Basis of Design Report
Tract II Highland Avenue (9-32-136)
Niagara Falls, New York
Work Assignment D004441-30

Prepared for

New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau E
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March 2010
Revision: FINAL
EA Project No. 14474.30

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1. INTRODUCTION

EA Engineering, P.C. and its affiliate EA Science and Technology (EA) have prepared this Basis of Design (BOD) Report for the Tract II Highland Avenue site in the city of Niagara Falls, Niagara County, New York (Figure 1) at the request of the New York State Department of Environmental Conservation (NYSDEC). The BOD provides a summary of results from the supplemental investigation (SI) conducted at the site in 2009 and evaluates the selected remedy presented in the March 2003 Record of Decision[1] (ROD) based on those results. The purpose of the SI was to confirm site conditions reported in the Site Investigation/Remedial Alternative Report completed in August 2000, and to further delineate the depth and characteristics of impacted materials. Following approval of the BOD, EA will prepare design documents and drawings to be used for construction at the Tract II site.

This BOD Report summarizes current conditions at the site and provides the design assumptions to be utilized for implementation of this Work Assignment. The report is organized in the following sections.

- ***Section 1***—Introduction.

- ***Section 2***—Site Description and History. This section provides a brief description of the site, its operational history, and the remedial action selected for the site as presented in the March 2003 ROD.

- ***Section 3***—Supplemental Investigation. This section presents the results of the SI conducted by EA during 2008 and 2009.

- ***Section 4***—Basis of ROD Amendment. This section discusses the basis for supplemental remedial actions at the site included in the ROD Amendment to be prepared by the NYSDEC.

- ***Section 5***—Design Assumptions. This section presents a description of the nature and extent of impacted soils and design assumptions to be used for preparation of design specifications, design drawings, the site management plan, and the environmental easement. Regulatory requirements for the remedial action and a focused comparison of remedial alternatives are also included.

1 NYSDEC. 2003. Record of Decision for the Tract II Site (NYSDEC Site No. B-0022-9), Niagara County, New York. March.

2. SITE DESCRIPTION AND HISTORY

2.1 SITE DESCRIPTION

The Tract II Highland Avenue site is located within the Highland Avenue Redevelopment Area in the city of Niagara Falls, Niagara County, New York, on Highland and Beech avenues (Figure 1). The site is a vacant industrial property approximately 20 acres in size and includes a concrete foundation parking garage located in the south central part of the site, and a dilapidated cinder block building located in the northeastern portion of the site. The site lies within a predominately residential area with various commercial and industrial properties nearby. To the west, across Highland Avenue, are residential properties, a union hall, and an auto repair facility; to the north lies a vacant warehouse structure that was formerly used as a battery manufacturing facility; to the east are residential properties and a church located on 17th Street; and to the south across Beech Avenue are residential properties, a sheet metal business, a church, an electric power transformer building, and a park. National Grid owns a narrow strip of property that runs north and south through the central portion of the site, directly north of 15th Avenue. The American Land and Title Association (ALTA) Survey prepared by Prudent Engineering provided base maps which show property owners, property boundaries, structures and topography, and are presented in Figures 2 and 3.

2.2 SITE HISTORY

The Carter Crume Co., Ltd., and subsequently the American Sales Book Co., Ltd. and Moore Business Forms, Inc., produced business forms in a facility known as the Highland Avenue Plant at the site since 1903. The plant closed in 1971 and most aboveground structures were demolished. However, the underground parking garage and various building foundations still remain at the site. In the northeastern portion of the site, a dilapidated building which was part of a manufacturing facility located adjacent to Moore Business Forms still stands. This was part of the Power City industrial battery manufacturing plant located north of the Tract II site which operated from 1930 to 1970.

No environmental investigations, other than that conducted as part of the State Brownfield Program, had been undertaken at the site prior to 1998. The city's application to participate in the State Brownfield Program was approved in August 1998 and the State Assistance Contract for the project was signed in February 1999.

A site investigation was conducted at the Tract II Highland Avenue site in November and December 1998, and June of 2000 by Ecology and Environment, Inc. (E&E), to characterize the site's environmental condition. The investigation evaluated the nature and extent of contamination in various media onsite. E&E's site investigation consisted of surface soil sampling, test pit excavation and sampling, subsurface soil boring, sump water and sludge sampling, and a groundwater study which included the installation of four bedrock monitoring wells. Investigation activities also included soil permeability testing, and collection of samples

from suspected asbestos-containing material (ACM) in the underground parking garage and the dilapidated structure at the site.

Surface soil analytical data indicated that concentrations of several semivolatile organic compounds (SVOCs), metals, polychlorinated biphenyls (PCBs), and some pesticides were present in the samples. High lead concentrations were also found in samples that were collected on the eastern portion of the site. Analytical results from the subsurface soil samples indicated elevated concentrations of lead, SVOCs, pesticides, metals, and cyanide throughout the soils at the site. Analytical samples collected from the sump in the parking garage had elevated concentrations of volatile organic compounds (VOCs), SVOCs, PCBs, metals, cyanide, and high concentrations of lead. The analytical data indicated that groundwater samples contained some concentrations of VOCs (xlyene, toluene), but were below Class GA drinking water standards. In addition, elevated concentrations of methylene chloride were found in the groundwater at monitoring well MW-04. Asbestos samples collected from the underground parking garage contained asbestos ranging in percentages from 10 to 68 percent. Four of the seven asbestos samples collected from the dilapidated structure contained asbestos ranging in percentages from 1 to 80 percent.

Following the site investigation activities, E&E conducted a risk evaluation of the site that consisted of a screening-level assessment to determine which site contaminants posed the most significant threats to human health and the environment. E&E submitted a Site Investigation/Remedial Alternative Report in 2000 upon which NYSDEC developed the ROD. The ROD was released in 2003 and detailed a remedy at the site which included building demolition, asbestos removal and disposal, and solid waste disposal. The bulk of the remedy included excavating the top 2 ft of soil in the eastern portion of the site and limited excavation in "hot spot" areas (elevated SVOCs) in the western portion of the site. The impacted soil was to be disposed of at a regulated off-site facility. Details of the March 2003 ROD are discussed below.

2.3 RECORD OF DECISION

The ROD issued in March 2003 evaluated five alternatives and selected a remedy for the site. Alternatives were selected based on the proposed future use of the Tract II site, which was industrial or commercial development at that time. The ROD identified the following specific remedial goals for the remedial action at the Tract II site:

- Reduce, control, or eliminate to the extent practicable the contamination present within the on-site soils, wastes, and refuse.

- Provide for attainment of standards, criteria, and guidance for soil, to the extent practicable.

- Eliminate the potential for direct human contact with, and ingestion or inhalation of, the contaminated soils, wastes, and refuse on the site.

- Eliminate the physical hazards posed by the site building and garage.

- Facilitate site redevelopment.

Key elements of the selected remedial alternative outlined in the March 2003 ROD are summarized below:

- Implement a remedial design program to verify the components of the conceptual design and provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program.

- Implement the following remediation measures (estimated quantities are provided in parentheses):

    - Excavation and off-site disposal of contaminated soils from the east area including the 6-in. deep surface soils (5,250 yd^3) and shallow subsurface soils up to a depth of 2 ft (7,875 yd^3), and replacement with clean soil fill (13,125 yd^3).

    - Excavation and off-site disposal of contaminated soil from the hot spot area in the western portion of the site and replacement with clean soil fill (7.5 yd^3).

    - Removal and off-site disposal of sediments (5 ft^3) and water (less than 100 gal) from the parking garage sump.

    - Removal and off-site disposal of ACM (210 tons) and other wastes from the parking garage and the dilapidated building.

    - Demolition of the parking garage and the dilapidated building; parking garage rubble, if clean, to remain as on-site fill (3,600 yd^3), and dilapidated building rubble to be disposed off-site (2,000 yd^3).

    - Removal and disposal of general refuse dumped about the site.

    - Site restoration to include grading, topsoil placement, and seeding of excavated and/or filled areas.

    - Development of a soils management plan to address residual contaminated soils excavated during future redevelopment will be required if warranted by the type and concentration of residuals left after completion of remedial actions.

    - Imposition of a deed restriction will be required if warranted by residual soil contamination remaining after remedial actions are completed. The deed restriction will require compliance with the approved soils management plan and annual certification to the NYSDEC, by future property owners, that the

implemented remedy has been maintained in accordance with the soils management plan.

3. SUPPLEMENTAL INVESTIGATION

The purpose of the SI was to confirm site conditions reported in the Site Investigation/Remedial Alternative Report completed in August 2000 and also to further delineate the extent of impacts throughout site fill materials. The results of the SI indicate that the ROD will be amended to address the estimated volumes of impacted materials on site. These data will be used by the NYSDEC to prepare an amendment to the ROD released in March 2003. The SI report was submitted to the NYSDEC in October 2009 and is included in Appendix A. A summary of the SI and findings as they relate to the remedial design are discussed below.

