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FEASIBILITY STUDY AND CORRECTIVE MEASURES STUDY

SPAULDING COMPOSITES COMPANY FORMER INDUSTRIAL PLASTICS DIVISION 310 WHEELER STREET TONAWANDA, NEW YORK

Prepared For:

Spaulding Composites Company, Inc.
One Monogram Place
Rochester, New Hampshire

September 1999

Prepared By:

LEADER ENVIRONMENTAL, INC.
2300 Wehrle Drive
Williamsville, New York 14221

LEADER

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EXECUTIVE SUMMARY

This report summarizes the Feasibility Study/Corrective Measures Study ("FS/CMS"), conducted by Leader Environmental, Inc. ("Leader") for the Spaulding Composites Company, Inc. ("Spaulding") Tonawanda, New York Site. The Site is the location of Spaulding's former Industrial Plastics Division vulcanized-fiber and composite laminate manufacturing facility.

In June 1999, Leader completed a Supplemental RI/RFI that included a final list of seventeen (17) SWMUs and AOCs requiring remedial action at the Site. The AOCs and SWMUs were grouped into four (4) Operable Units ("OUs"), for the purpose of the FS/CMS, and are summarized below:

OU1: Regulated Landfill Wastes

SWMU 7 - Resin Drum Landfill
SWMU 8 - Laminant Dust Landfill

OU2: PCB-Contaminated Wastes

SWMUs 11 & 23 - Sludge Pond and Tank Farm Area
SWMU 12 - Sludge Settling Pond/Former Fuel Oil Tank ✓ PCBs also found in SWMU 14 and a portion of SWMU 13. Some NAPL found in SWMU 14.
SWMU 38 - Therminol Building
AOC 48 - Former Transformer Explosion Area

OU3: Petroleum-Contaminated Wastes

SWMU 36 - Former Tank Area — delineated as VOC contamination on
SWMU 13 - Sludge Settling Pond ✓ Figure 1-2, not petroleum contam.

OU4: Multiple Contaminant Wastes

AOC 35 - Lab Waste Storage Area ✓ The Limited In-Situ Bio program
AOC 45 - Rail Spur (List) includes SWMUs/AOCs in this
AOC 46 - Drum Storage Area group. This group, however,
AOC 47 - Bulk Chemical Unloading Area has been selected
SWMU 3 - Zinc Chloride Sludge Container Storage Area for removal. Perhaps
SWMU 5 - Empty Drum Storage Area SWMUs 5, 14 & AOC 45 should be moved
SWMU 14 - Sludge Settling Pond to OU 3.
SWMU 26 - Paper Sludge Application Area

Initially, broadly defined general response actions were defined for each OU, where a response was deemed necessary to protect public health or the environment based on the

RI/RFI conducted at the Site. Technologies for each general response action were identified and preliminarily screened solely on the basis of their effectiveness and technical feasibility (Phase I FS). The technologies that were retained through this initial screening process were then used to develop remedial alternatives for the Site.

The Phase II FS screening involved evaluating these remedial alternatives primarily on the basis of effectiveness and implementability for each OU. Those alternatives passing this second phase of screening were assembled into the following six (6) remedial alternatives for the OUs at the Site.

Alternative 1:	No Action;
Alternative 2:	Limited Action;
Alternative 3:	Excavation and Off-Site Landfill Disposal;
Alternative 4:	Consolidation and Capping
Alternative 5:	Excavation and Ex-Situ Bioremediation; and
Alternative 6:	In-Situ Bioremediation.

Treatability studies were completed to further assist in the selection of appropriate remedial alternatives for each OU. The results from this study verified the effectiveness of ex-situ bioremediation with respect to the PCB-contaminated soils at the Site.

During the Phase III FS, the potential remedial alternatives were subjected to a detailed evaluation with respect to each OU, including the following criteria: 1) overall protection of human health and the environment; 2) compliance with New York State Standards, Criteria and Guidelines (SCGs); 3) long-term effectiveness and performance; 4) reduction of toxicity, mobility, and volume; 5) short-term effectiveness; 6) implementability; and 7) cost. Alternatives were then compared to select an environmentally sound and cost-effective remedial action for each OU at the Site. State and community acceptance of the results of the FS/CMS will be evaluated prior to the NYSDEC's issuance of a Record of Decision ("ROD").

The remedial costs associated with each alternative were estimated based on vendor information, engineering cost estimates, generic unit costs and prior experience. The total present worth costs for each alternative were estimated using a 5 percent discount rate for the time period associated with implementation of the specific alternative, not to exceed 30 years.

Based upon the evaluation of the six (6) alternatives with respect to the seven evaluation criteria, the following alternatives are recommended for the OUs.

OU1 - Alternative 3 (Excavation and Off-Site Disposal)

Under this alternative, the wastes associated with the Resin Drum Landfill and the Laminant Dust Landfill would be excavated and disposed of at an off-Site disposal facility. The excavated areas would be backfilled and restored to grade. This alternative is recommended for OU1 for the following reasons:

1) This alternative satisfies the requirements for protection of human health and the environment, as well as satisfying the applicable SCGs.

2) The quantity of soil and waste being disrupted as a result of the remedial actions is relatively small, thereby limiting the effects of the remediation upon worker health and the surrounding community.

3) The long-term effects of placing this material in a new on-Site containment cell would compromise future development options for the SCS.

4) The costs of implementing other feasible alternatives for this OU were greater than the costs for implementing the recommended alternative.

This alternative satisfies all of the remedial action objectives for OU1 in a cost-effective manner in comparison with the other alternatives evaluated. Media requiring remediation are addressed and exposure and migration pathways are eliminated or controlled.

OU2 - Alternative 5 (Excavation and Ex-Situ Bioremediation)

✓ The breakdown products need to be evaluated for confirmatory sampling. If the reagent strips Cl from the PCB molecule, PCBs will be low in concentration but biphenyl will not.

This alternative involves excavation of the PCB-contaminated soils associated with OU2, consolidation of this material inside an area of the plant building, biotreatment of the soils and backfilling the excavations with the treated soil. This alternative is recommended for OU2 for the following reasons:

1) This alternative satisfies the requirements for protection of human health and the environment, as well as satisfying the applicable SCGs.

2) The quantity of soil being disrupted as a result of the remedial action is relatively small, thereby limiting the effects of the remediation upon worker health and the surrounding community.

3) The costs of implementing other feasible alternatives for OU2 were greater than the costs for implementing the recommended alternative.

This alternative satisfies all of the remedial action objectives for OU2 in a cost-effective manner in comparison with the other alternatives evaluated. Media requiring remediation are addressed and exposure and migration pathways are eliminated or controlled.

OU3 - Alternative 6 (In-Situ Bioremediation)

✓ Soils may be too tight to implement. Alternative screened out at O-Col-O. If the Limited In-Situ Bio program does not work, will Ex-Situ on this O.U be conducted?

This alternative involves the in-place biotreatment of the soils associated with OU3. This alternative is recommended for OU3 for the following reasons:

1) This alternative satisfies the requirements for protection of human health and the environment, as well as satisfying the applicable SCGs.

2) No soil is disrupted as a result of the remedial actions, limiting the effects of the remediation upon worker health and the surrounding community.

3) The long-term effects of placing this material in a new on-Site containment cell would compromise future development options for the SCS.

4) The costs of implementing other feasible alternatives for OU3 were greater than the costs for implementing the recommended alternative.

This alternative satisfies all of the remedial action objectives for OU3 in a cost-effective manner in comparison with the other alternatives evaluated. Media requiring remediation are addressed and exposure and migration pathways are eliminated or controlled

OU4 - Alternative 3 (Excavation and Off-Site Disposal)

The soil associated with OU4 would be excavated and disposed of at an off-Site disposal facility. The excavated areas would be backfilled and restored to grade. This alternative is recommended for OU4 for the following reasons:

1) This alternative satisfies the requirements for protection of human health and the environment, as well as satisfying the applicable SCGs

2) The quantity of soil being disrupted as a result of the remedial action is relatively small, thereby limiting the effects of the remediation upon worker health and the surrounding community.

3) This alternative greatly reduces scheduling delays associated with future development of the SCS.

4) The costs of implementing other feasible alternatives for OU4 were greater than the cost associated with the recommended alternative.

This alternative satisfies the remedial action objectives for OU4 in a cost-effective manner in comparison with the other alternatives evaluated. Media requiring remediation are addressed and exposure and migration pathways are eliminated or controlled.

Following public acceptance of the FS/CMS and approval of the ROD(s), detailed remedial workplans will be developed for each OU. These workplans will include a description of the following:

1) Site Preparation and Mobilization;
2) Cleanup Activities;
3) Target Analytes for Each Area;
4) Identification of Cleanup Levels;
5) Sampling and Analytical Testing Protocols;
6) Quality Assurance/Quality Control Procedures;
7) Decontamination Protocols; and
8) Reporting Requirements.

1 INTRODUCTION

This report summarizes the Feasibility Study/Corrective Measures Study ("FS/CMS") conducted by Leader Environmental, Inc. ("Leader") for the Spaulding Composites Company, Inc. ("Spaulding") Tonawanda, New York Site (hereafter referred to as "SCS" or "the Site"). The Site is the location of Spaulding's former Industrial Plastics Division vulcanized-fiber and composite laminate manufacturing facility. Figure 1 presents a Site Location Map and Figure 2 is a Site Plan.

1.1 BACKGROUND

Over the period 1911 through 1992, Spaulding operated an industrial manufacturing facility at the Site that used a variety of regulated materials (see the June 1999 Supplemental RI/RFI). The potential for on-Site releases of these materials prompted a USEPA-sponsored Resource Conservation and Recovery Act ("RCRA") Facility Assessment ("RFA"). This RFA was conducted by Camp, Dresser and McGee ("CDM") in the 1980s, and identified thirty-six (36) Solid Waste Management Units ("SWMUs") and Areas of Concern ("AOCs") at the Site.

Subsequently, Spaulding voluntarily proposed to concurrently implement a Remedial Investigation/Feasibility Study ("RI/FS") and a RCRA Facility Investigation and Corrective Measures Study ("RFI/CMS") program. Spaulding agreed to perform the RI/RFI components under the terms and conditions of "Schedule B" of the RCRA Corrective Action Order on Consent (File No. 91-18-R9-3425-91-04) and the RI/FS Order on Consent (File No. B9-0399-92-03), entered into by Spaulding and the New York State Department of Environmental Conservation ("NYSDEC").

Spaulding retained Conestoga Rovers Associates, Inc. ("CRA") to perform the RFI/RI that was finalized in September 1998. As part of its review process, NYSDEC identified additional areas requiring investigation or re-sampling. In June 1999, Leader completed a

Supplemental RI/RFI report that included a final list of seventeen (17) SWMUs and AOCs requiring remedial action at the Site. These areas are summarized below.

SWMU 7	Resin drum landfill;
SWMU 13	Sludge settling pond and former grinding oil tank;
SWMU 5, AOC 46 & 47	Empty drum storage dock, drum storage dock and bulk Chemical unloading area;
AOC 45	Rail Spur;
SWMU 36	Underground/above ground storage tanks;
AOC 48	Transformer explosion area;
SWMU 8	Laminant dust landfill;
SWMU 38	Therminol building area;
SWMU 23 and 11	Aboveground storage tanks and sludge settling pond;
SWMU 12	Sludge settling pond/former fuel oil tanks;
SWMU 14	Fiber waste sludge settling pond;
SWMU 26	Paper sludge land application area;
SWMU 3	Zinc chloride sludge container storage area; and
SWMU 35	Lab waste storage area.

On behalf of Spaulding, Leader submitted a July 12, 1999 letter to NYSDEC that proposed grouping the AOCs and SWMUs into four (4) Operable Units ("OUs"), for the purpose of the FS/CMS. The groupings were subsequently approved during a tele-conference between the NYSDEC and Leader and are discussed in Section 2.0.

In response to NYSDEC comments regarding the Supplemental RI/RFI, NYSDEC and Leader completed groundwater sampling of Well A and the former Production Well (BW-3C) on August 5, 1999. The NYSDEC requested the re-sampling of BW-3C to resolve an order-of-magnitude difference in the analytical testing results from the two rounds of sampling collected during the CRA RFI/RI. Well A is located along the northeast perimeter of the Site on Wheeler Street and was re-sampled to resolve a discrepancy between NYSDEC and Leader analytical testing results. In accordance with NYSDEC's request, the sampling was completed prior to the completion of the FS/CMS. The results were submitted to NYSDEC as an addendum to the Supplemental RI/RFI Report and confirmed the conclusion of the Supplemental RI/RFI that migration of contaminants in groundwater is not occurring at the Site.

1.2 BASIS FOR FS/CMS

At a November 1998 meeting between NYSDEC and Spaulding, NYSDEC indicated that because the FS/CMS Report would need to satisfy both NYSDEC's FS guidance as well as RCRA CMS requirements, the more stringent of the two evaluation approaches (i.e., FS versus CMS) should be applied to this project. Thus, Leader has conducted this FS/CMS in general accordance with NYSDEC FS guidance documents including the following:

- 40 CFR Part 300 "National Oil and Hazardous Substances Pollution Contingency Plan ("NCP") Final Rule;
- United States Environmental Protection Agency ("USEPA") "Guidance for Conducting Remedial Investigation/Feasibility Studies Under CERCLA", October 1988;
- 6 NYCRR Part 373 "Final Status Standards For Owners and Operators of Hazardous Treatment, Storage and Disposal Facilities", January 1995;
- 6 NYCRR Part 375 "Inactive Hazardous Waste Site Regulations";
- May 15, 1990 NYSDEC Technical and Administrative Guidance Memorandum ("TAGM") #4030 entitled, "Selection of Remedial Actions at Inactive Hazardous Waste Sites", and subsequent revisions; and
- January 24, 1994 NYSDEC TAGM entitled, "Determination of Soil Cleanup Objectives and Cleanup Levels".

These documents are in general agreement; however, the May 1990 NYSDEC TAGM states that cost should not be considered as an evaluation criteria in the Screening of Technologies (Phase I FS) or the Preliminary Screening of Alternatives (Phase II FS). However, 6NYCRR Part 375 regulations do consider cost-effectiveness and technical feasibility to be factors that may be included in remedy selection. As a result, in preparation of this FS/CMS report, Leader followed the NYSDEC-TAGM relative to this issue. However, cost was considered in subsequent phases of remedy evaluation. Additionally, based on conversations with NYSDEC personnel, the NYSDEC requested that the May 15, 1990 TAGM scoring tables not be used in the Phase II FS nor the Detailed Analysis of Alternatives (Phase III FS).

1.3 PURPOSE OF THE FS/CMS

The purpose of this FS/CMS is to evaluate and identify remedial action alternatives, which cost-effectively eliminate exposure pathways, and therefore, limit the risks to human health and the environment resulting from analytes at the SCS. This report has been prepared to fulfill the reporting requirements of the RI/FS Work Plan for the Resin Drum Landfill, the Site-Wide RFI Work Plan, and the previously mentioned Orders on Consent.

1.4 FS/CMS OVERVIEW

This FS/CMS report identifies general response actions, evaluates remedial technologies, and formulates and evaluates potential remedial action alternatives. The FS/CMS process involved the identification of specific response actions, where a response was deemed necessary to protect public health and the environment based on the 1998 RFI/RI and the 1999 Supplemental RI/RFI. Technologies for each response action were identified and preliminarily screened on the basis of their effectiveness and technical feasibility. The technologies that were retained through this initial screening process (i.e., the Phase I FS) were used to develop remedial alternatives for the Site.

The FS/CMS then evaluated these remedial alternatives on the basis of effectiveness and implementability (Phase II FS). Those alternatives passing the Phase II FS underwent a detailed evaluation which considered: 1) overall protection of human health and the environment; 2) compliance with New York State Standards, Criteria and Guidelines

("SCGs"); 3) long-term effectiveness and performance; 4) reduction of toxicity, mobility, and volume; 5) short-term effectiveness; 6) implementability; and 7) cost. In addition, the anticipated future use of the Site as an industrial facility was also considered. Alternatives were qualitatively compared to identify environmentally sound and cost-effective remedial actions for the SCS. State and community acceptance of the results of this FS/CMS will be evaluated prior to the NYSDEC's Record of Decision ("ROD"). Based on discussions with local officials who are in contact with members of the community, industrial reuse of the facility shall be acceptable to the community due to the creation of jobs and overall economic revitalization. *

1.5 REPORT ORGANIZATION

The information contained in this report is in general accordance with NYSDEC and USEPA requirements and the format is in general accordance with "USEPA Guidance for Conducting RI/FS Under CERCLA" (Table 6-5 EPA/540/G-89/004, October, 1988).

The organization of this FS/CMS Report is as follows:

Section 1 - Introduction;
Section 2 - Identification and Screening of Technologies;
Section 3 - Development and Screening of Alternatives;
Section 4 - Treatability Studies;
Section 5 - Detailed Analysis of Alternatives;
Section 6 - Recommended Remedial Alternatives;
Section 7 - Limitations and Use of Report; and
Section 8 - References.

2 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

This section includes the identification and screening of remedial technologies considered for the SCS. Initially, this section summarizes the findings of the 1998 RFI/RI Report and the June 1999 Supplemental RI/RFI for the SCS, as it applies to the FS/CMS process. This section also includes a discussion of the remedial action objectives and general response actions for each of the OUs. Finally, feasible technologies and process options are identified and screened to provide a basis for the subsequent development of OU-specific remedial alternatives, discussed in Section 3.0.

2.1 SUMMARY OF MEDIA TO BE REMEDIATED

The media to be remediated at the SCS are the surface and subsurface soil and waste materials that exceed applicable SCGs. However, as concluded in the Supplemental RI/RFI, the presence of Site-related contaminants in the Site soils and groundwater does not pose a significant threat to human health or the environment based on the current Site use. Potential for human exposure to the impacted media is limited due to the absence of ground invasive activities at the Site and the presence of the Site fence and security. Nevertheless, certain remedial activities, engineering and/or institutional controls are required to limit accidental exposure to anticipated future industrial workers at the Site.

The Supplemental RI/RFI concluded that groundwater contamination at the Site is limited to small, isolated areas. These areas of limited groundwater contamination are addressed in this FS/CMS through the soil remediation alternatives.

Analytical data collected from the monitoring wells and Production Well C at the SCS indicate that the existing clay layer, along with the building foundations and other man-made Site features, have limited the migration of analytes in groundwater. Located below the SCS is a natural clay layer that limits the vertical migration of analytes from the various SWMUs and AOCs into the bedrock groundwater bearing zone. Due to the low permeability clay soils present at the Site (i.e., estimated permeability less than 10^{-7}

centimeters per second), analytes have also experienced limited horizontal migration beyond the original limits of the source areas. Additionally, the 1998 RI/RFI indicated that the Site utility bedding materials are not an off-Site migration pathway for the analytes of concern.

Based on the sampling of storm water outfalls conducted at the Site, storm water runoff is not a significant route of off-Site migration of contaminated sediments. This condition is exhibited by the lack of sediments in the off-Site storm sewer and the lack of elevated levels of Site-related analytes in the storm water. The existing State Pollutant Discharge Elimination System ("SPDES") permit and on-Site water treatment system should become obsolete once the remedial alternatives presented in Section 6.0 are fully implemented.

The 1998 RFI/RI and the 1999 Supplemental RI/RFI developed conservative remediation volumes based on the sampling and testing programs and comparison to applicable SCGs. For the purposes of the FS/CMS, these volumes were further reviewed and the AOC 48, SWMU 38 and SWMU 36 soil volumes were reduced slightly based on the following rationale.

Groundwater elevation data in each of these areas were substantially above the depth of soil remediation presented in the 1998 RFI/RI Report. In each of these areas, the primary contaminants are petroleum-based (e.g., PCB containing oil and BTEX compounds), would not readily dissolve in water and would have specific gravity's below 1.0 (i.e., the contaminants would tend to float on top of the groundwater table). Although it is anticipated that the groundwater levels fluctuate in each of these areas allowing contaminants to migrate downward as the water level drops, it appears that the existence of low permeability soils at the Site combined with the properties of the contaminants themselves, indicate that the contaminant levels detected by CRA at depths 10 feet below the top of groundwater are probably unrepresentative. Thus, Leader applied a conservative assumption in each of these areas by estimating that the actual vertical extent of the petroleum-based compounds in each of these areas is no more than 5 feet below the measured groundwater elevation.

This assumption reduced the estimated volume of soil requiring remediation by the following amounts:

Area	**CRA Volume (CY)**	**Revised Volume (CY)**	**% Reduction**
AOC 48	711	592	17%
SWMU 38	785	585	25%
SWMU 36	23,333	14,000	40%

Ultimately, actual volumes to be remediated will be determined in the field (i.e., field screening and/or analytical testing) during the implementation of the selected remedial action for each OU. Table 2-1 provides a summary of the SWMUs and AOCs and the associated contaminants and media of concern. The 1998 RFI/RI and 1999 Supplemental RI/RFI provide details on the operational histories at each SWMU/AOC.

