiveness and Permanence

This alternative would utilize proven technology. It would provide an effective means of isolating the contaminants from human and environmental exposure and controlling the mobility of contaminants in the long term. It would not be considered permanent because it does not treat or remove the source of contamination.

Reduction of Source Toxicity, Mobility, and Volume

This alternative would not reduce the source toxicity and volume. The hydraulic asphalt cap would reduce infiltration and, hence, would reduce the mobility of the contaminant.

Short-Term Effectiveness

This alternative would be effective in the short term in maintaining overall protectiveness. However, short-term effectiveness in reducing soil contaminant concentrations would not be achieved.

The potential impact on workers associated with construction activities would be insignificant due to the existing asphalt-paved parking area overlying the impacted soils. Impacts associated with this alternative would be related to dust generation and possible contact with contaminants during replacement of any existing asphalt pavement. To mitigate these impacts, all construction activities would be performed in accordance with OSHA regulations (29 CFR Part 1926). A health and safety program would be developed and implemented during construction. Potential effects on the local community would be mitigated using standard construction practices.

Time to implement this alternative from design through completion of construction is estimated to be 3 to 4 months.

Implementability

Capping is implementable since the site is covered with an existing asphalt pavement. Special care would only be required during construction of the cap where pavement replacement is needed.

Cost

The capital cost associated with Alternative 2S3 includes the construction of the hydraulic asphalt cover and the replacement of any existing asphalt pavement that needs repair. The annual O&M cost associated with this alternative includes cap maintenance and semi-annual groundwater monitoring over a limited monitoring period. A summary of the costs, including the present value cost, for Alternative 2S3, is provided in Table 4c. The total present value cost is estimated to be $1 million.

5.2.4 Alternative 2S4 — In-Situ Treatment: Stabilization/Solidification

5.2.4.1 Description

Alternative 2S4 consists of in-situ treatment by stabilization/solidification. Treatment would be accomplished by mobilizing equipment to the site. The existing asphalt would be stripped and the stabilization/solidification treatment would be completed by mixing a stabilizing agent and the soil in place using large gang augers. A treatability study would be necessary to determine the exact stabilization reagent and concentration. In general, pozzolanic materials (e.g., cement, lime, flyash, cement dust) in different combinations and concentrations have been found to be effective in binding metals. The mixing would occur down to the perched groundwater table. If sampling showed lead levels in the solid matrix beneath the perched water table, the area would be dewatered and stabilization would be performed down to the top of clay. Upon completion, the site would be repaved and restored to its original condition. Asphalt maintenance would be performed as necessary to maintain the integrity of the parking lot. A treatability study would be required prior to implementing this alternative due to the presence of PCBs in the soil in some areas.

5.2.4.2 Evaluation

Overall Protection of Human Health and the Environment

There would be no unacceptable potential human health or environmental impacts with this alternative. This alternative would provide additional protection of human health and the environment over Alternatives 2S1, 2S2, or 2S3 by eliminating the potential for future contact with lead in soils.

Compliance with SCGs

It is anticipated that no action- or location-specific SCGs would apply to this alternative. This alternative would address soils above the 1,000 ppm site-specific cleanup goal for lead. Mobility would be eliminated, thereby meeting the RAOs.

Long-Term Effectiveness and Permanence

This alternative would be effective in the long term because the treatment would be irreversible.

Reduction of Source Toxicity, Mobility, and Volume

Alternative 2S4 would employ solidification/stabilization treatment methods to treat the in-situ soil impacted above the remedial goal. Solidification/stabilization would be effective in reducing the toxicity and mobility of contamination through treatment, but would not reduce the volume of total waste.

Short-Term Effectiveness

Soil mixing would disturb the impacted media. Protection of the community would be provided by dust control. Limiting the hours of construction and using mufflers/silencers on construction equipment would mitigate any impacts associated with noise. Worker protection would be adequately provided by readily available personal protection equipment. Environmental impacts during implementation would be mitigated by dust control and standard sediment and erosion control measures (i.e., grading, hay bales, silt fences). The time required to remediate the site is estimated to be on the order of 18 months, including design through completion.

Implementability

Solidification/stabilization technology is available from several vendors. Since the process is affected by the presence of organics, a treatability study would be required to verify implementability.

In-situ solidification/stabilization could be implemented using readily available construction means and materials.

Costs

The costs for implementing Alternative 2S4 are presented in Table 4d. The total present value cost is estimated to be $3.8 million.

5.2.5 Alternative 2S5 — Excavation and On-Site Treatment by Solidification/Stabilization

5.2.5.1 Description

Alternative 2S5 consists of excavation of the impacted soil to the perched water table and on-site treatment by solidification/stabilization. Excavated material would be stockpiled on site for treatment. Confirmatory sampling in the excavation would be performed to ensure that soils above the cleanup goal have been removed for treatment. After treatment, treated material would be placed back in the excavation. The site would be regraded to accommodate the increased volume of treated fill after solidification/ stabilization and repaved. Asphalt maintenance would be provided as outlined in Section 5.2.4.1.

5.2.5.2 Evaluation

Overall Protection of Human Health and the Environment

There would be no unacceptable potential human health or environmental impacts with this alternative. This alternative would provide additional protection of human health and the environment over Alternatives 2S1, 2S2, or 2S3 by eliminating the potential for future contact with lead in soils. Protectiveness would be equivalent to that under Alternative 2S4 (in-situ treatment).

Compliance with SCGs

This alternative would comply with the site-specific cleanup goal for lead, and mobility would be eliminated. Action- and location- specific SCGs would require compliance with the requirements for air monitoring and dust suppression during remedial activities (NYSDEC Technical and Administrative Guidance Memorandum HWR-89-4031). Groundwater SCGs would likely be attained through natural recovery following source removal. Effectiveness in SCG compliance would be equivalent to Alternative 2S4.

Long-Term Effectiveness and Permanence

This alternative would be effective in the long term because treatment would be irreversible.

Reduction of Source Toxicity, Mobility, and Volume

Alternative 2S4 would employ solidification/stabilization treatment methods to treat the in-situ soil impacted above the remedial goal. Solidification/stabilization would be effective in reducing the toxicity and mobility of contamination through treatment, but would not reduce the volume of total waste.

Short-Term Effectiveness

Excavation, stockpiling, and material handling during treatment would potentially impact the community, workers, and the environment during the remedial activities. However, community and worker impacts would be mitigated by dust control and limiting access to the site. Potential environmental impacts would be mitigated by standard sediment and erosion control techniques (i.e., grading, hay bales, silt fences). Limiting the hours of construction and using mufflers/silencers on construction equipment would mitigate any impacts associated with noise. The time to remediate the site, from design through completion of the remedial activities, is estimated to be 18 months.

Implementability

On-site solidification/stabilization is a reliable remedial technology available from several vendors. The process is effective in binding metals in impacted soil. The on-site treatment and removal of the soil can be accomplished with readily available construction equipment and practices. A treatability study would be required prior to implementation to verify implementability due to the presence of organics.

Costs

The costs associated with implementing on-site treatment are presented in Table 4e. The total present value cost is estimated to be $3.6 million.

5.2.6 Alternative 2S6 — Excavation and Off-Site Disposal

5.2.6.1 Description

Alternative 2S6 would involve the excavation of impacted soils with total lead concentrations greater than 1,000 ppm for disposal. Impacted excavated materials would be transferred directly into lined holding containers. The containers would be stored in an on-site staging area until transported for off-site disposal. The excavated material would be analyzed and shipped to an approved facility. For the purpose of the analysis conducted here, it is assumed that disposal in a hazardous waste landfill would be required (see Section 3.3.5). Upon completion of the removal activity, confirmatory sampling would be performed in the excavation to ensure that the remaining soils met the remediation goals. The site would be backfilled with clean fill and the surface restored to its original condition.

5.2.6.2 Evaluation

Overall Protection of Human Health and the Environment

There would be no unacceptable potential human health or environmental impacts with this alternative, as none are associated with baseline (unremediated) site conditions. This alternative might provide additional protection of human health and the environment by eliminating the potential for future contact with lead in soils. However, due to the absence of unacceptable risk under no action, only limited additional protectiveness would be attained compared with no action or limited action. Protectiveness would be equivalent to that under Alternatives 2S4 and 2S5.

Compliance with SCGs

This alternative would provide attainment of the site-specific cleanup goal. Action- and location- specific SCGs would require compliance with the requirements for handling and management of the impacted soils including NYSDEC Technical and Administrative Guidance Memorandum HWR-89-4031, and 6 NYCRR Part 371.

Long-Term Effectiveness and Permanence

This alternative would be effective in the long term because the impacted soil would be eliminated. Improvements in site conditions would be permanent. However, the alternative would not meet the criterion of permanence because the impacted material would not be treated.

Reduction of Source Toxicity, Mobility, and Volume

Since the impacted soil would be excavated and disposed of off-site, there would be a reduction of source toxicity, mobility, and volume.

Short-Term Effectiveness

Potential impacts from excavation and storing the soil on site would be mitigated by dust control during remedial activities and placement of the soil directly into lined holding containers. Standard sediment and erosion control methods would be employed during construction (i.e., grading, hay bales, silt fences). Limiting the hours of construction and using mufflers/silencers on construction equipment would mitigate any impacts associated with noise. The time to remediate the site from remedial design through completion of the surface restoration is estimated to be 6 to 8 months.

Implementability

Excavation and off-site disposal is a common method of site remediation. The equipment and labor would be available to implement the removal and disposal of the impacted soil. Existing disposal facilities are readily available for disposal of the soils removed. There are no site constraints that would adversely hinder the removal of the material. Source removal is a reliable remedy and the remedial activity would not interfere with future remedial activities at the site, if required. Disposal capacity should be readily available.

Costs

The costs associated with implementing excavation and disposal are presented in Table 4f. The total present value cost is estimated to be $5.6 million.

5.3 Groundwater Alternatives

The limits of lead contamination in groundwater are presented in Figure 4.

5.3.1 Alternative 2G1 — No Action

5.3.1.1 Description

No remedial action would take place under this alternative for either source control or management of migration. The existing asphalt pavement at this site would act as a cover source to prevent infiltration into the lead-impacted soils and aid in the control of horizontal mobility. The existing deed restriction prevents the use of groundwater for potable purposes.

5.3.1.2 Evaluation

Overall Protection of Human Health and the Environment

Under this alternative, the existing asphalt pavement would help prevent infiltration into the impacted soil, thereby minimizing lead migration. Existing conditions pose no unacceptable risk to human health, as perched groundwater is not a potable source and bedrock groundwater has not been impacted by the detected contaminant source. This alternative would not be protective in the long term, because no maintenance of the pavement is proposed. Off-site environmental impacts associated with groundwater migration have not been identified. Future risks associated with groundwater are prevented by the existing deed restriction precluding the use of groundwater as a potable water source. The environmental condition would remain in the present form; therefore, this alternative would not be protective of the environment.

Compliance with SCGs

No action would not provide short-term attainment of groundwater SCGs for lead. However, contraventions of the lead groundwater standard were limited and restricted to the perched groundwater. In all likelihood, attainment of SCGs would be achieved in the long term through natural recovery, as the existing asphalt cover restricts infiltration. Bedrock groundwater SCGs are already attained. Location- and action-specific SCGs would not apply, as there would be no remedial activities associated with this alternative.

Long-Term Effectiveness and Permanence

All potential future risks would remain under this alternative; although no adverse human health or environmental impacts have been identified under current conditions. However, this alternative would not be considered effective in the long term and would not provide a permanent remediation because it does not treat or remove either the source of contamination or contamination that has migrated in the groundwater.

Reduction of Source Toxicity, Mobility, and Volume

No treatment is proposed for Alternative 2G1. Therefore, evaluation of reduction of toxicity, mobility, and volume is not applicable.

Short-Term Effectiveness

The no action alternative would be readily implementable and involve no construction activities. There would therefore be no associated worker or community impacts. This alternative would be effective in the short term in maintaining overall protectiveness and meeting bedrock groundwater SCGs, but not in meeting perched groundwater SCGs.

Implementability

The no action alternative could be considered to be easily implementable, as it involves no construction activities.

Cost

There would be no capital and annual O&M costs associated with the no action alternative. A summary of the costs, including the present value cost, is provided in Table 4g. The total present value cost would be $0.

5.3.2 Alternative 2G2 — Limited Action: Maintenance of Existing Pavement and Groundwater and Storm Sewer Monitoring

5.3.2.1 Description

The existing asphalt pavement at this site would act as a cover source to prevent infiltration into the lead-impacted soils and aid in the control of horizontal mobility. This alternative, which is similar to Alternative 2G1, would also include routine annual maintenance on the existing pavement. The existing deed restriction for this property precludes the use of groundwater for potable purposes.

Semi-annual groundwater quality monitoring of selected site and off-site wells (e.g., MW-200), as well as maintenance of the wells, would be performed for a limited time period to demonstrate that the present site conditions either persist or improve. Samples would be analyzed for lead. The data would be used to evaluate changes in lead concentrations over time. Existing downgradient monitoring wells MW-203, MW-205, MW-200, and MW-5 would be utilized to check downgradient water quality as well as three additional wells to be installed in the southern portion of Parking Lot No. 4 near the property line, while existing upgradient monitoring wells MW-204 MW-206, MW-201, and MW-1 would be used to monitor upgradient water quality. The monitoring well locations are shown on Drawing 2.

Additionally, Manhole 2 (the last manhole on the site at the southern end of Parking Lot No. 4) would be monitored for lead on a semi-annual basis along with the groundwater monitoring and maintained during the monitoring period.

5.3.2.2 Evaluation

Overall Protection of Human Health and the Environment

Since existing conditions pose no unacceptable risk to human health and wildlife environment, the limited action alternative would offer adequate protectiveness of human health and the environment. It is anticipated groundwater quality and associated downgradient surface water quality would improve over time as the asphalt controls infiltration.

