REMEDIAL ALTERNATIVES REPORT
and
WORK PLAN

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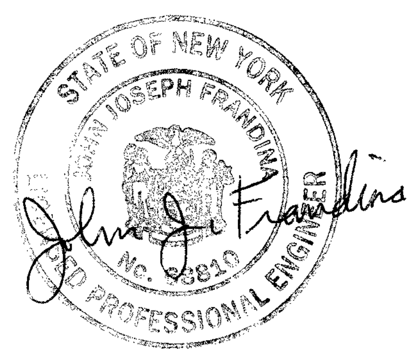


July 2006

1.0 INTRODUCTION

1.1 Background Information

The Jo Lyn Enterprises, Ltd. facility is located at 21 Valley Street, Village of Mayville, Chautauqua County, New York (Figure 1, Attachment 1). This parcel of land consists of approximately 1.06 acres of land located within the lake plain across Route 394 along the western side of Chautauqua Lake. Historically, the facility was operated by Wappat Saw Company. Later the facility was operated as Standard Portable Products, Inc. One or more of the prior owners reportedly performed various metal working operations, including vapor degreasing using a Trichloroethene (TCE) degreasing unit. It is understood that the spent TCE solvent from this unit was disposed of or stored in an exterior underground septic tank.

The current owner, Jo Lyn Enterprises Ltd. d/b/a Standard Portable ("Jo Lyn"), purchased certain assets including the facility in 1996 and began manufacturing operations. Pre-purchase due diligence investigations identified a septic tank historically believed to be used as storage/disposal for TCE waste generated by the vapor degreasing unit; a remedial program was conducted by Anderson International, Inc. on Jo Lyn's behalf. It should be noted that the septic tank was removed in 1996 at the time of Jo Lyn's purchase. The waste that Jo Lyn generated in association with the vapor degreaser was containerized and transported off-site for disposal. The use of the vapor degreaser continued until 2001, when it was taken out of service. In late 2002, Jo Lyn sought to sell the subject site, and as part of the due diligence process, a Phase II ESA was performed on behalf of the potential buyer's financial lending institution. The results of that Phase II ESA indicated significant levels of TCE contamination in the soil and groundwater in the vicinity of former septic tank.

During May 2006, Jo Lyn retained Hazard Evaluations, Inc. (HEI) to perform a focused Subsurface Site Investigation (SSI) in order to obtain additional data and information concerning the subsurface condition of the subject site relative to the historic, pre-purchase release of Trichloroethylene. The goals of the SSI included obtaining: 1) a more thorough characterization of Volatile Organic Contaminants (VOCs) within on-site soil profile, both vertically and laterally; 2) water table elevations and the approximate on-site groundwater flow direction; 3) definition of the on-site shallow contaminant plume with respect to site boundaries; 4) condition of the subfloor soil/fill in the vicinity of the former degreaser; and 5) identification of any "hot spots" within the soil profile in the impacted area, including any on-site areas exhibiting dense non-aqueous phase liquid (DNAPL) product. The results of the SSI revealed well-defined areas of soil and groundwater contaminated with TCE. In addition, recoverable free phase DNAPL was observed off-site along the southeastern border of the subject site. This RAR is based on the above findings of the SSI and have formed the basis for a determination as to the technical and economic feasibility of Jo Lyn performing a voluntary on-site remediation in accordance with the rules of the New York State Brownfields Cleanup Program.

1.2 Purpose

The purpose of this report is to provide the NYSDEC with information in compliance with Draft DER-10 "Technical Guidance for Site Investigation and Remediation", dated December 2002. Using the site data and information collected during the SSI, this Remedial Alternatives Report (RAR) document evaluates and identifies a plan for implementing the most appropriate remedial action that will address: 1) potential free phase DNAPL (TCE) which may be on-site and encountered along the southeast border of the site; 2) the on-site contaminated groundwater and soil profile between the likely source area (the former septic tank), and the site boundary; and 3) the potential soil vapor issues within the facility. In accordance with an agreement with the NYSDEC Division of Hazardous Waste Remediation, this document has been prepared to address on-site TCE contamination.

1.3 Responsibilities of Personnel

Various personnel have been identified and assigned specific responsibilities for the site remediation, as indicated below. All personnel with assigned responsibilities may be working at any location on the subject site, and therefore will receive appropriate instruction concerning the health and safety procedures related to all aspects of the site remediation.

Technical Control and Project Oversight

HEI's Principal, C. Mark Hanna, CHMM, has the overall responsibility to commit any resources required to implement and execute the different phases of the site remediation. This individual will have the authority to ensure that any aspect of the site remediation is expedited and facilitated in accordance with both Jo Lyn's Brownfield Cleanup Agreement and the associated agreements between Jo Lyn and HEI. The resolution of all technical issues will be coordinated through HEI's Principal.

Project Management

General project management tasks will be the responsibility of Scott Overhoff, HEI's Project Manager for site investigation and remediation. The Project Manager's responsibilities will also include acting in a supervisory capacity over all HEI and subcontractor employees during the on-site activities related to the site remediation. The Project Manager will also ensure all Quality Assurance/ Quality Control aspects of this project, including equipment decontamination, analytical blank preparation and sample custody procedures.

Health & Safety

All site related responsibilities for the health and safety of all HEI and subcontractor employees, agency personnel and any visitors to the subject site during any remedial activities will be assumed by the Project Manager.

Professional Engineer

Technical aspects of the site remediation and this RAR will be certified by John J. Frandina, PE.

Subcontractors

Various subcontractors to HEI will be utilized for specific aspects of the site remediation, including, at a minimum, Zebra Environmental (soil probe and piezometer installation), Paradigm Environmental Services (analytical laboratory) and Frank's Vacuum Truck Service (liquid waste disposal). All subcontractors will be qualified for the tasks assigned to them by HEI, and will carry appropriate insurance.

2.0 REMEDIAL GOALS & REMEDIAL ACTION OBJECTIVES

2.1 Basis for Selection of Remedial Measures

The SSI identified the presence of: 1) TCE at depth within the on-site soil profile in an area extending generally from the former septic tank location outside the facility to the southeast to the property boundary; 2) TCE within the shallow groundwater shows a similar, but less widespread, migration pathway relative to the soil contamination; 3) Free phase DNAPL (TCE) off-site at the SB1 location; and 4) TCE in the soil and groundwater beneath the southern warehouse area of the facility and a portion of the current manufacturing area (SB8 and SB13 locations). It should be noted that the 2002 Phase II ESA identified DNAPL in the vicinity of the former septic tank location; however, during the SSI, the former UST location (SB18), which is located directly upgradient from SB1, exhibited the highest soil TCE level, but no free product was observed. In addition, free phase DNAPL has not been identified on-site, to date. Any data gaps regarding the presence of free phase DNAPL on-site will be supplemented during the installation of the 4-8 piezometers wells along the border of the site in the vicinity of SB1, which has been determined to be off-site and is known to contain DNAPL.