2.2 REMEDIAL ACTION OBJECTIVES

General remedial goals are guided by the National Contingency Plan, 40 CFR 300.68, which specifies that the objective of every remedial action is to "mitigate and minimize damage to and provide adequate protection of public health, welfare or the environment". The following Site-specific remedial objectives were developed for the SCS:

1. Limit incidental ingestion of soil/waste material containing analyte concentrations which exceed SCGs;
2. Limit dermal/skin contact with soil/waste material containing analyte concentrations which exceed SCGs; and
3. Limit the potential for releases of analytes to groundwater that would result in an exceedence of water quality SCGs.

Due to the natural confining barriers to contaminant migration through groundwater and the access controls currently in place, these remedial action objectives are satisfied under the current conditions. However, Spaulding's desire to prepare the Site for redevelopment requires that these remedial action objectives be satisfied under a future industrial use scenario. Note that the SCGs applied to the SCS were developed using very conservative exposure assumptions based on children ingesting or coming in contact with soil. Thus, the goal will be to satisfy SCGs; however, the anticipated industrial reuse of the Site and the technical and cost-effectiveness of the remedy will also considered.

2.3 GENERAL RESPONSE ACTIONS

General response actions describe those actions that satisfy the remedial action objectives. Based on information gathered during the RFI/RI, general response actions, or classes of actions, were identified for soil/waste and groundwater. The response actions are considered applicable if they generally address the environmental concerns identified in Section 2.2.

Table 2-2 summarizes the general remedial response actions. General response actions considered include the "no action" alternative, which will serve as a baseline against which other remedial measures can be compared. The "no action" alternative is mandated for inclusion by the Superfund Amendments and Reauthorization Act ("SARA"). Additionally, potential remedial technologies are identified for each general response action.

2.3.1 General Response Actions for Soil/Waste

General response actions for soil and waste material address the pathways of ingestion, dermal contact, leaching and fugitive dust transport. Institutional controls such as deed restrictions and fencing are possible responses to contamination in the soil. Containment would reduce the potential for exposure, leaching from percolation and limit the transport of contaminants by air. Excavation and treatment or disposal of soil would immobilize or separate soil contaminants and would remove the source of contamination.

2.3.2 General Response Actions for Groundwater

General response actions appropriate for groundwater contamination under a future industrial use scenario include monitoring and source removal. Sampling of groundwater completed during the 1998 RFI/RI, the 1999 Supplemental RI/RFI and the August 5,1999 sampling event indicate that analytes are not migrating offsite ✓ in groundwater.

Soil remediation at the seventeen AOCs and SWMUs requiring remediation and periodic groundwater monitoring would limit the migration, remove the contaminants from the groundwater and provide data on groundwater quality. Thus, this FS/CMS will consider soil and waste remedial technologies as latent groundwater response actions.

2.4 IDENTIFICATION OF OPERABLE UNITS

For the purposes of this report, the SWMUs and AOCs at the Site that require remediation have been divided into the following four (4) OUs:

OU1: Regulated Landfill Wastes
- SWMU 7 - Resin Drum Landfill
- SWMU 8 - Laminant Dust Landfill

OU2: PCB-Contaminated Wastes
- SWMUs 11 and 23 - Sludge Pond and Tank Farm Area
- SWMU 12 - Sludge Settling Pond/Former Fuel Oil Tank
- SWMU 38 - Therminol Building
- AOC 48 - Former Transformer Explosion Area
- SWMU 13 - Sludge Settling Pond (included on Figure 6-2) ✓

OU3: Petroleum-Contaminated Wastes
- SWMU 36 - Former Tank Area
- SWMU 13 - ~~Sludge Settling Pond~~ Grinding Oil Tank ✓

OU4: Multiple Contaminant Wastes
- AOC 35 - Lab Waste Storage Area
- AOC 45 - Rail Spur
- AOC 46 - Drum Storage Area
- AOC 47 - Bulk Chemical Unloading Area
- SWMU 3 - Zinc Chloride Sludge Container Storage Area
- SWMU 5 - Empty Drum Storage Area
- SWMU 14 - Sludge Settling Pond ← PCB & petroleum contamination. Include with OU's 2 & 3? ✓
- SWMU 26 - Paper Sludge Application Area

These four OUs will be addressed in general accordance with the FS/CMS guidelines as described in Section 1.2 of this report. As previously stated, these groupings were verbally approved by NYSDEC in July 1999.

2.5 RATIONALE FOR GROUPING

In general, according to Section 3.0 of TAGM #4030, remedial alternatives are developed when: 1) volumes or areas of environmental media (air, water, soil/waste) are identified where contamination is present; and 2) the remedial action alternatives and associated technologies (including alternative treatments) are screened to identify effective hazardous waste and media treatments. These two activities are used to group technologies and the media to which they will be applied into OUs.

Based on TAGM #4030, OUs were identified for this FS/CMS based on the following rationale:

1. The selected SWMUs and/or AOCs within each OU have similar types of media, nature of contaminants and concentration levels (e.g., same PCB arochlor or petroleum contamination);

2. The selected SWMUs and/or AOCs within each OU are in proximity to one another, facilitating implementation; and/or

3. The selected SWMUs and/or AOCs within each OU have similar volumes of contaminated media.

2.6 IDENTIFICATION OF APPLICABLE REMEDIAL TECHNOLOGIES

Table 2-3 summarizes the applicable remedial technologies and process options for soil and waste. These applicable remedial technologies include a specific list of technologies available within each of the general remedial response actions identified above.

Contaminated soil remedial technologies can be used to contain, remove, or treat the soil and waste at the Site. The following soil and waste remedial technologies were initially considered.

No Action

"No action" was considered for comparison purposes.

Institutional Actions

Institutional actions involve access restrictions and/or use controls. Such restrictions or controls would include deed restrictions and fencing-off areas of contaminated soil and waste.

On-Site Treatment

On-Site treatment is a general group of technologies that involves treating soil or waste material through the use of chemical or biological agents or physical manipulations, which degrade, remove, or immobilize contaminants. Some of these treatment technologies can be implemented insitu, without removing the soil/waste, while others are more effective using an exsitu treatment process.

The In-situ treatment process considered for SCS is bioremediation. In-Situ Bioremediation ("ISB") is a technique for treating zones of soil contamination in place by microbial degradation. The technology involves enhancing the natural biodegradation process by injecting nutrients, oxygen, and cultured bacterial strains or by introduction of genetically engineered microbes. Bioremediation can provide substantial reduction in organic contaminant levels in soils, without the cost of soil excavation. The technique is well suited for soil contaminated by petroleum by-products. A number of site-specific factors, such as site geology, soil characteristics, and aquifer characteristics, are critical in evaluating the implementability of this technology.

Ex-Situ Bioremediation ("ESB") is the biological treatment of a removed contaminated matrix by microbial degradation. An ESB system at the Site would include the construction of a "heap soil" reactor. Excavated soils would be transferred to a selected, accessible building on-Site and stockpiled. The soil would be rendered inert and available to be backfilled into the excavation areas. A number of site-specific factors, such as soil characteristics, are critical in evaluating the implementability of this technology.

Thermal treatment, or incineration, can be used on-site to destroy organic contaminants in liquid, gaseous and solid waste streams. The most common incineration technologies include thermal desorption, liquid injection, rotary kiln, multiple hearth, fluidized bed and pyrolysis.

Partial or Complete Removal and Off-Site Disposal

Excavation and removal of soils and wastes is used extensively in the remediation of hazardous waste Sites. This technology includes excavating, loading and transporting soil and waste material to an off-Site location for disposal or treatment. Generally, the excavated areas are backfilled with clean fill and graded. This technology usually involves the use of conventional heavy construction equipment with special procedures for worker safety and containment of contamination during excavation and transport.

Containment

Containment of contaminated soils and wastes involves the on-Site construction of a new landfill, upgrading existing landfills or containing an area through capping or vertical barriers. This technology could include consolidation of soil and wastes to a specific area of the Site followed by capping and containment technologies. This containment cell would be excluded from future Site development plans. This new construction or upgrading would be completed in general accordance with NYSDEC Part 360 regulations.

✓ Include comments on alternative 4 on page 3.3

Part 360 requirements include, among other specifications, a composite capping system and long-term monitoring. ✓ A modified 360 cap could be also constructed. Also, areas like the resin drum landfill could be capped in place [illegible] the need for building a landfill cell. Such an option is not included in Alternative 4.

2.7 SCREENING OF TECHNOLOGIES

An initial screening of potentially applicable remedial technologies and process options for the SCS was completed based on technical implementability for each OU (i.e., cost criteria were not considered in this evaluation). Table 2-4 summarizes this screening of technologies and process options. Technical implementability, as per USEPA 540 G-89/004, involves an evaluation of each technology based on the following:

- Site conditions and characteristics;
- Physical and chemical characteristics of contaminants to evaluate the compatibility of various technologies; and
- Performance, reliability, and operating problems.

This initial screening process eliminated on-Site thermal treatment technologies that were considered difficult to implement, particularly given the surrounding residential community on two sides of the facility, and are not expected to achieve as high a level of effectiveness as the other technologies considered. The technologies with the greatest potential for applicability to the Site characteristics and constituents of concern have been retained and are evaluated further in the subsequent sections of this report.

2.8 EVALUATION OF TECHNOLOGIES & PROCESS OPTIONS

The technologies and process options considered to be "implementable" were evaluated on the basis of effectiveness and implementability. Relative cost was also reviewed; however, cost was not used as the sole criteria to screen-out any of the technologies or process options. A summary of the evaluation criteria is presented below.

Effectiveness

Effectiveness refers to the degree to which a technology achieves the remedial action objectives. As this evaluation pertains to technologies rather than overall remedial alternatives, a technology need not achieve the remedial objective in its entirety to be considered effective. Effective technologies may be combined with other complementary technologies, if required, to form effective alternatives to achieve the remedial objectives. Thus, this evaluation is based upon the effectiveness of each technology at its intended site-specific function.

Implementability

Implementability encompasses both the technical and administrative feasibility of implementing a technological process. Technical implementability is used to initially screen technologies and to eliminate those that are clearly ineffective or unworkable at a site. Thus, this subsequent and more detailed evaluation of technologies places greater emphasis on the institutional aspects of implementability, such as the ability to obtain the necessary permits for off-site actions, the availability of treatment, storage and disposal services (including capacity), and the availability of necessary equipment and skilled workers to implement the technology.

Cost

Relative capital and operation and maintenance ("O&M") costs were estimated during this stage of the screening process. The cost estimates were made on the basis of published unit costs and vender estimates, and each process option is evaluated as to whether costs are high, medium or low relative to other process options of the same technology type.

Based on the above evaluation, the technologies and process options that passed the screening phase (see Section 2.7) were retained through the evaluation phase. All of the remaining technologies and process options were considered effective and implementable and had relatively comparable costs per unit volume of soil/waste.

2.9 EVALUATION RESULTS

Based on the screening and evaluation processes discussed above (Phase I FS), the following combinations of remedial technologies and process options have been retained for further consideration:

1) Institutional Actions;
2) Excavation and Off-Site Disposal;
3) Containment - Consolidation and Capping
4) On-Site Treatment - Excavation and Ex-Situ Bioremediation; and
5) On-Site Treatment - In-Situ Bioremediation.

3 DEVELOPMENT AND SCREENING OF ALTERNATIVES

Screening and evaluation of potentially applicable technologies and process options were addressed in Section 2.0 (Phase I FS). Based on the remedial technologies and process options that have passed this initial screening process, Section 3.0 addresses the development and screening of alternatives and the identification of the most feasible comprehensive remedial alternatives for each OU (Phase II FS).

3.1 DEVELOPMENT OF ALTERNATIVES

The remedial alternatives presented in this section include alternatives that exceed, achieve, or do not achieve appropriate levels of remediation, as defined by the remedial action objectives (see Section 2.2) and consider the future use and development of the SCS.

Table 3-1 includes remedial alternatives for soils and wastes for each OU. These alternatives are based on the applicable technologies presented in Section 2.9 and have been grouped for the purpose of evaluation (i.e., to identify the best alternatives for each operable unit):

Alternative 1:	No Action; ✓
Alternative 2:	Limited Action; — called institutional actions in Section 2.9
Alternative 3:	Excavation and Off-Site Landfill Disposal;
Alternative 4:	Consolidation and Capping
Alternative 5:	Excavation and Ex-Situ Bioremediation; and
Alternative 6:	In-Situ Bioremediation.

Each of the six (6) alternatives presented on Table 3-1 are described below for application at specific OUs.

Alternative 1: No Action

The no action alternative for soil/waste would involve leaving the SCS in its present condition. Analytes in the soil and wastes would remain on-Site. The no action alternative is presented here as a baseline against which to evaluate other alternatives.

Alternative 2: Limited Action

The limited action alternative would limit public access to the SCS and contact with contaminated areas identified during the RFI/RI. This alternative would include Site fencing, monitoring, maintenance and deed restrictions. The existing water treatment system would continue to operate in accordance with the SPDES permit.

Alternative 3: Excavation and Off-Site Landfill Disposal

This alternative would involve excavation and removal of soil and waste above SCGs. Excavation and off-Site disposal is a proven technology for remediation of Sites where waste quantities are not excessive and the excavated material can be accepted at an off-Site landfill. Watering and other dust control measures would be implemented during excavation. Soil excavation can be accomplished by a wide variety of conventional equipment ranging in size from a 22 cubic yard dragline down to the 1/4 cubic yard backhoe.

VOC ✓ control

These basic types of excavation machinery fall into the following general categories:

- Backhoes;
- Cranes and attachments (draglines and clamshells); and
- Dozers and loaders.

Based on waste characterization testing of the excavated material, the soil above the cleanup criteria would be taken to an industrial landfill if below the Toxic Characteristic Leaching Procedure ("TCLP") limits or a hazardous waste landfill if above TCLP limits.

Alternative 4: Consolidation and Capping

Include capping some areas in place without building a landfill cell. Deleted. ✓

Consolidation and capping includes the excavation of the contaminated soil and waste, followed by consolidating this material within an existing containment cell or a newly constructed cell. The on-Site contaminated soil would be placed above the natural clay confining unit, thus limiting the potential for vertical migration of analytes. A cap would then be installed over the contaminated area to limit surface water infiltration.

Alternative 5: Excavation and Ex-Situ Bioremediation

The petroleum and PCB contaminants at the SCS are candidates for bioremediation. This alternative would involve excavation of the impacted soil and the construction of a "heap soil" reactor. Excavated soils would be transferred to an accessible on-Site building and stockpiled. In general, effluent would be pumped from the reactor vessel and distributed (e.g., sprayed) through the soil stockpile via an irrigation network. Bacteria would contact the PCB and petroleum molecules and, through the throttling between aerobic (oxygen dependent) and anaerobic (non-oxygen dependent) conditions, would breakdown chemical bonds. Catechol compounds and metal chlorides (e.g., salts) would be formed. No chlorine-based "off-gases" are produced from this process. Leachate would be collected from the bottom of the stockpile and recirculated through the system. Periodic mixing of the soil would be required (i.e., backhoe) to enhance contact with the bacteria. Once contaminant destruction is complete, it can be measured by standard analytical tests. The soil would be rendered inert and available to be backfilled into the excavation areas. As a latent benefit, the soil will remain biologically activated and through continued irrigation (e.g., precipitation) and fertilization, would continue to treat immediately adjacent soils and groundwater once backfilled.

Alternative 6: In-Situ Bioremediation

In-situ Bioremediation involves treatment of the soil by injecting nutrients, oxygen, and cultured bacterial strains or by introduction of genetically engineered microbes. Pending acceptable hydrogeological and chemical soil conditions, in-situ bioremediation will use much of the same methodology, biology and chemistry as ex-situ bioremediation. However, due to the chemical bond structure of PCB molecules, ISB treatment of PCB-contaminated soils is not considered to be as effective as ESB. Thus, the application of ISB technology is generally limited to petroleum-related contaminants at the Site.

In addition to the reactor vessel, ISB includes the strategic installation of an extraction/injection well grid surrounding the perimeter of the impacted area. The injection wells provide water to saturate the soil and deliver the bacteria. Extraction wells provide negative pressure to pull the introduced water through the soil and back into the reactor vessel. Once this hydraulic circuit is complete, the aforementioned biologically activated effluent is introduced at high pressure into the wells. Due to soil permeability characteristics and the inability to mix the soil, contact with the contaminants is somewhat slower than ESB and requires additional time to achieve complete destruction. The soil is rendered inert and, as a latent benefit, will remain biologically activated. Through continued irrigation (e.g., precipitation) and fertilization, the soil will provide limited in-situ treatment of immediately adjacent soils and groundwater.

This alternative has been deemed applicable for certain areas at the SCS due to the shallow natural clay layer, which would limit vertical migration/movement of reinjected water and contaminants. A Site-specific bench- and pilot-scale tests and/or modeling would be needed to evaluate and design a groundwater extraction/injection system for the SCS.

agree! ✓

3.2 SCREENING OF REMEDIAL ALTERNATIVES

In this section, remedial alternatives discussed in Section 3.1 for the four OUs are screened on the basis of effectiveness and implementability. The objective of the screening is to narrow the list of potential remedial alternatives. Pursuant to the May 1990 NYSDEC TAGM, cost was not used as an evaluation criteria. Note that alternatives were compared and screened-out based on a comparison of scores within alternative groupings (e.g., containment, treatment, etc).

Alternative 1: No Action

The no action alternative has been retained for each OU to provide a baseline condition against which other alternatives can be compared. As the title states, this alternative involves no remedial action and would leave the SCS in its present condition. The no action alternative does not meet the remedial action objectives for the four OUs under a future use scenario.

Effectiveness

"No action" is not considered effective because, under a future, industrial reuse scenario, environmental and public health risks would not be alleviated by this alternative. The magnitude of risks would remain the same and any reduction in risk would be due solely to natural attenuation. The contaminated soil within each OU would continue to be subjected to surface water percolation and run-off as well as lateral and vertical seepage. There is also the potential for exposure to contaminants for future industrial workers via fugitive dust or during any on-Site ~~excavation~~ intrusive ✓ activities.

Implementability

There would be no technical difficulty associated with the implementation of this alternative.

Alternative 2: Limited Action

The limited action alternative would include fencing the OU areas and land and formalizing supply well use restrictions. (land use restrictions? ✓) This alternative would not address the contaminated media at the SCS and does not meet the remedial action objectives for the four OUs under a future use scenario.

Effectiveness

Limited action is not considered effective, because the potential for future environmental and public health risks would not be alleviated by this alternative. The contaminated soil within each OU would continue to be subjected to surface water percolation and run-off as well as lateral and vertical seepage. There is the potential for exposure to contaminants for future industrial workers via fugitive dust.

Implementability

There would be no significant technical difficulty associated with the implementation of this alternative. Land use restrictions associated with this alternative would require minor coordination activities between ~~NYSDEC~~ Spaulding ✓ and the local government.

Alternative 3: Excavation and Off-Site Landfill Disposal

This alternative includes excavation of contaminated soil and waste above SCGs and disposal in an off-Site landfill. This alternative could satisfy the remedial action objectives for OU1, OU2, OU3 and OU4.

Effectiveness

This alternative has a high degree of effectiveness and relies on established technologies for removal and disposal of contaminated soil and waste. Additionally, remedial action objectives for the soil and waste would be met and the potential for ground water or surface water contamination from the soil/sediment would be reduced. Short-term risks to the community during transport of the material and the possibility of worker exposure from on-Site inhalation could be addressed through environmental controls. Long term ground water monitoring would be limited under this alternative.

Implementability

This alternative may be readily implemented. However, it will be necessary to identify a landfill with sufficient space to accept the contaminated soil and waste. Implementation of this alternative may require treatment at the disposal facility, prior to landfilling, to meet landfill acceptance criteria.

Alternative 4: Consolidation and Capping

This alternative involves excavating contaminated soil and waste, consolidating it in a new or existing containment cell underlain by clay, and capping the containment cell with a composite cap. Capping of the soils would limit fugitive dust migration. It would also limit surface water infiltration thereby limiting leachate generation. However, waste would remain on-Site and horizontal migration of contaminated ground water could potentially occur over the long term. Based on the volume and type of contaminants, this alternative could meet the remedial action objectives for OU1, OU3 and OU4.

Effectiveness

This alternative would not eliminate the potential for horizontal migration of any contaminated groundwater. However, based on the data collected in the overburden groundwater zone, contaminated groundwater appears to be limited to the areas where the contaminated soil has been identified.

Implementability

Capping and excavation technologies are reliable and well demonstrated. It is important to note that future remedial and development actions at the Site may be hindered by this alternative. Additionally, the construction of an on-Site, TSCA-compliant landfill for OU2 does not appear to be implementable from a regulatory perspective.

Alternative 5: Excavation and Ex-Situ Bioremediation

Under this alternative, contaminated soil would be excavated, transferred to an appropriate, unused and accessible building on-Site and stockpiled. Through the ESB process, the soil would be rendered inert and available to be backfilled into the excavation areas. This technology involves enhancing the natural biodegradation process by injecting nutrients, oxygen, and cultured bacterial strains.