3.1 FIELD INVESTIGATION ACTIVITIES

The following field activities were completed as part of the field investigation portion of the Work Assignment:

- Asbestos sampling, area inventory, and inspection
- General site mowing and clearing
- Test pit excavations and soil sampling
- Surface soil sampling
- Site surveying
- Waste consolidation.

Activities were summarized in the SI Report (Appendix A).

3.1.1 Asbestos Sampling and Inspection

As part of the field activities at the site, a pre-demolition asbestos inspection was completed by Sienna Environmental Technologies, LLC (Sienna). Sienna was tasked to perform an investigation of the partially collapsed structure in the northeast portion of the property, the basement/parking garage structure in the central portion of the property, and also several debris piles that have been dumped around the property.

The pre-demolition asbestos survey included identification, sampling, analysis, and quantification of confirmed asbestos containing components. Thirteen samples were obtained from the partially collapsed structure, the basement/parking garage structure, and also the debris piles. Eight samples were found to contain ACMs. The full asbestos report, as prepared by Sienna, is provided in the SI Report (Appendix A).

3.1.2 General Site Mowing and Clearing

Site clearing was completed to allow for access to all areas of the site and to prepare for the SI and remedial action. Much of the site was overgrown with brush and woody vegetation. Trees larger than 6 in. in diameter at breast height and those that provided a visual screen for the

residents were left on the site. Access to all areas of the site was limited by areas laden with piles of construction debris and household refuse resulting from illegal dumping at the site. These areas, with the exception of those suspected of containing asbestos, were consolidated into waste debris piles in a central location to be staged for eventual off-site disposal. At the request of NYSDEC, EA returned to the site in July 2009 to locate additional test pits and clear the Japanese knotweed that inundated the eastern portion of the site.

3.1.3 Test Pit Excavations and Soil Sampling

A total of 28 exploratory test pits were excavated at the site from 30 to 31 March 2009 for the purpose of characterizing and sampling the subsurface soil. An additional 14 test pits were excavated in July 2009 to supplement the data collected in March. The 2-ft wide test pits were excavated to depths ranging from 1 to 10 ft below ground surface. The total depth of the test pits were determined by where the native clay layer was encountered during installation.

During excavation activities, soil samples were classified and logged according to the Unified Soil Classification System. Field screening using a photoionization detector (PID) and field observations were recorded during excavation. A field record of soil types, classification, sampling intervals, PID readings, and other field observations were recorded on the test pit log forms provided in the SI Report (Appendix A).

In March 2009, one soil sample was collected from each test pit from the 0 to 2 ft interval, except for test pits TP-3, TP-4, TP-4A, TP-4B, and TP-4C. Test Pits TP-03, TP-04, TP-04A, TP-4B, and TP-4C were installed to visually delineate an area to the northwest of the parking garage where a source of polycyclic aromatic hydrocarbons impacted soils was identified during the 2000 site investigation by E&E. The "hot spot" consisted of approximately 44 yd^3 (20 ft × 30 ft × 2 ft) of decomposed burned cardboard materials. A total of 23 soil samples were collected from the exploratory test pits.

In July 2009, test pits TP-26 through TP-40 were excavated in the eastern portion of the site to determine the metal concentrations in the fill at depth. Beginning at 2 ft, soil samples were collected in 1 ft intervals to total depth of the fill. A total of 54 soil samples were collected from test pits.

Soil samples collected from the test pits installed in March and July 2009 were sent to Life Science Laboratories of East Syracuse, New York and analyzed for target analyte list (TAL) metals (Resource Conservation and Recovery Act [RCRA] 8) by United States Environmental Protection Agency (USEPA) Method 6010. Based on the results, several samples were selected for additional toxicity characteristic leaching procedure (TCLP) analysis for lead to determine hazardous waste characteristics. A total of 29 samples were analyzed for TCLP lead concentrations.

3.1.4 Surface Soil Sampling

In March 2009, surface soil samples were collected from the 0 to 2 in. interval below root structures of grasses. The soil samples were visually inspected and described according to the Unified Soil Classification System. Twenty-three surface soil samples were collected throughout the site. Surface soil samples were selected as directed by the NYSDEC Project Manager. Once the sampling locations were determined, a discrete surface soil sample was collected from the location.

To avoid cross-contamination of samples, sampling equipment was cleaned prior to sampling surface soil samples. Surface soil samples collected from the site were sent to Life Science Laboratories of East Syracuse, New York and analyzed for TAL metals (RCRA 8) by USEPA Method 6010.

3.1.5 Site Surveying

A topographic survey was performed in accordance with ALTA requirements by Prudent Engineering, a professional land surveyor located in East Syracuse, New York. Buildings, edges of pavement, test pit locations, surface soil sampling locations, and other relevant site features were surveyed in December 2008 and April 2009. Topographic elevation contours were developed at 1 ft intervals across the site. The surveyor established elevations with respect to benchmarks currently installed at the site. All vertical measurements were referenced to the National Geodetic Vertical Datum of 1988 and reported to the nearest 0.1 ft.

Horizontal control was established by traverse runs to define location with respect to the New York State planar horizontal coordinate grid system and provided in New York State Plane (NAD83). Horizontal traverses were tied into established permanent benchmarks. Horizontal traverse runs were tied back to initial control points as a check for closure and error of closure was recorded. The horizontal location of wells was reported to within 0.1 ft.

3.1.6 Waste Consolidation

To allow access to the entire property and to partially clean up the site for aesthetic purposes, any waste and debris piles that have been illegally disposed of at the property were consolidated near the southwest corner of the dilapidated structure that is located in the northeast corner of the site. Most of the debris and waste appeared to be construction and demolition debris in the form of roofing materials, wood, concrete, and metal. Most of the waste was consolidated, with the exception of any ACMs which were left undisturbed and will be disposed of during the remedial action.

4. BASIS FOR RECORD OF DECISION AMENDMENT

4.1 SIGNIFICANT DIFFERENCE IN ESTIMATED VOLUME AND QUALITY OF IMPACTED MATERIALS

Data collected during the SI completed in 2009 indicated that the volumes of fill and metal concentrations in fill materials onsite were underestimated in the previous investigations. The additional data collected during the SI indicate that impacts are present not only in the top 2 ft of fill materials, but are disbursed throughout the total depth of the fill. Analytical data collected from the test pit and surface sample locations on the eastern portion of the site indicate the RCRA metal concentrations exceed both the Part 375 Unrestricted and Commercial Use Soil Cleanup Objectives. In addition, 48 percent of soil samples analyzed for TCLP lead concentrations exceeded the limits for hazardous waste. Based on the analytical results and depth of the fill, the volume of the impacted fill to be excavated for treatment and/or disposal has been re-calculated. NYSDEC requires that all hazardous wastes be treated to meet Part 375 soil cleanup criteria or removed from the site and disposed of at a regulated facility. In addition, the city has proposed potential site uses that are consistent with the Highland Avenue Brownfield Opportunity Area (BOA) Plan. The city proposes reusing the western portion of the site as commercial property and redeveloping the eastern portion of the site for residential/recreational use. This is significantly different than the intended use that the 2003 ROD was based upon. The remedial options, as presented in the 2003 ROD, have been reevaluated due to significant increases in the estimated volumes of impacted soils requiring excavation and the newly established intended use for the property. Based on the results of the SI, the ROD will be amended by the NYSDEC to address the management of hazardous waste materials on-site, and will address optional treatment of hazardous wastes prior to disposal. Modifications will be included in the final remedial design, contract documents, and drawings; and will be implemented during the construction phase.

Conditions identified on-site during the SI that impact the selected remedial design are discussed in more detail below.

4.1.1 Physical Characteristics of Fill Materials

Soil boring logs indicate that the fill materials onsite are fairly homogeneous and consist of silty sand mixed with industrial wastes including brick, concrete, ash and crushed battery casings found consistently throughout the fill. Because of the physical homogeneity of the fill, it will be difficult to separate hazardous waste from non-hazardous waste on a visual basis, as well as a chemical constituent basis as discussed below. The non-hazardous building debris material (such as brick, concrete, and wood) can be physically screened from the contaminated fill and waste material. This would reduce the amount of material that needs to be treated in order to facilitate disposal as a non-hazardous waste.

4.1.2 Lead Concentrations in Fill Materials

Soil investigations were completed to delineate hazardous waste characteristics in onsite soils based on TCLP lead analysis. TCLP analysis performed during the SI indicated that seven of nine soil samples collected from 0 to 2 ft below the surface exceeded hazardous waste limits for lead. In addition, 7 of 20 samples collected for TCLP analysis from 2 to 8 ft below the surface exceeded the limits for hazardous waste. Approximately, 48 percent of the samples tested had lead concentrations that exceeded TCLP limits for hazardous waste. The data indicated that lead concentrations were found to exist throughout the depth of the fill with no defined vertical or horizontal pattern of distribution. Because of the wide distribution of contaminants throughout the fill, separation of non-hazardous granular fill materials will be difficult and will be required to be performed on a predetermined quantity basis based on disposal facility requirements.