In accordance with Subsection 4.3(c) of the NYSDEC's Draft DER-10 Technical Guidance Document, this RAR and Site Remediation Work Plan addresses the Remedy Selection requirements for a voluntary on-site remediation in accordance with the rules of the New York State Brownfields Cleanup Program. The Purpose, Site Description and Summary of Remedial Investigations required by DER-10, Subsection 4.3(c)(1-3) are summarized and/or referenced in Section 1.0 of this document.

2.2 Remedial Goal

The goal of Jo Lyn's site remedial activities is to mitigate any significant threats to human health and the environment presented by the existing on-site TCE contamination. This goal will be achieved through the proper application of product recovery (if DNAPL is found on-site) and enhanced in-situ bioremediation technologies, as well as minimization of the potential for vapor intrusion into the facility. This goal is consistent with the current and future intended use of the subject site, and has taken into consideration site institutional controls to be incorporated into the property's deed, including prohibition of: 1) Installation of drinking or ancillary use water wells; 2) Construction and/or use of buildings for other than commercial or industrial purpose; and 3) a Site Management Plan.

2.3 **Remedial Action Objectives**

Remedial Action Objectives (RAOs) for the subject site have been established for four Operable Units (OU), which have been designated as follows: 1) The area along the southeastern border of the site adjacent to the off-site area where free product was observed at SB-1 (OU-1), 2) The on-site shallow groundwater (OU-2); 3) The on-site impacted soils saturated with groundwater (OU-3); and 4) The on-site facility subfloor vadose zone air (OU-4). In each of OU-1 through OU-3, a limited number of volatile organic compounds (VOCs) related to the historic, pre-purchase TCE release (including several degradation compounds) exceed either the potentially applicable NYSDEC Recommended Soil Cleanup Objectives for soil [Appendix A, Table 1 of TAGM HWR-94-4046, dated January 24, 1994 (TAGM 4046)] or the Ambient Water Quality Standards and Guidance Values (TOGS 1.1.1, dated June 1998). The existence of free product on-site will be investigated during the installation of the 4 to 8 wells along the site border, in the vicinity of SB-1 during the IRM. The concentration of VOCs within OU-4 has not yet been monitored; however, the assessment and RAOs proposed for OU-4 will be incorporated into the remedial action selection process. Potential public health and environmental exposure pathways and the corresponding RAOs are presented below.

OU-1 (On-Site Free Product) Exposure Pathways and RAOs

As indicated above, free product (DNAPL TCE) was first observed within the soil profile at 10'-13' below grade (bg) off-site along the southeast property boundary. The potential for human exposure to free product within OU-1 is highly unlikely. Though it is currently unknown if there is free product on-site; even if it is assumed that this area contains free product similar to the level found at SB1, the potential for human exposure to free product is highly unlikely. There are no known on-site underground utilities in this area of the site (based upon the utilities locations for the SSI) that would require Jo Lyn or utility employees to excavate soil from this area. Presuming the institutional controls set forth in Section 2.2 are implemented, the potential for human exposure to contaminants within OU-1 is negligible.

There is potential environmental exposure related to the potential presence of free product DNAPL in OU-1. Soil contacted by free product adsorbs varying amounts of the product into the soil structure pore spaces and becomes contaminated. In turn, groundwater that passes through the contaminated soils becomes contaminated through natural chemical dissolution or physical dispersion of those contaminants. Other than these on-site environmental media, there are no specific, on-site, sensitive environmental receptors such as streams, lakes or estuaries.

The RAO for OU-1 involves the identification of and removal of measurable free product, if it is found in the area of along the southeastern border of the site through the proposed Interim Remedial Measure.

OU-2 (On-Site Impacted Soil Saturated with Groundwater) Exposure Pathways and RAOs

As indicated in the SSI, groundwater contamination by TCE was identified migrating from the facility toward the southeast. The potential for human exposure to this highly contaminated groundwater within OU-2 is unlikely; however, low level TCE contamination was identified in the groundwater across most of the eastern and southern half of the subject site during the SSI. This area includes the utilities rights-of-way along Route 394; therefore, human exposure to contaminated groundwater could occur in the front of the property along the roadway. It should be noted that the contaminant concentrations in the groundwater in the area of these utilities was determined to be very low (slightly above groundwater standards), and should not result in exposure at levels that would present dermal contact impacts to utility workers. The ingestion and/or inhalation of these low levels of groundwater TCE in this area would not be anticipated. Presuming the institutional controls set forth in Section 2.2 are implemented, the potential for human exposure via other exposure pathways within OU-2 is unlikely.

There is potential environmental exposure related to the presence of VOCs in OU-2. However, since the groundwater on-site is already contaminated by TCE, further on-site environmental exposure in not likely.

The RAO for OU-2 includes the reduction of TCE and related VOCs concentrations in on-site groundwater to levels below site-specific cleanup criteria.

OU-3 (On-Site Saturated Soils) Exposure Pathways and RAOs

As indicated in the SSI, soil profile contamination by TCE was identified in a plume from the facility toward the southeast. The potential for human exposure to the area of impacted soil within OU-3 is unlikely; however, lower levels of TCE contamination were identified at depth within the soil profile toward eastern property boundary along Route 394 during the SSI. This area may include the utilities rights-of-way along Route 394; therefore, human exposure to contaminated saturated soil could occur in the front of the property along the roadway. It should be noted that the contaminant concentrations in the soil near the roadway, possibly in the area of these utilities, was determined to be low (below RSCOs), and should not result in exposure at levels that would present dermal contact injuries to utilities workers. The ingestion and/or inhalation of these low levels of TCE in the saturated soils of this area of OU-3 would not be anticipated. Presuming the deed restrictions set forth in Section 2.2 are implemented, the potential for human exposure to contaminants within OU-3 is low.

There is potential environmental exposure related to the presence of TCE and related VOCs in site soils. However, since the soil profile on-site is already contaminated by TCE, further on-site environmental exposure in not likely.

The RAO for OU-3 includes the reduction of TCE and related VOCs concentrations in on-site soils to levels below the Site-Specific Cleanup Levels.

OU-4 (On-Site Subfloor Air/Interior Structure Air) Exposure Pathways and RAOs

As indicated in the SSI, soil and groundwater contamination by TCE were identified under the southern portion of the warehouse floor and adjacent manufacturing areas.