Compliance with SCGs

This alternative would provide slightly greater opportunity for natural recovery of groundwater, when compared with no action by ensuring that the asphalt paving remains in place. Restriction of infiltration by the paving should allow natural recovery to attain SCGs in perched groundwater in the long term. The SCGs would not be met in the perched groundwater in the short term. Bedrock groundwater SCGs are already attained. Action- and location-specific SCGs would not apply.

Long-Term Effectiveness and Permanence

This alternative would be effective in the long term in maintaining protectiveness and attaining bedrock groundwater SCGs, and possibly in meeting perched groundwater SCGs. It would not provide a permanent remediation by treating or removing the source of contamination or contamination that has migrated in the groundwater.

Reduction of Source Toxicity, Mobility, and Volume

This alternative does not meet this criterion, which applies only to reduction of toxicity, mobility, and volume of impacted soils through treatment.

Short-Term Effectiveness

The limited-action alternative would be readily implementable and involve no construction activities. There would be no associated worker or community impacts. This alternative would be effective in the short term in maintaining overall protectiveness and attaining bedrock groundwater SCGs, but not in meeting perched groundwater SCGs. While it is anticipated groundwater quality and associated downgradient surface water quality would eventually improve, this natural recovery would probably not be effective in a short period of time.

Implementability

There are no limitations associated with monitoring and maintenance. Periodic water quality sampling and analysis to monitor natural recovery would be performed as described above. Routine maintenance on the existing pavement would continue annually.

Cost

The annual O&M activities associated with this alternative would include pavement maintenance and groundwater monitoring over the limited monitoring period. A summary of the costs, including the present value cost, is provided in Table 4h. The total present value cost is estimated to be $183,000.

5.3.3 Alternatives 2G3 — Collection, Pretreatment, and Discharge to BSA

5.3.3.1 Description

Alternative 2G3 would include collection of groundwater from the fill materials, pretreatment for removal of PCBs prior to discharge, and discharge to the Buffalo Sewer Authority (BSA). Collection would be accomplished by installing trench drains at the downgradient side of the extent of contamination. The trench drains would include installation of a perforated pipe and free draining backfill. The trench would flow to a collection manhole. The manhole would include a discharge pump. The collection flowrate would be determined during remedial design, but for the purpose of this analysis, the collection flowrate is assumed to be 10 gpm. Carbon adsorption pretreatment equipment for residual PCB removal would be installed on site. Solids filtration would be provided before carbon adsorption to protect the carbon adsorption units. This system would also serve as pretreatment for lead. Since the lead contamination in groundwater is due to the solids, filtration, as well as the additional filtering provided by the carbon, will reduce the lead concentrations in the water to acceptable levels. No further pretreatment is anticipated to be necessary because lead concentrations in groundwater have been below the BSA discharge limit of 430 ppb. A force main would be constructed to discharge to the on-site treatment plant effluent pump station. This system will remove particulates which the SI identified to be the source of the lead contamination in groundwater. See Table 2 for a comparison of the groundwater lead and PCB concentrations and the BSA discharge criteria. Effluent monitoring with respect to BSA requirements would be performed.

Groundwater monitoring of the nine on-site wells as well as the three newly installed wells discussed in Section 5.3.2.1 would be performed for a limited time period to be determined based on the sampling results, as well as maintenance of the wells. Maintenance of the existing asphalt pavement would also be performed as necessary to maintain the integrity of the parking lot and to limit the potential for additional infiltration.

5.3.3.2 Evaluation

Overall Protection of Human Health and the Environment

Since existing conditions pose no unacceptable risk to human health and wildlife environment, this alternative would offer adequate protectiveness of human health and the environment. There is no predicted additional protectiveness relative to Alternatives 2G1 (no action) or 2G2 (limited action) because groundwater use would not occur regardless.

It is anticipated groundwater quality and associated downgradient surface water quality would improve over time as the asphalt controls infiltration and lead is removed.

Compliance with SCGs

Compared with no action or limited action, this alternative would expedite attainment of SCGs for lead in perched groundwater through collection (pumping). The off-site disposal of PCBs would be accomplished by using appropriately permitted haulers and treatment facilities, and preparing and transporting wastes in accordance with the proper manifesting and recordkeeping requirements.

Long-Term Effectiveness and Permanence

This alternative would be effective in the long term in meeting SCGs. However, because the source would not be entirely removed or treated, it would not be considered permanent.

Reduction of Source Toxicity, Mobility, and Volume

This alternative would not be effective in reducing toxicity, mobility, and volume of lead contamination through treatment because pre-treatment to meet discharge criteria would be limited to PCBs.

Short-Term Effectiveness

Remedial activities that could potentially disturb the impacted media would be limited to the installation of the trench. Protection of the community would be provided by temporary fencing and standard dust and run-on/runoff control measures. Limiting the hours of operation and using mufflers/silencers on construction equipment would mitigate any impacts associated with noise. Worker protection would be adequately provided by readily available personal protection equipment. Environmental impacts during implementation would be minimal since the only disturbance would occur during the trench installation. The time required to remediate the site cannot be determined. The nature of lead contamination at the site is such that several pockets or areas of lead impacted groundwater may exist, and lead-contaminated fill is believed to have been placed in the surrounding vicinity. This alternative would therefore not be considered effective on a short term basis.

Implementability

Groundwater pumping and treatment is a common technology utilized in remediation of impacted sites. Construction of the on-site trench and treatment equipment can be accomplished with readily available construction equipment and practices. The groundwater pumping would not interfere with further remedial activities at the site, if required.

Costs

The costs for implementing Alternative 2G3 are presented in Table 4i. The total present value cost is estimated to be $853,000.

5.3.4 Alternative 2G4 — Collection, Treatment, and Direct Discharge

5.3.4.1 Description

Alternative 2G4 would include collection of groundwater, treatment and direct discharge to surface water (Scajaquada Creek) via an on-site manhole. Collection and treatment would be accomplished as described in Section 5.3.3.1. Based upon the concentrations presented in Table 2, treatment for removal of PCBs and lead would be needed. Treatment would consist of solids filtration for particulate lead removal followed by activated carbon filters for PCB removal. Effluent testing would be required to monitor compliance with a SPDES permit which would have to be obtained from the NYSDEC.

Groundwater monitoring, maintenance of the wells, and asphalt maintenance would be performed for a limited period of time to be determined based on the results of the sampling.

5.3.4.2 Evaluation

Overall Protection of Human Health and the Environment

Since existing conditions pose no unacceptable risk to human health and wildlife environment, this alternative would offer adequate protectiveness of human health and the environment. There is no predicted additional protectiveness relative to Alternatives 2G1 (no action) or 2G2 (limited action) because groundwater use would not occur regardless. It is anticipated groundwater quality and associated downgradient surface water quality would improve over time as the asphalt controls infiltration and lead is removed.

Compliance with SCGs

Compared with no action or limited action, this alternative would expedite attainment of SCGs for lead in perched groundwater through collection (pumping). Since bedrock groundwater SCGs are already attained, there would be no additional compliance for bedrock groundwater compared with no action or limited action. Overall compliance would be the same as for Alternative 2G3. Action-specific SCGs would include obtaining approval for installation of the on-site remediation system, including appropriate management of any waste storage containers associated with the treatment system. The off-site disposal of PCBs would be accomplished by using appropriately permitted haulers and treatment facilities, and preparing and transporting wastes in accordance with the proper manifesting and recordkeeping requirements. Compliance with a State Pollutant Discharge Elimination System permit (6 NYCRR Parts 750-758) would be achieved through treatment.

Long-Term Effectiveness and Permanence

This alternative would be effective in the long term in meeting SCGs. However, although lead contamination would be gradually reduced, the alternative would not be considered permanent because the source would not be entirely removed or treated.

Reduction of Source Toxicity, Mobility, and Volume

Alternative 2G4 would employ filtration technology to remove lead from the discharge stream. Filtration would be effective in reducing toxicity, mobility, and volume of contamination through treatment.

Short-Term Effectiveness

Remedial activities that could potentially disturb the impacted media would be limited to the installation of the trench. Protection of the community would be provided by temporary fencing, and standard dust and run-on/runoff control measures. Limiting the hours of operation and using mufflers/silencers on construction equipment would mitigate any impacts associated with noise. Worker protection would be adequately provided by readily available personal protection equipment. Environmental impacts during implementation would be minimal since the only disturbance would occur during the trench installation. The time required to remediate the site cannot be determined. The nature of lead contamination at the site is such that several pockets or areas of lead impacted groundwater may exist, and lead-contaminated fill is believed to have been placed in the surrounding vicinity. This alternative would therefore not be considered effective on a short-term basis.

Implementability

Groundwater pumping and the treatment technologies are common technologies utilized in remediation of impacted sites. Construction of the on-site trench and treatment equipment can be accomplished with readily available construction equipment and practices. The groundwater pumping would not interfere with further remedial activities at the site, if required.

Costs

The costs for implementing Alternative 2G4 are presented in Table 4j. The total present value cost is estimated to be $795,000.

5.4 Comparative Analysis of Alternatives

A detailed analysis of soil and groundwater alternatives is presented below in Sections 5.4.1 and 5.4.2, respectively. The alternatives are compared utilizing the evaluation criteria presented in Section 4.1.2.

5.4.1 Soil Alternatives

Overall Protection of Human Health and the Environment

Alternative 2S1 (no action) is currently protective of human health and the environment, because the existing deed restriction limits future use of the site to industrial uses and lead present in soil does not present an unacceptable hazard to future workers who might be exposed. The remaining alternatives might reduce the residual risk by capping/treating/removing impacted soil. However, because the current exposure is acceptable, additional protection is not required.

Compliance with SCGs

Based on the site-specific conditions, Alternatives 2S1 through 2S3 would not meet the SCGs. However, Alternatives 2S2 and 2S3 would address the cleanup goal for lead in soils by maintaining the current cover, thereby meeting the RAOs, although the lead concentrations would not decrease. Alternatives 2S4 and 2S5 would provide compliance by treating the impacted material; these alternatives would provide equivalent compliance with SCGs. The compliance would be slightly greater with Alternative 2S6 since the removal of the material would ensure that no residual contamination above the cleanup goal would remain in place.

Long-Term Effectiveness and Permanence

Only Alternatives 2S4, 2S5, and 2S6 would provide long-term effectiveness and permanence. Alternatives 2S5 and 2S6 would provide slightly greater permanence than Alternative 2S4 since removal of the material would ensure that no residual contamination above the cleanup goal remains. However, long-term residual risk would not be unacceptable for any alternative, including 2S1 (no action).

Reduction of Source Toxicity, Mobility, and Volume

Only Alternatives 2S4 and 2S5 employ treatment technologies. Alternative 2S5 uses on-site technology, which is a more reliable and proven technology than in-situ treatment (2S4). Therefore, Alternative 2S5 provides the greatest reduction in toxicity, mobility, and volume of contaminants through treatment.

Short-Term Effectiveness

Alternatives 2S1 through 2S3 would not result in SCG compliance in the short term because the source would not be removed or treated. Alternatives 2S4, 2S5, and 2S6 would provide for more rapid attainment of groundwater SCGs; these alternatives would have minimal impact to workers and the community. The impacts could be mitigated using standard practices such as limiting the hours of construction, using mufflers/silencers on construction equipment, and using techniques such as grading, hay bales/silt fences, and dewatering to control run-on/runoff from the site. Short-term impacts associated with Alternatives 2S1, 2S2, and 2S3 would be non-existent.

Implementability

Alternatives 2S1, 2S2, and 2S3 are the most implementable, since little or no remedial activity would occur. Alternatives 2S4, 2S5, and 2S6, are all implementable. Of these, Alternatives 2S5 and 2S6 would be the most reliable and available.

Cost

Table 4 summarizes the costs for all the remedial alternatives. Cost for Alternative 2S2 is approximately $633,000, while implementation of Alternatives 2S3 through 2S6 range from a little over $1 million to $5.6 million. There is no cost associated with Alternative 2S1.

5.4.2 Groundwater Alternatives

Overall Protection of Human Health and the Environment

Because perched groundwater is not a potable water supply and bedrock groundwater is not impacted, there are no human health risks associated with lead in groundwater under current site conditions. The existing deed restriction ensures that groundwater at the site is not used for potable purposes. Off-site environmental impacts associated with groundwater migration have not been identified. Therefore, Alternatives 2G1 and 2G2 are protective. The measures provided for in Alternatives 2G3 and 2G4 would not provide additional protection of human health.

Compliance with SCGs

Alternatives 2G1 and 2G2 would not attain immediate compliance with lead SCGs, in perched groundwater, although SCGs might ultimately be met through the infiltration control provided by the asphalt. Bedrock groundwater SCGs are already met. Alternatives 2G3 and 2G4 would attain groundwater SCGs by source control and treatment. SCGs related to effluent discharge for Alternatives 2G3 and 2G4 would be met through treatment.

Long-Term Effectiveness and Permanence

None of the alternatives would be considered permanent, because they either don't include groundwater collection or they require the maintenance of a pumping system. Alternatives 2G3 and 2G4 would be effective in meeting SCGs in the long term because of the removal of impacted groundwater. All of the alternatives would be effective in the long term in protecting public health because of the deed restriction.

Reduction of Source Toxicity, Mobility, and Volume

Only Alternative 2G4 reduces lead toxicity, mobility, and volume through treatment. Alternative 2G3 does not provide for lead treatment.

Short-Term Effectiveness

Since there are no unacceptable risks at present, all the alternatives would be effective in the short term in protecting public health. Alternatives 2G1 and 2G2 would not attain groundwater SCGs in the overburden in the short term, but are also not associated with any worker or community impacts. Alternatives 2G3 and 2G4 would have minor impacts associated with trench installation; these alternatives would be effective in attaining perched groundwater SCGs. The impacts could be mitigated using standard practices such as limiting the hours of construction, using mufflers/silencers on construction equipment, and using techniques such as grading, hay bales/silt fences, and dewatering to control run-on/runoff from the site.