4.1.3 Other Chemical Constituents in Fill Materials

The SI tested soil samples for RCRA metals and found that all metals tested were present in the fill; however, lead, chromium, and mercury were also present in concentrations above Part 375 Restricted Use Cleanup goals onsite. SVOCs, organic compounds, pesticides, and PCBs, as well as TAL metals were detected in soils during previous investigations. Data indicate that the organic compounds were present primarily in the top 2 ft of fill material onsite. Depending on the stabilization method used, the presence of organic compounds may or may not complicate treatment options on-site.

4.1.4 Volume of Fill Calculations

Data generated from test pits and a topographic survey completed during the SI conducted in 2009 was used to determine volume of fill materials onsite. Based on data collected, the net cut volume was re-estimated to be approximately 44,589 yd^3 (cut volume: 44,713 yd^3; fill volume: 124 yd^3). This volume equated to an average fill thickness of approximately 3.9 ft over a 7.1 acre area of contaminated media within the boundary of test pit locations.

Using outer boundary of test pits as limit of excavation
Volume of excavation = 44,589 yd^3
Add 20 percent safety factor
Calculated final fill volume after treatment = 44,589 yd^3*1.2 = 53,507 yd^3

An average soil density of 1.7 tons/yd^3 was used in calculating the tonnage as shown below.

53,507 yd^3* 1.7 tons/yd^3 = 90,962 tons

A conservative estimate of 91,000 tons of impacted materials was used in estimating soil disposal and soil treatment options at the Tract II site.

4.2 SUPPLEMENTAL REMEDIAL ACTION ALTERNATIVE

Based on the data collected during the SI, additional remedial actions may be completed during the remedial design to treat hazardous materials prior to disposal. A memorandum was developed by EA to re-evaluate remedial options at the Tract II site based on a significant increase in the estimated volume of impacted fill materials. The memorandum discussed various treatment and disposal options for the site and provided preliminary cost estimates to implement these options. A copy of the memorandum can be found in Appendix B. Based on the memorandum, the modifications to the 2003 ROD may include excavating hazardous waste materials, treating materials onsite, and disposing materials offsite as a non-hazardous waste at a regulated facility. Materials that do not meet the criteria for Residential Use Cleanup Objectives will also be excavated and disposed of off-site at a regulated facility as non-hazardous waste. Treatment options selected for this site are discussed in more detail below.

4.2.1 Stabilization Treatment Option

As an alternative to direct removal and disposal of impacted materials, stabilization of metals prior to disposal will be included as part of the remedial design. Stabilization of materials will render the hazardous materials into non-hazardous materials and significantly reduce the costs of disposal. Treatment options including stabilization with both phosphate based compounds and silica based compounds including cement-kiln dust were evaluated as viable remedial options for the site. For the purposes of developing the remedial design and providing engineering estimates, the phosphate based treatment option was selected based on relative costs. However, other stabilization treatment options that render materials to non-hazardous conditions prior to disposal will be considered during bidding this portion of the work.

Each stabilization treatment option will require a preliminary treatability study which may include collecting data from materials onsite including pH of soils, geotechnical data, and detailed profile of chemical composition of soils including metals, VOCs, SVOCs, PCBs, and pesticides. Estimated costs to complete treatability studies range from $5,000 (phosphate based treatment) to $100,000 (silicate based treatment). For the purposes of developing the remedial design and providing preliminary engineers estimate for treatment options, phosphate based stabilization treatment is provided below. However, other treatment and disposal options may be used in the final remedy, as long as established criterion for onsite materials is met.

4.2.1.1 Phosphate Based Stabilization Treatment

A blend of phosphate compounds and additives are mixed with impacted soils to chemically bind metallic ions reducing the solubility and leaching potential of compounds. Stabilized materials will meet RCRA regulations for disposal as non-hazardous waste. It is important to note that total metals concentrations in treated materials will be unchanged. The process will be completed onsite as an *ex-situ* treatment and treated soils will be transported to a landfill as a non-hazardous material which will be verified by confirmatory sampling prior to transportation.

Because the impacted fill materials will be removed from the site and replaced with clean materials, a cover system to protect against direct contact with materials will not be required.

4.3 DISPOSAL OF IMPACTED FILL MATERIALS

Treated fill materials will be transported and disposed of by permitted haulers at regulated disposal facilities. All materials removed from the Tract II site will be documented using a manifest tracking system.

4.4 SUMMARY OF SELECTED REMEDIAL OPTIONS

Key Elements of the 2010 ROD Amendment are listed below:

- Implement a remedial design program to verify the components of the conceptual design and provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program.

- Implement the following remediation measures (estimated quantities are provided in parentheses), all fill materials assumed to be hazardous:

    - Excavation and treatment of hazardous fill materials onsite (91,000 tons) using stabilization treatment.

    - Off-site disposal of treated soils (95,550 tons), including a 5 percent increase in weight due to the treatment process, from the east area including the total depth of fill materials and replacement with clean soil fill (53,507 yd^3).

Excavation and off-site disposal of contaminated soil from the “hot spot” area in the western portion of the site and replacement with clean soil fill (44 yd^3).

    - Removal and off-site disposal of ACM (210 tons) and other wastes which remain following USEPA response actions from the parking garage and the dilapidated building.

    - Demolition of the parking garage and the dilapidated building; parking garage rubble, if clean, to remain as on-site fill (3,600 yd^3); and dilapidated building rubble, if clean, to remain onsite (2,000 yd^3).

    - Removal and disposal of general refuse consolidated on-site.

    - Site restoration to include grading, topsoil placement, and seeding of excavated and/or filled areas including building locations.

- Development of a site management plan to address residual contaminated soils during future redevelopment.

- Imposition of an environmental easement in western portion of the site may be required depending on residual contamination remaining after remedial actions are completed. An environmental easement will require compliance with the approved site management plan and annual certification to the NYSDEC.

5. DESIGN ASSUMPTIONS

Supplemental remedial alternatives will be assessed in addition to the remedial options selected in the March 2003 ROD. Remedial design assumptions are detailed following a brief discussion of the alternative assessment.

5.1 NATURE AND EXTENT OF CONTAMINATION

Based upon the March 2003 ROD, the chosen remedy includes excavation and off-site disposal of the east area contaminated soils including the 6-in. deep surface soils (5,250 yd^3) and the shallow subsurface soils (7,875 yd^3) up to a maximum of 2-ft depth from ground surface.

The original estimate in the ROD for disposal volumes for the top 2 ft was 13,125 yd^3 over a 4.1 acre area. The additional data collected during the SI indicate that impacts are present not only in the top 2 ft, but throughout the total depth of the fill. As a result of the SI activities, the recalculated volume of impacted fill to be excavated and disposed of off-site are approximately 44,589 yd^3. Data generated from test pits and a topographic survey completed during the SI was used to determine volume of fill materials on-site. Based on data collected, the net cut volume was re-estimated to be approximately 44,589 yd^3 (cut volume: 44,713 yd^3; fill volume: 124 yd^3). This volume equated to an average fill thickness of approximately 3.9 ft over a 7.1 acre area of contaminated media within the boundary of test pit locations. Based on the SI Report, a conservative estimate of 91,000 tons of impacted materials was used in estimating soil disposal and soil treatment options at the Tract II site. The revised volume estimate is approximately 5 times larger than the volume presented in the ROD.

There have not been significant changes in the soil constituent concentrations since the ROD was issued by the NYSDEC in 2003, except for the documented distribution of impacted materials.

5.2 ASSESSMENT OF RECORD OF DECISION ALTERNATIVES

The March 2003 ROD evaluated the cost and effectiveness of five alternatives for the Tract II site. These alternatives include:

- No Action
- Alternative 1A. Full Site Soil Cover & Demolition
- Alternative 1B. East Area Soil Cover, Hot Spot Removal & Demolition
- Alternative 2A. Full Site Excavation & Demolition
- Alternative 2B. East Area Excavation/2 ft Maximum Depth, Hot Spot Removal& Demolition

- Alternative 2C. East Area Excavation/6-in. Depth, Hot Spot Removal & Demolition.

Based on the results of the Site Investigation/Remedial Alternative Report, the NYSDEC selected Alternative 2B as the remedy for the site. As stated in the ROD, with exception of project costs, Alternatives 2A and 2B would provide adequate and similar compliance with threshold and balancing criteria. The substantially higher cost of Alternative 2A over Alternative 2B would not result in significantly higher levels of protection nor substantially improved development opportunities. NYSDEC argued that Alternative 2B would be most cost effective and, therefore, was selected for implementation at that time. In 2003, the original ROD used NYSDEC Division of Environmental Remediation TAGM-4046 "Determination of Soil Cleanup Objectives and Cleanup Levels" for the soil cleanup objectives. These cleanup objectives were superseded in December 2006 by the soil cleanup objective contained in 6 New York Codes, Rules and Regulations (NYCRR) Part 375.