The RAO for OU-4 involves the installation of a passive sub-slab vapor extraction system, which is proposed to address any concerns relative to soil vapor intrusion into the buildings.

3.0 REMEDIAL ALTERNATIVES EVALUATION & SELECTION

3.1 General Response Actions

In accordance with DER-10 Section 4.2(a)(3), the identified general response actions for this site range from "No Action" to site-wide contaminant excavation and off-site disposal with high volume site dewatering and groundwater treatment. An applicable innovative technology which has been determined to be suitable as a response action for the subject site involves enhanced in-situ bioremediation. This technology has been proven to be effective at remediating chlorinated organics in soil and groundwater.

The estimated volumes of impacted media include: 1) Approximately 10,000 tons of impacted soil covering an area 100 feet wide by 150 long by twelve feet deep; and 2) Approximately 675,000 gallons (static volume) of impacted groundwater present within a fine to medium sand with an approximate specific yield of 25% (estimated area 150 feet wide by 200 long by twelve feet deep).

3.2 Remedial Alternatives Evaluation

The technically implementable remedial alternatives that will be considered for the subject site will include: 1) No Action; 2) Site-wide Excavation/Disposal with High Volume Site Dewatering and On-site Groundwater Treatment; and 3) Source Removal with Enhanced, In-Situ Bioremediation. Each alternative will be presented as a "site-wide" remedial approach given the specificity of the site contamination and the interrelationship of remedial actions for all four Operable Units.

Alternative 1 - "No Action"

"No Action" would involve allowing the free phase DNAPL plume, if present, the impacted groundwater plume, and impacted soil plume to remain under the current forces of natural mobility and degradation. In accordance with DER-10 Section 4.2(a)(5)(i), with respect to the listed considerations, the "No Action" alternative poses the following:

Size and Configuration of Process Options - Not Applicable to this Alternative

Time For Remediation - No Action would, in essence, rely on natural attenuation to remediate the site which could take decades to complete.

Spatial Requirements - Not applicable to this Alternative

Options for Disposal - Not Applicable to this Alternative

Substantive Technical Permit Requirements - Not Applicable to this Alternative

Limitations or Other Factors Necessary to Evaluate the Alternative - There are limited data in the media with regard to the timeframe necessary for complete remediation of a similar site via natural attenuation.

Adverse Impacts on Fish and Wildlife Resources - None anticipated for the No Action Alternative for on-site contamination.

In accordance with DER-10 Section 4.1(e)(1-7), the "No Action" Alternative will be discussed with regard to the seven criteria shown below:

Overall Protection of Public Health and the Environment - "No Action" does not pursue the goal of protection of the public health and the environment in any manner. Free phase DNAPL would still exist on-site, if present and would continue to present a source of contamination which could migrate off the site. The volume of impacted groundwater would likely increase as natural groundwater flow passes through the site and contacts either DNAPL or impacted soils.

Compliance with SCGs - "No Action" would not pursue or obtain (in a reasonable timeframe) compliance with the applicable SCGs.

Long Term Effectiveness and Permanence - "No Action" would provide no benefit of long term effectiveness or permanence.

Reduction of Toxicity, Mobility, or Volume with Treatment - "No Action" will not reduce toxicity, mobility or volume using active treatment, although natural processes do degrade the contaminants over time.

Short-Term Effectiveness - "No Action" poses no short term effectiveness.

Implementability - "No Action" would be easily implementable by definition, as no resources or effort are necessary.

Cost - The cost of "No Action" would appear to be negligible.

<u>Alternative 2 - Widespread Excavation/Disposal with High Volume Site Dewatering and On-site Groundwater Treatment</u>

"Site-wide Excavation/Disposal with High Volume Site Dewatering and On-site Groundwater Treatment" would involve demolition of approximately 30% of the on-site structure, high volume dewatering and carbon treatment of groundwater on the site, excavation and disposal of approximately 10,000 tons of impacted soil, backfilling of the excavation, and reconstruction of the building. In accordance with DER-10 Section 4.2(a)(5)(i), with respect to the listed considerations, this alternative poses the following:

Size and Configuration of Process Options - The size and configuration of the process options for this alternative are dependant on the volume of impacted material which, for soil, is virtually fixed. The volume of groundwater for this process option may increase substantially due to the inflow of groundwater resulting from the water table depression caused by dewatering during excavation and the proximity of Chautauqua Lake. Certain areas of the site may exhibit preferential flow paths in specific locations on the site which may further result in increased water volumes needing treatment. Such processes tend to be field modified depending upon the conditions encountered.

Time For Remediation - The time for remediation of the site using this alternative is estimated to be 6-12 months from agency approval. Inclement weather or other unforeseen circumstances may result in a slightly increased project duration.

Spatial Requirements - The spatial requirements for this option would include at lest 50% of the site surface area and an additional two acres of adjacent property currently owned by the local municipality. The use of the adjacent or other nearby property would be necessary for the storage of heavy equipment, treatment vessels and tanks, and for maneuvering vehicles used for hauling wastes off the subject site.

Options for Disposal - The options for disposal for this alternative include numerous licensed landfills. It is anticipated that the material will be considered a hazardous waste, which would necessitate the material being disposed of at an appropriately licensed landfill. Options for this include the Waste Management Model City Landfill and Vickery Landfill located in Ohio.

The treated groundwater would technically not be disposed of; however, the options for discharge of the treated water may be to the storm sewer system or local sanitary sewer and POTW.

Substantive Technical Permit Requirements - This option would involve obtaining an appropriate SPDES permit for the discharge of the treated groundwater to a local surface water body. Alternatively, a permit for the local POTW may be necessary to discharge treated water to the POTW facilities. In addition, municipal permits will likely be needed for the demolition of the building, excavation and building reconstruction. Significant effort will be needed to obtain approval for the reconstruction, given updated building codes, etc.

Limitations or Other Factors Necessary to Evaluate the Alternative - This alternative is a presumptive measure which involves a substantial amount of physical modifications to the site.

Adverse Impacts on Fish and Wildlife Resources - The anticipated adverse impacts on wildlife on and nearby the subject site would be the exposure of birds or other animals to vapors and dusts that could emanate from the area during the excavation process.

In accordance with DER-10 Section 4.1(e)(1-7), the Widespread Excavation/Disposal with High Volume Site Dewatering and Groundwater Treatment alternative will be discussed with regard to the seven criteria shown below:

Overall Protection of Public Health and the Environment - This alternative will provide the significant benefit of contaminant mass removal which would reduce the exposure of workers who could take part in on-site subsurface work in the future. Additionally, workers within the on-site structure would be protected from any exposure to contaminants within the interior air space of the on-site building. The subsurface environment would be benefited in that contaminant mass would be removed which would virtually eliminate continued contaminant migration.