Due to the inorganic contaminants associated with OU1 and OU4, this alternative does not meet the remedial action objectives for these OUs. Based on the PCB and petroleum contaminants present, this alternative meets the remedial action objectives for OU2 and OU3 and can be applied to these areas, pending the findings of the Treatability Study (see Section 4.0).

Effectiveness

Ex-situ bioremediation techniques are effective in destroying organic contaminants, thereby eliminating their release to the environment and the possibility of direct contact with potential receptors. See Alternative 6 below for further discussion of the effectiveness of bioremediation systems.

Implementability

This alternative is implementable at certain areas of the SCS due to the available areas of the SCS building that could be used for construction of a "heap soil" reactor system. However, the excavation of contaminated soil below the water table and the potentially large volume of soil that would require treatment need to be considered. Environmental controls would be necessary to reduce the short-term effects from airborne dust and waste particulates during excavation.

Alternative 6: In-Situ Bioremediation

Under this alternative, contaminated soil would be treated in-place using a bio-reactor vessel and well network. This process includes the strategic installation of an extraction/injection well grid surrounding the perimeter of the impacted area. The injection wells provide water to saturate the soil and deliver the bacteria. Soils would be rendered inert. The technology includes enhancing the natural biodegradation process by injecting nutrients, oxygen, and cultured bacterial strains or by introduction of genetically engineered microbes.

Due to the types of contaminants present, the effectiveness of this alternative for OU1, OU2 or OU4 is questionable. This alternative meets the remedial action objectives for OU3 because in-situ bioremediation of organic and petroleum contaminants has proven to be effective at other sites. This alternative is considered ineffective for OU1 and OU4, due to the inorganic nature of some of the contaminants. Due to the low-permeability of the Site soils and the depth of PCB contamination in the OU2 areas, this alternative is not considered effective for OU2.

✓ Depth of contamination at SWMU 36 is similar for PCB areas

Effectiveness

In-situ bioremediation techniques have been effective in destroying organic contaminants, thereby eliminating their release to the environment and the possibility of direct contact with potential receptors. This alternative can be effectively used to treat phenolic/creosote and petroleum contamination.

Successful bioremediation systems use a combination of aerobic and anaerobic conditions, which enhance ex-situ or in-situ systems. A "biomass support bed" is used within the bioreactor vessel, which contains the effluent. The physical opening and closing of the bioreactor's vents and valves can allow the system to throttle between aerobic and anaerobic phases of bacteria growth and development. Once a phase is stabilized, the bioreactor is allowed to deliver the effluent to either the irrigation network or the injection wells, as required.

Implementability

This alternative is implementable at the SCS due to the nature and extent of petroleum contamination and accessibility. Typical bench- and pilot-scale testing is required prior to final design to assess Site-specific hydrogeological conditions.

3.3 SUMMARY OF SCREENING

Remedial alternatives retained for each OU are based on the evaluation process, as discussed below. The alternatives for soil and waste, which passed the FS/CMS screening process, were assembled into comprehensive remedial alternatives for each OU. These comprehensive remedial alternatives are summarized below and are further evaluated during the Detailed Analysis of Alternatives (Section 5.0). Section 4.0 (Treatability Studies) presents the results of Site-specific bench-scale ESB testing that was completed to further evaluate the effectiveness of ESB in addressing OU2.

OU1 - LAMINANT DUST LANDFILL AND DRUM RESIN LANDFILL

ALTERNATIVE 1: NO ACTION

- No remedial action; leave this OU in its present condition.

ALTERNATIVE 2: LIMITED ACTION

- Institutional Actions
  - Deed Restrictions (Supply Wells, Site Development)
  - Groundwater Monitoring Activities
  - Site Restrictions (Fence, Gate, Signs)
  - Maintenance Activities (Mowing, Inspection)

ALTERNATIVE 3: EXCAVATION AND OFF-SITE LANDFILL DISPOSAL

- Institutional Actions what specific controls? ✓

- Excavate & Transport Contaminated Soils for off-Site Disposal
- Restoration

ALTERNATIVE 4: CONSOLIDATION AND CAPPING

- Institutional Actions what specific controls ? ✓
- Excavate and Consolidate Material Into a New Containment Cell
- Cover Containment Cell with an Impermeable Cap
- Restoration

OU2 - THERMINOL BUILDING/FORMER TRANSFORMER EXPLOSION AREA/SLUDGE POND/SLUDGE SETTLING POND/FORMER FUEL OIL TANK

ALTERNATIVE 1: NO ACTION

- No remedial action; leave this OU in its present condition.

ALTERNATIVE 2: LIMITED ACTION

- Institutional Actions

ALTERNATIVE 3: EXCAVATION AND OFF-SITE LANDFILL DISPOSAL

- Institutional Actions ? ✓
- Excavate & Transport Contaminated Soils/Sediments for off-Site Disposal
- Restoration

ALTERNATIVE 5: EXCAVATION AND EX-SITU BIOREMEDIATION

- Institutional Actions ? ✓
- Excavate Contaminated Soils/Sediments
- Stage soils within a secured building on-Site for treatment
- Restoration and backfill using treated soils

OU3 - FORMER TANK AREA/SLUDGE SETTLING POND & FORMER GRINDING OIL TANK

ALTERNATIVE 1: NO ACTION

- No remedial action; leave this OU in its present condition.

ALTERNATIVE 2: LIMITED ACTION

- Institutional Actions

ALTERNATIVE 3: EXCAVATION AND OFF-SITE LANDFILL DISPOSAL

- Institutional Actions ?
- Excavate & Transport Contaminated Soils/Sediments for off-Site Disposal
- Restoration

ALTERNATIVE 5: EXCAVATION AND EX-SITU BIOREMEDIATION

- Institutional Actions ?
- Excavate Contaminated Soils/Wastes
- Stage soils within a secured building on-Site for treatment
- Restoration and backfill using treated soils

ALTERNATIVE 6: IN-SITU BIOREMEDIATION

- Institutional Actions ?
- Construct extraction/injection well grid
- Install groundwater treatment bio-reactor system
- Treatment and discharge into soil
- Restoration

OU4 - LAB WASTE STORAGE AREA/RAIL SPUR/DRUM STORAGE DOCK/BULK CHEMICAL UNLOADING AREA/ZINC CHLORIDE SLUDGE CONTAINER STORAGE AREA/EMPTY DRUM STORAGE AREA/SLUDGE SETTLING POND/PAPER SLUDGE APPLICATION AREA

ALTERNATIVE 1: NO ACTION

- No remedial action; leave SCS in its present condition.

ALTERNATIVE 2: LIMITED ACTION

- Institutional Actions

ALTERNATIVE 3: EXCAVATION AND OFF-SITE LANDFILL DISPOSAL

- Institutional Actions ?
- Excavate & Transport Contaminated Soils/Waste for off-Site Disposal
- Restoration

ALTERNATIVE 4: CONSOLIDATION AND CAPPING

- Institutional Actions ?
- Excavate and Consolidate Material in New Containment Cell
- Cover Containment Cell with Impermeable Cap
- Restoration

4.0 TREATABILITY STUDIES

As part of the FS/CMS process, laboratory bench-scale ESB testing was conducted to evaluate the applicability of this technology to the PCB-contaminated soils at the Site. The results of this study are included in Appendix A.

4.1 Overview of Bench-Scale Testing Program

Leader completed a bench-scale study during January and February 1999 with its bio-remediation sub-contractor, Advanced Biological Solutions, Inc. ("ABS") of Mt. Clemens, Michigan. Specifically, Leader collected a five-gallon pail of soil adjacent to the Therminol Building where previous sampling during the 1998 RI/RFI had detected elevated concentrations of PCBs. The soils were homogenized and submitted to ABS.

As part of the Bench-Scale Test, ABS used 50 microbial strains, coupled with a water-based emulsifier to breakdown oil-based transporters and biodegrade the PCB in various matrices. There was no pre-treatment conducted in the soils. Environmental monitoring of the soil was also performed (i.e., pH, temperature and moisture content).

The Bench-Scale Test included the use of the following equipment:

1. One (1) 10-gallon glass tank;
2. One (1) 0.2 CFM diffuser bar;
3. ABS Proprietary Microbes (50 strains);
4. pH/Temperature/Moisture Meter; and
5. Proprietary Chemicals.

This type of bench study is a simple and efficient approach for simulating the treatment of contaminated soils using the ex-situ remedial methodology.

4.2 Pre-Testing

Moisture content was measured to be approximately 45%. The pH level was measured and maintained at 6.5 to 8.5. Temperature was maintained at 72°F. Analytic & Biological Laboratories, Inc. of Farmington Hills, Michigan ("A&B") performed pre-analytical testing, including a PCB Aroclor identification scan. The testing confirmed the presence of Aroclor 1248 at 17,500 ppm (see Appendix A). This Aroclor is consistent with previous sampling and operations at the Therminol Building.

4.3 Bench-Scale ESB Process

The glass tank was loaded with the 5-gallon pail of soil, leaving about 1/3 of freeboard within the tank. After collecting the pre-testing samples, the soil was brought to near saturation using distilled, non-chlorinated water mixed with the nutrient slurry. This slurry was circulated throughout the soil to promote anaerobic microbial reaction.

Once manual mixing of the soil was completed, the tank was covered and sealed. The system was allowed to stabilize, with no other adjustments made during the anaerobic phase of the test. Approximately six days into the testing program, the cover was removed to initiate the aerobic phase of the test. The soil was turned at this point and was further observed for a period of approximately 12 days.

4.4 Post-Testing

The pH and soil moisture content were monitored daily. A representative sample of the soil was collected at the end of the testing program, homogenized and sent to A&B for post-analytical testing. Results indicated that Aroclor 1248 was reduced to less than 10 ppm.

4.5 Conclusions

The results of the Bench-Scale Test indicate that removal of PCBs within contaminated soils and wastes can be performed by ESB. The same process of involving microbe strains and environmental conditioning is used in an in-situ program.

Does the proprietary chemicals strip chloride from the PCB molecule? If so, PCB concentrations will be low but biphenyl concentrations may remain high. Analyses for biphenyl would be required to confirm successful bioremediation.

5 DETAILED ANALYSIS OF ALTERNATIVES

✓ 5 alternatives for OU 3.

The four remedial alternatives developed for each of the OUs at the SCS were summarized in Section 3.3. Consistent with the NCP and NYSDEC guidance documents, these remedial alternatives undergo a more detailed evaluation in this section. The Detailed Analysis of Alternatives (Phase III FS) includes an individual and comparative analysis of the alternatives relative to criteria described in USEPA 540/6-89/004.

5.1 CRITERIA FOR ANALYSIS OF ALTERNATIVES

The remedial alternatives developed for each of the OUs represent a range of distinct waste management strategies, which, to a varying degree, address human health and environmental concerns associated with the Site. Although the selected alternative for each OU will be further refined as necessary during the design phase, these alternatives reflect the fundamental components of the various alternative hazardous waste management approaches being considered for the Site. These alternatives are evaluated with respect to seven (7) of the nine (9) criteria recommended in USEPA 540/G-89/004. The seven (7) criteria are summarized in the following paragraphs. State acceptance and community acceptance, the remaining two criteria, are not considered herein, but will be addressed in the Record of Decision ("ROD"), upon receipt of comments for the FS/CMS report.

1) Overall Protection of Human Health and the Environment - The evaluation of each alternative with respect to the overall protection of human health and the environment provides a summary of how the alternative reduces the risk from potential exposure pathways through treatment, engineering or institutional controls. This criterion also evaluates whether alternatives pose unacceptable short-term or cross-media impacts. Pursuant to NYSDEC's request for this project, the risks associated with each alternative were evaluated qualitatively as opposed to a quantitative evaluation.

2) Compliance with SCGs - The applicable or relevant and appropriate SCGs are applied to each alternative. The ability of each alternative to meet the SCGs or the need to justify a waiver is noted for each. In addition to TAGM 4046, the limits of contamination in surface soil are based on analytical testing data compared with the health-based NYSDEC/USEPA Soil RCRA Action Levels, as presented in TAGM 3028 – "Contained-In Criteria for Environmental Media". These action levels are based on oral ingestion of soil in a residential scenario. In addition to detected contaminant concentrations, current and future use of the contaminated areas were used for determining if, and what, further action may be required.

3) Long-Term Effectiveness and Permanence - Long-term effectiveness and permanence are evaluated with respect to the magnitude of residual risk and the adequacy and reliability of controls used to manage remaining waste (i.e., untreated waste and treatment residuals) over the long-term. Alternatives that have the highest degree of long-term effectiveness and permanence are those that leave little or no waste remaining at the Site, such that long-term maintenance and monitoring are unnecessary and reliance on institutional controls is limited.

4) Reduction of Toxicity, Mobility, or Volume Through Treatment - Evaluation of reduction of toxicity, mobility, or volume through treatment addresses the anticipated performance of the treatment technologies. This evaluation relates to the statutory preference for selecting a remedial action that uses treatment to reduce the toxicity, mobility, or volume of hazardous substances. Aspects of this criteria include: 1) the amount of waste treated or destroyed; 2) the reduction of toxicity, mobility, or volume; 3) the irreversibility of the treatment process; and 4) the type and quantity of residuals resulting from any treatment process.

5) Short-Term Effectiveness - Evaluation of alternatives with respect to short-term effectiveness takes into account: 1) protection of workers and the community during the remedial action; 2) environmental impacts from implementing the action; and 3) the time required to achieve the cleanup goals.

6) **Implementability** - Implementability deals with the administrative and technical feasibility of implementing the alternatives as well as the availability of necessary goods and services. This evaluation includes such items as: 1) the ability to obtain services, capacities, and equipment; 2) the ability to construct and operate components of the alternative; 3) the ability to monitor the performance and the effectiveness of the technologies; and 4) the ability to obtain the necessary approvals and permits from other agencies.

7) **Costs** - Costs are divided into capital and operation and maintenance (O&M) costs. Capital costs include those expenditures required to implement a remedial action (i.e., both direct and indirect costs are considered). Direct capital costs include construction costs or expenditures for equipment, labor, and materials required to implement a remedial action. Indirect capital costs include those associated with engineering, permitting, construction management, and other services necessary to carry-out a remedial action.

Annual O&M costs include labor, maintenance materials, energy, and purchased services. The O&M costs include costs incurred even after the initial remedial activity is complete. The 1999 present worth costs are estimated using a 5 percent discount per year for the time period associated with implementation of the specific alternative, not to exceed 30 years.

The cost estimates presented herein are order-of-magnitude estimates; these costs are based on vendor information, conventional cost estimating guides, generic unit costs and/or prior experience. The FS/CMS cost estimates have been prepared for guidance in project evaluation from the information available at the time of the estimate. The real costs of the project at the time of implementation will depend on real labor and material costs, site conditions, competitive market conditions, final project scope, the implementation schedule, and other variable factors both anticipated and unforeseen. An uncertainty that would affect the cost is actual volumes of contaminated soil and waste. The accuracy of these "study estimate" costs are expected to be in the range of +50 percent to -30 percent based on anticipated Site conditions and other variables as mentioned above.

5.2 INDIVIDUAL ANALYSIS OF ALTERNATIVES FOR OU1

In this section, each of the alternatives for OU1 are evaluated with respect to each of the seven evaluation criteria.

5.2.1 Alternative 1 - No Action

The no action alternative is included in this FS/CMS to measure the potential environmental risks posed by the Site if no remedial actions were to be implemented. All waste material within OU1 would remain on-Site.

1) Overall Protection of Human Health and the Environment - Since no remedial actions would be conducted as part of this alternative, the risk to human health and the environment from potential pathways would not be reduced, except through natural degradation of the analytes.

2) Compliance with SCGs - This alternative would not meet the applicable SCGs since no steps were taken to manage the current status of the contaminants.

3) Long-Term Effectiveness and Permanence - The selection of this alternative would not result in a long-term, or permanent solution since the analytes would remain in place.

4) Reduction of Toxicity, Mobility, or Volume Through Treatment - Since there are no activities to be performed during this alternative, the only reduction in toxicity, mobility or volume of the contamination is the naturally occurring degradation of the analytes.

5) Short-Term Effectiveness - The lack of any activities conducted under this alternative has also eliminated the short-term risks encountered by workers on-Site.

6) Implementability - Since there are no activities which will be performed under this alternative, this alternative is considered to be the most implementable.

7) Costs – There would be no costs associated with this Alternative because all waste material within OU1 would remain in its current location.

5.2.2 Alternative 2 - Limited Action

Actions under this alternative would include land use restrictions, supply well installation and usage restrictions, fencing, and periodic groundwater monitoring of the level of contaminants in monitoring wells.

Institutional actions to be completed for the SCS encompass four activities. The Site would have deed restrictions to prevent below ground surface use of the property. The deed restrictions would not allow the property to be used for residential, recreational or agricultural purposes. This would limit future exposure to materials containing the analytes of concern.

Local government and/or agencies will be requested to oversee well installation and use in the area that is in the vicinity of the Site. This oversight may include a local regulation requiring a review/permit for all proposed ground water well installation and use plans. This regulation would prohibit installing or using wells in the vicinity of the Site so that the analytes that are currently beneath the landfill do not migrate as a result of off-Site pumping.

Ground water monitoring is a method of evaluating the performance of the selected remedial alternative by reviewing the contaminant concentrations within the ground water over time. Ground water monitoring of indicator parameters within the existing monitoring wells would be done periodically, until the parameter levels satisfy the established performance criteria. This periodic monitoring program would continue beyond the cessation of remediation (for a limited time) to verify that none of the analytes are migrating. No remediation under this alternative ✓

Repair or replacement of the existing fence line surrounding the SCS property will provide site control. New fencing would be installed as needed to ensure Site security. Access to the Site will be through a series of gates which will be maintained and locked unless in use. Signs will be posted on the fence at uniform locations.

The current Site conditions and the Site control structures will be maintained through periodic inspections of the SCS. Routine activities such as water treatment plant operation and maintenance, lawn mowing and fence/gate repair will also be conducted.

1) Overall Protection of Human Health and the Environment - Because no remedial actions would be implemented to correct or contain the contamination with the limited action alternative, long-term human health and environmental risks for the Site would essentially be the same as those identified in the RFI/RI.

2) Compliance with SCGs - This alternative allows for the continued migration of contaminants. Since no action is being taken to reduce or contain the contamination, it would not meet SCGs for a number of analytes under a future use scenario.

3) Long-Term Effectiveness and Permanence - This alternative includes no controls for exposure and no long-term management measures. Current and potential future risks would remain under this alternative.

4) Reduction of Toxicity, Mobility, or Volume Through Treatment - This alternative provides no reduction in toxicity, mobility or volume of the contaminated soil or wastes through treatment.

5) *Short-Term Effectiveness* - There would be no additional risks posed to the community, the workers, or the environment as a result of this alternative being implemented.

6) *Implementability* - The only implementation concern is that of the addition of land and supply well use restrictions to the deeds of the effected properties.

7) *Costs* - The present operation and maintenance costs and capital costs are summarized on Table 5-1.

5.2.3 Alternative 3 - Excavation and Off-Site Disposal

This alternative consists of excavation of all materials which exceed the soil SCGs established in the RFI/RI and transportation of this material to off-Site disposal facilities. The specifications and the sequence of work required to implement this alternative is described below.

The approximate 2,083 cubic-yards of resin waste in the Resin Drum Landfill would be excavated and disposed of in an approved Subtitle "D" landfill. Initiation of excavation will be performed with installation of a sump to dewater the excavation area. The clean cap soil will be removed and staged next to the excavation. Excavation of the resin drums will be performed with a tracked-excavator and material will be directly loaded into transport vehicles for off-Site disposal. Upon completion of excavation, the area will be backfilled with cap material, fill from existing treatment cells and/or existing fill staged on Site.

The approximate 593 cubic-yards of asbestos waste in the Laminant Dust Landfill would be excavated and disposed of at a TSCA/Subtitle "D" Landfill. This waste stream is assumed not to be classified as an "F" listed waste. Initial opening of this landfill area will be performed by removal of overlying soil by use of a tracked-excavator. Excavated soils will be directed loaded into transport vehicles for off-Site disposal. It is anticipated that double-bagged asbestos debris and resin dust will be encountered in this landfill area. This material, when encountered, will be manually repackaged into 1 cubic yard reinforced poly-transport sacks. These bulk sacks will then be loaded into transport vehicles for off-Site disposal. If asbestos debris is encountered which is not properly contained, misters will be utilized to prevent air borne asbestos contamination when repackaging this material. Background sampling for airborne asbestos fibers will be performed during the excavation phase of this work. Project personnel handling asbestos bearing material will utilize proper PPE and be personally monitored for asbestos exposure. It is not anticipated that groundwater will be encountered during performance of this work. Upon completion of excavation and removals, this area will be backfilled with utilization of imported fill materials.

Confirmatory Sampling ✓

Decontamination would be done at the designated decontamination area. This area would include a decontamination pad to be used for decontaminating equipment. The pad would be bermed and sloped to a sump to collect the water used to decontaminate the equipment. This water would then be treated at the on-Site wastewater treatment plant and discharged to the POTW.

Following excavation and backfilling, the disturbed areas will be graded to limit surface flow on the land surface during storm events. The graded areas will then be seeded with perennial grass seed. This procedure will also improve aesthetic conditions.