Implementability

All of the alternatives are easily implementable. The pumping and treatment called for in Alternatives 2G3 and 2G4 are commonly used and involve readily available technology.

Cost

Groundwater alternatives cost on the order of $183,00 for limited action to $853,000 for groundwater collection, treatment, and discharge. There is no cost associated with Alternative 2G1.

6 RECOMMENDED ALTERNATIVES

6.1 OU1

6.1.1 Soils

With the exception of no action, all of the alternatives are protective of human health because they eliminate the potential for future contact with impacted soils, while alternatives 1S4, 1S5, and 1S6 are also protective of the environment. The surface cleanup goal of 1 ppm PCBs is not contravened at the site. The 10 ppm PCBs subsurface goal would be met by Alternatives 1S4, 1S5, and 1S6. Based on the site-specific conditions, Alternatives 1S1, 1S2, and 1S3 would not meet the SCGs, but Alternatives 1S2 and 1S3 would meet the RAOs. Excavation and Off-Site Disposal (OU1 Alternative 1S6) is preferred because it will remove the source of the PCBs, the LNAPL in the soil, in the shortest time frame, as well as remove PCB-impacted groundwater through the dewatering process.

As a result, excavation and off-site disposal is the recommended alternative.

6.1.2 Groundwater

In the absence of removal of the PCB-impacted soils and LNAPL, neither no action (1G1) nor the limited action alternative (1G2) are protective by preventing further off-site migration of the groundwater. Alternatives 1G3 and 1G4 would be equally effective and protective for essentially the same cost (around $1 million). However, groundwater will be addressed as part of the soil alternative (1S6). As part of the dewatering process, impacted groundwater would be collected, treated, and discharged to BSA. No long term pump and treat will be required since the soil alternative removes the source of the groundwater contamination, the LNAPL and PCB-impacted soil, preventing any future impacts to groundwater.

However, to confirm the effectiveness of Alternative 1S6, a modified Alternative 1G2 - Limited Action, is the recommended remedial alternative. This alternative will provide for groundwater monitoring of selected wells for a limited time to confirm that the presence of PCBs in shallow groundwater either remains constant or is decreasing after the implementation of Alternative 1S6. The reference in 1G2 to "maintenance of existing pavement" is deleted because the PCB source at issue will be removed under 1S6.

6.1.3 Concurrence with Evaluation Criteria

The recommended alternatives are 1S6, Excavation and Off-Site Disposal, for soil, and a modified 1G2, Limited Action, for groundwater.

Alternative 1S6 involves dewatering of the OU1 area of contamination, treatment of the collected groundwater and discharge to BSA, excavation of the impacted material to the top of clay, backfilling with clean materials, and disposal of impacted material at an approved off-site facility. Although this alternative is intended to address the LNAPL and PCB-impacted soil, the need to dewater the impacted area prior to excavation will address groundwater. By treating impacted groundwater as part of this alternative and removing the source of the PCBs, the LNAPL and PCB-impacted soil, this alternative will complete the remediation of OU1. Limited short-term groundwater monitoring of selected wells will be conducted to ensure that current conditions either persist or improve after implementation of Alternative 1S6.

A discussion of the recommended alternatives' concurrence with the evaluation criteria follows.

Overall Protection of Human Health

The recommended alternatives would be protective of human health and the environment since the source (LNAPL and PCB-impacted soil) and impacted groundwater would be removed preventing future off-site contaminant migration. The existing deed restriction in place for the site prevents use of the property for purposes other than industrial uses, thereby preventing the use of groundwater as a potable water source.

Compliance with SCGs

The recommended alternatives will comply with the 10 ppm subsurface cleanup goal for soils. The 1 ppm surficial cleanup goal for soils has not been contravened. Dewatering during excavation and treatment of the groundwater will meet the surface water discharge criteria for PCBs.

Long-Term Effectiveness and Permanence

The alternatives will be effective in the long-term because the source would be removed, but will not be considered permanent because the source would not be treated.

Reduction of Source Toxicity, Mobility and Volume

Although the recommended alternatives remove the source from the site, they do not reduce toxicity, mobility, and volume because the source is not treated.

Short-Term Effectiveness

The recommended alternatives will achieve the remedial action objectives in the shortest time frame. Potential impacts from excavation and storing the soil on-site would be mitigated by dust control during remedial activities and placement of the soil directly into lined holding containers. Standard sediment and erosion control methods would be employed during construction. Limiting the hours of operation and using mufflers/silencers on construction equipment would mitigate any impacts associated with noise.

Implementability

The recommended alternatives are easily implemented, reliable, and available.

Cost

The total cost to address OU1 is estimated to be $1.29 million.

6.2 OU2

6.2.1 Soil

The recommended alternative for lead in soils is Alternative 2S2-Limited Action. This recommendation is based primarily on the fact that there is no current human health or environmental risk associated with the site. There is also no unacceptable hazard under future hypothetical conditions that would result in worker exposure. The current site conditions are protective because of the asphalt layer and the existing deed restriction limiting future uses of the site to industrial. Alternative 2S2 would preserve this protectiveness through asphalt repair and maintenance. "Limited Action" is therefore recommended as it is the most cost-effective remedy that is protective.

6.2.2 Groundwater

The recommended alternative for groundwater is 2G2-Limited Action. This remedy involves maintenance of the existing asphalt cover, installation of three additional downgradient monitoring wells at the south property line, semi-annual groundwater monitoring and maintenance of wells, and semi-annual monitoring of the site storm sewers and inspections/maintenance. This alternative is protective because the existing deed restriction precludes the use of groundwater at the site for potable purposes. Additionally, the source of the lead contamination, the ash fill, has been in place for over 60 years. In this time period, the lead has not migrated or caused a negative impact to groundwater. Lead concentrations present in the groundwater were shown to be the result of suspended particulate matter. As a result, monitoring will be conducted for a limited time period to demonstrate that the present conditions either persist or improve after the implementation of 1S6. This alternative is therefore recommended as it is the most cost-effective remedy that is protective.

6.2.3 Concurrence with Evaluation Criteria

The recommended alternatives for OU2 are 2S2, Limited Action, for soil and 2G2, Limited Action, for groundwater. These alternatives will involve installation of three additional downgradient groundwater monitoring wells located on the site, south of the former Scajaquada Creek channel near the south property line; semi-annual groundwater monitoring and maintenance of the wells; semi-annual monitoring of the site storm sewers and maintenance as necessary; and evaluation, repair, and annual maintenance of the asphalt.

The existing deed restriction issued as part of the sale of the property to AAM in 1994 limits the use of the site to industrial purposes. Additionally, in accordance with 9 NYCRR Part 902.1(a), industrial facilities are restricted from using groundwater as a source of potable water if public water is available. Consequently, the deed restriction preventing residential use of the site precludes the use of on-site groundwater for potable purposes.

The site is currently covered by an asphalt parking lot which acts as a cap, isolating the lead-contaminated fill materials below the surface. The highest lead concentration observed in the fill materials during the Site Investigation was 14,000 ppm. A risk evaluation conducted for a hypothetical construction scenario indicated that lead concentrations below 20,000 ppm do not pose an unacceptable risk to human health. Therefore, limited action, requiring evaluation, repair, and maintenance of the asphalt pavement, was recommended.

A discussion of the recommended alternatives' concurrence with the evaluation criteria follows.

Overall Protection of Human Health

The recommended alternatives would be protective of human health and the environment since there are no risks associated with the site in its present state. The alternatives would ensure protectiveness by maintaining the existing asphalt cover and monitoring the quality of perched groundwater.

Compliance with SCGs

Based on the site-specific conditions, the recommended alternatives will not meet the SCGs, but will address the site-specific cleanup goal for lead in soil by maintaining the existing cover, thereby meeting the RAOs. As stated above, the source of the lead contamination, the ash fill material, has been in place for over 60 years, during which time, the lead has not been shown to migrate. Furthermore, the presence of materials with lead concentrations above this level would not pose an unacceptable risk. Groundwater SCGs would not be met in the short-term, but may ultimately be achieved as the pavement controls infiltration.

Long-Term Effectiveness and Permanence

Since the recommended alternatives do not involve source removal or treatment, they are not permanent, although they do offer protection.

Reduction of Source Toxicity, Mobility and Volume

Because the recommended alternatives do not involve treatment, there is no reduction in toxicity, mobility, and volume of lead.

Short-Term Effectiveness

Because there are no health risks at present, the recommended alternatives would be effective in the short term in protecting public health. The potential impact on workers associated with construction activities would be insignificant due to the existing asphalt-paved parking area overlying the impacted soils. Impacts associated with this alternative would be related to dust generation and possible contact with contaminants during repair/replacement of any existing asphalt pavement. To mitigate these impacts, all construction activities would be performed in accordance with OSHA regulations (29 CFR Part 1926). A health and safety program would be developed and implemented during construction. This program would identify site hazards and procedures for mitigating the hazards, and provide guidance for training and medical surveillance, selection of protective equipment and engineering controls to ensure that permissible exposure limits are not exceeded, and decontamination procedures. Effects on the local community would be mitigated using standard construction practices to reduce nuisance conditions (dust, noise, traffic).

Implementability

The recommended alternatives are easily implemented.

Cost

The total cost to address OU2 is estimated to be $818,000.

LIMITATIONS

The services described in this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, nor the use of segregated portions of this report.

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TABLES

Table 1a
GENERAL MOTORS CORPORATION
SUMMARY OF CHEMICAL-SPECIFIC STANDARDS, CRITERIA, AND GUIDELINES (SCGs)

OPERABLE UNIT 1

Soil PCB SCGs

NYSDEC Soil Cleanup Objective[1]	1.0 ppm (surface) 10.0 ppm (subsurface)

Groundwater PCB SCGs

New York State Groundwater Standard[2]	0.1 ug/l (ppb)

Surface Water PCB SCGs

New York State Surface Water Standard (Aquatic)[2]	0.001 ug/l (ppb)
New York State Surface Water Standard (Human Health)[2]	0.01 ug/l (ppb)

OPERABLE UNIT 2

Soil Lead SCGs

NYSDEC Soil Cleanup Objective[1]	Site background[3] = 1,000 ppm
Site-Specific Risk-based Action Level[5]	20,000 ppm

Groundwater Lead SCGs

New York State Groundwater Standard[2]	25 ug/l (ppb)
New York State Groundwater Effluent Standard[2]	50 ug/l (ppb)

[1] NYSDEC Division Technical and Administrative Guidance Memorandum (TAGM): Determination of Soil Cleanup Objectives and Cleanup Levels. HWR-94-4046.
[2] 6 NYCRR Part 703.5(f), Table 1. 6 NYCRR Part 703.6(e), Table 3.
[3] Site background based on previous investigations at site. Soil with subsurface lead concentrations of 1,000 ppm or less consistently had TCLP lead concentrations less than 5 ppm indicating the material is non-hazardous.
[4] USEPA, 1994. EPA's National Guidelines for Lead Hazards in Dust, Soil and Paint: A Summary and Analysis.
[5] See Appendix A.

Table 1b
GENERAL MOTORS CORPORATION
SUMMARY OF LOCATION-SPECIFIC AND ACTION-SPECIFIC SCGs and TBCs

Agencies	Regulatory Compliance Activity/Requirements
• NYSDEC • City of Buffalo/Buffalo Sewer Authority	• Treated Wastewater Discharge and/or Uncontaminated Stormwater Runoff to Surface Water – 6 NYCRR Parts 750-758 (State Pollutant Discharge Elimination System (SPDES) Requirements • Installation of Storage Tanks associated with Treatment Systems – 6 NYCRR Part 596 (Registration of Hazardous Substances Bulk Storage Tanks) – 6 NYCRR Part 598 (Handling of Hazardous Substances) – 6 NYCRR Part 599 (Standards for New or Modified Hazardous Substance Storage Facilities) • Treated Wastewater Discharge to City of Buffalo Sewage Treatment Plant – 40 CFR Part 403 (General Pretreatment Requirements) – Sewer Authority Sewer Use Regulations
• NYSDEC	• Potential Air Emissions from Remedial Construction/ Excavation Activities On Site – 6 NYCRR Parts 212-254 (Air Emission Requirements) – Technical and Administrative Guidance Memorandum: Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites. HWR-89-4031.
• NYSDEC	• Potential Transport of Materials or Wastes to/from Site – 6 NYCRR Part 364 (Waste transporter requirements) – 6 NYCRR Parts 370-372 (Hazardous waste management, including manifesting) – 6 NYCRR Part 374 (Standards for management of specific hazardous wastes) – 40 CFR Part 262 (Hazardous waste manifesting requirements) – 40 CFR Part 263 (Hazardous waste transporter requirements) – 49 CFR Part 107 (171.1-.500) (Rules for hazardous materials transport)
• NYSDEC	• Management of PCB Wastes Resulting from Remedial Activities – 6 NYCRR Part 371 (including 371.4(e) wastes containing polychlorinated biphenyls (PCBs)) – 6 NYCRR Part 373 (Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities) – 6 NYCRR Part 376 (Land Disposal Restrictions) – EPA Interim Policy for Planning and Implementing CERCLA Off-Site Response Actions (50 FR 45933, November 5, 1985) – 40 CFR Part 761.60 (PCB disposal requirements)

Table 1b
GENERAL MOTORS CORPORATION
SUMMARY OF LOCATION-SPECIFIC AND ACTION-SPECIFIC SCGs and TBCs

• NYSDEC	• Remedial Construction Activities – 6 NYCRR Part 375 (Inactive Hazardous Waste disposal Site Remedial Program)
• OSHA	• Remedial Construction Activities – 20 CFR Parts 1910 (Occupational Safety and Health Standards) and 1926 (Safety and Health Regulations for Construction
• Local Agencies, as appropriate	• Deed Restrictions to Limit Land Use • Siting and Construction of Selected Treatment Systems (Zoning and building requirements/storage tank installation)