However, an excavation of such magnitude would potentially expose remedial workers to elevated levels of contaminants during the site work. Additionally, given the high volatility of the TCE contamination and the fact that there is a public park directly across the road from the site, it is highly likely that the public could be affected by this remedial alternative, in that odors would likely emanate into the park during excavation activities.

Although the subsurface environment would substantially benefit from this alternative, the atmospheric environment would be negatively affected through substantial volatilization of contaminants.

Compliance with SCGs - This alternative is presumptive and would meet the SCGs for the on-site remediation of soil and groundwater. It may be more difficult to meet applicable SCGs with regard to ambient air emissions and exposure of the public to nuisance odors or VOCs in excess of ACGIH exposure limits.

Long Term Effectiveness and Permanence - The long-term effectiveness and permanence of this alternative is high given the contaminant mass removal.

Reduction of Toxicity, Mobility, or Volume with Treatment - This alternative would significantly reduce the toxicity, mobility and volume of the on-site contaminants due to the contaminant mass removal.

Short-Term Effectiveness - The short term effectiveness this alternative is very good given the relatively short duration of the project and extensive contaminant mass removal.

Implementability - This alternative would be difficult to implement given the excessive scope and cost. Demolition and reconstruction of the on-site structure would be exceptionally complex, and could threaten the viability of the existing business. The soil removal and groundwater treatment would take a significant amount of heavy equipment and labor, which would result in higher costs. The presence of a municipal park and other local tourist attractions significantly complicates the implementation of this alternative, as high truck traffic and the release of fugitive vapors or nuisance odors is highly likely.

Cost - The cost of Site-wide Excavation/Disposal with High Volume Site Dewatering and On-site Groundwater Treatment is calculated to be $2,165,000.

Alternative 3 - Source Removal with Enhanced In-Situ Bioremediation

Source Removal with Enhanced In-Situ Bioremediation would involve the implementation of several different remedial technologies that would symbiotically function to achieve the remedial goal of the site, including active product recovery, low-flow hydraulic control of the on-site impacted groundwater, active carbon filtration, and phased, enhanced anaerobic and aerobic in-situ bioremediation.

In accordance with DER-10 Section 4.2(a)(5)(i), with respect to the listed considerations, the "Enhanced In-Situ Bioremediation" alternative poses the following:

Size and Configuration of Process Options - The size and configuration of the process options for this alternative are variable and will be dependent on information that will be collected during pilot testing proposed as part of the alternative. Pump sizes, product and groundwater extraction rates, recovery tank size, treatment vessel specifications, and the specific bioremedial enhancements will all be adjusted according to the site characteristics.

Time For Remediation - The time for remediation of the site using this alternative is estimated to be three to five years from agency approval based on a limited number of published results of sites exhibiting similar conditions. Advancements in bioremedial augmentation technologies over the course of remediation period may decrease the timeframe

Spatial Requirements - The spatial requirements for this option would include an approximate 200 square foot area along the wall of an undesignated portion of the building for the purpose of a product recovery tank. Additionally, an approximate 200 square foot area of the interior of the building (as well as the adjoining wall space) will be needed for pumping equipment. The remainder of the spatial requirement will be localized on the site during installation of extraction or injection points and underground piping.

Options for Disposal - The options for disposal for this alternative are related to the disposal of any recovered free phase DNAPL, groundwater, spent carbon, or other remediation derived wastes. The DNAPL may be recycled for energy recovery (off-site), incinerated or disposed of using other appropriate methods. Groundwater will be treated via activated carbon and reinjected on-site. Spent carbon will likely be regenerated by the carbon supplier, or alternatively, it can be disposed of using other appropriate solid waste disposal methods. Other remediation derived wastes will be disposed of using various methods. The specific method for managing all wastes generated during the remedial project will be dependent on the specific characteristics of the waste themselves, the available treatment or recycling options for those wastes, and the cost associated with those methods.

Substantive Technical Permit Requirements - It is not anticipated that substantive technical permits will be required for this alternative. As SPDES permit may be required, minor permitting may be needed for construction of the area used for the product recovery tank.

Limitations or Other Factors Necessary to Evaluate the Alternative - The limitations in evaluating this alternative are certain site-specific data related to hydrogeology and bacterial microcosms within the subsurface environment. This lack of information does not affect the overall ability to determine if the alternative will result in meeting the remedial goals given what is currently known about the site characteristics.

Adverse Impacts on Fish and Wildlife Resources - There is no anticipated adverse impacts on wildlife or fish as a result of this alternative.

In accordance with DER-10 Section 4.1(e)(1-7), the <u>Source Removal with Enhanced In-Situ Bioremediation</u> alternative will be discussed with regard to the seven criteria shown below:

Overall Protection of Public Health and the Environment - This alternative will provide a significant benefit of contaminant mass removal through potential active product recovery and biodegradation of the subsurface contaminants, which would reduce the exposure of workers who may of take part in on-site subsurface work in the future. Additionally, workers within the on-site structures will be protected from exposure to contaminants within the interior air space of the on-site buildings due to the installation of a mitigation system. The subsurface environment will benefit in that the contaminant mass will be reduced, which will reduce the amount of continued contaminant migration.

This alternative is not expected to expose remedial workers to significantly elevated levels of contaminant during the site work activities. Additionally, the public will not be affected by this remedial alternative, given that the majority of the contaminant mass removal will occur underground through biological processes.

Compliance with SCGs - This alternative is considered an innovative technology and although not presumptive, it has been proven to be effective at similar sites. It should attain relevant SCGs.

Long Term Effectiveness and Permanence - The long-term effectiveness and permanence of this alternative is substantial, given the contaminant mass removal via active product recovery and enhanced bioremediation.

Reduction of Toxicity, Mobility, or Volume with Treatment - This alternative would significantly reduce the toxicity, mobility, and volume of the on-site contaminants given the contaminant mass removal via active product recovery and enhanced bioremediation.

Short-Term Effectiveness - The short term effectiveness of this alternative is acceptable given the immediate active product recovery, low flow hydraulic control, carbon filtration and reinjection.

Implementability - This alternative would very suitable for implementation at this site given the presence of a municipal park and other local tourist attractions. Additionally, the project can be implemented given the financial resources available to carry out this alternative.