Based on data collected from the site in 2009, the selected remedy must be modified to meet objectives of the ROD. Because there is a significant increase in the estimated volume of impacted soil, on-site treatment then off-site disposal as non-hazardous waste is the less expensive alternative. NYSDEC has selected stabilization treatment and off-site disposal remedy due to the new cost difference. In addition, a soil cover will not be required in the eastern portion of the site because impacted materials will be removed from the site. A detailed cost comparison between various treatment and disposal options is included as Appendix B. The two options differ in that off-site disposal as hazardous waste costs approximately three times as much as off-site disposal as non-hazardous waste. Off-site disposal as non-hazardous waste requires on-site treatment, sampling, transportation, tipping fees, and soil characterization prior to disposal. The cost evaluation focuses on these differences and assumes that common elements will have similar costs under both options.

5.3 **REMEDIAL DESIGN** SPECIFICATIONS

Specifications included in the remedial design are expected to include, but are not limited to, the following:

- ***Erosion and Sedimentation Control—***Prior to site work, a stormwater pollution prevention plan will be developed to address erosion and sediment control. Best management practices outlined in the stormwater pollution prevention plan will be implemented prior to construction and properly maintained for the duration of remedial activities. Erosion control will be required around work and stockpile areas to prevent sediment and contaminant migration. Surface water within work areas may be diverted into settling basins or into other approved drainage ways provided approved methods are used to reduce the amount of sediment contained in the water prior to discharge. At the completion of the remedial work, ditches will be backfilled and the ground surface restored to original conditions. Perimeter controls may include, but are not limited to, a temporary stormwater diversion, silt fence, and super silt fence. Throughout the construction activities, the Contractor will install additional perimeter controls (i.e., silt

fence or super silt fence) as needed in order to control erosion and sediment.

- ***Access Roads/ Stabilized Construction Entrance—***Access roads are required to be adequately maintained throughout the course of remedial activities. Additional access roads may need to be installed or existing roads widened to allow heavy machinery to enter and exit the site. Access roads will be designed to handle expected load during the remedial action. To reduce the potential for tracking of soil/fill waste off-site, a stabilized construction entrance will be constructed on the existing access road to Tract II immediately outside the limit of waste. Such maintenance may include periodic top dressing with additional aggregate. All soil/fill waste that is spilled, dropped, or washed onto public rights-of-way or on roads that are outside the limit of waste at Tract II will be removed immediately. Soil/fill waste will not be allowed to enter storm drains, ditches, or watercourses.

- ***Site Clearing—***Prior to excavating impacted soil and building demolition, surfaces of impacted areas and around buildings will be mowed and cleared of large trees, shrubs, and other debris prior to initiating excavation as necessary. Large trees will be cut and disposed of off-site. Other green wastes may be incorporated into the ground surfaces on-site, if appropriate. Utilities located on-site will be clearly identified.

- ***Building Demolition—***Two dilapidated structures on the property, the underground parking garage and the cinder block building, are in poor structural condition and will be demolished to grade for safety purposes.

- ***Excavation, Treatment and Removal of Hazardous and Non-hazardous Wastes—*** Excavation of the impacted materials will be completed in accordance with design documents including amount of material removed, staging locations, treatment, and other requirements to be identified in design and bid documents. Excavation will be completed to a maximum depth of 9 ft below ground surface and waste materials will be staged onsite for stabilization treatment. The soil stabilization technology, EcoBond® as provided by MT2 or equivalent, may be utilized to treat waste materials to non-hazardous waste conditions prior to disposal. Treatment of waste materials will be completed to render hazardous wastes into non-hazardous wastes prior to off-site waste disposal. TCLP analysis obtained from soil boring samples indicates that approximately 48 percent of excavated materials will need to be classified as hazardous waste. Waste characterization will need to be performed to meet waste disposal facilities' requirements for disposal.

- ***Confirmatory Sampling—***Waste materials will be sampled before and after stabilization treatment to determine characteristics of waste materials excavated, confirm the efficacy of treatment, and to provide waste characterization analysis for disposal of materials. Size of sampling aliquots for disposal waste characterization (in cubic yards) will be determined based on disposal facility requirements.

- ***Waste Transportation and Disposal—***Transportation and disposal of treated wastes including containerizing, labeling, testing for waste characterization, and manifesting will be performed in accordance with all applicable federal and state regulations including 6 NYCRR Parts 370-376.

- ***Community Air Monitoring Plan—***Community Air Monitoring Plan units will be in place on the Highland Avenue parcel and within the buffer zone on the eastern portion of residential properties to monitor for potential vapor and dust releases, if any, that might occur during construction activities at the site and to assist in determining when additional mitigation measures need to be taken.

- ***Backfill and Compaction—***Certified clean fill material will be utilized to fill the limits of the excavation after removal of impacted soils. Clean hard fill (such as brick and concrete) from the building demolition may be used as backfill, if appropriate. All fill materials will be sufficiently compacted within the limits of the excavation.

- ***Site Restoration—***Final grades will be developed for the site to provide open spaces suitable for general recreational use. Topsoil will be installed, seeded, and mulched to restore the ground surface and provide a suitable surface for recreational use.

- ***Monitoring Well Decommissioning—***Monitoring wells currently located on-site will be decommissioned as part of the remedy.

- ***Final Site Survey—***Post-construction surveys will be required to show that the subgrade has met proposed grade requirements prior to installation of the final cover system. The ALTA Survey prepared in 2009 will be updated to include site improvements and potential deed restrictions.

5.4 DRAWINGS

Drawings included in the design are likely to include, but are not limited to, the following:

- Existing conditions
- Erosion and sedimentation controls
- Excavation and staging
- Treatment system
- Final grading and backfilling
- Final conditions
- Details.

5.5 SITE MANAGEMENT PLAN

As part of the remedial design, EA will develop a site management plan that will include the following institutional and engineering controls as identified in the ROD:

- Discussion of an environmental easement that will be used to manage any redevelopment of the western portion that will result in excavation into the subsurface soil impacted by metals and other constituents of concern that remain on-site.

- Standards, criteria, and guidance for on-site contaminants will be evaluated with reference to Subparts 375-6.8 (a) and (b): Remedial Program Soil Cleanup Objectives of NYCRR.

This plan will be prepared in conjunction with the remedial design and amended as needed following completion of the remedial construction.

5.6 ENVIRONMENTAL EASEMENT

Additionally, EA will assist the NYSDEC in preparing an environmental easement for the Tract II site. The easement will have five exhibits:

- **Schedule A**—An adequate legal description of the property subject to the environmental easement

- **Schedule B**—The ALTA/American Congress on Surveying and Mapping survey

- **Schedule C**—A narrative description of the remaining impacted areas and institutional controls; and the monitoring/inspection, maintenance, and reporting requirements

- **Schedule D**—Maps/diagrams of as-built controls

- **Schedule E**—A clean, legible copy of the U.S. Geological Survey Quadrangle map.

The environmental easement will be prepared in conjunction with the remedial design and amended as needed following completion of the remedial construction and initiation of the site management plan.

5.7 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS, PERMITS, CODES, AND STANDARDS

5.7.1 Applicable or Relevant and Appropriate Requirements

Applicable or relevant and appropriate requirements (ARARs) were developed and evaluated with regard to the remedy selected in the ROD. Design of the remedy will incorporate the appropriate engineering and monitoring controls to ensure compliance with ARARs. Below is a list of ARARs that will potentially be required during the Tract II site remedial design.