Table 2
GENERAL MOTORS CORPORATION
GROUNDWATER CONCENTRATIONS OF CONTAMINANTS OF CONCERN
DETECTED VS. DISCHARGE CRITERION

Contaminant (ug/l)	MW-200	MW-203	MW-204	MW-205	MW-206	MW-207	BSA Discharging Criteria [1]	Surface Water Discharge Criteria
PCBs	ND	0.38	ND	ND	0.38	ND	ND [2]	0.001
Total Lead	49	98	68	120	250	37	430	25

NOTES: ND = below detection limit

[1] Maximum Monthly Average Discharge

[2] Non detected using USEPA Method 608 for PCBs (detection limit = 0.065 ug/l)

Table 3
GENERAL MOTORS CORPORATION
PRESENT VALUE COST SUMMARY

	Present Value Cost*
SOIL ALTERNATIVES	
OU1 Alternative 1S1 - No Action	$0
OU1 Alternative 1S2 - Limited Action	$28,531
OU1 Alternative 1S3 - Soil Containment/Capping	$68,261
OU1 Alternative 1S4 - In-Situ Treatment (TerraTherm Thermal Desorption)	$1,294,642
OU1 Alternative 1S5 - Excavation and On-Site Treatment (XTRAX Thermal Desorption)	$2,993,861
OU1 Alternative 1S6 - Excavation and Off-Site Disposal	$1,185,327
GROUNDWATER ALTERNATIVES	
OU1 Alternative 1G1 - No Action	$0
OU1 Alternative 1G2 - Limited Action	$106,547
OU1 Alternative 1G3 - LNAPL Collection/Groundwater Pretreatment/Discharge to BSA	$1,190,807
OU1 Alternative 1G4 - LNAPL Collection/Groundwater Treatment/Direct Discharge	$1,124,979

* Present value cost = capital cost + (annual O&M cost x present worth factor for 5% interest over 30 years)

LS	Lump Sum
SY	Square Yard
CY	Cubic Yard
DAY	per Day
55 GAL	55-gallon Drum
TON	per Ton
EA	Each
GAL	Gallon
LF	Linear Foot

Table 3a
GENERAL MOTORS CORPORATION
PRESENT VALUE COST SUMMARY
OU1 Alternative 1S1 - No Action

Item No.		Approximate Quantities		Unit Price	Total Price	Present Value Cost
		Quantity	Unit			
	Capital Costs					
1	Not Applicable	0		$0		
	Subtotal					$0
	Annual O & M Costs					
1	Not Applicable	0		$0		
	Subtotal					$0
	Subtotal					$0
	Contingency 30%					$0
	Engineering 10%					$0
	Permitting 5%					$0
	Total					$0

Table 3b
GENERAL MOTORS CORPORATION
PRESENT VALUE COST SUMMARY
OU1 Alternative 1S2 - Limited Action

Item No.		Approximate Quantities				
		Quantity	Unit	Unit Price	Total Price	Present Value Cost
	Capital Costs					
1	Not Applicable	0		$0		
	Subtotal					$0
	Annual O&M Costs					
1	Asphalt Maintenance	40	SY	$32	$1,280	$19,677
	Subtotal					$19,677
	Subtotal					$19,677
	Contingency 30%					$5,903
	Engineering 10%					$1,968
	Permitting 5%					$984
	Total					$28,531

Table 3c
GENERAL MOTORS CORPORATION
PRESENT VALUE COST SUMMARY
OU1 Alternative 1S3 - Soil containment/Capping

Item No.		Approximate Quantities		Unit Price	Total Price	Present Value Cost
		Quantity	Unit			
	Capital Costs					
1	Asphalt Repair	400	SY	$23	$9,000	$9,000
2	Asphalt Cap	800	SY	$23	$18,400	$18,400
	Subtotal					$27,400
	Annual O&M Costs					
1	Asphalt Maintenance	40	SY	$32	$1,280	$19,677
	Subtotal					$19,677
	Subtotal					$47,077
	Contingency 30%					$14,123
	Engineering 10%					$4,708
	Permitting 5%					$2,354
	Total					$68,261

Table 3d
GENERAL MOTORS CORPORATION
PRESENT VALUE COST SUMMARY
OU1 Alternative 1S4 - In-Situ Treatment (TerraTherm Thermal Desorption)

Item No.		Approximate Quantities		Unit Price	Total Price	Present Value Cost
		Quantity	Unit			
	Capital Costs					
1	Dewatering	1	LS	$10,000	$10,000	$10,000
2	Treatment System Mob/Demob	1	LS	$45,900	$45,900	$45,900
3	On-site Water Treatment	70	DAY	$2,860	$200,200	$200,200
4	Oil Disposal	16	55 GAL	$1,130	$18,080	$18,080
5	On-Site Treatment Thermal Desorption	4,050	TON	$140	$567,000	$567,000
6	Confirmatory Sampling	1	LS	$5,000	$5,000	$5,000
7	Asphalt Repair	1,200	SY	$23	$27,000	$27,000
	Subtotal					$873,180
	Annual O&M Costs					
1	Asphalt Maintenance	40	SY	$32	$1,280	$19,677
	Subtotal					$19,677
	Subtotal					$892,857
	Contingency 30%					$267,857
	Engineering 10%					$89,286
	Permitting 5%					$44,643
	Total					$1,294,642

Table 3e
GENERAL MOTORS CORPORATION
PRESENT VALUE COST SUMMARY
OU1 Alternative 1S5 - Excavation and On-Site Treatment (XTRAX Thermal Desorption)

Item No.		Approximate Quantities		Unit Price	Total Price	Present Value Cost
		Quantity	Unit			
	Capital Costs					
1	Dewatering	1	LS	$10,000	$10,000	$10,000
2	Treatment System Mob/Demob	1	LS	$45,900	$45,900	$45,900
3	On-site Water Treatment	100	DAY	$2,860	$286,000	$286,000
4	Oil Disposal	16	55 GAL	$1,130	$18,080	$18,080
5	Excavation	2,450	CY	$7	$15,925	$15,925
6	On-Site Treatment Thermal Desorption	4,050	TON	$400	$1,620,000	$1,620,000
7	Confirmatory Sampling	1	LS	$5,000	$5,000	$5,000
8	Backfill with Treated Material	2,450	CY	$7	$17,150	$17,150
9	Asphalt Repair	1,200	SY	$23	$27,000	$27,000
	Subtotal					$2,045,055
	Annual O&M Costs					
1	Asphalt Maintenance	40	SY	$32	$1,280	$19,677
	Subtotal					$19,677
	Subtotal					$2,064,732
	Contingency 30%					$619,420
	Engineering 10%					$206,473
	Permitting 5%					$103,237
	Total					$2,993,861

Table 3f
GENERAL MOTORS CORPORATION
PRESENT VALUE COST SUMMARY
OU1 Alternative 1S6 - Excavation and Off-Site Disposal

Item No.		Approximate Quantities: Quantity	Unit	Unit Price	Total Price	Present Value Cost
	Capital Costs					
1	Dewatering	1	LS	$10,000	$10,000	$10,000
2	Treatment System Mob/Demob/ Decon	1	LS	$45,900	$45,900	$45,900
3	On-site Water Treatment	21	DAY	$2,860	$60,060	$60,060
4	Oil Disposal	16	55 GAL	$1,130	$18,080	$18,080
5	Construction Equipment Mob/ Demob/Decon	1	LS	$8,615	$8,615	$8,615
6	Excavation, Dry	2,450	CY	$7	$15,925	$15,925
7	Loading	20	DAY	$2,000	$40,000	$40,000
8	Transport and Off-site Disposal (Hazardous)	4,050	TON	$120	$486,000	$486,000
9	Stabilization of Rail Cars	36	CARS	$500	$18,000	$18,000
10	Confirmatory Sampling	1	LS	$5,000	$5,000	$5,000
11	Backfill With Imported Material	2,940	CY	$22	$63,210	$63,210
12	Asphalt Repair	1,200	SY	$23	$27,000	$27,000
	Subtotal					$797,790
	Annual O&M Costs					
1	Asphalt Maintenance	40	SY	$32	$1,280	$19,677
	Subtotal					$19,677
	Subtotal					$817,467
	Contingency 30%					$245,240
	Engineering 10%					$81,747
	Permitting 5%					$40,873
	Total					$1,185,327

Table 3g
GENERAL MOTORS CORPORATION
PRESENT VALUE COST SUMMARY
OU1 Alternative 1G1 - No Action

Item No.		Approximate Quantities: Quantity	Approximate Quantities: Unit	Unit Price	Total Price	Present Value Cost
	Capital Costs					
1	Not Applicable	0		$0		
	Subtotal					$0
	Annual O&M Costs					
1	Not Applicable	0		$0		
	Subtotal					$0
	Subtotal					$0
	Contingency 30%					$0
	Engineering 10%					$0
	Permitting 5%					$0
	Total					$0

Table 3h
GENERAL MOTORS CORPORATION
PRESENT VALUE COST SUMMARY
OU1 Alternative 1G2 - Limited Action

Item No.		Approximate Quantities		Unit Price	Total Price	Present Value Cost
		Quantity	Unit			
	Capital Costs					
1	Not Applicable	0		$0		
	Subtotal					$0
	Annual O&M Costs					
1	Asphalt Maintenance	40	SY	$32	$1,280	$19,677
2	Semi-Annual Groundwater Monitoring	2	LS	$1,750	$3,500	$53,804
	Subtotal					$73,481
	Subtotal					$73,481
	Contingency 30%					$22,044
	Engineering 10%					$7,348
	Permitting 5%					$3,674
	Total					$106,547

Table 3i
GENERAL MOTORS CORPORATION
PRESENT VALUE COST SUMMARY
OU1 Alternative 1G3 - LNAPL Collection/Groundwater Pretreatment/Discharge to BSA

Item No.		Approximate Quantities		Unit Price	Total Price	Present Value Cost
		Quantity	Unit			
	Capital Costs					
1	Extension of Collection Drain	150	LF	$500	$75,000	$75,000
2	Pump/Electrical	1	LS	$20,000	$20,000	$20,000
3	Forcemain	250	LF	$7	$1,750	$1,750
4	Pretreatment Facility	1	EA	$33,000	$33,000	$33,000
5	Water Storage Tank	1	EA	$5,000	$5,000	$5,000
	Subtotal					$134,750
	Annual O&M Costs					
1	Asphalt Maintenance	40	SY	$32	$1,280	$19,677
2	Pretreatment Plant Maintenance	1	LS	$2,200	$2,200	$33,820
3	LNAPL Disposal *	436	55 GAL	$1,130	$492,680	$492,680
4	Discharge Fee to BSA	2,628,000	GAL	$0.001	$2,628	$40,399
5	Pretreatment Effluent Sampling	12	EA	$250	$3,000	$46,118
6	Semi-Annual Groundwater Monitoring	2	LS	$1,750	$3,500	$53,804
	Subtotal					$686,496
	Subtotal					$821,246
	Contingency 30%					$246,374
	Engineering 10%					$82,125
	Permitting 5%					$41,062
	Total					$1,190,807

* Cost projected to be incurred in first year of operation.

Table 3j
GENERAL MOTORS CORPORATION
PRESENT VALUE COST SUMMARY
OU1 Alternative 1G4 - LNAPL Collection/Groundwater Treatment/Direct Discharge

Item No.		Approximate Quantities		Unit Price	Total Price	Present Value Cost
		Quantity	Unit			
	Capital Costs					
1	Extension of Collection Drain	150	LF	$500	$75,000	$75,000
2	Pump/Electrical	1	LS	$20,000	$20,000	$20,000
3	Forcemain	250	LF	$7	$1,750	$1,750
4	Treatment Facility	1	EA	$33,000	$33,000	$33,000
	Subtotal					$129,750
	Annual O&M Costs					
1	Asphalt Maintenance	40	SY	$32	$1,280	$19,677
2	Treatment System Maintenance Direct Discharge	1	LS	$2,200	$2,200	$33,820
3	LNAPL Disposal *	436	55 GAL	$1,130	$492,680	$492,680
4	Effluent Sampling	12	EA	$250	$3,000	$46,118
5	Semi-Annual Groundwater Monitoring	2	LS	$1,750	$3,500	$53,804
	Subtotal					$646,098
	Subtotal					$775,848
	Contingency 30%					$232,754
	Engineering 10%					$77,585
	Permitting 5%					$38,792
	Total					$1,124,979

* Cost projected to be incurred in first year of operation.