1) Overall Protection of Human Health and the Environment - This alternative would protect human health and the environment by removing all of the soil and waste exceeding the SCGs from the Site.

2) Compliance with SCGs - The elimination of contamination from the Site results in meeting all of the SCGs on a long-term basis.

3) Long-Term Effectiveness and Permanence - This alternative is the most permanent since all soil and waste will be removed from the Site and replaced with clean fill material.

4) Reduction of Toxicity, Mobility, or Volume Through Treatment - Since the soil and waste will be removed from the Site, the toxicity, mobility and volume of the material on the Site will be eliminated.

5) Short-Term Effectiveness - This Alternative still contains activities ~~which~~ that have short-term concerns for worker exposure and the surrounding community. This alternative has the lowest short-term effectiveness because this is the only alternative where all of the soil on-Site is being excavated and moved.

6) Implementability - Although this alternative is implementable, obtaining landfill space and the scheduling of transportation vehicles adds difficulty to the coordination of this alternative.

7) Costs - The present worth cost of this Alternative is presented on Table 5-1.

5.2.4 Alternative 4 – Consolidation and Capping

The remedial activities conducted under Alternative 4 consists of the following components:

1) Excavation of the soil/subsurface materials (2,676 CY) and consolidation into a newly constructed containment cell;
2) Capping of the containment cell with a synthetic membrane composite cap; and
3) Institutional controls.

✓ Wastes could be capped in place with the cap keyed into the underlying silty clay. Any capping, however, will impact future development of the property.

All soil and waste material exceeding the SCGs would be excavated following the methods described in Section 5.2.3. The soils and wastes would be placed in a newly constructed on-Site landfill with a composite cap.

Following excavation and backfilling, the disturbed areas will be graded to limit surface flow on the land surface during storm events. The graded areas will then be seeded with perennial grass seed. This procedure will also improve aesthetic conditions.

✓ The surface water control should be discussed since it is included in Table 5-1.

1) Overall Protection of Human Health and the Environment - Alternative 4 exceeds the requirements for protection of human health and the environment because it almost eliminates all potential exposure pathways.

2) Compliance with SCGs - This alternative meets all of the SCGs by containing all soil and wastes with analyte concentrations in excess of the SCGs.

3) Long-Term Effectiveness and Permanence - The long-term effectiveness of this alternative is dependent upon proper maintenance of the cap.

✓ greater reduction than what? Alternative 3 eliminates toxicity and mobility through removal.

4) Reduction of Toxicity, Mobility, or Volume Through Treatment – Alternative 4 provides a greater reduction in the toxicity and the mobility of the contamination at the SCS by containing the soil and wastes within the landfill cell.

5) Short-Term Effectiveness - Alternative 4 requires excavation of the same quantity of soil/waste as Alternatives 3. The main short-term concern is the exposure, which occurs during the excavation and movement of this material. *

6) Implementability - This alternative includes obtaining long-term access to the Site, requiring negotiation with a future Site owner and deed restrictions. Other than these previously discussed concerns, there are no specific implementability problems for Alternative 4.

✓ Include a table of costs for capping in place.

7) Costs - The present worth cost of Alternative 4 for OU1 is presented on Table 5-1.

5.3 INDIVIDUAL ANALYSIS OF ALTERNATIVES FOR OU2

5.3.1 Alternative 1 – No Action

The no action alternative is included in this FS/CMS to measure the potential risks posed by the Site if no remedial actions were to be implemented. All soil and waste material within associated with OU2 would remain on-Site. The evaluation of the No Action alternative for OU2 is the same as the evaluation presented in Section 5.2.1. *

5.3.2 Alternative 2 – Limited Action

Continued use of on-site treatment plant ✓

Actions under this alternative would include land use restrictions, supply well installation and usage restrictions, fencing, and periodic monitoring of the level of contaminants in monitoring wells (see Section 5.2.2). The evaluation of the Limited Action alternative for OU2 is the same as the evaluation presented in Section 5.2.2.

5.3.3 Alternative 3 – Excavation and Off-Site Disposal

This alternative consists of excavation of soil and waste associated with OU2, which exceeds applicable SCGs and transportation of this material to an off-Site disposal facility. The specifications and the sequence of work required to implement this alternative are described below.

Confirmation sampling ✓

Soils exceeding the SCGs would be removed using backhoes and/or similar earth moving equipment. Shoring and dewatering techniques would be implemented, as necessary. OU2 includes the following approximate quantities:

also ✓ include portion of SWMU 13 shown on Fig 5-2. See also Section 5.3.4

✓ SWMU 12:	QUANTITY OF SOIL TO BE EXCAVATED:	23 ✓	cubic yards
✓ SWMU 11 & 23:	QUANTITY OF SOIL TO BE EXCAVATED:	333 ✓	cubic yards
✓ SWMU 38:	QUANTITY OF SOIL TO BE EXCAVATED:	585 ✓	cubic yards
✓ AOC 48:	QUANTITY OF SOIL TO BE EXCAVATED:	592 ✓	cubic yards
	TOTAL TO BE EXCAVATED:	1,533	cubic yards

This soil would be loaded into poly-lined roll-offs or dump trucks and transported to an appropriate TSCA Subtitle D landfill (i.e., no soil exceeding TCLP levels is anticipated from this OU). Additional waste characterization testing and landfill approvals would be needed prior to disposal.

Decontamination would be completed at the designated decontamination area. The decontamination water would then be treated at the on-Site wastewater treatment plant and discharged to the POTW. Following excavation and backfilling, the disturbed areas will be graded and vegetated to limit surface flow on the land surface during storm events.

1) Overall Protection of Human Health and the Environment - This alternative would protect human health and the environment by removing all of the soil and waste exceeding the SCGs from the Site.

2) Compliance with SCGs - The elimination of contamination from the Site results in meeting all of the SCGs on a long-term basis.

3) Long-Term Effectiveness and Permanence - This alternative is the most permanent since all soil and waste will be removed from the Site and replaced with clean fill material.

4) Reduction of Toxicity, Mobility, or Volume Through Treatment - Since the soil and waste will be removed from the Site, the toxicity, mobility and volume of the material on the Site will be eliminated.

5) Short-Term Effectiveness - This Alternative still contains activities which have short-term concerns for worker exposure and the surrounding community. This alternative has the lowest short-term effectiveness because this is the only alternative where all of the soil on-Site is being excavated and moved off-Site.

6) Implementability - Although this alternative is implementable, the obtaining of landfill space and the scheduling of transportation vehicles add difficulties to the coordination of this alternative.

7) Costs - The present worth cost of this Alternative is presented on Table 5-1.

5.3.4 Alternative 5 – Excavation and Ex-Situ Bioremediation

This alternative consists of excavation of soil exceeding the applicable SCGs, staging of this material within an on-Site secured building and biological treatment. The specifications and the sequence of work required to implement this alternative are described below.

Soil and waste materials exceeding the SCGs (1,533 CY) would be removed using backhoes and/or similar earth moving equipment. This soil would be staged within a heated, secured building on-Site within a "heap soil" reactor for treatment. Prior to placement, a bermed area, complete with poly sheeting and leachate collection laterals would be constructed. The collection laterals would be connected to a bio-reactor vessel having a designed capacity. The reactor vessel is a tank containing biomass, a support bed, aeration vanes and a proprietary nutrient-rich, water-based effluent supporting the proprietary microbes. *

In general, effluent would be pumped from a bio-reactor vessel and distributed (e.g., sprayed) through the soil stockpile via an irrigation network. Bacteria would contact the PCB molecules, and through the throttling between aerobic (oxygen dependent) and anaerobic (non-oxygen dependent) conditions, breakdown chemical bonds. Catechol compounds and metal chlorides (e.g., salts) are typically formed. Chlorine-based "off-gases" are not produced from this process. Leachate would be collected from the bottom of the stockpile and recirculated through the system. Periodic mixing of the soil would be required (i.e., backhoe) to enhance contact with the bacteria. Contaminant destruction is complete and can be measured by standard analytical tests.

The packed bed within the bio-reactor resists biomass buildup, which can impact the performance and efficiencies of other types of bioremediation systems. Upon achieving the desired cleanup levels, the excavations would be backfilled and restored with the treated soil.

Compounds to have been successfully removed using this process include, but are not limited to PCBs, petroleum contaminants, creosotes, VOCs and semi-VOCs. The technology has a latent benefit of enhancing the natural biodegradation process by leaving residual nutrients, nitrogen and oxygen, and cultured bacterial strains.

1) Overall Protection of Human Health and the Environment - This alternative would protect human health and the environment by treating of the soil and waste exceeding the SCGs from the Site.

2) Compliance with SCGs - The elimination of concentrations above cleanup levels results in meeting all of the SCGs on a long-term basis.

3) Long-Term Effectiveness and Permanence - Alternative 5 destroys the chemistry of the contaminants, having no significant concerns for worker exposure and the surrounding community. Thus, this Alternative is considered to achieve permanent results and is not expected to require long-term or future remedial action.

4) Reduction of Toxicity, Mobility, or Volume Through Treatment - Ex-situ bioremediation is considered to achieve a permanent and significant reduction in the toxicity, mobility and volume of contaminants for this OU.

5) Short-Term Effectiveness - This alternative has the highest short-term effectiveness because this is the only alternative where all of the soil on-Site is being excavated and directly treated on-Site. The treatment of PCB-contaminated soils is typically completed in less than two months. Air emissions are typically insignificant with the type of biological destruction to be implemented. This proposed method of ex-situ bioremediation is not considered to have significant potential for system failures and upon completion of treatment, is expected to be considered permanent.

Because ✓ soils must be excavated, worker exposure potentials are high. See section 5.3.3

6) Implementability - This alternative is implementable. The obtaining of adequate building space and utilities should not prove difficult in the coordination of this alternative.

7) Costs - The present worth cost of this Alternative for OU2 is presented on Table 5-1.

5.4 INDIVIDUAL ANALYSIS OF ALTERNATIVES FOR OU3

5.4.1 Alternative 1 – No Action

The no action alternative is included in this FS/CMS to measure the potential risks posed by the Site if no remedial actions were to be implemented. Soil and waste material associated with OU3 would remain on-Site. The evaluation of the No Action alternative for OU3 is the same as the evaluation presented in Section 5.2.1.

5.4.2 Alternative 2 – Limited Action

Actions under this alternative would include land use restrictions, supply well installation and usage restrictions, fencing, and periodic monitoring of the level of contaminants in monitoring wells (see Section 5.2.2). The evaluation of the Limited Action alternative for OU3 is the same as the evaluation presented in Section 5.2.2.

5.4.3 Alternative 3 – Excavation and Off-Site Disposal

This alternative consists of excavation of soil exceeding the SCGs established in the RFI/RI and transportation of this material to an off-Site disposal facility. OU3 includes soils impacted by petroleum- related compounds and includes the following approximate quantities:

Revise to reflect PCB area of OU2. ✓

SWMU 36:	QUANTITY OF SOIL TO BE EXCAVATED:	14,000	cubic yards
SWMU 13:	QUANTITY OF SOIL TO BE EXCAVATED:	7,111	cubic yards
	TOTAL TO BE EXCAVATED:	21,111	cubic yards

Confirmatory sampling. ✓

[illegible] shoring and dewatering [illegible] (see [illegible] 5.3.3) ✓

This soil would be excavated and loaded into roll-offs or dump trucks and transported to a local industrial landfill (i.e., no soils exceeding TCLP levels are anticipated for this OU). Additional waste characterization testing and landfill approvals would be needed prior to disposal. Following excavation and backfilling, the disturbed areas would be graded and vegetated to limit surface water erosion during storm events.

1) Overall Protection of Human Health and the Environment - This alternative would protect human health and the environment by removing all of the soil and waste exceeding the SCGs from the Site.

2) Compliance with SCGs - The elimination of contamination from the Site results in meeting all of the SCGs on a long-term basis.

3) Long-Term Effectiveness and Permanence - This alternative is the most permanent since all soil and waste will be removed from the Site and replaced with clean fill material.

4) Reduction of Toxicity, Mobility, or Volume Through Treatment - Since the soil and waste will be removed from the Site, the toxicity, mobility and volume of the material on the Site will be eliminated.

5) Short-Term Effectiveness - This alternative still contains activities, which have short-term concerns for worker exposure and the surrounding community. This alternative has the lowest short-term effectiveness because this is the only alternative where all of the soil on-Site is being excavated and moved off-Site.

6) Implementability - Although this alternative is implementable, the obtaining of landfill space and the scheduling of transportation vehicles add difficulties to the coordination of this alternative. Excavators with longer boom lengths will be needed to reach the expected depths of contamination. This type of earthwork typically involves shoring and bracing within the excavation for the heavy equipment and to prevent cave-ins. Deep excavations also typically encounter dewatering issues.

7) Costs - The present worth cost of this Alternative for OU3 is presented on Table 5-1.

5.4.4 Alternative 5 – Excavation and Ex-Situ Bioremediation

This alternative consists of excavation of soil that exceeds the applicable SCGs (21,111 CY), staging of this material at an on-Site secured building and biological treatment. The sequence of remediation would be similar to that described in Section 5.3.4.

Section 4.0 [illegible] compounds. ✓

The petroleum compounds associated with OU3 have been successfully removed using this process (see Section 4.0). The technology has a latent benefit of enhancing the natural biodegradation process of the backfill material by leaving residual nutrients, nitrogen and oxygen and cultured bacterial strains.

1) Overall Protection of Human Health and the Environment - This alternative would protect human health and the environment by treating the soil and waste exceeding the SCGs from the Site.

2) Compliance with SCGs - The elimination of concentrations above SCGs results in meeting all of the SCGs on a long-term basis.

3) Long-Term Effectiveness and Permanence - Alternative 5 destroys the chemistry of the contaminants, having no significant concerns for worker exposure and the surrounding community. Thus, this Alternative is considered to achieve permanent results and is not expected to require long-term or future remedial action.

4) Reduction of Toxicity, Mobility, or Volume Through Treatment - Ex-situ bioremediation is considered to achieve a permanent and significant reduction in the toxicity, mobility and volume of contaminants at this OU.

See comment from Section 5.3.4 ✓

5) Short-Term Effectiveness - This alternative has high short-term effectiveness due to the soil being excavated and directly treated on-Site. Air emissions are typically insignificant with the type of biological destruction to be implemented. This proposed method of ex-situ bioremediation is not considered to have significant potential for system failures and upon completion of treatment, is expected to be permanent.

6) Implementability - This alternative is implementable; however, as with Alternative 3, excavators with longer boom lengths will be needed to reach the expected depths of contamination. The obtaining of adequate building space could also prove difficult in the coordination of this alternative, due to large quantity of soil involved.

7) Costs - The present worth cost of this Alternative for OU3 is presented on Table 5-1.

5.4.5 Alternative 6 - In-Situ Bioremediation

This alternative consists of treating soil from OU3 that exceeds the SCGs established in the RI/RFI by in-ground biological treatment. The specifications and the sequence of work required to implement this alternative are described below.

This process is implemented by installing an array of injection and extraction wells around the perimeter of the contaminated soils and wastes. PVC piping is then installed and connected to a manifold leading to the exhaust side (injection) and suction side (extraction) of a pump. This creates a pressure differential within the affected area. The effluent, which contains the microbes, comes into contact with the contaminants, which are withdrawn out of the soil and into the bio-reactor.

The contaminated effluent is passed through a packed bed with a proprietary material within the bio-reactor, promoting the biological degradation of the contaminants. The special packed bed resists biomass buildup, which significantly affects the performance and efficiencies of other types of bioremediation systems.

The well array spacing would be determined in the field and by the radius of influence, which is defined as the distance from extraction at which subsurface flow is observed. Soils within the radius of influence would be subject to treatment. The radius of influence is a site-specific design parameter, dependent on the type of soils and soil profile at a given site. The soils within this OU include fill materials underlain by native silty clay with a lower permeability. Based on Leader's experience at sites with similar soils and stratigraphy, the radius of influence would generally peak from approximately 40 feet within fill materials to approximately 10 to 20 feet within the native, undisturbed clay.

This alternative was screened out at a nearby site with similar soils due to the low K of silty clay soils. The limited treatability study should provide information about the feasibility of this alternative being effective. ✓

Assuming an average radius of influence of 20 feet, approximately 10 wells (5 injection and 5 extraction) would be placed at SWMU 13 and approximately 12 wells (6 injection and 6 extraction) would be placed at SWMU 36 to reach the target soils. Overburden groundwater flow was observed during the RFI/RI field effort to flow from south to north. The contaminated effluent would be conveyed to a bio-reactor (at each SWMU). An in-line heater may be used for maintaining necessary temperatures within the treatment system.

The organic compounds associated with OU3 have been successfully removed using this process. The technology has a latent benefit of enhancing the natural biodegradation process by leaving residual nutrients, nitrogen and oxygen, and cultured bacterial strains.

1) Overall Protection of Human Health and the Environment - This alternative would protect human health and the environment by treating the soil and waste exceeding the SCGs from the Site.

2) Compliance with SCGs - The elimination of concentrations above cleanup levels results in meeting all of the SCGs on a long-term basis.

3) Long-Term Effectiveness and Permanence - Alternative ~~8~~ 6 destroys the chemical bonds of the contaminants, having no significant concerns for worker exposure and the surrounding community. Confirmatory sampling is used to determine the completion of the program. Thus, this Alternative is considered to achieve permanent results. *

4) Reduction of Toxicity, Mobility, or Volume Through Treatment - In-situ bioremediation is considered to achieve a permanent and significant reduction in the toxicity, mobility and volume of contaminants for this OU.

5) Short-Term Effectiveness - This alternative has high short-term effectiveness due to the soil being directly treated on-Site. Air emissions are typically insignificant with the type of biological destruction to be implemented. This proposed method of in-situ bioremediation is not considered to have significant potential for system failures and upon completion of treatment, is expected to be permanent. Considering the stratigraphy and contaminant levels within the Site soils, the in-situ program may take 6 to 12 months to achieve complete cleanup objectives. With this alternative, there would be a temporary operational impact from installing the well array system above grade. Laterals and piping may need to be placed below ground or protected above ground, resulting in increased Site disruption. and cost. *

6) Implementability - This alternative is implementable. Following regulatory approvals and installation, a one to two week start-up/shakedown period would occur. The period of operation is conservatively estimated to be 12 months for the purpose of this evaluation. Contaminant removal rates would begin at a relatively high rate at the inception of the program. After a certain amount of time, the removal rates would diminish and remain constant, indicating the completion of the in-situ bioremediation program.

7) Costs - The present worth cost of this Alternative for OU3 is presented on Table 5-1.

5.5 INDIVIDUAL ANALYSIS OF ALTERNATIVES FOR OU4

5.5.1 Alternative 1 – No Action

The no action alternative is included in this FS/CMS to measure the potential risks posed by the Site if no remedial actions were to be implemented. Soil and waste material associated with OU4 would remain on-Site. The evaluation of the No Action alternative for OU4 is the same as the evaluation presented in Section 5.2.1.

5.5.2 Alternative 2 - Limited Action

Actions under this alternative would include land use restrictions, supply well installation and usage restrictions, fencing, and periodic monitoring of the level of contaminants in monitoring wells (see Section 5.2.2). The evaluation of the Limited Action alternative for OU4 is the same as the evaluation presented in Section 5.2.2.

5.5.3 Alternative 3 - Excavation and Off-Site Disposal

This alternative consists of excavation of soil and waste materials that exceed the applicable SCGs and transportation of this material to an off-Site disposal facility. This material includes the following approximate quantities:

✓ AOC 45:	QUANTITY OF SOIL TO BE EXCAVATED:	1,185 cubic yards ✓
✓ AOC 46,47, SWMU 5:		
	QUANTITY OF SOIL TO BE EXCAVATED:	5,393 cubic yards ✓
✓ SWMU 3:	QUANTITY OF SOIL TO BE EXCAVATED:	77 cubic yards ✓
✓ SWMU 14:	QUANTITY OF SOIL TO BE EXCAVATED:	2,222 cubic yards ✓
✓ SWMU 26:	QUANTITY OF SOIL TO BE EXCAVATED:	12 cubic yards ✓
✓ SWMU 35:	QUANTITY OF SOIL TO BE EXCAVATED:	8 cubic yards ✓
	TOTAL TO BE EXCAVATED:	8,897 cubic yards

Remove ✓ extent [illegible] 2-1 comments.

Soil and waste material would be removed using backhoes and/or similar earth moving equipment. Shoring and dewatering methods would be employed, as necessary. In the case of SWMUs 3, 26 and 35, the contamination is limited to surface soils (i.e., approximately 1-foot below ground surface) and can be readily removed. Soil would be loaded into roll-offs or dump trucks and transported to an approved Subtitle "D" Landfill because phenols and zinc are not considered a RCRA waste and cresols were identified to be less than 200 ppm. (i.e., no soil exceeding TCLP levels are anticipated for this OU). Additional waste characterization testing and landfill approvals would be needed prior to disposal. Following excavation and backfilling, the disturbed areas would be graded and vegetated to limit surface water erosion during storm events.