POTENTIALLY APPLICABLE REQUIREMENTS	
Requirement	**Rationale**
FEDERAL	
Clean Water Act **National Polluant Discharge Elimination System (40 CFR Part 122)** The National Pollutant Discharge Elimination System establishes permitting requirements; technology-based limitations and standards, control of toxic pollutants, and monitoring of effluents to assure discharge permit conditions and limits are not exceeded.	Applicable if surface water or groundwater will be discharged from the site.
Safe Drinking Water Act (National Primary and Secondary Drinking Water Regulations) (42 U.S.C. 300f, 40 CFR Part 141, 40 CFR Part 143) The Safe Drinking Water Act provides a national framework to ensure the quality and safety of drinking water. The primary standards establish maximum contaminant levels and maximum contaminant level goals for chemical constituents in drinking water. Secondary standards pertain primarily to the aesthetic qualities of drinking water.	The removal action is being conducted to reduce chemical concentrations in soil and groundwater, with a goal of meeting cleanup levels at the property boundary.
Clean Air Act, as Amended (42 U.S.C. 7401) The Clean Air Act is a comprehensive law which is designed to regulate any activities that affect air quality, and provides the national framework for controlling air pollution. The National Primary and Secondary Ambient Air Quality Standards (40 CFR Part 50) set standards for ambient pollutants which are regulated within a region. The National Emissions Standards for Hazardous Air Pollutants (40 CFR Part 61) establishes numerical standards for hazardous air pollutants.	The Clean Air Act will be required if any remediation alternatives produce air emissions.
Comprehensive Environmental Response, Compensation and Liability Act Provides regulations for government intervention in cleanup actions at abandoned waste site for the protection of public health.	Establishes basis for government sponsored cleanup of abandoned hazardous waste sites.
Superfund Amendments and Reauthorization Act Establishes standards that govern the degree of cleanup required at a site. Superfund Amendments and Reauthorization Act mandates that remedies must meet federal and/or state ARARs. State ARARs can take precedent over federal ARARs providing that the state requirements are promulgates, and are more stringent than the federal requirements.	All site criteria for cleanup will be applied to New York State guidelines as promulgated by Superfund Amendments and Reauthorization Act.
RCRA Provides the governing regulations for owners and operators of hazardous waste treatment, storage, and disposal facilities; and for the generators and transporters of hazardous waste.	All waste generated during the removal action will be characterized and handled per RCRA regulations.
Occupational Safety and Health Act (29 CFR 1910) Establishes the worker health and safety requirements for operations at hazardous waste sites.	Site activities will be conducted under appropriate Occupational Safety and Health Act standards.
Rules for Transport of Hazardous Waste (49 CFR 107, 171) The U.S. Department of Transportation establishes requirements for packaging, handling, and manifesting hazardous waste.	Any hazardous waste generated during site activities will be characterized as needed to determine packaging, handling, and transport requirements.

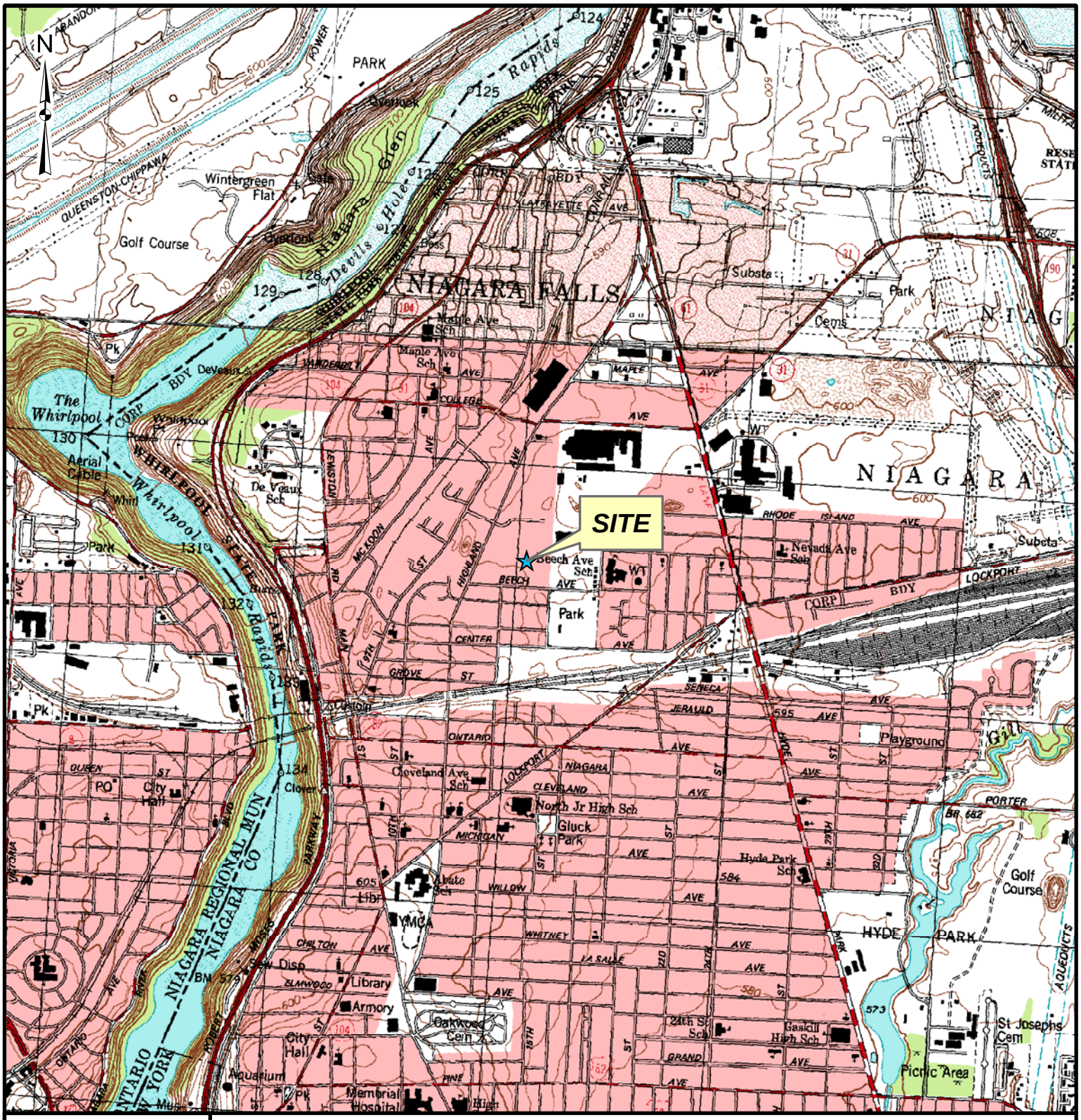
POTENTIALLY APPLICABLE REQUIREMENTS	
Requirement	**Rationale**
STATE	
6 NYCRR Part 375 Provides a basis and procedure to determine soil cleanup levels at State Superfund sites.	Site cleanup will be conducted in accordance with 6 NYCRR Part 375 using Restricted Use and Commercial Use Soil Cleanup Objectives.
Water Quality Regulations for Surface Waters and Groundwater (6 NYCRR Part 700-705) State Pollutant Discharge Elimination System Provides standards, regulations, and guidelines for the protection of waters within the state.	Site cleanup will be conducted in accordance with 6 NYCRR Part 700-705 stormwater regulations
Waste Transporter Permits (NYCRR Part 364) Provides standards and regulations for waste transporters.	These regulations will be followed for off-site disposal of hazardous waste.
New York State Department of Transportation Rules for Hazardous Materials Transport (49 CFR, Parts 107, 171.1-500) Addresses requirements for marking, manifesting, handling, and transport of hazardous materials; applicable if off-site treatment or disposal of wastes is required.	
Air Quality Standards (6 NYCRR Part 257) Air quality standards are designed to provide protection from the adverse health effects of air contamination; and they are intended further to protect and conserve the natural resources and environment.	All substantive requirements of the State air pollution control regulations will be followed during implementation of the remedial action.

5.7.2 Codes and Standards

Codes and standards will be followed. Based on the type of work performed, codes, and standards that apply will consist of National Fire Protection Association standards (storing flammable materials), National Electrical Code (temporary power), American Society of Testing and Materials (compaction testing, sieve testing, soil moisture content determinations and other construction related test methods), USEPA Standards (analytical methods), Occupational Safety and Health Administration standards, and New York State Industrial Safety and Health Act standards.

5.7.3 Permitting Plan/Permits

The remedial action contractors will acquire any work permits needed including building or electric permits at the municipal level. Since this is a State Superfund site, some permits are not required. However, substantive requirements of all permits typically required will be met. Substantive requirements of the following permits are anticipated to be met during design and construction of the remedy: State Pollutant Discharge Elimination System for stormwater management and discharge, general construction and electric permits, solid and hazardous waste management and transport permits, and air pollution control permits. Because intrusive work will not be performed within 100 ft of a state-listed freshwater wetland, a NYSDEC Freshwater Wetlands Permit will not be required for this action.



EA Engineering, Science, and Technology, Inc.