TABLE 4
GENERAL MOTORS CORPORATION
PRESENT VALUE COST SUMMARY

	Present Value Cost*
SOIL ALTERNATIVES	
OU2 Alternative 2S1 - No Action	$0
OU2 Alternative 2S2 - Limited Action (Evaluation and Repair)	$633,694
OU2 Alternative 2S3 - Soil Containment/Capping	$1,008,066
OU2 Alternative 2S4 - In-Situ Treatment	$3,780,738
OU2 Alternative 2S5 - Excavation and On-Site Treatment	$3,630,436
OU2 Alternative 2S6 - Excavation and Off-Site Disposal	$5,599,122
GROUNDWATER ALTERNATIVES	
OU2 Alternative 2G1 - No Action	$0
OU2 Alternative 2G2 - Limited Action	$183,455
OU2 Alternative 2G3 - Collection, Pretreatment, Discharge to BSA	$853,081
OU2 Alternative 2G4 - Collection, On-Site Treatment, Direct Discharge	$794,503

*Present Value Cost = capital cost + (annual O&M cost x present worth factor for 5% interest over 30 years)

LS Lump Sum
SY Square Yard
CY Cubic Yard
DAY per Day
TON per Ton
EA Each
GAL Gallon
LF Linear Foot

TABLE 4a
GENERAL MOTORS CORPORATION
PRESENT VALUE COST SUMMARY
OU2 Alternative 2S1 - No Action

Item No.		Approximate Quantities		Unit Price	Total Price	Present Value Cost
		Quantity	Unit			
	Capital Costs					
1	Not Applicable	0		$0		
	Subtotal					$0
	Annual O&M Costs					
1	Not Applicable	0		$0		
	Subtotal					$0
	Subtotal					$0
	Contingency 30%					$0
	Engineering 10%					$0
	Permitting 5%					$0
	Total					$0

TABLE 4b
GENERAL MOTORS CORPORATION
PRESENT VALUE COST SUMMARY
OU2 Alternative 2S2 - Limited Action (Evaluation and Repair)

Item No.		Approximate Quantities		Unit Price	Total Price	Present Value Cost
		Quantity	Unit			
	Capital Costs					
1	Asphalt Evaluation	1	LS	$10,000	$10,000	$10,000
2	Asphalt Repair	16,000	SY	$23	$368,000	$368,000
	Subtotal					$378,000
	Annual O&M Costs					
1	Asphalt Maintenance	120	SY	$32	$3,840	$59,030
	Subtotal					$59,030
	Subtotal					$437,030
	Contingency 30%					$131,109
	Engineering 10%					$43,703
	Permitting 5%					$21,852
	Total					$633,694

TABLE 4c
GENERAL MOTORS CORPORATION
PRESENT VALUE COST SUMMARY
OU2 Alternative 2S3 - Soil Containment/Capping

Item No.		Approximate Quantities		Unit Price	Total Price	Present Value Cost
		Quantity	Unit			
	Capital Costs					
1	Asphalt Repair	9,425	SY	$23	$212,063	$212,063
2	Asphalt Cap	18,850	SY	$23	$424,125	$424,125
	Subtotal					$636,188
	Annual O&M Costs					
1	Asphalt Maintenance	120	SY	$32	$3,840	$59,030
	Subtotal					$59,030
	Subtotal					$695,218
	Contingency 30%					$208,565
	Engineering 10%					$69,522
	Permitting 5%					$34,761
	Total					$1,008,066

TABLE 4d
GENERAL MOTORS CORPORATION
PRESENT VALUE COST SUMMARY
OU2 Alternative 2S4 - In-Situ Treatment

Item No.		Approximate Quantities				Present Value Cost
		Quantity	Unit	Unit Price	Total Price	
	Capital Costs					
1	In-Situ Treatment	28,270	CY	$75	$2,120,250	$2,120,250
2	Confirmatory Sampling	1	LS	$4,000	$4,000	$4,000
3	Asphalt Repair	18,850	SY	$23	$424,125	$424,125
	Subtotal					$2,548,375
	Annual O&M Costs					
1	Asphalt Maintenance	120	SY	$32	$3,840	$59,030
	Subtotal					$59,030
	Subtotal					$2,607,405
	Contingency 30%					$782,222
	Engineering 10%					$260,741
	Permitting 5%					$130,370
	Total					$3,780,738

TABLE 4e
GENERAL MOTORS CORPORATION
PRESENT VALUE COST SUMMARY
OU2 Alternative 2S5 - Excavation and On-Site Treatment

Item No.		Approximate Quantities		Unit Price	Total Price	Present Value Cost
		Quantity	Unit			
	Capital Costs					
1	Excavation	28,270	CY	$7	$183,755	$183,755
2	On-Site Treatment	27,485	TON	$60	$1,649,083	$1,649,083
3	Confirmatory Sampling	1	LS	$4,000	$4,000	$4,000
4	Backfill with treated material	28,270	CY	$7	$183,755	$183,755
5	Asphalt Repair	18,850	SY	$23	$424,125	$424,125
	Subtotal					$2,444,718
	Annual O&M Costs					
1	Asphalt Maintenance	120	SY	$32	$3,840	$59,030
	Subtotal					$59,030
	Subtotal					$2,503,749
	Contingency 30%					$751,125
	Engineering 10%					$250,375
	Permitting 5%					$125,187
	Total					$3,630,436

TABLE 4f
GENERAL MOTORS CORPORATION
PRESENT VALUE COST SUMMARY
OU2 Alternative 2S6 - Excavation and Off-Site Disposal

Item No.		Approximate Quantities		Unit Price	Total Price	Present Value Cost
		Quantity	Unit			
	Capital Costs					
1	Excavation	28,270	CY	$7	$183,755	$183,755
2	Loading	90	DAY	$1,200	$108,000	$108,000
3	Transport and Off-Site Disposal	27,485	TON	$85	$2,336,225	$2,336,225
4	Confirmatory Sampling	1	LS	$4,000	$4,000	$4,000
5	Backfill With Imported Material	33,924	CY	$22	$746,328	$746,328
6	Asphalt Repair	18,850	SY	$23	$424,125	$424,125
	Subtotal					$3,802,433
	Annual O&M Costs					
1	Asphalt Maintenance	120	SY	$32	$3,840	$59,030
	Subtotal					$59,030
	Subtotal					$3,861,463
	Contingency 30%					$1,158,439
	Engineering 10%					$386,146
	Permitting 5%					$193,073
	Total					$5,599,122

TABLE 4g
GENERAL MOTORS CORPORATION
PRESENT VALUE COST SUMMARY
OU2 Alternative 2G1 - No Action

Item No.		Approximate Quantities		Unit Price	Total Price	Present Value Cost
		Quantity	Unit			
	Capital Costs					
1	Not Applicable	0		$0		
	Subtotal					$0
	Annual O&M Costs					
1	Not Applicable	0		$0		
	Subtotal					$0
	Subtotal					$0
	Contingency 30%					$0
	Engineering 10%					$0
	Permitting 5%					$0
	Total					$0

TABLE 4h
GENERAL MOTORS CORPORATION
PRESENT VALUE COST SUMMARY
OU2 Alternative 2G2 - Limited Action

Item No.		Approximate Quantities		Unit Price	Total Price	Present Value Cost
		Quantity	Unit			
	Capital Costs					
1	Additional Well Installation	1	LS	$6,000	$6,000	$6,000
	Subtotal					$6,000
	Annual O&M Costs					
1	Asphalt Maintenance	120	SY	$32	$3,840	$59,030
2	Semi-Annual Groundwater/ Storm Sewer Monitoring	2	LS	$2,000	$4,000	$61,490
	Subtotal					$120,520
	Subtotal					$126,520
	Contingency 30%					$37,956
	Engineering 10%					$12,652
	Permitting 5%					$6,326
	Total					$183,455

TABLE 4i
GENERAL MOTORS CORPORATION
PRESENT VALUE COST SUMMARY
OU2 Alternative 2G3 - Collection, Pretreatment, Discharge to BSA

Item No.		Approximate Quantities		Unit Price	Total Price	Present Value Cost
		Quantity	Unit			
	Capital Costs					
1	Collection Drain	1,500	LF	$210	$315,000	$315,000
2	Forcemain	650	LF	$7	$4,550	$4,550
3	Pretreatment Facility	1	LS	$25,000	$25,000	$25,000
4	Additional Well Installation	1	LS	$6,000	$6,000	$6,000
	Subtotal					$350,550
	Annual O&M Costs					
1	Asphalt Maintenance	120	SY	$32	$3,840	$59,030
2	GW Pretreatment Maintenance Discharge to BSA	1	LS	$2,000	$2,000	$30,745
3	GW Pretreatment Discharge Fee to BSA	2,628,000	GAL	0.001	$2,628	$40,399
4	Confirmatory Sampling	12	EA	$250	$3,000	$46,118
5	Semi-Annual Groundwater Monitoring	2	LS	$2,000	$4,000	$61,490
	Subtotal					$237,782
	Subtotal					$588,332
	Contingency 30%					$176,500
	Engineering 10%					$58,833
	Permitting 5%					$29,417
	Total					$853,081

TABLE 4j
GENERAL MOTORS CORPORATION
PRESENT VALUE COST SUMMARY
OU2 Alternative 2G4 - Collection, On-Site Treatment, Direct Discharge

Item No.		Approximate Quantities		Unit Price	Total Price	Present Cost
		Quantity	Unit			
	Capital Costs					
1	Collection Drain	1,500	LF	$210	$315,000	$315,000
2	Forcemain	650	LF	$7	$4,550	$4,550
3	Treatment Facility	1	LS	$25,000	$25,000	$25,000
4	Additional Well Installation	1	LS	$6,000	$6,000	$6,000
	Subtotal					$350,550
	O & M Costs					
1	Asphalt Maintenance	120	SY	$32	$3,840	$59,030
2	On-Site Treatment Maintenance Direct Discharge	1	LS	$2,000	$2,000	$30,745
3	Confirmatory Sampling	12	EA	$250	$3,000	$46,118
4	Semi-Annual Groundwater Monitoring	2	LS	$2,000	$4,000	$61,490
	Subtotal					$197,383
	Subtotal					$547,933
	Contingency 30%					$164,380
	Engineering 10%					$54,793
	Permitting 5%					$27,397
	Total					$794,503

FIGURES

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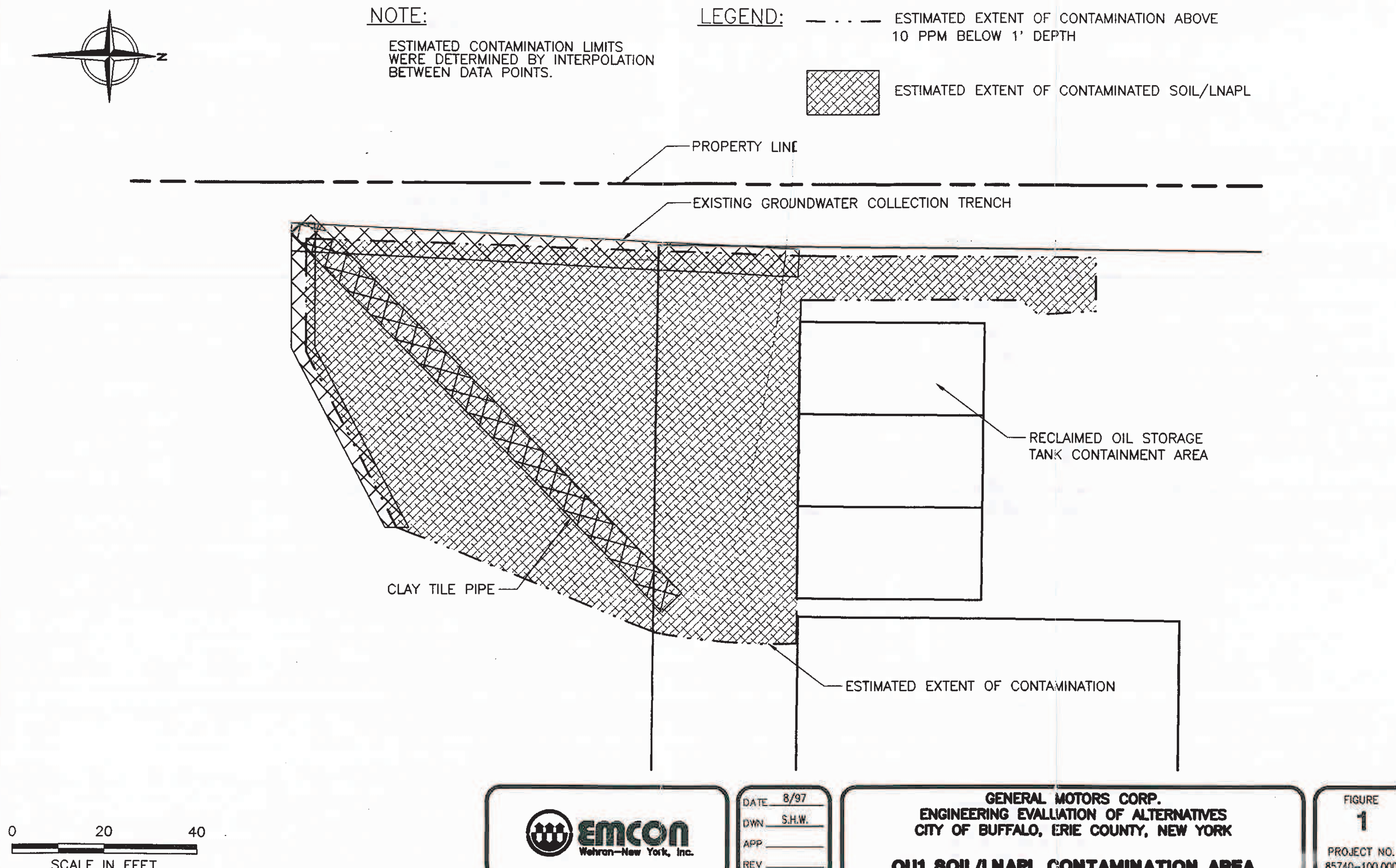


EMCON
Wehran–New York, Inc.