Supplemental RFI/RFI data for SWMUs 3 & 35 suggests that at least 2' of soil needs to be removed. ✓

Confirmatory sampling ✓

✓ Groundwater monitoring at AOC 45 will be required to evaluate effect of source removal on groundwater quality in this area.

1) Overall Protection of Human Health and the Environment - This alternative would protect human health and the environment by removing all of the soil and waste exceeding the SCGs from the Site.

2) Compliance with SCGs - The elimination of contamination from the Site results in meeting all of the SCGs on a long-term basis.

3) Long-Term Effectiveness and Permanence - This alternative is the most permanent since all soil and waste will be removed from the Site and replaced with clean fill material.

4) Reduction of Toxicity, Mobility, or Volume Through Treatment - Since the soil and waste will be removed from the Site, the toxicity, mobility and volume of the material on the Site will be eliminated.

5) Short-Term Effectiveness - This Alternative ~~still~~ contains activities, ~~which~~ that have short-term concerns for worker exposure and the surrounding community. This alternative has the lowest short-term effectiveness because this is the only alternative where all of the soil on-Site is being excavated and moved.

6) Implementability - Although this alternative is implementable, the obtaining of landfill space and the scheduling of transportation vehicles add difficulties to the coordination of this alternative.

7) Costs - The present worth cost of this Alternative is presented on Table 5-1.

5.5.4 Alternative 4 - Consolidation and Capping

The remedial activities conducted under Alternative 4 consist of the following components:

1) Excavation of the soil/subsurface materials (8,897 CY) and consolidate into a newly constructed containment cell;
2) Capping of the containment cell with a synthetic membrane composite cap; and
3) Institutional controls.

All soils and waste materials, which exceed the SCGs, would be excavated using backhoes and/or similar earth moving equipment and shoring and dewatering techniques, as necessary. The soils and wastes will be placed in a newly constructed containment cell. Following excavation and backfilling, the disturbed areas would be graded and vegetated to limit surface flow on the land surface during storm events.

1) Overall Protection of Human Health and the Environment - Alternative 4 exceeds the requirements for protection of human health and the environment because it almost eliminates all potential exposure pathways.

2) Compliance with SCGs - This alternative meets all of the SCGs by containing all soil and wastes with analyte concentrations in excess of the SCGs.

3) Long-Term Effectiveness and Permanence - The long-term effectiveness of this alternative is dependent upon proper maintenance of the cap.

4) Reduction of Toxicity, Mobility, or Volume Through Treatment – Alternative 4 provides a greater reduction in the toxicity and the mobility of the contamination at the SCS by containing the soil and wastes within the landfill cell.

5) Short-Term Effectiveness - Alternative 4 requires excavation of the same quantity of soil/waste as Alternatives 3. The main short-term concern is the exposure which occurs during the excavation and movement of this material.

6) Implementability - This alternative includes obtaining long-term access to the Site, requiring negotiation with a future Site owner and deed restrictions. Other than these previously discussed concerns, there are no specific implementability problems for Alternative 4.

7) Costs - The present worth cost of Alternative 4 for OU4 is presented on Table 5-1.

5.6 COMPARATIVE ANALYSIS OF ALTERNATIVES

A comparative analysis of the alternatives discussed above was completed, in general accordance with USEPA 540/6-89/004 and the May 1990 NYSDEC TAGM for the Selection of Remedial Actions at Inactive Hazardous Waste Sites. For each OU, Alternative 1 – No Action and Alternative 2 – Limited Action did not satisfy the seven evaluation criteria under a future Site development scenario. Thus, the remaining alternatives for each OU were compared.

With respect to each OU, Alternatives 3, 4, 5 and 6 compared similarly to one another for six of the seven criteria. Implementation could be achieved within one construction season, including confirmatory sampling. These alternatives would all achieve compliance with applicable SCGs; significant reductions of toxicity; mobility or volume through treatment; protection of human health and the environment; and short-term and long-term effectiveness.

Revise to incorporate the different table descriptions

A cost comparison identified the greatest differences between the alternatives. Table 5-1 includes cost estimates for the alternatives considered for each OU, reflecting both capital and O&M costs over 30 years. Additionally, because Spaulding desires to prepare the Site for redevelopment, remedial alternatives which rely on significant alterations to the Site or require significant capital expenditures and long-term O&M activities, would be less favorable (i.e., construction, management and maintenance of a waste containment cell). Thus, alternatives with the lowest costs that achieved compliance with the seven criteria and allowed redevelopment options were considered to be the most cost-effective. Section 6 identifies the results of this Detailed and Comparative Analysis of Alternatives and presents the recommended alternatives for each OU, with rationales for selection.

6 IDENTIFICATION OF THE RECOMMENDED ALTERNATIVES

Based upon the evaluation of the seven criteria with respect to each of the four comprehensive remedial alternatives discussed in Section 5, the following alternatives are recommended for the OUs. The estimated costs for these selected alternatives are presented in Table 6-1.

OU1 - Alternative 3 (Excavation and Off-Site Landfill Disposal)

Figure 6-1 includes a diagram of the areas included under OU1. This alternative is recommended for OU1 for the following reasons:

1) This alternative satisfies the requirements for protection of human health and the environment, as well as satisfying the applicable SCGs.

2) The quantity of soil and waste being disrupted as a result of the remedial actions is relatively small, thereby limiting the effects of the remediation upon worker health and the surrounding community.

3) The long-term effects of maintaining a new containment cell would compromise future development options for the SCS.

4) The costs of implementing Alternative 4 were greater than the costs for implementing Alternative 3.

Alternative 3 satisfies all of the remedial action objectives in a cost-effective manner in comparison with the other alternatives evaluated in the Detailed Analysis Phase. Media requiring remediation are addressed and exposure and migration pathways are eliminated or controlled.

OU2 – Alternative 5 (Excavation and Ex-Situ Bioremediation)

Figure 6-2 includes a diagram of the areas included under OU2 along with a conceptual diagram of the proposed heap soil reactor system. This alternative is recommended for OU2 for the following reasons:

1) This alternative satisfies the requirements for protection of human health and the environment, as well as satisfying the applicable SCGs.

2) The quantity of soil being disrupted as a result of the remedial actions is relatively small, thereby limiting the effects of the remediation upon worker health and the surrounding community.

3) The costs of implementing Alternative 3 were greater than the costs for implementing Alternative 5.

Alternative 5 satisfies all of the remedial action objectives in a cost-effective manner in comparison with the other alternatives evaluated in the Detailed Analysis Phase. Media requiring remediation are addressed and exposure and migration pathways are eliminated or controlled.

OU3 – Alternative 6 (In-Situ Bioremediation)

Figure 6-3 includes a diagram of the areas included under OU3 along with a conceptual diagram of the proposed ISB system. This alternative is recommended for OU3 for the following reasons:

1) This alternative satisfies the requirements for protection of human health and the environment, as well as satisfying the applicable SCGs

2) No soil is disrupted as a result of the remedial action thereby limiting the effects of the remediation upon worker health and the surrounding community.

3) The long-term effects of maintaining a new containment cell would compromise future development options for the SCS.

4) The costs of implementing Alternatives 3 and 5 were greater than the costs for implementing Alternative 6. *

Alternative 6 satisfies all of the remedial action objectives in a cost-effective manner in comparison with the other alternatives evaluated in the Detailed Analysis Phase. Media requiring remediation are addressed and exposure and migration pathways are eliminated or controlled.

OU4 - Alternative 3 (Excavation and Off-Site Landfill Disposal)

Figure 6-4 includes a diagram of the areas included under OU4. This alternative is recommended for OU4 for the following reasons:

1) This alternative satisfies the requirements for protection of human health and the environment, as well as satisfying the applicable SCGs.

2) The quantity of soil being disrupted as a result of the remedial action is relatively small, thereby limiting the effects of the remediation upon worker health and the surrounding community.

3) Alternative 3 greatly reduces scheduling delays associated with future development of the SCS.

4) The costs of implementing Alternative 4 were greater than the costs for implementing Alternative 3.

Alternative 3 satisfies all of the remedial action objectives in a cost-effective manner in comparison with the other alternatives evaluated in the Detailed Analysis Phase. Media requiring remediation are addressed and exposure and migration pathways are eliminated or controlled.

7 LIMITATIONS AND USE OF REPORT

This Feasibility Study/Corrective Measures Study Report was prepared by Leader Environmental, Inc. in accordance with generally accepted practices of other consultants preparing similar reports, and we observed that degree of care and skill generally exercised by other consultants under similar circumstances and conditions. The analyses and conclusions submitted in this report are based upon data and information, provided by others, and are contingent upon their validity. Cost and volume estimates included herein should be considered approximate.

This FS/CMS Report was prepared exclusively for Spaulding Composites Company, Inc. for specific application to the Wheeler Street, Tonawanda, New York Site in accordance with generally accepted engineering practice. No other warranty, expressed or implied, is made.

8 REFERENCES

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TABLES

TABLE 2-1
FEASIBILITY STUDY / CORRECTIVE MEASURES STUDY
SPAULDING COMPOSITES COMPANY, INC.
TONAWANDA, NEW YORK
SUMMARY OF CONTAMINATED MEDIA

AREA	DESCRIPTION	NATURE AND EXTENT OF CONTAMINATION	VOLUME OF SOIL CONTAMINATION ABOVE SCGs (CUBIC YARDS)
AOC 48 Transformer Explosion Area	FORMER AREA OF A PCB TRANSFORMER OIL RELEASE TO SOIL	PCB CONCENTRATIONS IN SOIL UP TO 1,500 PPM 40' X 40' X 12' DEEP → 711.11 yd³ Revised depth? ✓ NYSDEC CLEANUP LEVEL = 10 PPM MOST SAMPLE CONC. BELOW 1,000 PPM	592
SWMU 38 Therminol Building Area	FORMER AREA OF PCB DISCHARGE TO GROUND SURFACE	PCB CONCENTRATIONS IN SOIL UP TO 13,900 PPM 785 CUBIC YARDS ABOVE 10 PPM Revised depth? ✓ NYSDEC CLEANUP LEVEL = 10 PPM ASBESTOS IN BUILDING TO BE REMOVED BASEMENT WATER CONTAMINATED WITH PCBS (No - Supp RFI/RI) ✓ BASEMENT WALLS MAY NEED DECON 4000 SQ-FT X 20 FT BGS ASBESTOS ? ✓ CONTAMINATION NEAR FOUNDATION WALLS MOST SAMPLE CONC. BELOW 1,000 PPM	585
SWMU 7 Resin Drum Landfill	FORMER AREA OF RESIN DRUM DISPOSAL	50X75X15 FOOT DEEP LANDFILL IN CLAY 0.26 PPM PHENOLS IN GW 750 55-GALLON DRUMS DEPOSITED CAP NOT CONTAMINATED CONTAMINATION LIMITED TO LF LIMITS	2,083
SWMU 36 Aboveground/Underground Storage Tanks	FORMER AREA OF TANK RELEASES	BTEX COMPOUNDS TO 300,000 PPB → 23,333 yd³ ✓ 180' X 140' X 25' DEEP Revised depth?	14,000
SWMU 23 Aboveground Storage Tanks SWMU11-Sludge Settling Pond	FORMER AREA OF TANK AND POND RELEASES	BTEX COMPOUNDS, CHLOR. SOLVENTS (110 PPM) AND PCBS (84 PPM) (surface soils) 30' X 30' X 10' DEEP (SWMU 11) ✓ SWMU 23 AND 11 IN CLOSE PROXIMITY	333
AOC 45-Rail Spur	FORMER RELEASES TO GROUND SURFACE	95,000 PPB PHENOLS, 34,000 PPB CRESOLS AND 422 PPM ZINC IN SOIL ✓ 400' X 20' X 4' DEEP Groundwater Contamination	1,185
SWMU 14 Sludge Settling Pond	FORMER RELEASES OF PETROLEUM AND PCB PRODUCTS	100' X 120' X 5' DEEP PETROLEUM CONTAMINATION BTEX 12 PPM PCBS	2,222
SWMU 13 Sludge Settling Pond and former Grinding Oil Tank	FORMER RELEASES OF RESIN AND PETROLEUM PRODUCTS	160' X 100' X 12' DEEP PETROLEUM CONTAMINATED SOILS Include separate estimate for PCB area.	7,111 ✓
SWMU 5 Empty Drum Storage AOC 47 Bulk Chemical Unloading AOC 46 Drum Storage Dock	ALL THREE AREAS IN PROXIMITY RELEASES OF PHENOLS CRESOLS AND ZINC	100,000 PPB PHENOLS, 74,000 PPB CRESOLS AND 258 PPM ZINC 160' X 140' X 6.5' DEEP	5,393
Unit 7 - SWMU 8 Laminant Dust Landfill	LANDFILL CONTAINING BAGS OF LAMINANT DUST	LAMINANT DUST CONTAINS METHYLENE CHLORIDE TOLUENE, PHENOL, CRESOLS, PHTHALATES AND PCBS 40' X 40' X 10' DEEP LIMITS OF LF CONTAMINATION LIMITED TO LF	593
SWMU 26 - Paper Sludge Land Application Area	SURFACE SOIL IMPACTED BY FORMER RELEASES OF PCBs, ZINC AND SVOCS	APPROXIMATE 30 FOOT DIAMETER BY 6" DEEP VOLUME OF SURFACE SOIL. PCBS LESS THAN 10 PPM	12
SWMU 12 Sludge Settling Pond	FORMER RELEASES OF PETROLEUM AND PCB PRODUCTS	36' DIAMETER AREA X 6" DEEP 41 PPM PCBS SVOCS	23
SWMU 3 Zinc Chloride Sludge Container Storage Area	FORMER RELEASES OF ZINC CHLORIDE	70' X 30' X 1' DEEP 1,770 PPM ZINC BTEX SVOCS Samples exceeding SCGs collected from 0'-2' depth (Supp. RI/RFI) ✓	77
SWMU 35 Lab Waste Storage Area	FORMER AREA OF DRUMMED LABORATORY WASTES	20' X 10' X 1' DEEP 20,500 PPM ZINC SVOCS " " " " Revised volume estimates accordingly. ✓	8

TABLE 2-2

FEASIBILITY STUDY / CORRECTIVE MEASURES STUDY
SPAULDING COMPOSITES COMPANY, INC.
TONAWANDA, NEW YORK
SUMMARY OF GENERAL REMEDIAL RESPONSE ACTIONS

MEDIA	POTENTIAL EXPOSURE PATHWAY	GENERAL REPONSE ACTIONS
Soil/Waste	Surface, Subsurface, and Fugitive Dust	No Action. Institutional Action. Containment. Partial Removal. Complete Removal. On-Site/Off-Site Disposal. On-Site/Off-Site Treatment. In-Situ/Ex-Situ Treatment.
Groundwater	Migration of Contaminated Groundwater	No Action. Institutional Action. Containment. Partial Removal. Complete Removal. On-Site/Off-Site Disposal. On-Site/Off-Site Treatment. In-Situ/Ex-Situ Treatment.

TABLE 2-3

FEASIBILITY STUDY / CORRECTIVE MEASURES STUDY
SPAULDING COMPOSITES COMPANY, INC.
TONAWANDA, NEW YORK
SUMMARY OF APPLICABLE REMEDIAL TECHNOLOGIES

GENERAL RESPONSE ACTION	APPLICABLE REMEDIAL TECHNOLOGY	PROCESS OPTIONS
No Action	None	None
Institutional Controls	Access Restrictions	Fencing, Deed Restrictions
On-Site Treatment	Ex-Situ Treatment	Bioremediation
	In-Situ Treatment	Bioremediation
	Thermal Treatment	Liquid Injection, Rotary Kiln, Multiple Hearth, Fluidized Bed, Thermal Desorption and Pyrolysis.
Partial or Complete Removal	Excavation & Removal	Solids Excavation
Containment/On-Site Disposal	On-Site Landfill	Solids Excavation & Disposal
Off-Site Disposal	Off-Site Landfill	Solids Excavation & Disposal

TABLE 2-4
FEASIBILITY STUDY / CORRECTIVE MEASURES STUDY
SPAULDING COMPOSITES COMPANY, INC.
TONAWANDA, NEW YORK
SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTIONS	DESCRIPTION	SCREENING COMMENTS
No Action	None	Not Applicable	No Action	Required for consideration by NCP
Institutional Actions	Access Restrictions	Fencing	Fence-off areas of contaminated soils	Potentially applicable
		Deed restrictions	Deeds for property in the area of influence would include supply well restrictions	Potentially applicable
On-Site Treatment	Ex-Situ Treatment	Bioremediation	Treating zones of contamination by microbial degradation	Potentially applicable for organics and PCBs
	In-Situ Treatment	Bioremediation	Treating zones of contamination by microbial degradation	Potentially applicable for organics and PCBs
	Thermal Treatment	Liquid Injection	Refractory lined combustion chamber(s) incinerate pumpable waste.	Not Applicable to inorganics. Difficult to implement.
		Rotary Kiln	Incinerates all forms of wastes (solid, liquid, gas).	Not applicable to inorganics. Difficult to implement.

TABLE 2-4 (Continued)
FEASIBILITY STUDY / CORRECTIVE MEASURES STUDY
SPAULDING COMPOSITES COMPANY, INC.
TONAWANDA, NEW YORK
SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTIONS	DESCRIPTION	SCREENING COMMENTS
On-Site Treatment (Continued)	Thermal Treatment (Continued)	Multiple Hearth	Series of solid, flat hearths to incinerate all forms of waste, particularly sludges.	Not applicable to inorganics. Difficult to implement.
		Fluidized Bed	Wastes injected into an agitated bed of sand where combustion occurs.	Not applicable to inorganics. Difficult to implement.
		Thermal Desorption	Thermal removal of contaminants	Potentially applicable to organic wastes. Difficult to implement.
		Pyrolysis	Thermal conversion of waste into solid, liquid and gas components.	Not applicable to inorganics. Difficult to implement.
Partial or Complete Removal	Excavation & Removal	Solid Extraction	Excavate contaminated soils with a mechanical device.	**Potentially applicable**
Disposal	On-Site Land Disposal	On-Site Landfill	Improvement of existing landfills or contain area.	**Potentially applicable**
	Off-Site Land Disposal	Landfilling	Dispose of waste in an off-Site facility.	**Potentially applicable**

TABLE 3-1
FEASIBILITY STUDY / CORRECTIVE MEASURES STUDY
SPAULDING COMPOSITES COMPANY, INC.
TONAWANDA, NEW YORK
REMEDIAL ALTERNATIVE SUMMARY

REMEDIAL ALTERNATIVE	DESCRIPTION
OU1	
No Action	No Action
Limited Action	Fencing, Deed Restrictions, Monitoring & Maintenance
Excavation and Off-Site Disposal	Contaminated Soil/Waste to an off-Site Landfill
Consolidation and Capping	Excavation and Consolidation in an on-Site Containment Cell
OU2	
No Action	No Action
Limited Action	Fencing, Deed Restrictions, Monitoring & Maintenance
Excavation and off-site disposal ✓ ~~Off-Site D~~isposal	Contaminated Soil/Waste to an off-Site Landfill
On-Site Treatment	Excavation and Ex-Situ Bioremediation
OU3	
No Action	No Action
Limited Action	Fencing, Deed Restrictions, Monitoring & Maintenance
Excavation and Off-Site Disposal	Contaminated Soil/Waste to an off-Site Landfill
On-Site Treatment	Excavation and Ex-Situ Bioremediation In-Situ Bioremediation
OU4	
No Action	No Action
Limited Action	Fencing, Deed Restrictions, Monitoring & Maintenance
Excavation and Off-Site Disposal	Contaminated Soil/Waste to an off-Site Landfill
Consolidation and Capping	Excavation and Consolidation in an on-Site Containment Cell

Renumber tables to correspond with OU number. ✓

TABLE 5-1
ESTIMATE OF COSTS
SPAULDING COMPOSITES COMPANY, INC.
TONAWANDA, NEW YORK SITE

OPERABLE UNITS 1, 2, 3 AND 4

ALTERNATIVE 2 - LIMITED ACTION

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT COST	CAPITAL	YEARLY O&M	TOTAL [A]
DIRECT COSTS							
1	INSTITUTIONAL ACTIONS						
	Deed restrictions	1	LS	$5,000	$5,000		$5,000
	Groundwater Monitoring Activities						
	Install wells	2	Well	$2,500	$5,000		$5,000
	Monitoring	4	Well	$1,000		$4,000	$57,680
	Maintenance Activities (Mowing, Security, Insp.)	1	Year	$20,000		$20,000	$288,401
TOTAL DIRECT COSTS (TDC)					$10,000	$24,000	$356,082
INDIRECT COSTS							
2	Contingency - 15% of TDC	1	LS	$1,500	$1,500		$1,500
TOTAL INDIRECT COSTS					$1,500	$0	$1,500
TOTAL COSTS					$11,500	$24,000	$357,582

NOTES:

A Includes capital costs plus present worth O&M costs for 30 years.