Cost - The cost of the "Enhanced, In-Situ Bioremediation" alternative is estimated to be $70,000 for the initial pilot testing, system installation and collection of baseline data. Operation, maintenance, monitoring and product and carbon disposal costs have been estimated to be $50,000 per year. The approximate project duration is estimated to be three to five years, with total project cost ranging between $220,000 to $320,000.

3.3 Remedial Alternative Selection

Alternative 3, Source Removal with Enhanced, In-Situ Bioremediation, has been selected as the remedial option for the subject site for the following reasons:

- It will achieve a higher level of overall protection of the public health and the environment when compared to Alternative 2, given the in-situ nature of the treatment.
- It will achieve the on-site SCGs over the duration of the project.
- Once on-site free product (if found) has been removed, and bioremediation of impacted soil and groundwater has occurred, the long term effectiveness and permanence of Alternative 3 will be high.

- The reduction of toxicity, mobility and volume of contaminants for Alternative 3 will be high given the potential use of active product recovery, low flow hydraulic control, and enhanced bioremediation.
- Short term effectiveness is addressed through potential active product recovery and low flow extraction and carbon filtration of groundwater.
- The practical implementability of Alternative 3 is much better than Alternative 2 for this site, given the setting of the site and the resources available to implement the alternative.
- Alternative 3 is the most cost-effective alternative.

4.0 REMEDIAL ACTION PLAN

HEI proposes to complete an IRM to immediately address the remedial goals. The following is a description of the proposed IRM that will be completed in conjunction with the selected Remedial Alternative.

4.1 IRM Implementation-Interior

HEI proposes to address the potential for vapor intrusion of TCE and related VOCs into the interior of the portions of southern warehouse and adjacent manufacturing areas of the facility. This IRM will involve the installation of a passive sub-slab depressurization and vapor extraction system that will vent to exterior atmosphere. This vapor extraction system will consist of 3" diameter, Schedule 40 PVC piping that extends from beneath the concrete floors of the facility within the selected areas through the roof of the facility for exterior emission of the extracted VOCs. An estimated eight separate extraction points will be selected around the perimeters of both the southern warehouse and the adjacent manufacturing area. Each pipe riser for this system will be installed down through a 6" diameter hole cored through the concrete floor and will be seated onto a small volume of clean 2" diameter crusher run stone to protect the opening of the pipe and allow adequate vapor flow. The coreholes will then be sealed around the PVC pipe risers with quick-set cement. Each riser will be secured to the inside of the exterior walls of the facility at several locations all the way to the ceiling, and will exit the roof with at least two feet extending above the roof line to allow adequate drafting. A pipe cap will be installed on top of the riser. The roof will be sealed appropriately to prevent leakage.

This passive sub-floor vapor extraction system will be installed in such a manner to allow modification to an active vapor extraction system.

4.2 IRM Implementation-Exterior

This portion of the IRM will involve the installation of four to eight (depending on the site conditions encountered) 1" diameter piezometers in the vicinity of SB1 in order to: 1) Determine the extent of any on-site free phase DNAPL TCE mass in this area; 2) Perform free phase DNAPL TCE recovery; and 3) Provide observation "wells" during a limited pilot test to determine both water yield from each well and the effectiveness of low-flow vacuum extraction of free phase DNAPL.

The proposed additional 1" diameter PVC piezometers will be installed on-site in the vicinity of SB1 at approximate distances of five-six feet apart, depending on the free product encountered. These wells will be installed using a direct-push drilling rig equipped with a dual-tube system, which will minimize boring cave-in and allow the installation of a complete sand pack. Well screen will consist of 0.030-slotted PVC screen installed to the top of the silty clay confining layer which will extend to approximately one foot above the groundwater surface encountered in each well. The larger slot size in the screen will enhance product flow into the piezometers.

The area of the site containing the newly installed piezometers will be secured using orange plastic safety fence during the initial IRM activities. HEI proposes to test two different low-flow pumping methods to determine which is most effective in recovering product at the subject site. These two methods will include peristaltic pumping and direct vacuum pumping using an air pump and knockout vessel. Initially, a limited pilot test will be conducted over a four day period, with each pumping system being tested for two consecutive workday shifts. The selection of the optimal system will be determined by this pilot test based on the best product recovery capability.

Data generated during any on-site DNAPL recovery will be used to implement the enhanced bioremediation technology. If DNAPL is not found on-site and this data is not generated a limited pilot test will be performed to determine the total water yield from site wells and the limits of the effective zone of influence under variable pumping conditions prior to implementation of the enhanced bioremediation technology.

If necessary, following the selection of the pumping system, the selected system pumps will be run at various, manually-controlled, pumping rates with the discharge into clear plastic transfer vessels which will allow HEI to observe both the total fluid recovery and product recovery. This approach will permit the comparison of these recovery relationships. When the transfer vessels are nearly full, the recovered fluids will be transferred into a temporarily staged 1,000 gallon polyethylene product recovery tank equipped with a secondary containment structure. HEI will routinely monitor the groundwater surface levels and product thicknesses in each of these additional piezometers using a dual phase interface probe to determine if any hydraulic influence can be detected during the pumping. The data collected during this limited pilot test will be examined and will be used to determine the appropriate equipment for the proposed IRM [i.e., pump sizes, knockout vessel sizes, product recovery tank(s) size(s), etc.].

The presence of fine sand soils with an apparent moderate hydraulic conductivity, coupled with the relatively shallow clay confining layer, will likely allow a low-flow pumping system approach to achieve hydraulic control and plume remediation. In addition, the presence of cis-1,2-Dichloroethene (DCE) and Vinyl chloride (VC) in the soil and groundwater analytical results demonstrate that naturally-occurring biodegradation is taking place. Finally, the presence of a relatively deep saturated zone (relative to the unsaturated zone) will facilitate the use of in-situ, enhanced biodegradation technologies.

In order to accomplish the NYSDEC's ultimate goals and objectives for this site, the IRM will include the following activities:

- Active free product recovery, if free product is found on-site.

- Enhanced biodegradation (both anaerobic and aerobic) will be implemented through groundwater extraction, electron acceptor/donor control, nutrient addition, augmentation (if necessary), and reinjection. Refer to EPA 542-R-04-16 "DNAPL Remediation; Selected Projects Approaching Regulatory Closure" dated December 2004 & EPA 542-R-00-008 "Engineered Approaches to In Situ Bioremediation of Chlorinated Solvents; Fundamentals and Field Applications" dated year 2000. Additional references are available upon request.

- Physical contaminant mass source removal will be performed as an ancillary function of the enhanced biodegradation system and will consist of carbon treatment of the extracted groundwater.