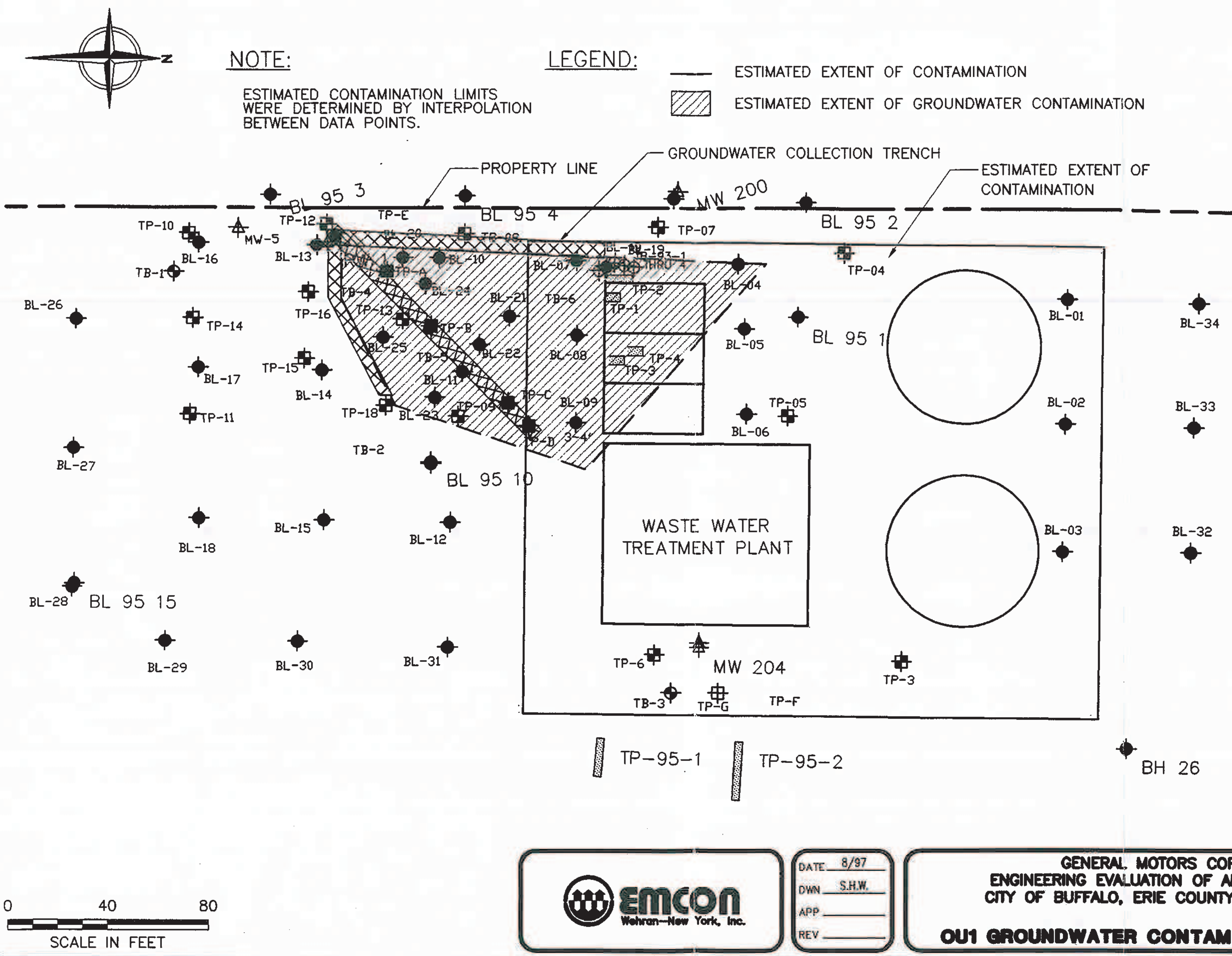
DATE 8/97
DWN S.H.W.
APP
REV

GENERAL MOTORS CORP.
ENGINEERING EVALUATION OF ALTERNATIVES
CITY OF BUFFALO, ERIE COUNTY, NEW YORK

OU1 SOIL/LNAPL CONTAMINATION AREA

FIGURE 1

PROJECT NO. 85740-100.000



Symbol	Description
TP-1	TEST PIT EXCAVATED BY GUGINO EQUIPMENT COMPANY IN APRIL 1987. EXCAVATION ACTIVITIES MONITORED BY WEHRAN-NEW YORK, INC.
BL-1	TEST BORING COMPLETED BY SJB SERVICES, INC. BETWEEN NOVEMBER 3 AND 16, 1993. DRILLING ACTIVITIES OBSERVED BY WEHRAN-NEW YORK, INC.
TB-93-1	TEST BORING COMPLETED BY EARTH DIMENSIONS, INC. ON APRIL 14, 1993. DRILLING ACTIVITIES MONITORED BY WEHRAN-NEW YORK, INC.
TB-1	PIEZOMETER INSTALLED BY EARTH DIMENSIONS, INC. BETWEEN JUNE 15 AND 16, 1989. DRILLING ACTIVITIES MONITORED BY WEHRAN-NEW YORK, INC.
TP-3	TEST PIT EXCAVATED BY GUGINO EQUIPMENT COMPANY BETWEEN AUGUST 3 AND 10, 1987. EXCAVATION ACTIVITIES OBSERVED BY WEHRAN-NEW YORK, INC.
TP-A	TEST PIT EXCAVATED BY GUGINO EQUIPMENT COMPANY IN 1989. EXCAVATION ACTIVITIES OBSERVED BY WEHRAN-NEW YORK, INC.
TP-E	TEST PIT EXCAVATED BY GUGINO EQUIPMENT COMPANY ON APRIL 3 AND 4, 1990. EXCAVATION ACTIVITIES OBSERVED BY WEHRAN-NEW YORK, INC. AND NYSDEC.
MW-5	MONITORING WELL INSTALLED BY EARTH DIMENSIONS, INC. IN 1989. DRILLING ACTIVITIES MONITORED BY WEHRAN-NEW YORK, INC.
TP-95-1	TEST PIT EXCAVATED BY CLEAN HARBORS DURING MARCH, 1995 AS PART OF RI. EXCAVATION ACTIVITIES OBSERVED BY WEHRAN-NEW YORK, INC. AND NYSDEC.
BH-6	TEST BORINGS COMPLETED BY SJB SERVICES, INC. AND EARTH DIMENSIONS INC. BETWEEN SEPT. & OCT., 1994. DRILLING ACTIVITIES OBSERVED BY WEHRAN-NEW YORK, INC.
BL-95-1	TEST BORINGS COMPLETED BY EARTH DIMENSIONS, INC. IN MARCH, 1995 AS PART OF THE RI. DRILLING ACTIVITIES OBSERVED BY WEHRAN-NEW YORK, INC. AND NYSDEC.
MW-200	MONITORING WELLS INSTALLED BY EARTH DIMENSIONS, INC. IN MARCH, 1995 AS PART OF THE RI. DRILLING ACTIVITIES OBSERVED BY WEHRAN-NEW YORK, INC. AND NYSDEC.
RW-95-1	BEDROCK MONITORING WELLS INSTALLED BY EARTH DIMENSIONS, INC. IN MARCH, 1995 AS PART OF THE RI. DRILLING ACTIVITIES OBSERVED BY WEHRAN-NEW YORK, INC. AND NYSDEC.

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Wehran-New York, Inc.

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GENERAL MOTORS CORP.
ENGINEERING EVALUATION OF ALTERNATIVES
CITY OF BUFFALO, ERIE COUNTY, NEW YORK

OU1 GROUNDWATER CONTAMINATION AREA

FIGURE
2

PROJECT NO.
85740-100.000

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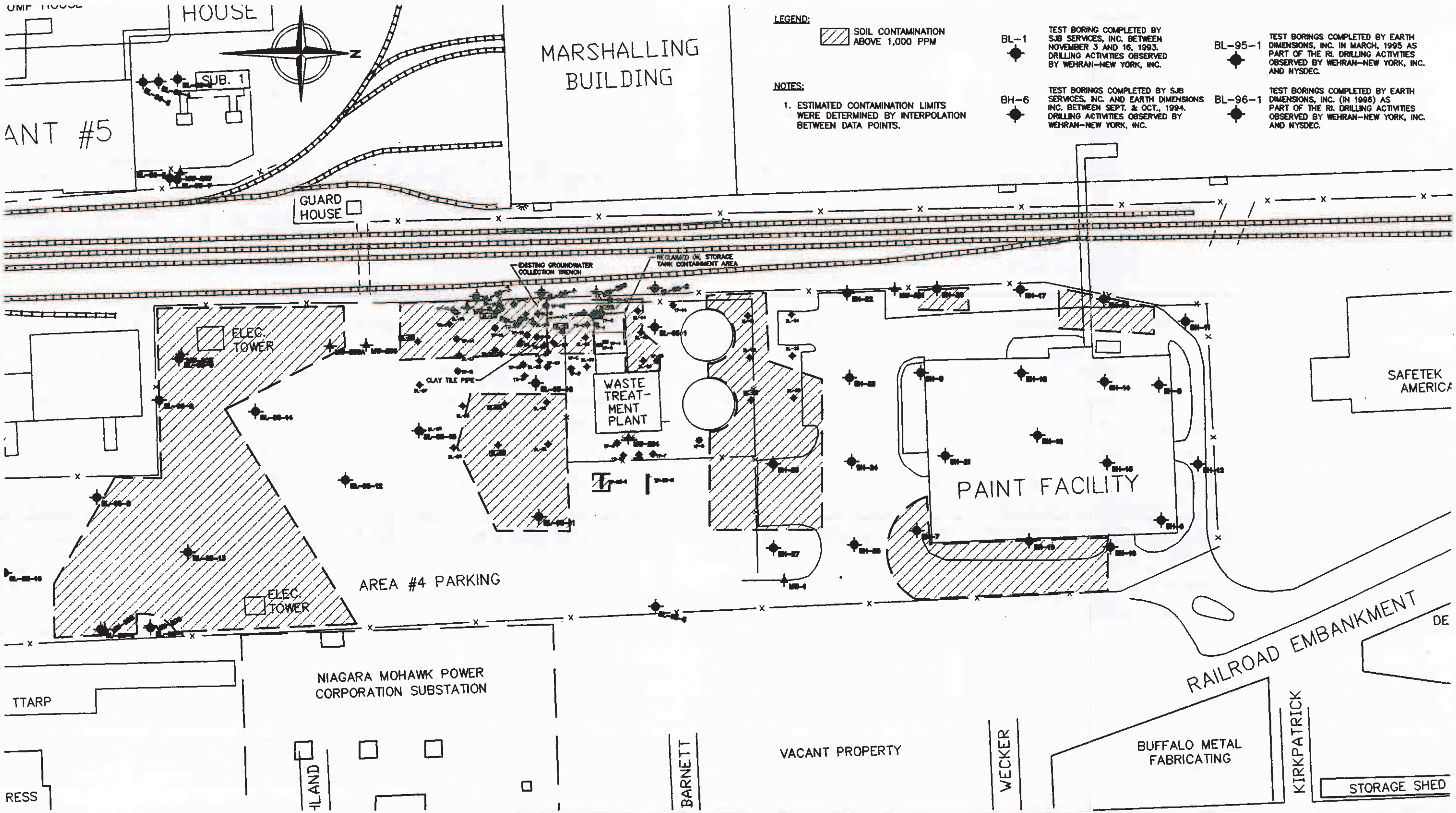

LEGEND:

SOIL CONTAMINATION ABOVE 1,000 PPM

BL-1 TEST BORING COMPLETED BY SJB SERVICES, INC. BETWEEN NOVEMBER 3 AND 16, 1993. DRILLING ACTIVITIES OBSERVED BY WEHRAN-NEW YORK, INC.

BH-6 TEST BORINGS COMPLETED BY SJB SERVICES, INC. AND EARTH DIMENSIONS INC. BETWEEN SEPT. & OCT., 1994. DRILLING ACTIVITIES OBSERVED BY WEHRAN-NEW YORK, INC.

BL-95-1 TEST BORINGS COMPLETED BY EARTH DIMENSIONS, INC. IN MARCH, 1995 AS PART OF THE RI. DRILLING ACTIVITIES OBSERVED BY WEHRAN-NEW YORK, INC. AND NYSDEC.

BL-96-1 TEST BORINGS COMPLETED BY EARTH DIMENSIONS, INC. (IN 1996) AS PART OF THE RI. DRILLING ACTIVITIES OBSERVED BY WEHRAN-NEW YORK, INC. AND NYSDEC.