Include costs for O&M of on-site [illegible] plant. ✓

✓ Why would two wells be installed and where - around the Former [illegible] Landfill. If so, these two wells + the 4 wells around the Resin Drum should be monitored. Different wells would be sampled for each OU; therefore, Limited Action [illegible] should be included for each OU.

TABLE 5-1
REMEDIAL COST ESTIMATE
SPAULDING COMPOSITES COMPANY, INC.
TONAWANDA, NEW YORK SITE

OPERABLE UNIT 1

ALTERNATIVE 3 - EXCAVATION AND OFF-SITE DISPOSAL

ITEM	DESCRIPTION	QUANTITY	UNIT	EXCAVATION UNIT COST (A)	DISPOSAL COSTS	CAPITAL	YEARLY O&M	TOTAL (B)
DIRECT COSTS								
1	Excavate & Removal of Contaminated Soils and Media							
	SWMU 7 Resin Drum Landfill	2,083	CY	$16	$53	$143,727		$143,727
	SWMU 8 Laminated Dust Landfill	593	CY	$60	$155	$127,495		$127,495
TOTAL DIRECT COSTS (TDC)						$271,222		$271,222
INDIRECT COSTS								
1	Engineering and Oversight - 10% of TDC	1	LS	$27,122		$27,122		$27,122
2	Contingency - 15% of TDC	1	LS	$40,683		$40,683		$40,683
3	Health & Safety Monitoring - 2% of TDC	1	LS	$5,424		$5,424		$5,424
4	Legal Fees - 2% of TDC	1	LS	$5,424		$5,424		$5,424
5	Req'd. License, Deed or Permit - 2% of TDC	1	LS	$5,424		$5,424		$5,424
6	Mobilization/Demobilization - 2% of TDC	1	LS	$5,424		$5,424		$5,424
TOTAL INDIRECT COSTS						$89,503		$89,503
TOTAL COSTS						$360,725		$360,725

NOTES:

A Unit Costs includes backfilling with clean fill and labor & equipment unit rates @ level D protection.

B Includes capital costs plus present worth O&M costs for 30 years.

✓ Confirmatory sampling costs

✓ What about restoration costs? These are included for alternatives 4 (see next page).

✓ Why are excavation costs more for the Laminate Dust Landfill than the Resin Drum Landfill.

✓ What about backfilling costs (see note A)

TABLE 5-1
REMEDIAL COST ESTIMATE
SPAULDING COMPOSITES COMPANY, INC.
TONAWANDA, NEW YORK SITE

OPERABLE UNIT 1

ALTERNATIVE 4 - CONSOLIDATION AND CAPPING

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT COST (A)	CAPITAL	YEARLY O&M	TOTAL (B)
DIRECT COSTS:							
1	Excavate & Placement of Contaminated Soils and Media						
	SWMU 7 Resin Drum Landfill	2,083	CY	$16	$33,328		$33,328
	SWMU 8 Laminated Dust Landfill	593	CY	$60	$35,580		$35,580
2	Construct Containment Cell (Approx. 90' x 90' x 10')						
	Clearing & Grubbing	1	LS	$5,000	$5,000		$5,000
	Subbase prep. (6 in.)	202	CY	$10	$2,017		$2,017
	Geotextile	10,890	SF	$0.50	$5,445		$5,445
	HDPE Liner (60 Mil)	10,890	SF	$0.50	$5,445		$5,445
	Soil Fill (24 in.)	807	CY	$12	$9,680		$9,680
	Topsoil (6 in.)	202	CY	$15	$3,025		$3,025
	Revegetation	1.00	LS	$5,000	$5,000		$5,000
3	Surface Water Control						$0
	Excavation/Construction of Drainage Structures	4,320	CY	$7	$30,240		$30,240
	Temporary Silt Fence	360	LF	$2.50	$900		$900
4	Groundwater Monitoring Activities						
	Install wells	2	Well	$2,500	$5,000	$0	$5,000
	Monitoring	4	Well	$1,000	$0	$4,000	$57,680
5	Site Restoration						
	Backfilling of Former Landfills	2,676	CY	$12	$32,112		$32,112
	Revegetation	1	LS	$5,000	$5,000		$5,000
6	Site Maintenance (Mowing, Security, etc.)	1	LS	$20,000	$0	$20,000	$288,401
TOTAL DIRECT COSTS (TDC)					[illegible]	**$24,000**	**$523,86[illegible]**
INDIRECT COSTS:							
1	Engineering and Oversight - 10% of TDC	1	LS	$17,777	$17,777		$17,777
2	Contingency - 15% of TDC	1	LS	$26,666	$26,666		$26,666
3	Health & Safety Monitoring - 2% of TDC	1	LS	$3,555	$3,555		$3,555
4	Legal Fees - 2% of TDC	1	LS	$3,555	$3,555		$3,555
5	Req'd. License, Deed or Permit - 5% of TDC	1	LS	$8,889	$8,889		$8,889
6	Mobilization/Demobilization - 2% of TDC	1	LS	$3,555	$3,555		$3,555
TOTAL INDIRECT COSTS					**$46,22[illegible]**	**$0**	**$46,22[illegible]**
TOTAL COSTS					[illegible]	**$24,000**	**$587,85[illegible]**

NOTES:

A Unit Costs includes backfilling with clean fill and labor & equipment unit rates @ level D protection.

B Includes capital costs plus present worth O&M costs for 30 years.

✓ Backfill costs are included in the excavation costs (Note A); however backfill costs are also included in Item 5 - Site Restoration.

✓ Why two new wells? At least four should be installed around new landfill.

✓ Confirmatory sampling [illegible]
[illegible]

TABLE 5-1
REMEDIAL COST ESTIMATE
SPAULDING COMPOSITES COMPANY, INC.
TONAWANDA, NEW YORK SITE

OPERABLE UNIT 2

ALTERNATIVE 3 - EXCAVATION AND OFF-SITE DISPOSAL

ITEM	DESCRIPTION	QUANTITY	UNIT	EXCAVATION UNIT COST [A]	DISPOSAL UNIT COSTS	CAPITAL	YEARLY O&M	TOTAL [B]
DIRECT COSTS								
1	Excavate & Removal of Contaminated Soils and Media							
	SWMU 11 & 23 -Sludge Pond and Tank Farm Area	333	CY	$18	$218	$78,588		$78,588
	SWMU 12 - Sludge Settling Pond/Former Fuel Oil Tank	23	CY	$18	$218	$5,428		$5,428
	SWMU 38 - Theminol Building	585	CY	$46	$218	$154,440		$154,440
	AOC 48 - Former Transformer Explosion Area	592	CY	$40	$218	$152,736		$152,736
TOTAL DIRECT COSTS (TDC)						$391,192	$0	$391,192
INDIRECT COSTS								
1	Engineering and Oversight - 10% of TDC	1	LS	$39,119		$39,119		$39,119
2	Contingency - 15% of TDC	1	LS	$58,679		$58,679		$58,679
3	Health & Safety Monitoring - 2% of TDC	1	LS	$7,824		$7,824		$7,824
4	Legal Fees - 2% of TDC	1	LS	$7,824		$7,824		$7,824
5	Req'd. License, Deed or Permit - 2% of TDC	1	LS	$7,824		$7,824		$7,824
6	Mobilization/Demobilization - 2% of TDC	1	LS	$7,824		$7,824		$7,824
TOTAL INDIRECT COSTS						$129,093	$0	$129,093
TOTAL COSTS						$520,285	$0	$520,285

NOTES:

A Unit Costs includes backfilling with clean fill and labor & equipment unit rates @ level D protection.

B Includes capital costs plus present worth O&M costs for 30 years.

C Disposal Costs include transport and tipping fees at a TSCA Subtitle D Landfill facility.

✓ Why are excavation costs more for SWMU 38 and AOC 48? These costs are also different from those of OU 1.

✓ Confirmatory sampling costs

✓ Site restoration costs

✓ Shoring and dewatering costs

TABLE 5-1
REMEDIAL COST ESTIMATE
SPAULDING COMPOSITES COMPANY, INC.
TONAWANDA, NEW YORK SITE

OPERABLE UNIT 2
ALTERNATIVE 5 - EXCAVATION AND EX-SITU BIOREMEDIATION

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT COSTS [(A)]		CAPITAL	YEARLY O&M	TOTAL [(C)]
DIRECT COSTS								
				EXCAVATE	EX-SITU [(B)]			
1	Treatment of Contaminated Soils and Media							
	SWMU 11 & 23 -Sludge Pond and Tank Farm Area	333	CY	$18	$83	$33,633		$33,633
	SWMU 12 - Sludge Settling Pond/Former Fuel Oil Tank	23	CY	$18	$83	$2,323		$2,323
	SWMU 38 - Therminol Building	585	CY	$46	$83	$75,465		$75,465
	AOC 48 - Former Transformer Explosion Area	592	CY	$40	$83	$72,816		$72,816
TOTAL DIRECT COSTS (TDC)						$184,237	$0	$184,237
INDIRECT COSTS								
1	Engineering and Oversight - 10% of TDC	1	LS	$18,424		$18,424		$18,424
2	Contingency - 15% of TDC	1	LS	$27,636		$27,636		$27,636
3	Health & Safety Monitoring - 2% of TDC	1	LS	$3,685		$3,685		$3,685
4	Legal Fees - 2% of TDC	1	LS	$3,685		$3,685		$3,685
5	Req'd. License, Deed or Permit - 2% of TDC	1	LS	$3,685		$3,685		$3,685
6	Mobilization/Demobilization - 2% of TDC	1	LS	$3,685		$3,685		$3,685
TOTAL INDIRECT COSTS						$60,798	$0	$60,798
TOTAL COSTS						$245,035	$0	$245,035

NOTES:

A Unit Costs include labor & equipment unit rates @ level D protection.

B Ex-Situ Unit Costs includes the backfilling of areas with bio-treated soils.

C Includes capital costs plus present worth O&M costs for 30 years.

✓ Confirmation sampling of excavation & treated soils.

✓ The excavation costs are the same as for Alternative 3 of OU 2, which includes backfilling. Since backfilling is included with the ex-situ costs, the excavation costs should be lower than those of Alternative 3.

✓ Shoring and dewatering costs.

✓ Costs for the construction of the biocell are not included.

✓ Site restoration costs.

TABLE 5-1
REMEDIAL COST ESTIMATE
SPAULDING COMPOSITES COMPANY, INC.
TONAWANDA, NEW YORK SITE

OPERABLE UNIT 3 ALTERNATIVE 3 - EXCAVATION AND OFF-SITE DISPOSAL								
DIRECT COSTS								
ITEM	**DESCRIPTION**	**QUANTITY**	**UNIT**	**UNIT COSTS (A)**		**CAPITAL**	**YEARLY O&M**	**TOTAL (C)**
1	Treatment of Contaminated Soils and Media			EXCAVATE	DISPOSAL			
	SWMU 36 - Former Tank Area	14,000	CY	$18	$35	$742,000		$742,000
	SWMU 13 - Sludge Settling Pond	7,111	CY	$18	$35	$376,883		$376,883
TOTAL DIRECT COSTS (TDC)						**$1,118,883**	**$0**	**$1,118,883**
INDIRECT COSTS								
1	Engineering and Oversight - 10% TDC	1	LS	$111,888		$111,888		$111,888
2	Contingency - 15% of TDC	1	LS	$167,832		$167,832		$167,832
3	Health & Safety Monitoring - 2% of TDC	1	LS	$22,378		$22,378		$22,378
4	Legal Fees - 2% of TDC	1	LS	$22,378		$22,378		$22,378
5	Req'd. License, Deed or Permit - 2% of TDC	1	LS	$22,378		$22,378		$22,378
6	Mobilization/Demobilization - 2% of TDC	1	LS	$22,378		$22,378		$22,378
TOTAL INDIRECT COSTS						**$369,231**	**$0**	**$369,231**
TOTAL COSTS						**$1,488,114**	**$0**	**$1,488,114**

NOTES: Backfilling ✓

A Unit Costs include labor & equipment unit rates @ level D protection.

~~B Ex-Site Unit Costs includes the backfilling of areas with bio-treated soils.~~ ✓

C Includes capital costs plus present worth O&M costs for 30 years.

✓ Cost of shoring and dewatering should be included in estimate.

✓ Confirmatory sampling.

✓ Site restoration costs.

TABLE 5-1
REMEDIAL COST ESTIMATE
SPAULDING COMPOSITES COMPANY, INC.
TONAWANDA, NEW YORK SITE

OPERABLE UNIT 3

ALTERNATIVE 5 - EXCAVATION AND EX-SITU BIOREMEDIATION

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT COSTS [(A)] EXCAVATE	UNIT COSTS [(A)] EX-SITU [(B)]	CAPITAL	YEARLY O&M	TOTAL [(C)]
DIRECT COSTS								
1	Treatment of Contaminated Soils and Media							
	SWMU 36 - Former Tank Area	14,000	CY	$18	$83	$1,414,000		$1,414,000
	SWMU 13 - Sludge Settling Pond	7,111	CY	$18	$83	$718,211		$718,211
TOTAL DIRECT COSTS (TDC)						$2,132,211	$0	$2,132,211
INDIRECT COSTS								
1	Engineering and Oversight - 10% TDC	1	LS	$213,221		$213,221		$213,221
2	Contingency - 15% of TDC	1	LS	$319,832		$319,832		$319,832
3	Health & Safety Monitoring - 2% of TDC	1	LS	$42,644		$42,644		$42,644
4	Legal Fees - 2% of TDC	1	LS	$42,644		$42,644		$42,644
5	Req'd. License, Deed or Permit - 2% of TDC	1	LS	$42,644		$42,644		$42,644
6	Mobilization/Demobilization - 2% of TDC	1	LS	$42,644		$42,644		$42,644
TOTAL INDIRECT COSTS						$703,630	$0	$703,630
TOTAL COSTS						$2,835,841	$0	$2,835,841

NOTES:

A Unit Costs include labor & equipment unit rates @ level D protection.

B Ex-Situ Unit Costs includes the backfilling of areas with bio-treated soils.

C Includes capital costs plus present worth O&M costs for 30 years.

✓ Confirmatory sampling

✓ Site restoration costs

✓ See comments from OU 2, alternative 5. Costs for ✓ site backfill [illegible] are not included.

TABLE 5-1
REMEDIAL COST ESTIMATE
SPAULDING COMPOSITES COMPANY, INC.
TONAWANDA, NEW YORK SITE

OPERABLE UNIT 3 ALTERNATIVE 6 - IN-SITU BIOREMEDIATION							
DIRECT COSTS							
ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT COSTS (A)	CAPITAL	YEARLY O&M	TOTAL (C)
1	Treatment of Contaminated Soils and Media			IN-SITU (B)			
	SWMU 36 - Former Tank Area	14,000	CY	$30	$420,000		$420,000
	SWMU 13 - Sludge Settling Pond	7,111	CY	$30	$213,330		$213,330
TOTAL DIRECT COSTS (TDC)					$633,330		$633,330
INDIRECT COSTS							
1	Engineering and Oversight - 10% of TDC	1	LS	$63,333	$63,333		$63,333
2	**Contingency - 15% of TDC**	**1**	**LS**	**$95,000**	**$95,000**		**$95,000**
3	Health & Safety Monitoring - 2% of TDC	1	LS	$12,667	$12,667		$12,667
4	Legal Fees - 2% of TDC	1	LS	$12,667	$12,667		$12,667
5	Req'd. License, Deed or Permit - 2% of TDC	1	LS	$12,667	$12,667		$12,667
6	Mobilization/Demobilization - 2% of TDC	1	LS	$12,667	$12,667		$12,667
TOTAL INDIRECT COSTS					$208,999	$0	$208,999
TOTAL COSTS					$842,329	$0	$842,329

NOTES:

A Unit Costs include labor & equipment unit rates @ level D protection.

B In-Situ Unit Costs include installation of injection well grid.

C Includes capital costs plus present worth O&M costs for 30 years.

✓ Confirmatory sampling

✓ What other costs are included in In-Situ costs: installing bioreactor, nutrients?

✓ Some O&M will be required. Groundwater wells/borings will need to be completed to evaluate effectiveness of cleanup.

TABLE 5-1
REMEDIAL COST ESTIMATE
SPAULDING COMPOSITES COMPANY, INC.
TONAWANDA, NEW YORK SITE

OPERABLE UNIT 4
ALTERNATIVE 3 - EXCAVATION AND OFF-SITE DISPOSAL

ITEM	DESCRIPTION	QUANTITY	UNIT	EXCAVATION UNIT COST [A]	DISPOSAL UNIT COSTS	CAPITAL	YEARLY O&M	TOTAL [B]
DIRECT COSTS								
1	Excavate & Removal of Contaminated Soils and Media							
	AOC 35 - Lab Waste Storage Area	8	CY	$18	$35	$424		$424
	AOC 45 - Rail Spur	1,185	CY	$18	$35	$62,805		$62,805
	AOC 46 - Drum Storage Area *AOC 47 - Bulk Chemical Unloading Area* *SWMU 5 - Empty Drum Storage Area*	5,393	CY	$18	$35	$285,829		$285,829
	SWMU 3 - Zinc Chloride Sludge Container Storage Area	77	CY	$18	$35	$4,081		$4,081
	SWMU 14 - Sludge Settling Pond	2,222	CY	$18	$35	$117,766		$117,766
	SWMU 26 - Paper Sludge Application Area	12	CY	$18	$35	$636		$636
TOTAL DIRECT COSTS (TDC)						$471,541	$0	$471,541
INDIRECT COSTS								
1	Engineering and Oversight - 10% of TDC	1	LS	$47,154.1		$47,154		$47,154
2	Contingency - 15% of TDC	1	LS	$70,731		$70,731		$70,731
3	Health & Safety Monitoring - 2% of TDC	1	LS	$9,431		$9,431		$9,431
4	Legal Fees - 2% of TDC	1	LS	$9,431		$9,431		$9,431
5	Req'd. License, Deed or Permit - 2% of TDC	1	LS	$9,431		$9,431		$9,431
6	Mobilization/Demobilization - 2% of TDC	1	LS	$9,431		$9,431		$9,431
TOTAL INDIRECT COSTS						$155,609	$0	$155,609
TOTAL COSTS						$627,150	$0	$627,150

NOTES
- A Unit Costs includes backfilling with clean fill and labor & equipment unit rates @ level D protection.
- B Includes capital costs plus present worth O&M costs for 30 years.

✓ Confirmatory sampling.
✓ Site restoration costs.
✓ Groundwater monitoring in AOC 45.

TABLE 5-1
REMEDIAL COST ESTIMATE
SPAULDING COMPOSITES COMPANY, INC.
TONAWANDA, NEW YORK SITE

OPERABLE UNIT 4

ALTERNATIVE 4 - CONSOLIDATION AND CAPPING

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT COST [A]	CAPITAL	YEARLY O&M	TOTAL [B]
DIRECT COSTS							
1	Excavate & Placement of Contaminated Soils and Media						
	AOC 35 - Lab Waste Storage Area	8	CY	$20	$160		$160
	AOC 45 - Rail Spur	1,185	CY	$20	$23,700		$23,700
	AOC 46 - Drum Storage Area						
	AOC 47 - Bulk Chemical Unloading Area						
	SWMU 5 - Empty Drum Storage Area	5,393	CY	$20	$107,860		$107,860
	SWMU 3 - Zinc Chloride Sludge Container Storage Area	77	CY	$20	$1,540		$1,540
	SWMU 14 - Sludge Settling Pond	2,222	CY	$20	$44,440		$44,440
	SWMU 26 - Paper Sludge Application Area	12	CY	$20	$240		$240
2	Construct Containment Cell (Approx. 160' x 160' x 10')						
	Clearing & Grubbing	1	AC	$10,000	$10,000		$10,000
	Subbase prep. (6 in.)	807	CY	$10	$8,067		$8,067
	Geotextile	43,560	SF	$0.50	$21,780		$21,780
	HDPE Liner (60 Mil)	43,560	SF	$0.50	$21,780		$21,780
	Soil Fill (24 in.)	807	CY	$12	$9,680		$9,680
	Topsoil (6 in.)	807	CY	$15	$12,100		$12,100
	Revegetation	1	AC	$10,000	$10,000		$10,000
3	Surface Water Control						$0
	Excavation/Construction of Drainage Structures	7,680	CY	$7	$53,760		$53,760
	Temporary Silt Fence	640	LF	$2.50	$1,600		$1,600
4	Groundwater Monitoring Activities						
	Install wells	2	Well	$2,500	$5,000	$0	$5,000
	Monitoring	4	Well	$1,000	$0	$4,000	$57,680
5	Site Restoration						
	Backfilling of Former Landfills	8,897	CY	$12	$106,764		$106,764
	Revegetation	1	AC	$10,000	$10,000		$10,000
6	Site Maintenance (Mowing, Security, etc.)	1	LS	$20,000	$0	$20,000	$288,401
TOTAL DIRECT COSTS (TDC)					[illegible]	$24,000	$784,652
INDIRECT COSTS							
1	Engineering - 10% of TDC	1	LS	$44,847	$44,847		$44,847
2	Contingency - 15% of TDC	1	LS	$67,271	$67,271		$67,271
3	Health & Safety Monitoring - 2% of TDC	1	LS	$8,969	$8,969		$8,969
4	Legal Fees - 2% of TDC	1	LS	$8,969	$8,969		$8,969
5	Req'd. License, Deed or Permit - 5% of TDC	1	LS	$22,424	$22,424		$22,424
6	Mobilization/Demobilization - 2% of TDC	1	LS	$8,969	$8,969		$8,969
TOTAL INDIRECT COSTS					[illegible]	$0	$116,602
TOTAL COSTS					[illegible]	$24,000	$956,002

NOTES:

A Unit Costs includes backfilling with clean fill and labor & equipment unit rates @ level D protection.