DNAPL Recovery

If DNAPL is found on-site, after the determination has been made regarding which pumping method proves to be most effective at on-site DNAPL TCE recovery, the appropriate equipment has been selected, and the operational parameters have been refined, HEI will implement the OU-1 IRM. For the purpose of this IRM Work Plan, HEI has estimated that the product recovery portion of the IRM if required, will include the following specifications:

- Product recovery will be performed using four to eight individual peristaltic pumps which will extract fluids from four to eight, one-inch diameter PVC piezometers. At each extraction point location, 3/8-inch ID HDPE tubing will be inserted to the bottom of the piezometer and will exit the top of the piezometer annulus and into a four-inch diameter Schedule 40 PVC protective pipe casing. This PVC piping will be installed into the ground surface, initially as a manifold system from the individual piezometer locations, with single or double pipe extending to the facility structure where the pumps will be installed.

- The four-inch diameter PVC protective pipe casing will be installed such that it can facilitate system expansion. Individual extraction tubing will be extended through the PVC pipe casing and manifold as it is constructed to reach each extraction point location. Each extraction point, including the PVC pipe, will then be covered with a 12" x 12" limited access roadbox that will be set in concrete. This large roadbox will be of a sufficient size to allow system adjustment and/or replacement of extraction tubing, if necessary.

- The estimated rate of product and/or groundwater extraction will be 0.25 gallons per hour for each extraction point. This rate will yield approximate system recovery volumes of up to 2.0 gallons per hour, 48 gallons per day and 1,440 gallons per month. The recovered fluid will be pumped into a 3,000-gallon MDPE tank located within a fenced area outside and adjacent to the closest facility wall, in the immediate vicinity of the recovery pumps. This tank will be equipped with a secondary containment structure capable of holding 110% of the volume of the tank. An XP, high-level cut off switch will be installed in the tank which will cut the power to all of the peristaltic pumps in the event that the maximum allowable tank capacity is reached.

- Twice each month, HEI will inspect the recovery system for proper operation. At this time, the volume of recovered product and water will be measured and/or calculated. Water that has been recovered and is observed to be a separate phase will be decanted by an HEI technician, directed through a 55 gallon drum of activated carbon, and injected into the ground surface within original source area (SB18 location). Prior to initial reinjection, the filtered water will be sampled to ensure parameters of concern have been removed. Additional, periodic sampling will be performed depending on recovery volumes. Depending on the actual volume of product recovered each month, and over time, HEI will either transfer the product into drums for off-site disposal (in the event of a low volume recovery proportionally) or continue to decant the recovered water monthly until greater than 2,000-gallons of product are contained in the recovery tank, at which time a bulk load of product will be removed for off-site disposal.

  Please Note: HEI has preliminarily calculated the approximate useful life of the drum of activated carbon to be used for decanting by taking the highest VOCs concentration of water sampled from the site (~200 ppm from SB9) and the specific retention capacity of the activated carbon (5# carbon per 1,000 gallon water), and included a safety factor that estimates breakthrough at 28% of the activated carbon's retention capacity. In this manner, HEI determined that a 55-gallon activated carbon drum will adequately treat (to below 5 ppm) 10,000 gallons of decanted water with influent VOCs levels (assumed to be TCE) up to 400 ppm. Drums of spent activated carbon will be appropriately labeled and transported off-site for proper regeneration or disposal.

Enhanced Bioremediation

The primary means of remediating the impacted soil and groundwater at the site will be the implementation of enhanced biodegradation technology. Initially, information collected as part of the limited pilot test performed for the IRM will be used to determine both the estimated total water yield from site wells and the limits of the effective zone of influence under variable pumping conditions. This information will assist in determining the number and spacing of the groundwater extraction points.

Subsequently, a row of 15 low-flow extraction piezometers will be implemented along the southeast property boundary downgradient from the on-site source area (former septic tank). SB16, one of the existing wells installed during the SSI will be incorporated into the boundary extraction piezometers. Note: Any no-site wells that exhibit free product will be incorporated into the DNAPL recovery system, which will be readily performed through appropriate installed valve configurations. If wells that are installed to locate DNAPL do not yield free product they will be incorporated as boundary extraction wells. The newly installed piezometers will be installed as described above for the recovery piezometers. The 14 newly installed piezometers will be installed as described above for the recovery piezometers. All wells will be developed using vacuum extraction methods prior use for extraction. Each extraction point will then be covered with a 12" x 12" limited access roadbox that will be set in concrete. This large roadbox will be of a sufficient size to allow system adjustment and/or replacement of extraction tubing, if necessary.

Two rows of moderately spaced injection point piezometers (10 per row) will be installed in an arched orientation similar in shape to the observed contaminant plume. The first row will be upgradient of the source area and the second row will be just within the estimated boundary of the plume. Each injection point will be installed similarly to the extraction points. When the system is operational, this orientation will promote groundwater flow through the soil profile contaminant plume and into the groundwater plume toward the center of the most highly impacted area in an effort to prevent further off-site migration through hydraulic control. Figure 2 presents the proposed recovery, extraction and injection system layout.

The following site monitoring wells installed during the SSI will be fitted with 8-inch diameter limited access manways encased in concrete, and will be developed using vacuum extraction methods to serve as observation wells: SB2, SB6, SB8, SB11, SB13, SB14, SB17, SB18 and SB19. These wells will be used for monitoring groundwater elevations and tracking indicator parameters and contaminant concentrations throughout the duration of the IRM.

During the installation of the extraction points, a soil sample representative of the site's impacted soil will be collected and submitted for a bioremedial assay to explore advanced augmentation options. Data obtained from this assay will also be used to assist in determining the most appropriate additives, nutrients and pH adjustments for the bioaugmentation. Baseline data will be collected from the nine observation wells listed above prior to system startup, and will include the following parameters: Selected chlorinated solvents (TCE and daughter compounds), Dissolved oxygen, REDOX potential, pH, Methane, Ferrous iron, Sulfates, Nitrates, Chlorides, Total Organic Carbon (TOC) and Volatile Acids. Quarterly monitoring will be conducted during the first year of the IRM to monitor the progress of the system, after which (depending upon the progress of the remedial system) monitoring will be reduced to a semi-annual frequency throughout the duration of the IRM.

Groundwater extraction will be performed using multi-head peristaltic pumps equipped with flow control for each extraction point. The estimated extraction rate for each piezometer will be 1.5 gallons per hour (36 gallons per day or 1,080 gallons per month) which will result in an extraction rate of approximately 16,000 gallons per month from the entire row of extraction points. Extraction locations that are being used for product recovery will continue to be pumped directly to the 3,000-gallon storage tank. Caution will be exercised to ensure that the overall pumping rate of the product recovery area (OU-1) will not be less than the extraction rate of adjacent areas which could cause a flattening effect of the product layer.