NOTES:

1. ESTIMATED CONTAMINATION LIMITS WERE DETERMINED BY INTERPOLATION BETWEEN DATA POINTS.

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DATE 8/97
DWN JPM
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GENERAL MOTORS
ENGINEERING EVALUATION OF ALTERNATIVES
BUFFALO, ERIE COUNTY, NEW YORK

OU2 SOIL CONTAMINATION AREAS

FIGURE 3

PROJECT NO. 85740-100.000

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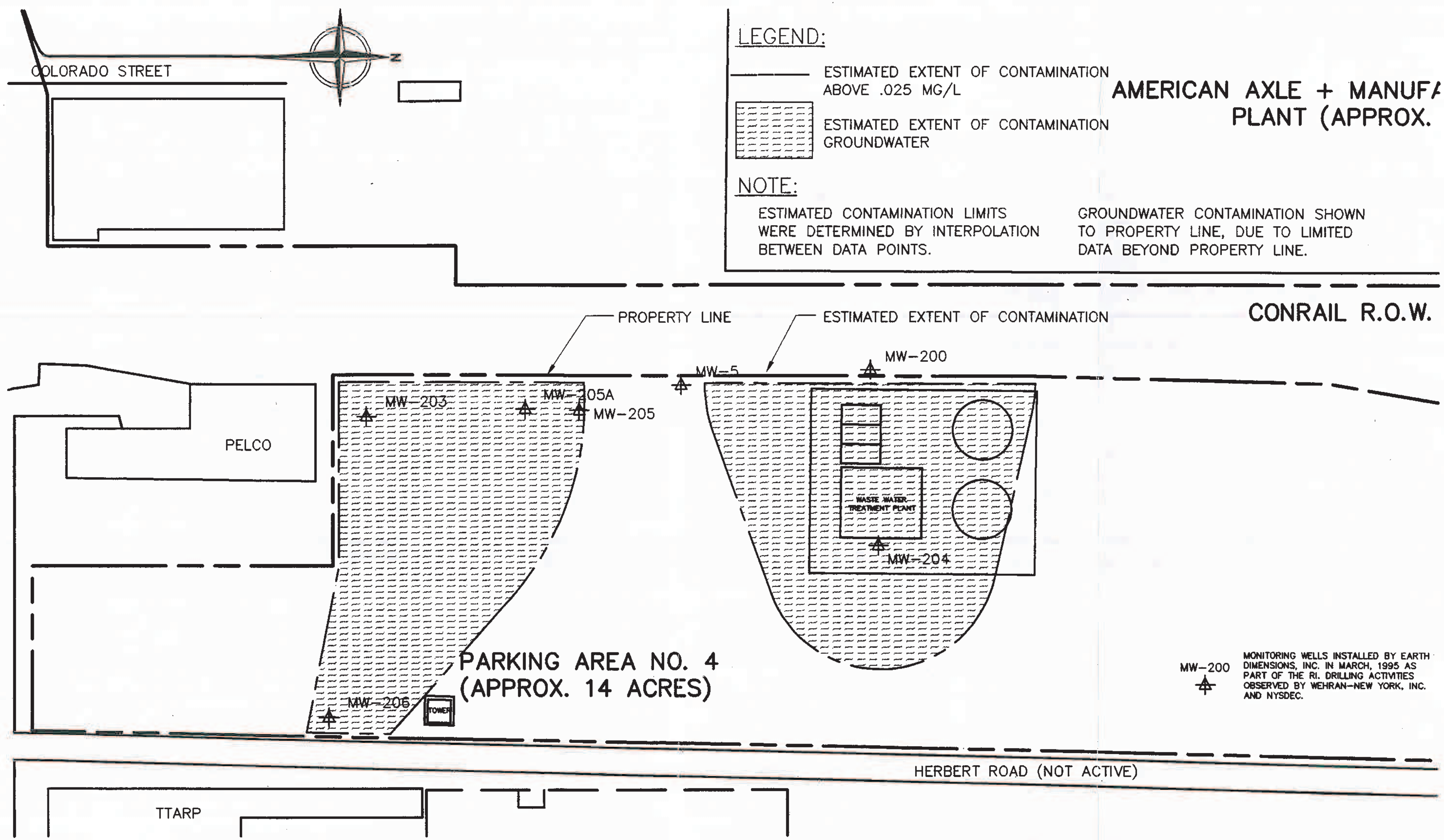

EMCON Wehran-New York, Inc.

DATE 8/97
DWN S.H.W.
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GENERAL MOTORS CORP.
ENGINEERING EVALUATION OF ALTERNATIVES
CITY OF BUFFALO, ERIE COUNTY, NEW YORK

OU2 GROUNDWATER CONTAMINATION AREAS

FIGURE 4
PROJECT NO. 85740-100.000

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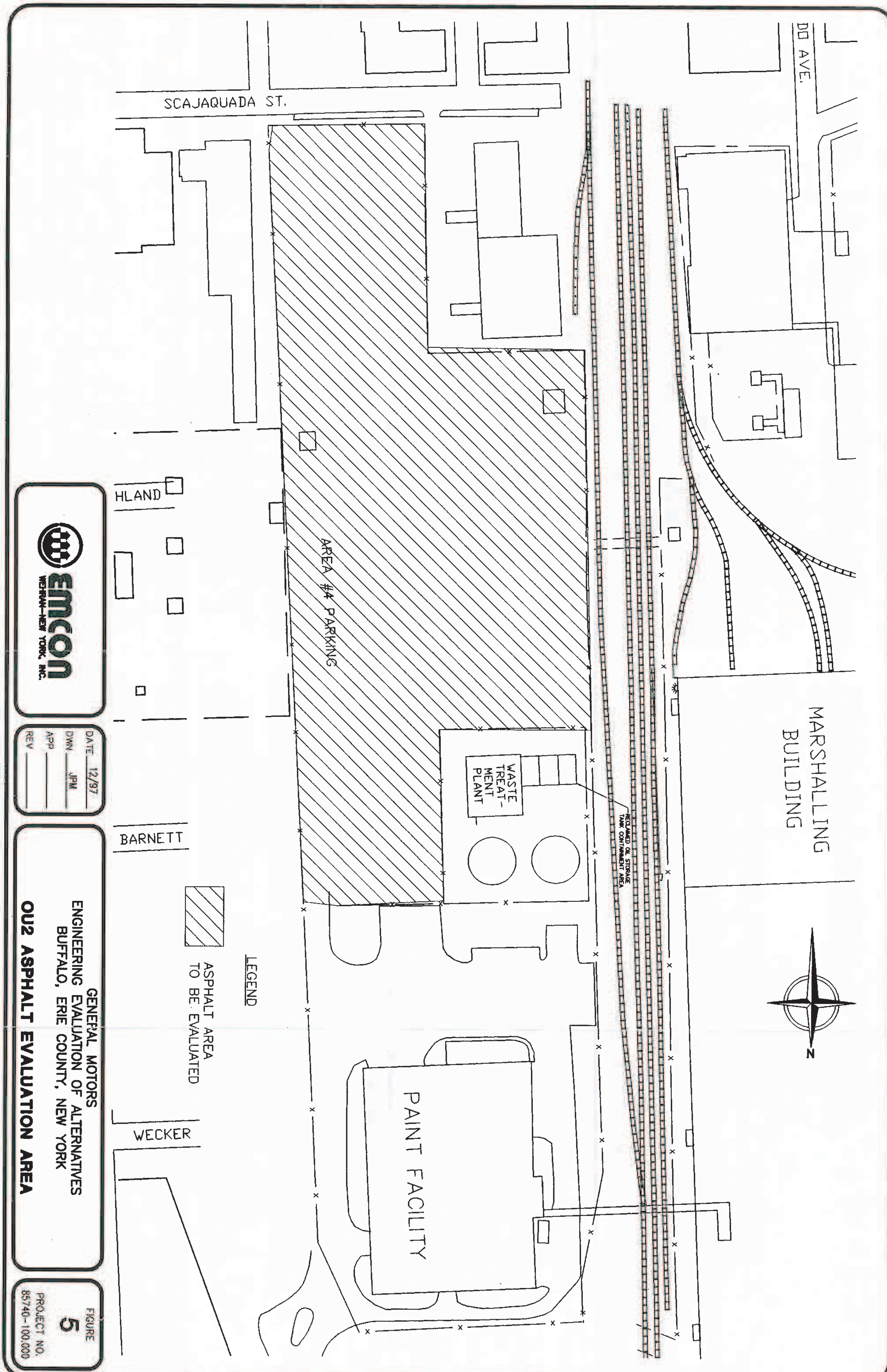

APPENDIX A

EXISTING DEED RESTRICTION

Buffalo, New York

BARGAIN AND SALE DEED

THIS INDENTURE ("Deed") is made as of this 28th day of February, 1994, between GENERAL MOTORS CORPORATION, a Delaware corporation, whose address is 3044 West Grand Boulevard, Detroit, Michigan 48202 ("Grantor"), and AMERICAN AXLE & MANUFACTURING, INC., a Delaware corporation, whose address is 1840 Holbrook Avenue, Detroit, Michigan 48212 ("Grantee").

WITNESSETH, that Grantor, in consideration of the sum of $10.00 and other valuable consideration paid by Grantor to Grantee, does hereby grant and release unto Grantee, its successors and assigns, forever, all of that certain plot, piece or parcel of land, with the buildings and improvements thereon erected, situate, lying and being in the County of Erie, State of New York, known and described as follows:

See Exhibit A attached hereto and incorporated herein by reference,

TOGETHER with all right, title and interest, if any, of Grantor in and to any streets and roads abutting the above described premises to the center lines thereof; TOGETHER with the appurtenances and all the estate and rights of Grantor in and to said premises (all of the foregoing being referred to below as the "Premises"); TO HAVE AND TO HOLD the Premises unto Grantee, its successors and assigns forever.

AND Grantor, in compliance with Section 13 of the Lien Law, covenants that Grantor will receive the consideration for this conveyance and will hold the right to receive such consideration as a trust fund to be applied first for the purpose of paying the cost of the improvement and will apply the same first to the payment of the cost of the improvement before using any part of the total of the same for any other purpose.

AND Grantor covenants that it has not done or suffered anything whereby the Premises have been incumbered in any way whatever, except as set forth on Exhibit B attached hereto and incorporated herein by reference.

AND Grantor and Grantee, for themselves and their respective successors and assigns, do further covenant and agree as follows:

1. Grantee acknowledges and agrees that, at any time after the date of this Deed and, except where emergency conditions require otherwise, upon reasonable prior notice, Grantor and its representatives may come upon the Premises pursuant to and in order to exercise its rights under that certain Asset Purchase Agreement, dated February 18, 1994 ("Agreement"), by and between Grantor and Grantee, and to undertake any and all actions authorized to be undertaken by Grantor pursuant to the Agreement, all in accordance with the terms and provisions of the Agreement.

2. Grantee acknowledges, warrants and agrees that it will not treat, store or dispose of any hazardous substances, hazardous wastes or toxic substances as those terms are defined under Environmental Laws (as defined in the Agreement), as may be amended from time to time, on, at or below the Premises and will maintain generator-only status; provided, however, that Grantee may: (i) temporarily, or for a limited time period, accumulate such substances or wastes as allowed under Environmental Laws without the necessity of a license or permit therefor; and (ii) use for lawful purposes and in a safe and environmentally appropriate and lawful manner commercial products which may contain such substances so long as, and to the extent that, Grantee does not adversely affect or impact any property or operation of Grantor which may occur in the vicinity of the Premises.

3. A. Grantee acknowledges, warrants and agrees that any contract, deed, transfer document or other instrument for transfer of any interest in, possession of, or right to use, the whole or any part of the Premises, through sale, lease, license, easement or otherwise will incorporate the obligations of Grantee hereunder and any subsequent user, occupant or transferee of the Premises shall be deemed to have assumed the obligations of Grantee as set forth in this Deed. Grantee further acknowledges that from and after the date of this Deed, the use of the Premises shall be restricted in perpetuity (or, if not permitted in perpetuity under law, then, for such shorter period of time as shall be the maximum period of time permitted under law), except as provided below, to industrial use and without access by members of the general public; provided, however, that customary office and other uses ancillary to the principal use of the Premises for industrial use shall not be deemed prohibited hereby and further provided, however, that such restriction may be eliminated as an encumbrance upon the Premises only with the written consent of Grantor.

B. In the event Grantee transfers all or any part of or any interest in the Premises to a third party, the transferee thereunder shall be deemed to have agreed not to sue Grantor and shall be deemed to have released Grantor from all liability for any environmental matter or condition involving the Premises, and the transferee shall be bound by the provisions of this Deed and shall be deemed to have agreed to be bound by and to have assumed Grantee's obligations under Article VI of the Agreement other than Grantee's indemnification obligations set forth in Section 6.12.3 of the Agreement; provided, however, that in the case of any such transfer of the Premises to an "Affiliate" (as such term is defined in the Agreement) of Grantee (whether or not from Grantee or otherwise), such Affiliate shall be deemed to have agreed to be bound by and to have assumed all of Grantee's obligations under this Deed and under Article VI of the Agreement, including, but not limited to, Grantee's indemnification obligations under Article VI of the Agreement; further, provided, however, that no such transfer (to a third party or to an Affiliate) will relieve Grantee of its obligations under this Deed and/or the Agreement. Grantee will indemnify and defend Grantor against any claims asserted by any transferee against Grantor which are contrary to the provisions of this Deed.

The terms and conditions of this Deed shall be directly enforceable by Grantor against Grantee and any subsequent user, occupant or transferee of the Premises and the same shall be deemed covenants running with the land binding upon Grantee and its successors in title and interest and assigns.

This conveyance is of premises which do not constitute all or substantially all of the assets of Grantor.

IT WITNESS WHEREOF, Grantor and Grantee have duly executed this Deed the day and year first above written.

WITNESSES:

Phyllis Rozof
* Phyllis Rozof

Patricia E. Hanratty
* PATRICIA E. HANRATTY

GENERAL MOTORS CORPORATION,
a Delaware corporation

By: John H. Monk Jr.
* JOHN H. MONK JR

Its: Finance Director, Saginaw Div.

"Grantor"

[signature]
* A. JEFFREY BEAR

B. Mathis
* B. G. MATHIS

AMERICAN AXLE & MANUFACTURING, INC.,
a Delaware corporation

By: Richard E. Dauch
*

Its: President + C.E.O.

"Grantee"

STATE OF MICHIGAN)
) SS.
COUNTY OF WAYNE)

On this 26th day of February, 1994, before me personally came John H. Monk, Jr., to me known, who, being by me duly sworn, did depose and say that he resides at 3900 Holland Rd, Saginaw, Mich, that he is the FINANCE DIR. SAGINAW DIV of General Motors Corporation, the corporation described in and which executed the foregoing instrument; and that he signed his name thereto by order of the Board of Directors of said corporation.

Marie B. Martinez
* MARIE B MARTINEZ, Notary Public
________ County, ________
My Commission Expires: ________

MARIE B. MARTINEZ
Notary Public, Wayne County, Mich.
My Commission Expires July 17, 1994

STATE OF MICHIGAN)
) SS.
COUNTY OF OAKLAND) * 1700 Rathmoor,

On this 26 day of February, 1994, before me personally came RICHARD E. DAUCH, to me known, who, being by me duly sworn, did depose and say that he resides at *BLOOMFIELD HILLS MICHIGAN 48304, that he is the PRESIDENT of American Axle & Manufacturing, Inc., the corporation described in and which executed the foregoing instrument; and that he signed his name thereto by order of the Board of Directors of said corporation.

[signature]
*________________, Notary Public
________ County, ________
My Commission Expires: ________

[SEAL]

*Type or print names beneath signatures.