B Includes capital costs plus present worth O&M costs for 30 years.

✓ Why are excavation costs different than alternative 3 excavation costs?

✓ Confirmatory sampling of excavated areas (See comments on page 3)

TABLE 6-1
SPAULDING COMPOSITES COMPANY, INC.
TONAWANDA, NEW YORK SITE

RECOMMENDED ALTERNATIVES REMEDIAL COST ESTIMATE

OPERABLE UNIT 1				
DIRECT COSTS				
METHODOLOGY	TOTAL QUANTITY (CY)	CAPITAL	YEARLY O&M	TOTAL (8)
TOTAL DIRECT COSTS (TDC)				
Excavate & Removal of Contaminated Soils and Media	2,676	$271,222	$0	$271,222
INDIRECT COSTS		$89,503	$0	$89,503
TOTAL COSTS FOR OPERABLE UNIT				$360,725

OPERABLE UNIT 2				
DIRECT COSTS				
METHODOLOGY	TOTAL QUANTITY (CY)	CAPITAL	YEARLY O&M	TOTAL (8)
TOTAL DIRECT COSTS (TDC)				
Excavate Contaminated Soils and Media for Ex-Situ Bioremediation	1,533	$184,237	$0	$184,237
INDIRECT COSTS		$60,798	$0	$60,798
TOTAL COSTS FOR OPERABLE UNIT				$245,03[illegible]

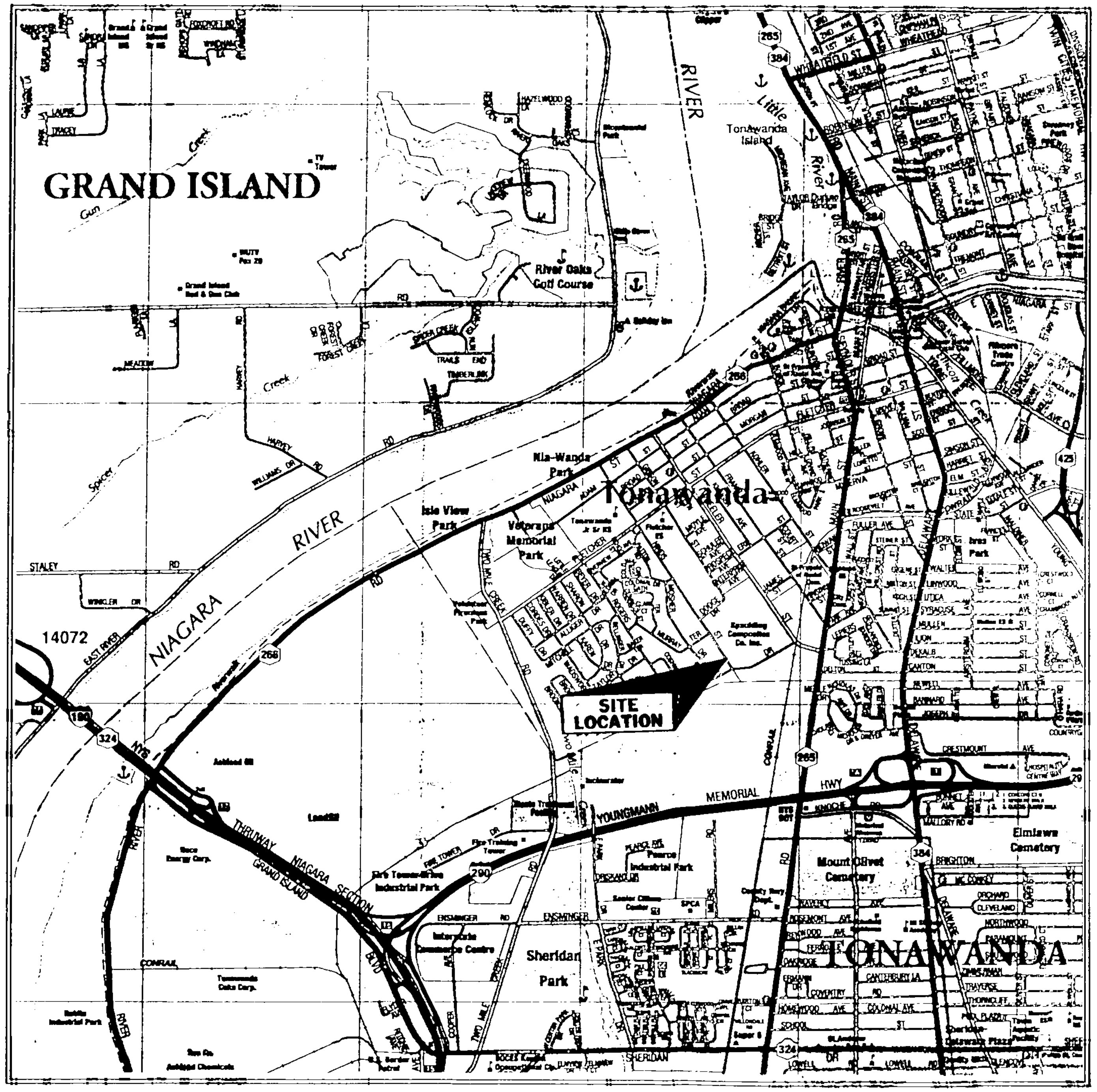
OPERABLE UNIT 3				
DIRECT COSTS				
METHODOLOGY	TOTAL QUANTITY (CY)	CAPITAL	YEARLY O&M	TOTAL (8)
TOTAL DIRECT COSTS (TDC)				
In-Situ Bioremediation	21,111	$633,330	$0	$633,330
INDIRECT COSTS		$208,999	$0	$208,999
TOTAL COSTS FOR OPERABLE UNIT				$842,32[illegible]

OPERABLE UNIT 4				
DIRECT COSTS				
METHODOLOGY	TOTAL QUANTITY (CY)	CAPITAL	YEARLY O&M	TOTAL (B)
TOTAL DIRECT COSTS (TDC)				
Excavate & Removal of Contaminated Soils and Media	8,897	$471,541	$0	$471,541
INDIRECT COSTS		$155,609	$0	$155,609
TOTAL COSTS FOR OPERABLE UNIT				$627,150

TOTAL PROJECT COST $2,075,239

TOTAL CONTINGENCY COSTS $156,033
TOTAL INDIRECT COSTS $514,909

FIGURES



DRAWN		CHK	
GPG		JAW	8/99

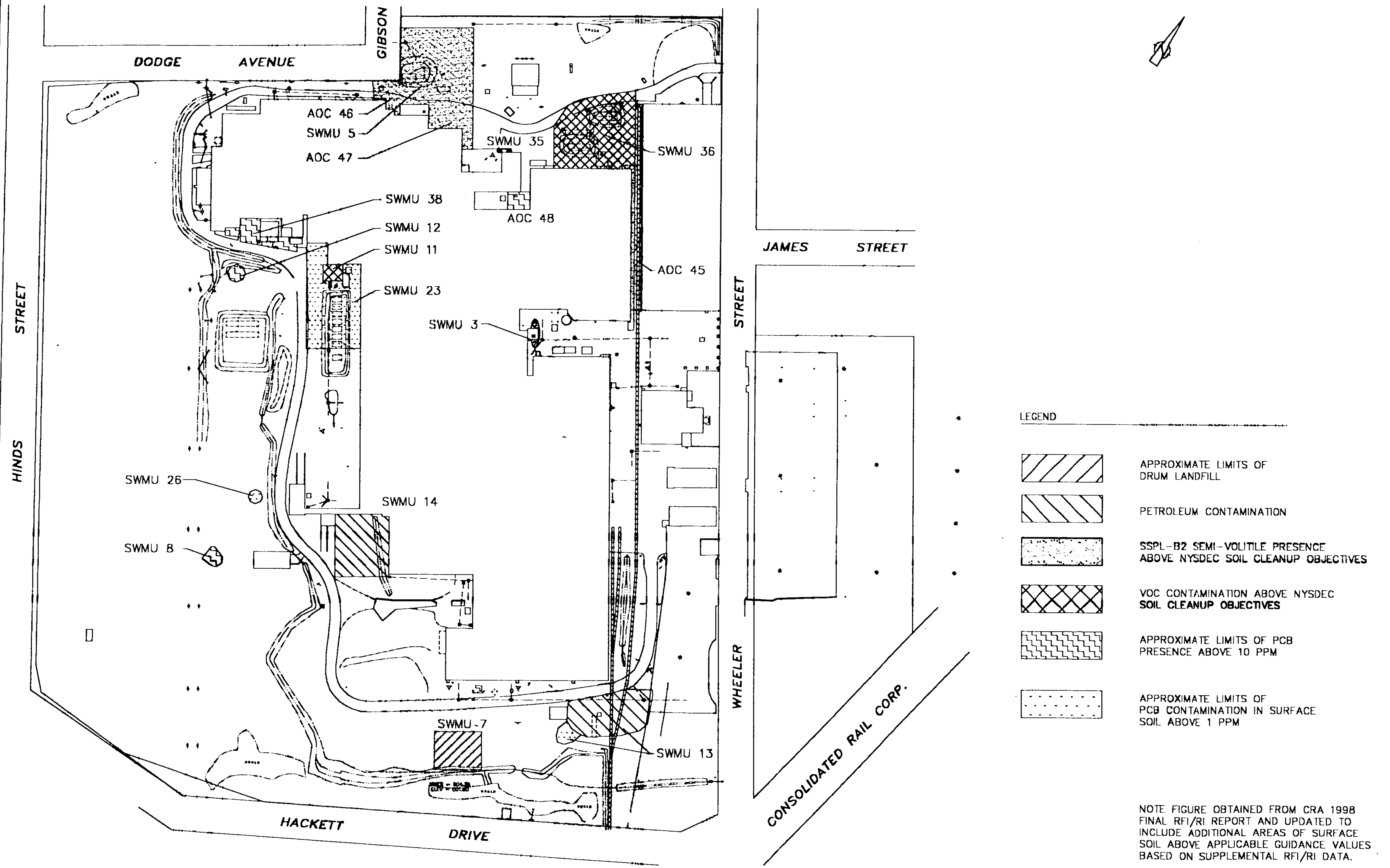
TITLE
SITE LOCATION PLAN

PREPARED FOR
SPAULDING COMPOSITES COMPANY

Leader Environmental, Inc.
2300 Wehrle Drive
Williamsville, New York 14221
(716) 565-0963
(716) 565-0964 (fax)
A Member of the Leader Group

PROJECT	SCALE
214.002	NTS

SHEET OF
1-1



NOTE FIGURE OBTAINED FROM CRA 1998 FINAL RFI/RI REPORT AND UPDATED TO INCLUDE ADDITIONAL AREAS OF SURFACE SOIL ABOVE APPLICABLE GUIDANCE VALUES BASED ON SUPPLEMENTAL RFI/RI DATA.

DRAWN		CHK	
GPG		JAW	8/99

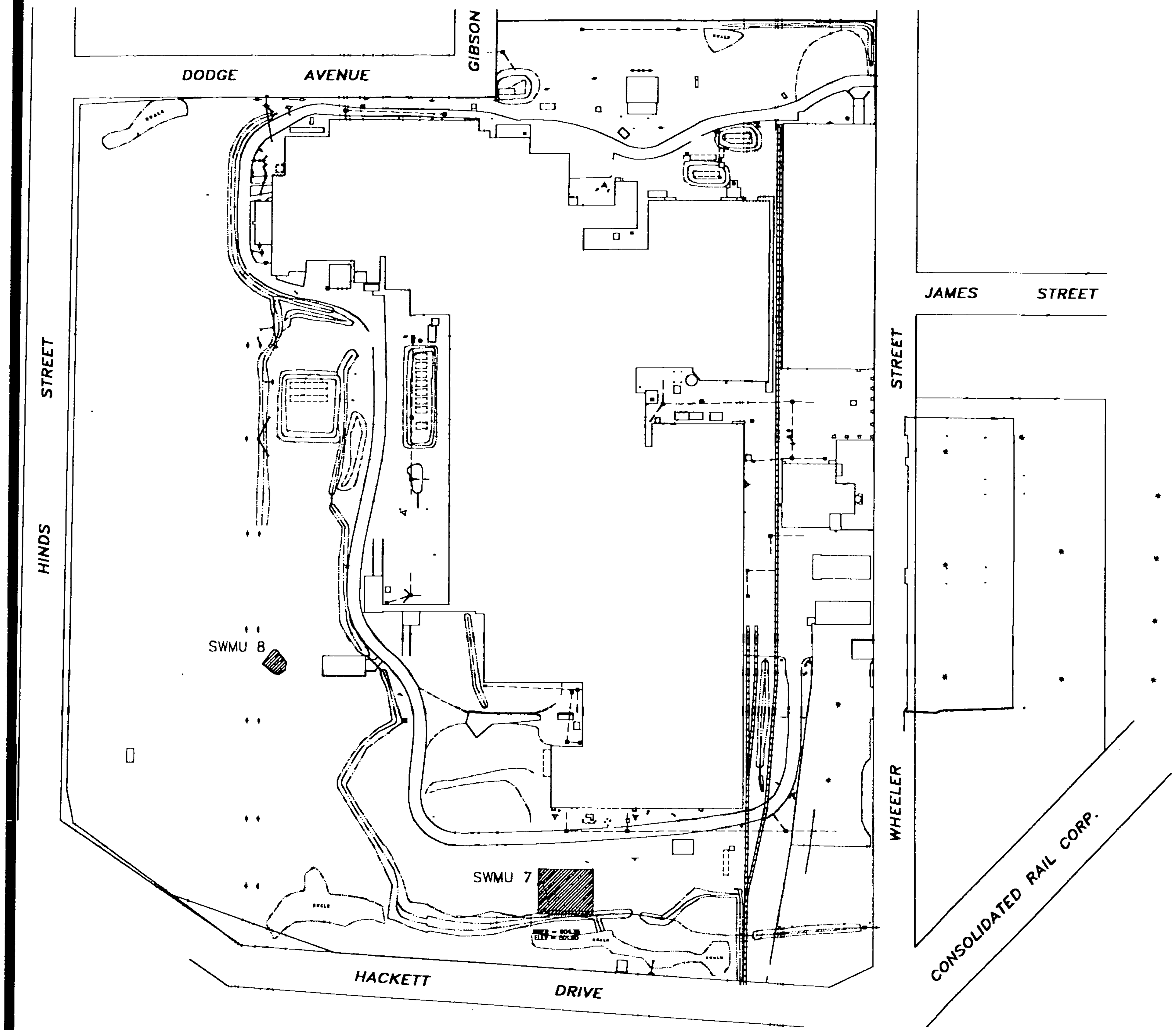
TITLE: SITE PLAN

PREPARED FOR: SPAULDING COMPOSITES COMPANY

LEADER
Leader Environmental, Inc.
2300 Wehrle Drive
Williamsville, New York 14221
(716) 565-0963
(716) 565-0964 (fax)
A Member of the Leader Group

PROJ. NO.	SCALE
214.002	NTS

FIGURE 1-2



NOTE FIGURE OBTAINED FROM CRA 1998 FINAL RFI/RI REPORT AND UPDATED TO INCLUDE ADDITIONAL AREAS OF SURFACE SOIL ABOVE APPLICABLE GUIDANCE VALUES BASED ON SUPPLEMENTAL RFI/RI DATA.

DRAWN		CHK	
GPG		JAW	8/99

TITLE
RECOMMENDED ALTERNATIVE
OU1 EXCAVATION & OFF-SITE DISPOSAL

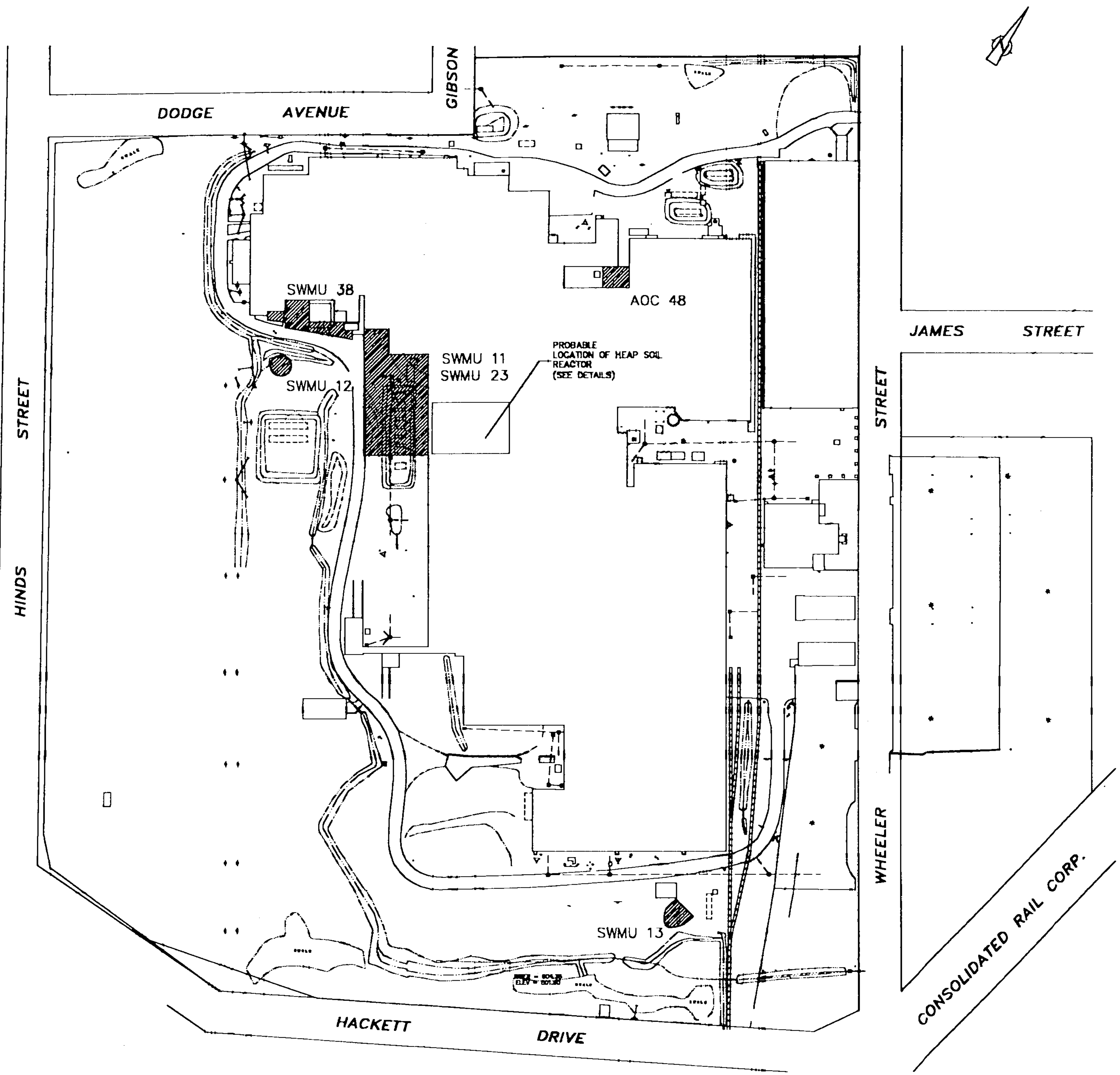
PREPARED FOR
SPAULDING COMPOSITES COMPANY

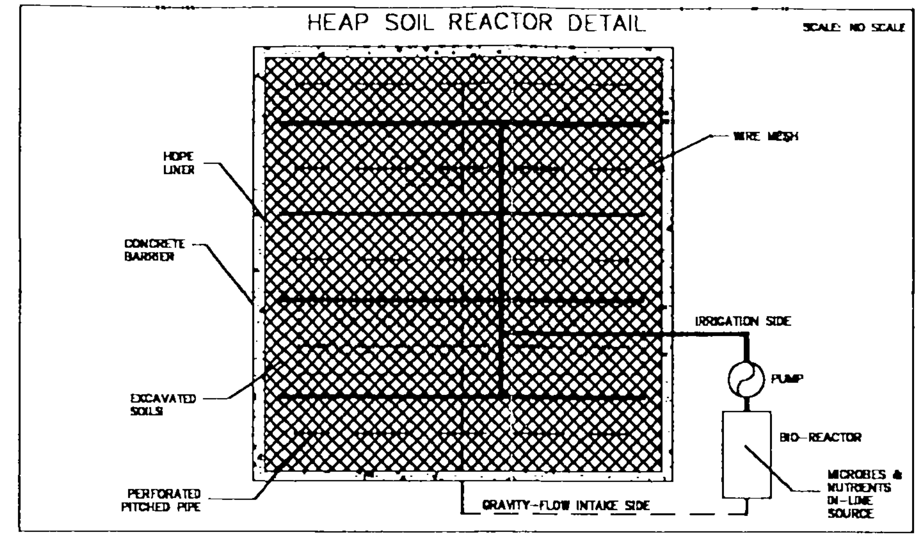
LEADER

Leader Environmental, Inc.
2300 Wehrle Drive
Williamsville, New York 14221
(716) 585-0983
(716) 585-0984 (fax)
A Member of the Leader Group

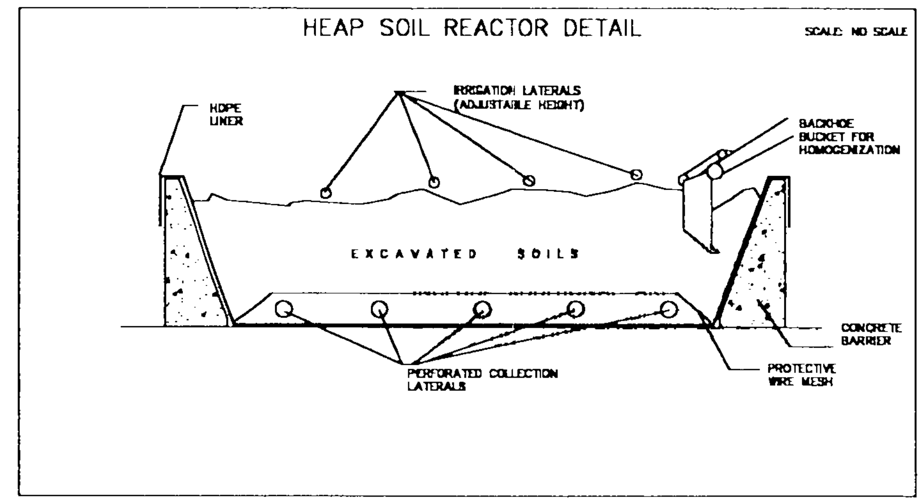
PROJ. NO.	SCALE
214.002	NTS

FIGURE
6-1





EX-SITU BIOREMEDIATION
TYPICAL PLAN VIEW



EX-SITU BIOREMEDIATION
TYPICAL CROSS-SECTION VIEW

NOTE FIGURE OBTAINED FROM CRA 1998 FINAL RFI/RI REPORT AND UPDATED TO INCLUDE ADDITIONAL AREAS OF SURFACE SOIL ABOVE APPLICABLE GUIDANCE VALUES BASED ON SUPPLEMENTAL RFI/RI DATA.