Extraction from wells that have not exhibited free product will be pumped directly into a 1,000 lb. capacity activated carbon vessel. Taking a very conservative approach assuming breakthrough at 28% of carbon saturation, this carbon vessel should treat approximately 55,000 gallons of water with TCE concentrations between 300 to 400 ppm. The testing of the discharge will be performed for TCE after the second month of operation to verify that breakthrough has not occurred, and will be performed monthly thereafter to determine when breakthrough does occur. To ensure free product does not inadvertently get pumped into the carbon vessel, the extraction tubing inlet in the extraction points that are being pumped directly to the carbon vessel will be installed at approximately four feet above the bottom of the well to allow an appreciable amount of DNAPL to collect within a given extraction point, thereby raising the probability free product would be detected during the quarterly groundwater gauging events.

Prior to reinjection, the appropriate amendments needed for the specific phase of the project being performed will be added to the filtered water using chemical metering pumps. Initially, for an estimated six months (Phase I), extracted water will be amended with Lactic acid at a rate that will result in a Lactic acid concentration of 100 mg/l. Nutrients may be added depending on the findings of baseline data collection, and the amendment rates will be adjusted as necessary. The intent of this phase of the remediation is to promote reductive dechlorination of the TCE to DCE and VC. It should be noted that the length of the anaerobic phase will depend on the observed concentrations of DCE and VC.

Phase II of the Sustained IRM will involve the development of an aerobic environment in the subsurface to promote aerobic biodegradation of DCE and VC. This will be accomplished by introducing oxygen into extracted water prior to its reinjection. The Oxygen source will most likely consist of a 65,000 cubic foot compressed liquid Oxygen bulk cylinder. Within the cylinder, liquid Oxygen is converted to a gas and which maintains a tank pressure of approximately 235 psi. This source of Oxygen requires no electric power for compression, generation or air drying. The concept takes advantage of the large economies of scale realized by large Oxygen generation facilities to provide a very low cost Oxygen source. The Oxygen will be regulated to an appropriate pressure as it exits the tank and is delivered into the water to be reinjected.

Reinjection for both the anaerobic and aerobic phases will be performed sequentially, one row at a time, for a specific time period for each row. The initial plan is to inject for a period of 2 hours into the upgradient row and then 1 hour into the plume area row. The intention of this injection scheme is to produce a slight gradient toward the plume center while also providing the benefit of immediate treatment of the interior of the plume, in contrast to injection only at an upgradient location which would be limited (in part) by the hydraulic conductivity of the soil profile.

5.0 CRITERIA ANALYSIS

As required in DER-10 Section 4.3(d) (Remedial Action Selection Report for Volunteer), this section provides a discussion of the first six criteria specified in DER-10 Section 4.1(e), as follows:

Overall Protection of Public Health & the Environment

The proposed IRM provides adequate protection of the public health and will meet the specific related RAOs discussed above. The potential for exposure to on-site free product (OU-1), on-site contaminated groundwater (OU-2) and on-site contaminated soil (OU-3) is unlikely and will be reduced. Institutional controls will prohibit the installation of groundwater wells, construction or use of structures for other than commercial or industrial purposes, and put a SMP in place.

The proposed IRM provides protection of the environment and will meet the specific related RAOs discussed above. Actions taken to recover free product, (if present) (OU-1) will reduce contaminant mass, thereby limiting continued contamination of soil and groundwater, and reducing contaminant migration.

The proposed enhanced bioremediation activities will reduce the contaminants of concern in the groundwater and soil using proven technologies which promote the anaerobic and aerobic degradation of the TCE and related VOCs. Significant contaminant mass degradation will occur on the site over the course of the IRM. Groundwater extraction along the property border will limit further off-site migration.

Compliance with Standards, Criteria and Guidance (SCGs)

The SCGs that the proposed IRM is potentially subject to include, but are not limited to, the following: 1) NYSDEC Spill Response Guidance; 2) TAGM 4046; 3) TOGS 1.1.1; 4) OSHA 40 CFR 1910.1000; 5) OSHA employee exposure limits; and 6) DER-10.

Each of the proposed remedial activities are industry proven methods and are highly likely to achieve compliance with the aforementioned SCGs over the IRM period. Similarly, it is anticipated the passive sub-floor vapor extraction system, which is also a proven, widely used technology, will be effective.

Long Term Effectiveness and Permanence

As indicated above, the proposed remedial activities are industry proven methods and will provide long term effectiveness and a permanent remedy, given that the original contaminant source was historically removed. Any product recovery (OU-1) and groundwater/soil bioremediation (OU-2 & OU-3) will remove contaminant mass over time. Once the site specific cleanup goals are met, the remediation will achieve permanence. Once OU-1, OU-2 and OU-3 have been remediated, the need for continued vapor mitigation (OU-4) may cease, although this passive system can operate without a time limitation without a negative effect on the facility or site.

Reduction of Toxicity, Mobility, or Volume with Treatment

The product recovery measures (if free product is found) (OU-1) will immediately reduce mass contaminant volume, and as a secondary effect, reduce the mobility of the free product plume. Groundwater extraction performed as part of the enhanced bioremediation will also reduce mobility by exerting a level of hydraulic control on the on-site groundwater plume (OU-2). The enhanced bioremediation will also reduce the plume toxicity and volume, as well as the mobility of the groundwater (OU-2) and soil (OU-3) plumes through carbon filtration and degradation of the various contaminants to naturally-occurring compounds. Vapor extraction (OU-4) will reduce the volume of subfloor contamination extraction and emission, as well as any migration of the VOCs vapors into the facility by creating a zone of negative pressure under the facility floor.

Short Term Adverse Impacts

Given the relative simplicity of the proposed remedial activities and physical characteristics of the subject site, only minimal potential short term impacts exist. For the proposed sustained product recovery activities, a fenced-off area will be present adjacent to the facility that will contain a 3,000-gallon tank for stored recovered product. The potential exists, although essentially controlled, that tampering or vandalism could create a surface release. Appropriate warning signs will be posted and the fence will be constructed such that in tampering will be difficult. The vent pipe for the product storage tank will be installed on the exterior facility wall with the opening being two feet above the top of the building. Similarly, the risers for the passive vapor extraction system will also terminate two feet above the roof of the facility. No vapor concentrations emanating from the roof of the facility should be so concentrated that they will create a public health risk.