TRACT II HIGHLAND AVENUE SITE (9-32-136)
BASIS OF DESIGN
NIAGARA FALLS, NEW YORK

FIGURE 1
SITE LOCATION

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
JAG	MJS	MJS	JAG	AS SHOWN	NOVEMBER 2009	14474.30	GIS/PROJECTS/ FIGURE1.MXD

MAP REFERENCES:

1. MAP ENTITLED "RESUBDIVISON OF LOTS ON 17TH ST., NIAGARA FALLS, N.Y., RESUBDIVIDED" BY WALLACE P. KELLER, P.E., L.S. AND FILED ON JANUARY 5, 1960 IN BOOK 64 OF MAPS AT PAGE 1595, NOW FILED IN BOOK 40 OF MICROFILMED MAPS AT PAGE 4000.
2. MAP ENTITLED "RESUBDIVISION OF SUBLOTS 206, 207, 208, AND 209 ON THE WEST SIDE OF 17TH STREET, CITY OF NIAGARA FALLS, COUNTY OF NIAGARA AND STATE OF NEW YORK, PREPARED BUY MCINTYRE SURVEYING FILED OCTOBER, 11 2003 IN BOOK 59 OF MICROFILMED MAPS AT PAGE 5979 AND 5980.
3. MAP ENTITLED "MAP OF PART OF LOTS 33 & 34 N.Y. STATE MILE RESERVE OWNED BY: HIGHLAND LAND CO." PREPARED BY JULIUS FREHSEE DATED OCTOBER 19TH 1895.
4. MAP ENTITLED "MAP OF PART OF LOTS 33 & 34 N.Y. STATE MILE RESERVE ORIGINALLY SUBDIVIDED BY JULIUS FREHSEE FOR THE HIGHLAND LAND CO.", COPIED WITH CHANGES BY PORTER, JONES, AND SCHAEFFER, CIVIL ENGINEERS, FILED NOVEMBER, 18 1899.
5. UNTITLED STREET MAP #17 FROM THE OFFICE OF CITY OF NIAGARA FALLS ENGINEER.

NOTES:

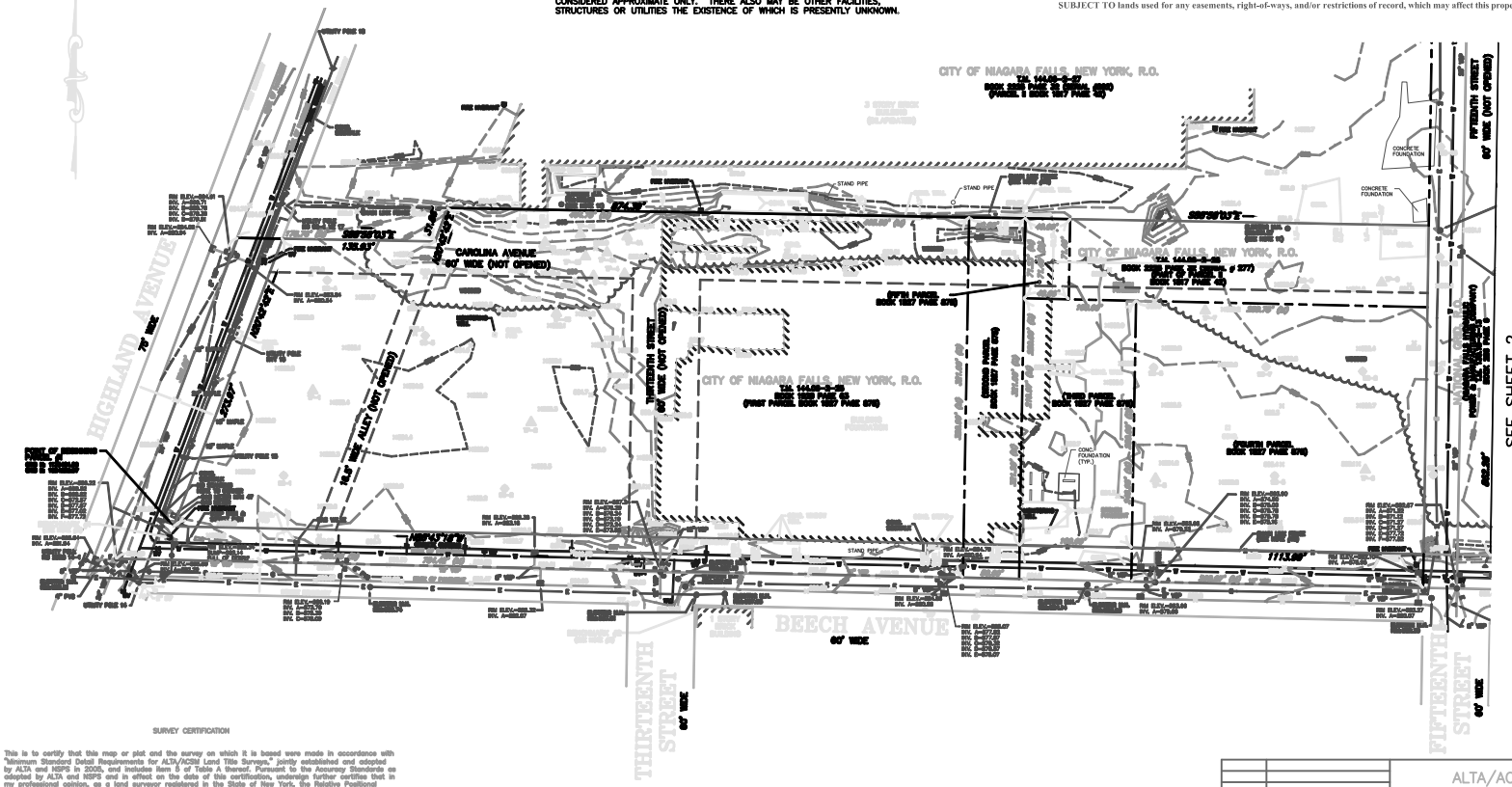
1. ELEVATIONS ARE REFERENCED TO NORTH AMERICAN VERTICAL DATUM (NAVD 88). ELEVATION CONTROL AT THE SITE WAS ESTABLISHED BY RUNNING DIFFERENTIAL LEVELS FROM NGS MONUMENT PID–OG0336 (P 411). STATE PLANE COORDINATES ARE NAD83(CORS96) NEW YORK STATE PLANE, WEST ZONE, US FOOT.
2. SITE BENCHMARKS
   - A. BENCHMARK #1: "X" CUT ON EASTERN BONNET BOLT OF THE FIRE HYDRANT AT THE INTERSECTIONS OF BEECH AVENUE AND HIGHLAND AVENUE ELEVATION: 587.62
   - B. BENCHMARK #2: "SQUARE" CUT ON GRANITE DOOR SILL ON THE WEST SIDE OF THE NIAGARA MOHAWK 1301 BEECH AVENUE STATION (STATION 81) AT THE INTERSECTIONS OF BEECH AVENUE AND THIRTEENTH STREET ELEVATION: 588.89
   - C. BENCHMARK #3: "SQUARE" CUT ON GRANITE CURBING AT AN INLET ON THE NORTH SIDE OF BEECH AVENUE APPROXIMATELY 120' WEST FROM THE INTERSECTION OF BEECH AVENUE AND SEVENTEENTH STREET ELEVATION: 584.79
3. THE STREETS THAT ARE "NOT OPENED" ARE SHOWN PER THE TAX MAP.
4. THE TOTAL AREA OF THE TWO PARCELS IS: 18.06 ACRES.
5. BEARINGS REFERENCED TO TRUE NORTH AT THE 78°35' MERIDIAN OF WEST LONGITUDE.
6. A FIELD SURVEY WAS COMPLETED ON 2–27–09.
7. LAST DEEDS OF RECORD ARE TAX DEEDS WITH NO QUANTITATIVE INFORMATION. RECORD DESCRIPTIONS FOUND FAIL TO FORM MATHEMATICALLY CLOSED FIGURES, DUE TO THE ABSENCE OF ANGLES AND/OR BEARINGS.
8. TITLE REPORT/ABSTRACT OF TITLE NOT PROVIDED BY OWNER.
9. SURVEY SUBJECT TO ANY STATE OF FACTS A TITLE REPORT/ABSTRACT OF TITLE WOULD DISCLOSE.
10. CHAINLINK FENCE MEANDERS ALONG BOTH SIDES OF THE PROPERTY LINE. OWNER UNKONWN.
11. ROUTE OF UNDERGROUND ELECTRIC, IF ANY NOT IDENTIFIED.
12. UNDERGROUND FACILITIES, STRUCTURES AND UTILITIES HAVE BEEN PLOTTED FROM A COMBINATION OF FIELD MEASUREMENTS, AVAILABLE MAPS, RECORDS AND INFORMATION PROVIDED BY THE OWNER, THEREFORE THEIR LOCATION AND TYPE OF USE SHOULD BE CONSIDERED APPROXIMATE ONLY. THERE ALSO MAY BE OTHER FACILITIES, STRUCTURES OR UTILITIES THE EXISTENCE OF WHICH IS PRESENTLY UNKNOWN.