DRAWN		CHK	
GPG		JAW	8/99

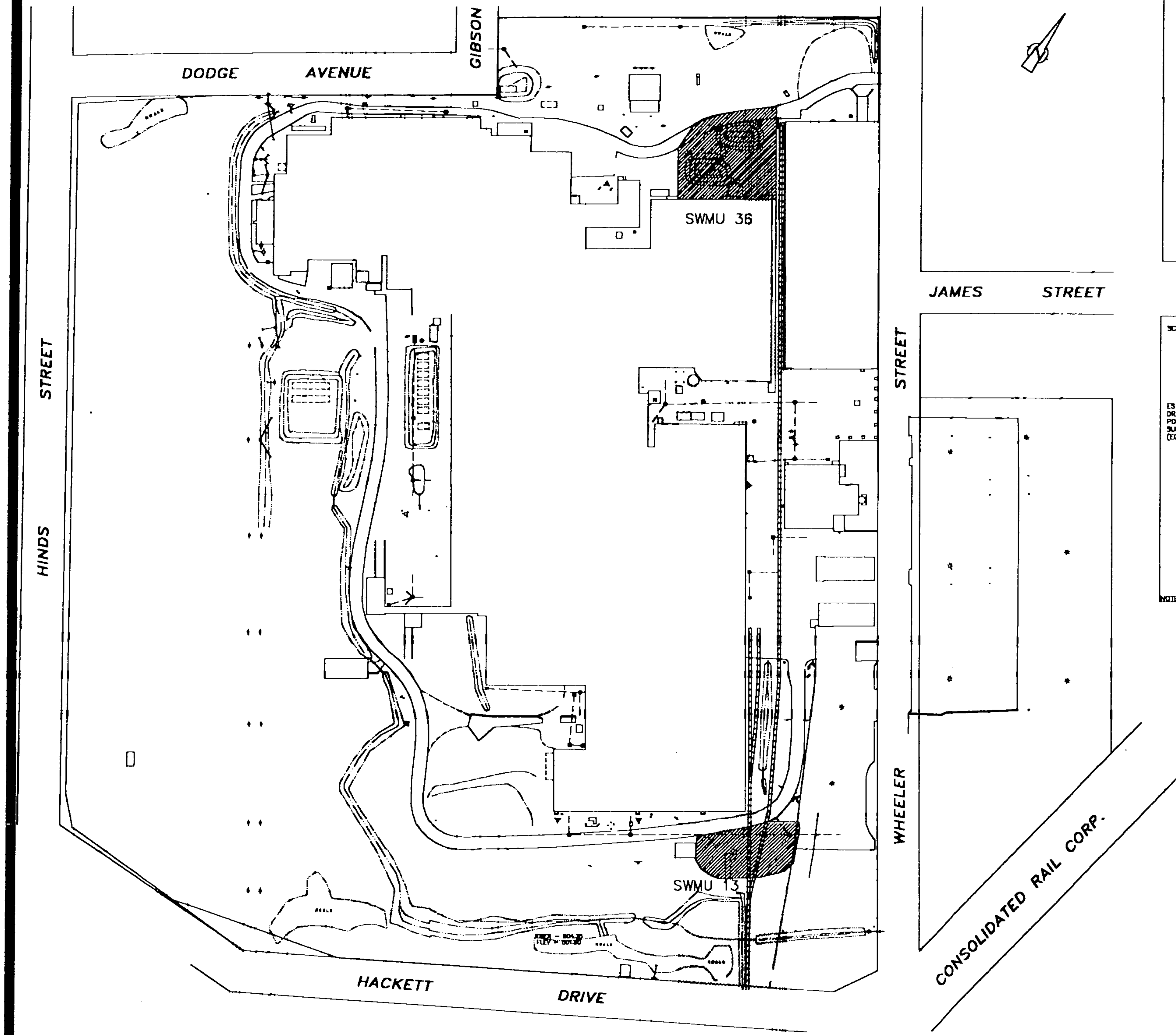
TITLE
RECOMMENDED ALTERNATIVE
OU2 EXCAVATION
& EXSITU BIO REMEDIATION

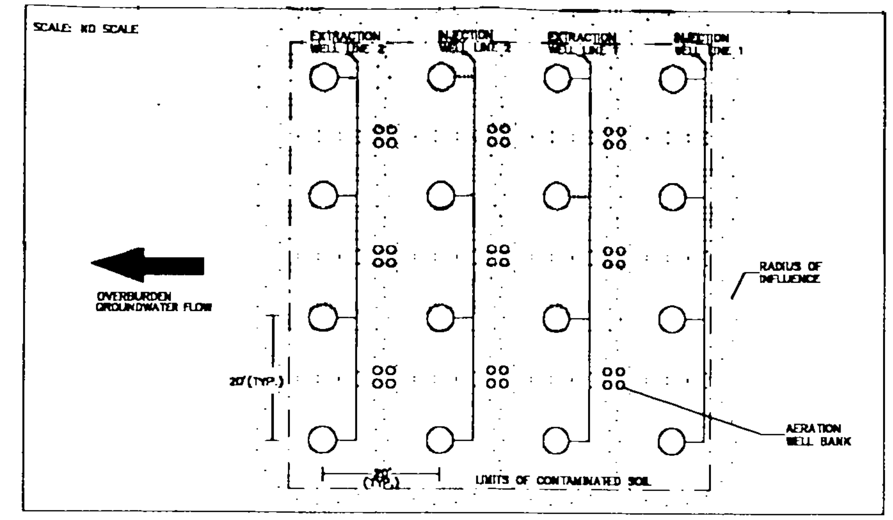
PREPARED FOR
SPAULDING COMPOSITES COMPANY

LEADER
Leader Environmental, Inc.
2300 Wehrle Drive
Williamsville, New York 14221
(716) 565-0963
(716) 565-0964 (fax)
A Member of the Leader Group

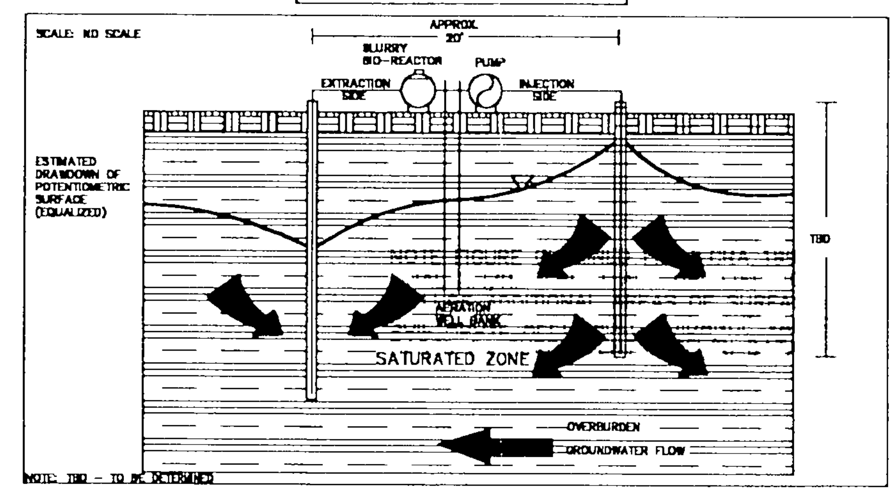
PROJ. NO.	SCALE
214.002	NTS

FIGURE
6-2





IN-SITU BIOREMEDIATION
TYPICAL PLAN VIEW



IN-SITU BIOREMEDIATION
TYPICAL CROSS-SECTION VIEW

NOTE FIGURE OBTAINED FROM CRA 1998 FINAL RFI/RI REPORT AND UPDATED TO INCLUDE ADDITIONAL AREAS OF SURFACE SOIL ABOVE APPLICABLE GUIDANCE VALUES BASED ON SUPPLEMENTAL RFI/RI DATA.

DRAWN	CHK	
GPG	JAW	8/99

TITLE
RECOMMENDED ALTERNATIVE
OU3 INSITU BIO REMEDIATION

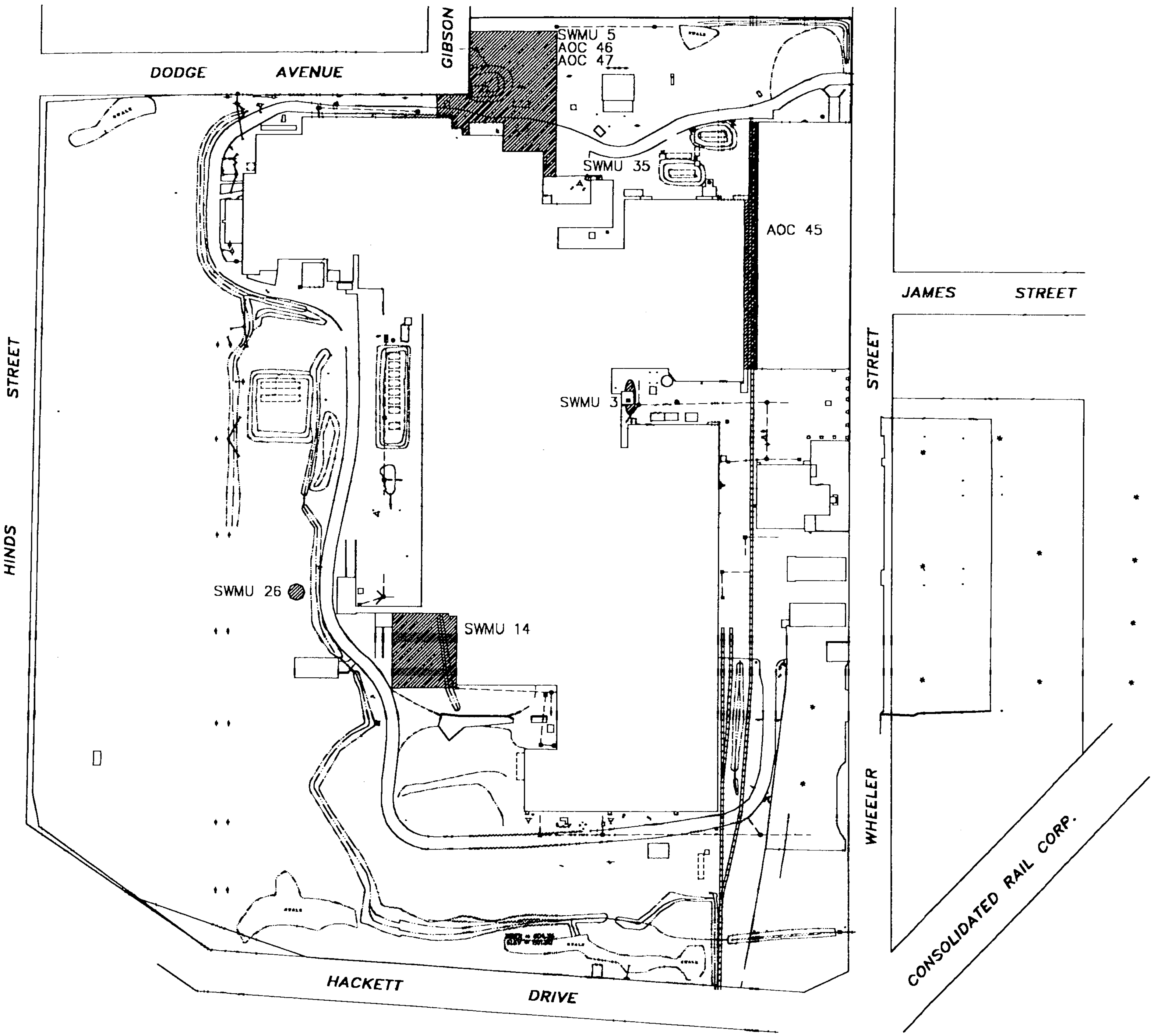
PREPARED FOR
SPAULDING COMPOSITES COMPANY

LEADER

Leader Environmental, Inc.
2300 Wehrle Drive
Williamsville, New York 14221
(716) 565-0963
(716) 565-0964 (fax)
A Member of the Leader Group

PROJ. NO.	SCALE
214.002	NTS

FIGURE
6-3



NOTE FIGURE OBTAINED FROM CRA 1998 FINAL RFI/RI REPORT AND UPDATED TO INCLUDE ADDITIONAL AREAS OF SURFACE SOIL ABOVE APPLICABLE GUIDANCE VALUES BASED ON SUPPLEMENTAL RFI/RI DATA.

DRAWN		CHK	
GPG		JAW	8/99

TITLE
RECOMMENDED ALTERNATIVE
OU4 EXCAVATION & OFF-SITE DISPOSAL

PREPARED FOR
SPAULDING COMPOSITES COMPANY

LEADER
Leader Environmental, Inc.
2300 Wehrle Drive
Williamsville, New York 14221
(716) 565-0963
(716) 565-0964 (fax)
A Member of the Leader Group

PROJ. NO. 214.002

SCALE NTS

FIGURE 6-4

APPENDIX A
TREATABILITY STUDY DATA

ADVANCED BIOLOGICAL SOLUTIONS, INC.
83 Macomb Place
Mt. Clemens, MI 48043

(810) 783-9162 Telephone
(810) 465-6370 Fax

Leader Environmental, Inc.
2300 Wehrle Dr.
Williamsville, New York 14221
Attn: Glen

February 15, 1999

Dear Glen,

RE: Spaulding Project, Tonawanda, New York
Results of bench study on your sample of soil from the Spaulding site contaminated with Aroclor 1248.

We provide a microbial process (50 microbial strains) which is able to degrade PCB within matrices by non-thermal alternative method in which the microorganisms utilized the PCB molecules as their food source. We have utilized our microorganism process, coupled with a water base emulsifier to biodegrade PCBs in different matrices (concrete, soil, wood, steel, water and asphalt) by spraying or soaking the microorganisms onto the contaminated surface, or by mechanical mixing. There is no special pre-treatment of the matrices other than monitoring the soil moisture and maintaining the proper pH of the soil. However, the speed of the microbial reaction is directly affected by the surface area available for microorganism reaction. This means that a large piece of PCB contaminated matrix requires a longer reaction time than if the matrix is initially crushed.

It is important to note that regardless of the particle size of the material being treated, the microorganisms process will still proceed to degrade the PCBs. All PCB treatment using microbes for destruction can proceed to completion in any PCB matrices under standard field conditions. The end-point or the detectable level of PCBs is decreased. All PCB microbial decontamination will be conducted on-site and at no time will any of the PCB contamination leave the site.

Bench Study Materials:

One 10 gallon fish tank

Advanced Biological Solution (ABS) Microbes (50 strains).
pH meter
Thermometer (F°)

This type of bench study is a very simple approach to treating contaminated soil using the ex-situ methodology.

The soil was removed from the 5 gallon pail that was sent to us by your company and placed into a 10 gallon fish tank. The amount of soil used filled the tank to a level of approximately 1/3 of the tanks capacity. The soil was tested for soil; moisture and adjusted to a moisture of 45%. The range of the pH was maintained at 6.5-8.5. The temperature was kept at approximately 72°F. The pre-treatment analytical of the soil showed levels of PCB (Aroclor 1248) at 17,500 mg/kg (ppm). ABS microbes were acclimated in the soil. After six (6) days the soil was turned and observed for a period of approximately 12 days. The pH and soil moisture where monitored daily. The soil was now tested for post-treatment analytical and the level showed a dramatic reduction of the PCB (Aroclor 1248) to a less than 10 mg/kg (ppm).

Conclusion:

It is our opinion that this soil matrix can be remediated ex-situ at a rate of approximately 1200 yards to a level of less than 5 mg/kg (ppm) with a 12 day turnaround inside one of the buildings at the Spaulding site. The clean material will then be returned to its original area for disposal.

If you have any questions please call me at (810) 783-9162.

Sincerely,

Tom Franks

Tom Franks
Microbiologist

Advanced Biological Solutions, Inc.

Attn: Tom Franks

February 1,1999

Sample #: L17530-1 Pre-Treatment Sample

Description: Leader Environmental
Spaulding Project
Tonawanda, New York

Matrix: Soil (Soil Moisture 45%)

Collected: 26-Jan-99

Submitted: 29-Jan-99

Acclimated 29-Jan-99 with Microbes, [redacted]

PARAMETERS	RESULTS	PQL	UNITS	MDL	METHOD
PCB					
PCB-1016	ND	330	mg/kg	330	8080 TierI
PCB-1221	ND	330	mg/kg	330	8080 TierI
PCB-1232	ND	330	mg/kg	330	8080 TierI
PCB-1242	ND	330	mg/kg	330	8080 TierI
PCB-1248	17,500	330	mg/kg	330	8080 TierI
PCB-1254	ND	330	mg/kg	330	8080 TierI
PCB-1260	ND	330	mg/kg	330	8080 TierI

Source: USEPA SW846 Methodology / 600 Series / AOAC
Note: ND denotes none detect above Practical Quantitative Limit.
mg/kg denotes ppm.

Amy Arno/Martine Hurwitz
Project Managers

END OF REPORT

Analytic & Biological Laboratories, Inc.
24330 INDOPLEX CIRCLE FARMINGTON HILLS, MICHIGAN 48335 (810) 477-6666 FAX (810) 477-4004

Advanced Biological Solutions, Inc.

February 15,1999

Attn: Tom Franks

Sample #: L18123-2 Post-Treatment Sample

Description: Leader Environmental
Spaulding Project
Tonawanda, New York

Matrix: Soil (Soil Moisture 45%) Collected: 09-Feb-99 Submitted: 09-Feb- 99 Acclimated 29-Jan-99 with Microbes. [redacted]

PARAMETERS	RESULTS	PQL	UNITS	MDL	METHOD
PCB					
PCB-1016	ND	330	mg/hg	330	8080 TierI
PCB-1221	ND	330	mg/kg	330	8080 TierI
PCB-1232	ND	330	mg/kg	330	8080 TierI
PCB-1242	ND	330	mg/kg	330	8080 TierI
PCB-1248	<10	330	mg/kg	330	8080 TierI
PCB-1254	ND	330	mg/kg	330	8080 TierI
PCB-1260	ND	330	mg/kg	330	8080 TierI

Source: USEPA SW846 Methodology / 600 Series / AOAC
Note: ND denotes none detect above Practical Quantitative Limit.
mg/kg denotes ppm.

Amy Arno/Martine Hurwitz
Project Managers

END OF REPORT

Analytic & Biological Laboratories, Inc.
[illegible] INDOFLEX CIRCLE FARMINGTON HILLS, MICHIGAN [illegible] (810) 477-[illegible] FAX (810) 477-[illegible]