Remedial system installation will not present undo risk of exposure to workers or the public. Remedial workers will be required to adhere to a site-specific health and safety plan (contained in the SMP), which will prevent exposure to site-related chemicals.

Implementability

The proposed remedial activities will be able to be implemented both technically and administratively. The technical aspects of construction are relatively simple, given both the design of the proposed system and the site's characteristics.

Monitoring will be effectively performed by collecting specified data from observation wells, as well as the extraction and injection points. There are no anticipated administrative limitations for implementation of the proposed IRMs.

6.0 REMEDIAL MEASURES REPORTS

At the completion of the construction of the remedial systems which will allow the performance of the IRMs, a Preliminary Interim Remedial Measures Report will be prepared which presents and discusses all data and information collected as part of these measures to that point in the remedial program. The following will be included, at a minimum:

- summary of each individual IRM system;
- descriptions of problems encountered during construction and operation;
- description of any changes to the initially proposed specifications;
- quantities and characteristics of any contaminants identified and removed;
- tabulations of data collected during the individual IRMs implementation; and
- disposal documentation for any wastes managed as part of the IRMs.

Subsequently, annual Progress Reports will be prepared which present and discusses all data and information collected as part of these measures upon each anniversary of the implementation of all remedial measures. Each report will be submitted 30 days following the identified anniversary date. The following information will be will be included in the progress reports, at a minimum:

- description of any changes to the initially proposed specifications;
- quantities and characteristics of any contaminants identified and removed;
- tabulations of data collected during the implementation of individual remedial measures; and
- disposal documentation for any wastes managed as part of the remedial activities.

Following the completion of the remedial program, a Remedial Measures Summary Report will be prepared which provides an overall synopsis of all previous reports (which will be appended for reference).

7.0 PROPOSED IRM IMPLEMENTATION SCHEDULE

The proposed implementation schedule includes the following milestones:

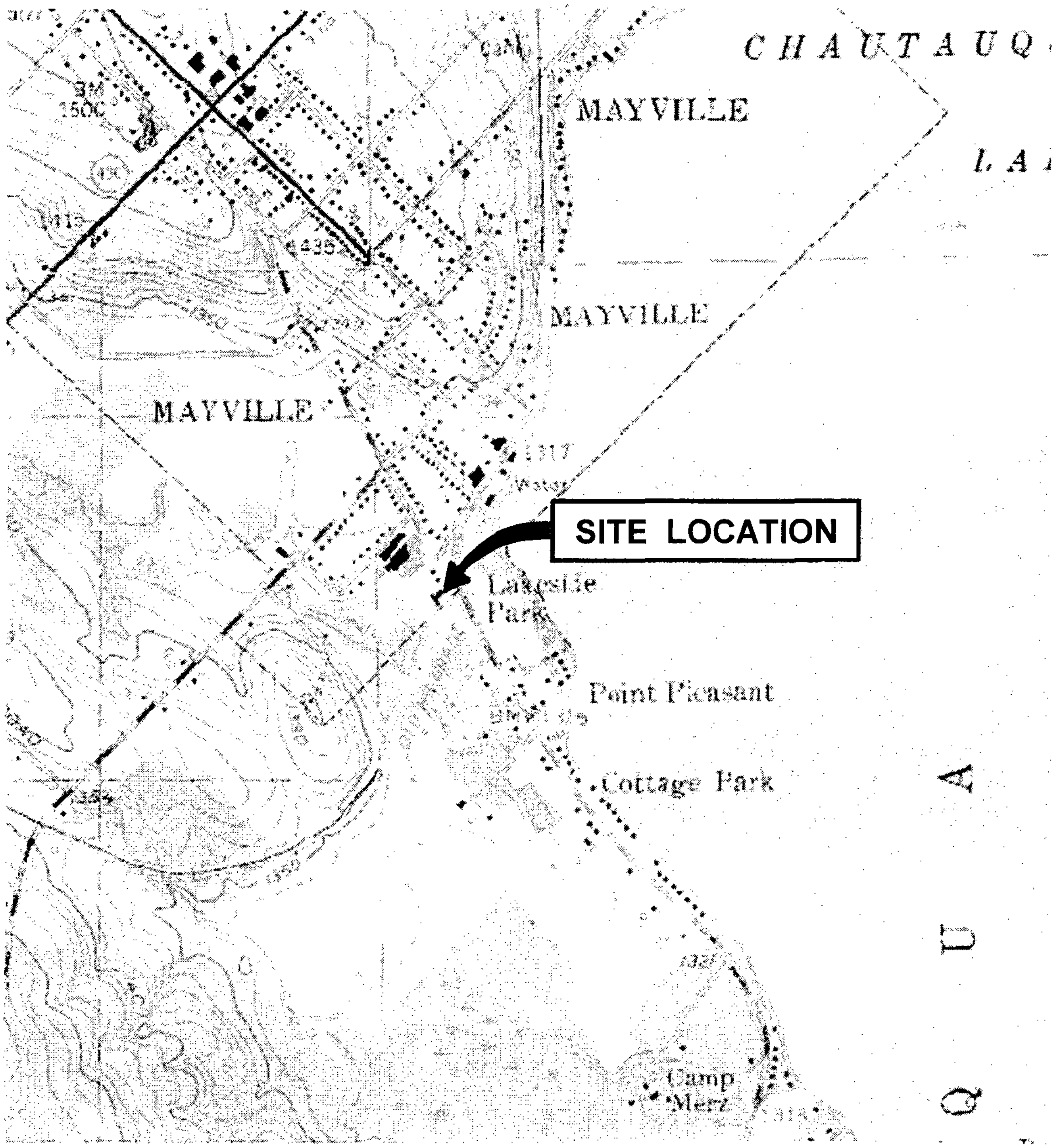
- o Initiate IRM pilot testing and subfloor extraction system (0U-4) within four weeks of agency approval.

- If free product is found on-site, install and implement the IRM product recovery system within eight weeks of agency approval (0U-1).

- Install enhanced bioremediation system after the product recovery system has been operating for approximately six months (0U-2 and 0U-3). The implementation of this remedial measure will take place during the Spring of 2007 once ground temperatures have risen to the point that all frost has melted.

Attachment 1

Figures



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HAZARD EVALUATIONS, INC.

Phase I/II Audits - Site Investigations - Facility Inspections

SITE LOCATION PLAN

JO LYN ENTERPRISES, LTD.

MAYVILLE, NEW YORK

DRAWN BY: DLW	SCALE: NOT TO SCALE	PROJECT: 15208
CHECKED BY: CMH	DATE: 7/06	DRAWING NO: 1