Return by mail to:

Albert T. Adams, Esq.
Baker & Hostetler
3200 National City Center
1900 East Ninth Street
Cleveland, Ohio 44114

RESERVE THIS SPACE FOR USE OF RECORDING OFFICE

A9610A

EXHIBIT A

LEGAL DESCRIPTION

PARCEL "A"

ALL THAT TRACT OR PARCEL OF LAND situate, lying and being in the City of Buffalo, County of Erie and State of New York, being part of Lot Number 53, Township 11, Range 7 of the Holland Land Company's Survey and being more particularly bounded and described as follows:

BEGINNING at the point of intersection of the east right of way line of Cornwall Avenue (60 feet wide) with the south right of way line of East Delavan Avenue (66 feet wide); thence north 89°17'18" east along the south right of way line of said East Delavan Avenue, 801.86 feet to a point in the west line of Conrail (Erie Lackawanna Railroad); thence southerly along the west line of said Conrail the following bearings and distances: 1) south 00°27'30" west, 82.47 feet, 2) south 00°16'10" west 440.05 feet, 3) south 02°30'10" west, 68.84 feet, 4) south 03°47'20" west, 117.14 feet, 5) south 00°10'10" west, 441.45 feet, 6) south 01°58'00" west 391.16 feet, 7) south 00°03'18" west, 1.30 feet, 8) south 81°42'36" west, 52.00 feet, 9) south 02°55'45" east, 150.40 feet, 10) south 00°35'44" west, 274.97 feet to a point in the north right of way line of Scajaquada Street (width varies); thence north 88°35'48" west and along said north right of way line, 131.64 feet to a point in the east right of way line of Colorado Avenue (60 feet wide formerly Norfolk Avenue); thence north 00°05'54" west and along said east right of way line 112.13 feet to a point in the north right of way line of said Colorado Avenue; thence south 89°54'06" west and along said north right of way line, 60.00 feet to a point in the west right of way line of Colorado Avenue; thence south 00°05'54" east and along said right of way line, 113.64 feet to a point in the north right of way line of Scajaquada

Street; thence westerly along the north right of way line of said Scajaquada Street, the following bearing and distances: 1) a curve to the left with a chord bearing of south 75°17'03" west with a radius of 240.36 feet an arc distance of 57.96 feet, 2) south 68°22'26" west, 66.71 feet, 3) north 00°05'54" west, 2.71 feet, 4) south 89°54'06" west, 118.00 feet to a point in the east right of way line of Northumberland Avenue (60 feet wide); thence north 00°05'54" west and along said east right of way line, 187.46 feet to a point in the north right of way line of said Northumberland Avenue; thence south 89°54'06" west and along said north right of way line, 60 feet to a point in the west right of way line of said Northumberland Avenue; thence south 00°05'54" east and along said west right of way line 257.43 feet to a point in the north right of way line of Scajaquada Street; thence westerly along the north right of way line of said Scajaquada Street the following bearings and distances: 1) south 68°22'25" west, 40.85 feet, 2) along a curve to the right, with a chord bearing of south 75°26'05" west, a radius of 180.36 feet, an arc distance of 83.36 feet, 3) north 00°05'54" west, 2.81 feet, 4) south 89°54'06" west, 118.00 feet to a point in the east right of way line of said Cornwall Avenue; thence north 00°05'54" west and along said east right of way line 2103.00 feet to the point or place of beginning.

PARCEL "B"

ALL THAT CERTAIN PIECE OR PARCEL OF LAND situate, lying and being in the City of Buffalo, County of Erie and State of New York, being part of Lot Number 53, Township 11, Range 7 of the Holland Land Company's Survey and being more particularly, bounded and described as follows:

BEGINNING at a point in the east line of Conrail (Erie Lackawanna Railroad), 425.67 feet south of its intersection with the south right of way line of East Delavan Avenue (66 feet wide); thence north 89°17'30" east, 330.19 feet to a point; thence south 21°55'36" east, 128.32 feet to a point; thence south 01°18'00" west, 1446.61 feet to a point in the north right of way line of Scajaquada Street (60 feet wide); thence north 88°42'00" west and along said north right of way line, 172.46 feet to a point; thence north 01°00'00" east, 301.05 feet to a point; thence north 89°00'00" west, 200.00 feet to a point in the east line of said Conrail; thence north 01°00'00" east and along said Conrail, 1252.98 feet to the point or place of beginning.

PARCEL "C"

ALL THAT CERTAIN PIECE OR PARCEL OF LAND SITUATE, LYING AND BEING IN THE City of Buffalo, County of Erie and State of New York, being part of Lot Number 54, Township 11, Range 7 of the Holland Land Company's Survey and being more particularly bounded and described as follows:

BEGINNING at the point of intersection of the north right of way line of East Delavan Avenue (66 feet wide) with the east right of way line of Norfolk Avenue (66 feet wide); thence north 00°01'48" west along the east right of way line of said Norfolk Avenue, 451.86 feet to a point; thence north 89°58'12" east, 108.00 feet to a point; thence north 00°01'48" west, 116.28 feet to a point; thence north 89°58'12" east, 125.50 feet to a point in the west line of Conrail (Erie Lackawanna Railroad); thence southerly along said boundary and curve to the right with a radius of 1877.08 feet, a chord bearing of south 04°48'31" east an arc distance of 380.08 feet to a point of tangency; thence south 00°59'35" west and along said boundary 186.94 feet to a point in the north right of way line of said East Delavan Avenue; thence south 89°17'18" west and along said right of way line, 261.79 feet to the point or place of beginning.

PARCEL "D"

ALL THAT CERTAIN PIECE OR PARCEL OF LAND situate, lying and being in the City of Buffalo, County of Erie and State of New York, being part of Lot Number 53, Township 11, Range 7 of the Holland Land Company's Survey and being more particularly bounded and described as follows:

BEGINNING at the point of intersection of the west right of way line of Cornwall Avenue (60 feet wide) with the south right of way line of East Delavan Avenue (66 feet wide); thence south 00°05'54" east and along the west right of way line of said Cornwall Avenue, 761.98 feet to a point; thence south 89°54'06" west, 118.00 feet to a point; thence north 00°05'54" west, 760.72 feet to a point in the south right of way line of said East Delavan Avenue; thence north 89°17'18" east and along said right of way line, 118.00 feet to the point or place of beginning.

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EXHIBIT B

EXCEPTIONS

1. Easement contained in a deed made by Bardol Company, Inc. to Meyer Belinson dated May 1, 1936 and recorded May 7, 1936 in Liber 2526 of Deeds at Page 213.

2. Rights to construct and maintain water and sewer lines reserved in a deed made by the City of Buffalo to General Motors Corporation dated February 17, 1967 and recorded March 31, 1967 in Liber 7337 of Deeds at Page 407.

3. Right of Way for construction and use of a railroad switch contained in a deed made by Lorraine Morrison to Bardol Company, Inc. dated April 8, 1953 and recorded April 8, 1953 in Liber 5301 of Deeds at Page 69.

4. Right of Way reserved in a deed made by Bardol Company, Inc. to Buffalo Gravel Corporation, Inc., a New York corp, date May 1, 1947 and recorded July 8, 1947 in Liber 4150 of Deeds at Page 275, as assigned by assignment of right of way made by Bardol Company, Inc. to Arbee Corporation dated October 21, 1953 and recorded October 22, 1953 in Liber 5423 of Deeds at Page 513.

5. Agreement made between Arbee Corporation with Buffalo Gravel Corporation, a Delaware Corp, dated May 18, 1965 and recorded May 21, 1965 in Liber 7111 of Deeds at Page 49.

6. Easement and right of way contained in a deed made by Buffalo Gravel Corporation to General Motors Corporation dated May 21, 1965 and recorded May 25, 1965 in Liber 7112 of Deeds at Page 29.

7. Easement and right of way contained in a deed made by Bardol Company, Inc. to General Motors Corporation dated May 21, 1964 and recorded May 21, 1964 in Liber 7000 of Deeds at Page 157.

8. Easement made by General Motors Corporation to Buffalo Sewer Authority dated September 26, 1980 and recorded October 27, 1980 in Liber 8957 of Deeds at Page 87.

9. A portion of the premises was formally a part of Northumberland, Colorado, Norfolk and Scajaquada Streets. The same is subject to possible public and private easements.

10. Rights of the public and others in and to that portion of the premises located within the former bounds of Scajaquada Creek, now culverted, enclosed and/or concreted over.

11. Hazardous Waste Index filed in the Erie County Clerk's Office June 30, 1993, list Registry Site name Saginow Buffalo, Number 915152.

12. Those additional documents set forth on Exhibit 4.1.4 to the Asset Purchase Agreement described in this Deed.

13. All matters disclosed on survey prepared by Bissell, Stone Associates dated November 29, 1993, Job No. 47121, as updated.

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APPENDIX B

CALCULATION OF SITE-SPECIFIC ACTION LEVEL FOR LEAD

CALCULATION OF SITE-SPECIFIC ACTION LEVEL FOR LEAD

CALCULATION OF TARGET INTAKE

Acceptable intake is assumed to equal the intake that would be experienced by a worker exposed to the OSHA Permissible Exposure Limit (PEL) of 50 ug/m^3 over a workday. A worker is assumed to inhale 20 m^3/day[1]. The intake over a workday would therefore be:

$$\frac{50\ ug\ Pb}{m^3} \times \frac{20\ m^3}{day} = \frac{1000\ ug\ Pb}{day}$$

The site intake would be derived from inhalation (air) and incidental ingestion (soil). The maximum acceptable intake through these two pathways ([a] and [s]) is 1000 ug/day:

$$ug(a) + ug(s) = 1000$$

The intake from these pathways is estimated below.

Assuming a worker inhales 20 m^3/day, intake via inhalation can be estimated as follows:

$$C_a\left(\frac{ug}{m^3}\right) \times \frac{20\ m^3}{day} = ug(a)$$

$$ug(a) = C_{dust}\left(\frac{mg\ soil}{m^3}\right) \times C_s\left(\frac{ug\ Pb}{g\ soil}\right) \times 10^{-3}\frac{g}{mg} \times 20\frac{m^3}{day}$$

where C_{dust} is the ambient air dust concentration and C_s is the soil lead concentration.

Intake via ingestion is estimated using the default assumption that a worker incidentally ingests 50 mg/day of soil[1]:

$$ug(i) = C_s\left(\frac{ug}{gsoil}\right) \times \frac{50\ mgsoil}{day} \times \frac{10^{-3}\ g}{mg}$$

Setting the intake from the two pathways to total 1000 ug/day and solving for C_s:

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1 USEPA, 1991. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual. Supplemental Guidance. "Standard Default Exposure Factors." Interim Final. OSWER Directive: 9285.6-03.

$$\left(C_s \times C_{dust}\left(\frac{mg\ soil}{m^3}\right) \times 10^{-3} \times 20\,\frac{m^3}{day}\right) + \left(Cs \times 50\,\frac{mg\ soil}{day} \times 10^{-3}\right) = 1000$$

$$\frac{\left[C_s\ x\ 20C_{dust}\right] + \left[50\,C_s\right]}{1000} = 1000$$

$$10^6 = C_s\left[20C_{dust} + 50\right]$$

$$C_s = \frac{10^6}{20C_{dust} + 50}$$

ESTIMATION OF DUST CONCENTRATIONS

Dust concentrations can be estimated using a wind erosion model that assumes that dust will be entrained and suspended from exposed soil[2].:

$$E = \left[1.7 \times \frac{G}{1.5} \times \frac{(365 - H)}{235} \times \frac{I}{15} \times J\right]$$

where:

E = Emission rate (lbs/day-acre)
G = Silt content (fraction); varies between 4% and 10% (conservative estimate based on site observations)
H = No. days/year with ≥ 0.01 inch precipitation = 150 (upstate NY[3])
I = % time wind speed > 5.4 m/sec (12 mph) = 18.4 (average of values of 18.38 and 18.51 reported at two Buffalo monitoring stations[4]
J = Fraction total suspended particulates (estimated by model at 0.5)

$$E = (1.7)\left(\frac{G}{1.5}\right)(0.915)(1.23)(0.5) = G \times 0.638$$

Silt = 4% : 0.0255 lbs/ac/day = 3.32×10^{-11} kg/m^2-sec

Silt = 10% : 0.0638 lbs/ac/day = 8.30×10^{-11} kg/m^2-sec

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2 CEQA, 1993. South Coast Air Quality Management District. California Environmental Quality Act. Air Quality Handbook. April.

3 USEPA, 1988. Superfund Exposure Assessment Manual.

4 NYSDEC, 1979. New York State Continuous Air Monitoring Network Climatological Data. 5-Year Summary 1974-1978.

$$C_{dust}\ (\frac{kg}{m^3}) = E\ (\frac{kg}{m^2 - \sec})\ x\ SF\ (\frac{\sec}{m})$$

where:

C_{dust} = Ambient air dust concentration (mg/m^3)
E Emission rate (kg/m^2-sec; from above)
SF = Suspension factor (sec/m)[5] = 15

Silt = 4%: CA = 5.0×10^{-10} kg/m^3 = 0.05 mg/m^3
Silt = 10%: CA = 1.2×10^{-9} kg/m^3 = 0.12 mg/m^3

ESTIMATION OF ACTION LEVEL

As detailed above, the action level for lead in site soils can be calculated as follows:

$$C_s = \frac{10^6}{20C_{dust} + 50}$$

The action level is dependent on the ambient dust concentration. The action levels that would be derived using different assumptions of the dust level are listed below.

Dust Concentration (mg/m^3)	Basis	Soil Lead Action Level (mg/kg)
0.05	Modeled assuming 4% silt	20,000
0.12	Modeled assuming 10% silt	19,100

[5] NYSDEC, 1991. New York State Air Guide - 1. Guidelines for the Control of Toxic Ambient Air Contaminants. Division of Air Resources.