PARCEL I

ALL THAT TRACT OR PARCEL OF LAND, situate in the City of Niagara Falls, County of Niagara and State of New York, being part of Lot 34 of the New York State Mile Reserve and being more particularly bounded and described as follows:
BEGINNING at point on the easterly line of Highland Avenue at its intersection with the northerly line of Beech Avenue; thence N20°42'42"E along the easterly line of Highland Avenue a distance of 273.97 feet to a point; thence S88°58'03"E a distance of 135.93 feet to a point; thence N20°42'42"E, a distance of 31.86 feet to a point on the northerly line of Carolina Avenue (not opened); thence S88°58'03"E along said northerly line of Carolina Avenue a distance of 874.39 feet to a point on the westerly line of Fifteenth Street (not opened); thence S00°54'11"W along the said westerly line of Fifteenth Street a distance of 292.75 feet to a point on the northerly line of Beech Avenue; thence N88°43'18"W along the northerly line of Beech Avenue a distance of 1113.99 feet to the point and place of beginning.
CONTAINING 6.99 acres of land, more or less.
SUBJECT TO lands used for any easements, right-of-ways, and/or restrictions of record, which may affect this property.
TOGETHER WITH any right, title, and interest that the grantor may have to those portions of Highland Avenue and Beech Avenue to the centerline of Highland Avenue and Beech Avenue, fronting said streets.

PARCEL II

ALL THAT TRACT OR PARCEL OF LAND, situate in the City of Niagara Falls, County of Niagara and State of New York, being part of Lot 34 of the New York State Mile Reserve and being more particularly bounded and described as follows:
BEGINNING at point on easterly line of Fifteenth Street (not opened) at its intersection with the northerly line of Beech Avenue; thence N00°54'11"E along the easterly line of said Fifteenth Street a distance of 862.28 feet to a point on the northerly line of Lot 34 of the New York State Mile Reserve; thence S89°40'00"E along the northerly line of Lot 34 of the New York State Mile Reserve a distance of 559.41 feet to the northwesterly corner of Lot 218 of the Resubdivison of Lots on 17th Street, Niagara Falls, NY according to a made by Wallace P. Keller, P.E., L.S. and recorded in the Niagara County Clerk's office on January 5, 1960 in Map Book 64 of Maps at Page 1595, now filed in Book 40 of Microfilmed Maps at Page 4000; thence S00°28'15"E along the westerly line of lots 218, 217, 216, 215, 214, 213, and part of lot 212 of said Resubdivision a distance of 299.61 feet to the northeasterly corner of a 10 foot wide alley; thence N89°04'07"W along the northerly line of said alley a distance of 10.00 feet to a point; thence S00°28'15"W along the westerly line of said alley a distance of 571.90 feet to a point on the northerly line of Beech Avenue; thence N88°43'18"W along the northerly line of Beech Avenue a distance of 555.97 feet to the point and place of beginning.
CONTAINING 11.07 acres of land, more or less.
SUBJECT TO lands used for any easements, right-of-ways, and/or restrictions of record, which may affect this property.



SURVEY CERTIFICATION

This is to certify that this map or plat and the survey on which it is based were made in accordance with "Minimum Standard Detail Requirements for ALTA/ACSM Land Title Surveys," jointly established and adopted by ALTA and NSPS in 2005, and includes Item 5 of Table A thereof. Pursuant to the Accuracy Standards as adopted by ALTA and NSPS and in effect on the date of this certification, undersign further certifies that in my professional opinion, as a land surveyor registered in the State of New York, the Relative Positional Accuracy of this survey does not exceed that which is specified therein.

Date:_____

_____
Michael J. Wright, L.S.
Registration No. 049155

GRAPHIC SCALE

(IN FEET)
1 inch = 60 ft.

REVISIONS

ALTA/ACSM LAND TITLE SURVEY
CITY OF NIAGARA FALLS
PART OF LOT 34 OF THE NYS MILE RESERVE
CITY OF NIAGARA FALLS
NIAGARA COUNTY NEW YORK

PROJECT No.	SHEET No.	DATE	SCALE
109.001 54	1 OF 2	JULY 17, 2009	1" = 50'

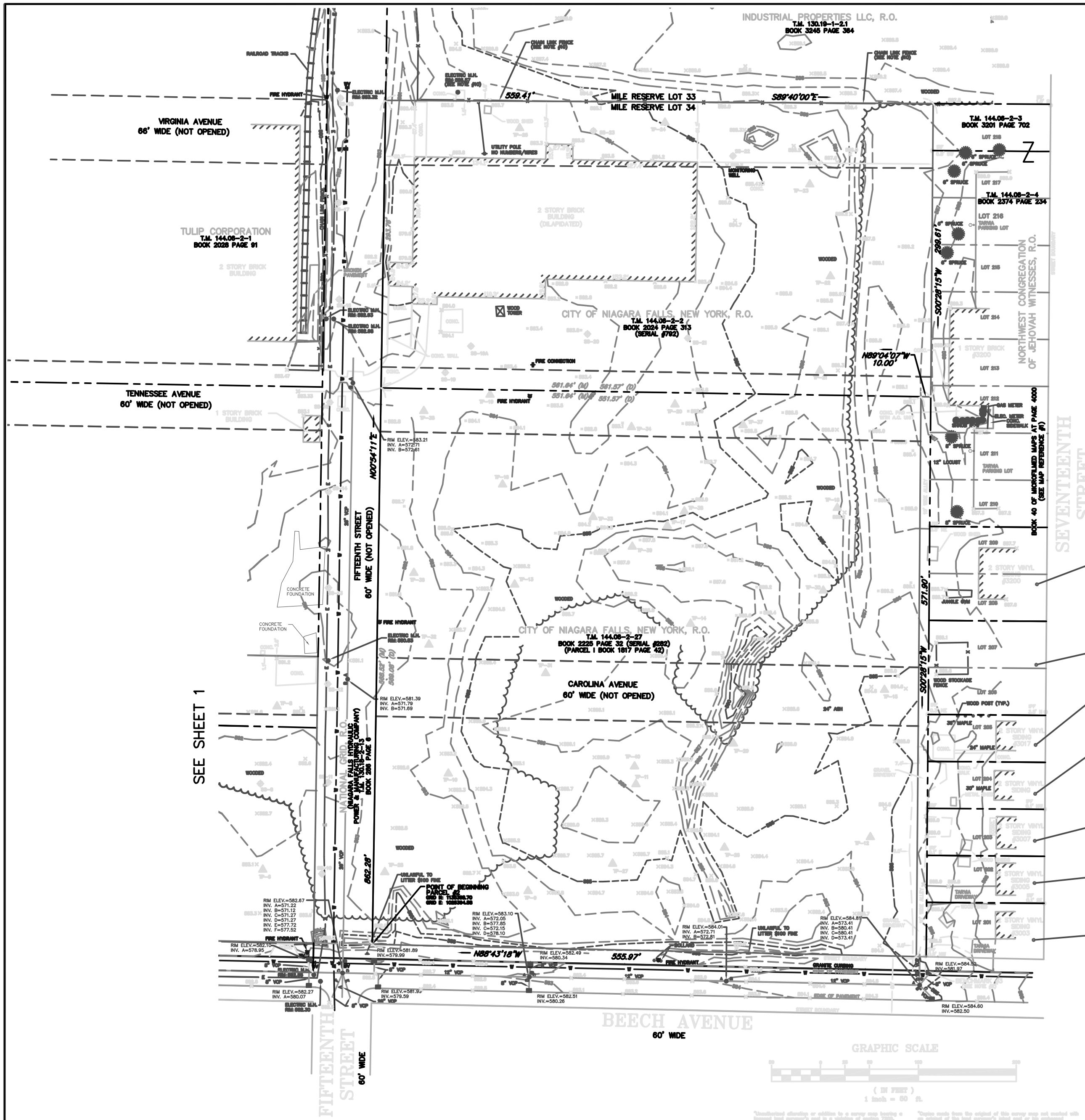
PRUDENT ENGINEERING LLP
ENGINEERING & LAND SURVEYING
6390 FLY ROAD
EAST SYRACUSE, NY 13057
PHONE: (315) 432–8923
FAX (315) 432–8928

PREPARED BY:
EA ENGINEERING, P.C.
AND ITS AFFILIATE
EA SCIENCE AND
TECHNOLOGY

PARCEL I (WEST)
ALTA/ACSM LAND TITLE SURVEY

TRACT II HIGHLAND AVENUE
BASIS OF DESIGN REPORT (FINAL)
NIAGARA COUNTY, NEW YORK

PROJECT MGR.	DESIGNED BY	DRAWN BY	CHECKED BY	DATE	SCALE	PROJECT NO.	FILE NAME	DRAWING NO.	FIGURE
JAG	JAG	DW	SLG	MARCH 2010	AS SHOWN	1447430	SITE LAYOUT	1 OF 2	FIGURE 2



LEGEND/ABREVIATIONS:

- CATCH BASIN
- CHAINLINK FENCE
- EDGE OF WOODS AND/OR BRUSH
- EXISTING CONTOUR
- GAS VALVE
- UNDERGROUND GAS
- HYDRANT
- IPF IRON PIPE FOUND
- IRF IRON ROD FOUND
- ELECTRIC MANHOLE
- UNDERGROUND ELECTRIC
- COMBINED SANITARY SEWER & STORM SEWER MANHOLE
- COMBINED SANITARY SEWER & STORM SEWER MANHOLE
- SIGN
- TREE
- UTILITY POLE
- WV WATER VALVE
- UNDERGROUND WATER
- LIGHT POLE
- x SPOT ELEVATION LOCATION
- SS SOIL SAMPLE
- TP TEST PIT
- CONC. CONCRETE
- (M) MEASURED DISTANCE
- (D) DEED DISTANCE
- VCP VITRIFIED CLAY PIPE
- CONC. CONCRETE
- ELEC. ELECTRIC
- INV. INVERT ELEVATION
- (TYP) TYPICAL
- M.H. MANHOLE
- ELEV. ELEVATION
- N: 1135398.70 E: 1025394.58 STATE PLANE GRID COORDINATES (SEE NOTE 1)

ALTA/ACSM LAND TITLE SURVEY
CITY OF NIAGARA FALLS
PART OF LOT 34 OF THE NYS MILE RESERVE
CITY OF NIAGARA FALLS
NIAGARA COUNTY NEW YORK

PROJECT No.	SHEET No.	DATE	SCALE
109.001 54	2 OF 2	JULY 17, 2009	1" = 50'

REVISIONS

PRUDENT ENGINEERING LLP
ENGINEERING & LAND SURVEYING
6390 FLY ROAD, EAST SYRACUSE, NY 13057

PARCEL II (EAST)
ALTA/ACSM LAND TITLE SURVEY

TRACT II HIGHLAND AVENUE
BASIS OF DESIGN REPORT (FINAL)
NIAGARA COUNTY, NEW YORK

PREPARED BY:
EA ENGINEERING, P.C. AND ITS AFFILIATE EA SCIENCE AND TECHNOLOGY

FIGURE	DRAWING NO.	FILE NAME	PROJECT NO.	SCALE	DATE	CHECKED BY	DRAWN BY	DESIGNED BY	PROJECT MGR.
FIGURE 3	2 OF 2	SITE LAYOUT	1447430	AS SHOWN	MARCH 2010	SLG	DW	JAG	JAG

Appendix A

Supplemental Investigation Report

Supplemental Investigation Report
Tract II Highland Avenue (9-32-136)
Niagara Falls, New York

Prepared for

New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233

Prepared by

EA Engineering, P.C. and Its Affiliate
EA Science and Technology
6712 Brooklawn Parkway, Suite 104
Syracuse, New York 13211-2158
(315) 431-4610

October 2009
Revision: FINAL
EA Project No. 14474.30

Supplemental Investigation Report
Tract II Highland Avenue (9-32-136)
Niagara Falls, New York

Prepared for

New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233

Prepared by

EA Engineering, P.C. and Its Affiliate
EA Science and Technology
6712 Brooklawn Parkway, Suite 104
Syracuse, New York 13211
(315) 431-4610

8 October 2009

Christopher J. Canonica, P.E., Program Manager — Date
EA Engineering, P.C.

8 October 2009

Judith A. Graham, Project Manager — Date
EA Science and Technology

October 2009
Revision: FINAL
EA Project No. 14474.30

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3A Toxicity Characteristic Leaching Procedure lead concentrations in test pit soil samples – July 2009.

4 Summary of lead concentrations in surface and subsurface soils – March and July 2009.

EA Engineering, P.C.
EA Science and Technology

6712 Brooklawn Parkway, Suite 104
Syracuse, New York 13211-2158
Telephone: 315-431-4610
Fax: 315-431-4280
www.eaest.com

30 October 2009

MEMORANDUM

FROM: Judy Graham, Project Manager, Chris Canonica, P.E. **LOCATION:** EA Science and Technology

TO: Mr. Jeffrey Konsella, P.E., **LOCATION:** NYSDEC - Region 9

RE: Contract/WA No: D004441-30
Tract II Highland Avenue Additional Work (9-32-136)
Treatment and Disposal Options for Impacted Soils

This memorandum summarizes the re-evaluation of treatment and disposal options for impacted soils at the Tract II Highland Avenue site in Niagara Falls, New York. Data collected from the Supplemental Investigation completed in 2009 indicated that the volumes of fill and metal concentrations in fill materials onsite were underestimated in the previous investigations. Issues that may impact the remedial design are discussed in detail below. Estimated costs for various remedial options are summarized in the attached tables.

VOLUME OF IMPACTED FILL MATERIAL

Data generated from test pits and a topographic survey completed during the supplemental investigation was used to determine volume of fill materials onsite. Based on data collected the net cut volume was re-estimated to be approximately 44,589 yd^3 (cut volume: 44,713 yd^3; fill volume: 124 yd^3). This volume equated to an average fill thickness of approximately 3.9 ft over a 7.1 acre area of contaminated media within the boundary of test pit locations.

Using outer boundary of test pits as limit of excavation
Volume of excavation = 44,589 yd^3
Add 20 percent safety factor
Calculated final fill volume after treatment = 44,589 yd^3*1.2 = 53,507 yd^3

An average soil density of 1.7 tons/yd^3 was used in calculating the tonnage as shown below.

53,507 yd^3* 1.7 tons/yd^3 = 90,962 tons

A conservative estimate of 91,000 tons of impacted materials was used in estimating soil disposal and soil treatment options at the Tract II site.

CHARACTERISTICS OF FILL MATERIALS

Physical Characteristics

Soil boring logs indicate that the fill materials onsite are fairly homogenous and consist of silty sand mixed with industrial wastes including brick, concrete, ash and crushed battery casings found consistently throughout the fill. Because of the homogeneity of the fill, it will be difficult to separate hazardous waste from non- hazardous waste on a visual basis, as well as a chemical constituent basis as discussed below.

Lead Concentrations

Soil investigations were completed to delineate hazardous waste characteristics in onsite soils based on toxicity characteristic leaching procedure (TCLP) lead analysis. TCLP analysis performed during the Supplemental Investigation indicated that seven of nine soil samples collected from 0 to 2 ft below the surface exceeded hazardous waste limits for lead. In addition, 7 of 20 samples collected for TCLP analysis from 2 to 8 ft below the surface exceeded the limits for hazardous waste. Approximately 48 percent of the samples tested had lead concentrations that exceeded TCLP limits for hazardous waste. The data indicated that lead concentrations were found to exist throughout the depth of the fill in no defined vertical or horizontal pattern of distribution. Separating hazardous waste (soils that fail TCLP criteria) from non-hazardous waste will need to be done on a batch-by-batch basis will present difficult logistic challenges and will be time consuming to complete.

Other Chemical Constituents

The Supplemental Investigation tested soil samples for Resource Conservation and Recovery Act metals, and found that all metals tested were present in the fill; however, lead, chromium and mercury were also present in concentrations above Part 375 Restricted Use Cleanup goals onsite. Semivolatile organic compounds (SVOCs), organic compounds, pesticides, and polychlorinated biphenyls (PCBs), as well as target analyte list (TAL) metals were detected in soils during previous investigations. Data indicate that the organic compounds were present primarily in the top 2 ft of fill material onsite.

TRANSPORTATION AND DISPOSAL COSTS

Estimates were received from three disposal contractors to transport and dispose of hazardous and non-hazardous soils from the Tract II site. For these estimates, it was assumed that the soils were impacted primarily with metals and that hazardous material criteria were based on TCLP concentrations for lead. If organic compounds are found to be present in soils at levels higher than expected, disposal costs may increase. Estimated tonnages of soils were based on percentage of samples that failed TCLP during the supplemental investigation. Table 1 summarizes the costs received from three contractors solicited for estimates. These costs are solely for transportation and disposal and do not include excavation, staging, or separating hazardous soils from non-hazardous soils.

STABILIZATION TREATMENT OPTIONS

As an alternative to removal and disposal of impacted materials, stabilization of metals is a treatment option that was evaluated for the site. Treatment options including stabilization with phosphate based compounds (EcoBond) and silica based compounds including cement-kiln dust (CKD) were evaluated as summarized below. Each stabilization treatment option would require a preliminary treatability study which may include collecting data from materials onsite including pH of soils, geotechnical data, and detailed profile of chemical composition of soils including (volatile organic compounds, SVOCs, PCBs, and pesticides). Estimated costs to complete treatability studies range from $4,000 (EcoBond) to $100,000 (CKD).

EcoBond

A proprietary blend of phosphate compounds are mixed with impacted soils to bind metallic ions reducing the solubility and leaching potential of compounds. It is important to note that total metals concentrations in treated materials will be unchanged. The process is completed onsite as an *ex-situ* treatment, and treated soils would either be disposed of onsite or transported to landfill as a non-hazardous material depending on the regulatory criteria. Because the total metals concentrations will be unchanged, soils disposed of onsite will require a cover system to protect against direct contact with materials. Table 2 summarizes the estimated costs to treat impacted soils onsite with EcoBond. Costs do not include transportation and disposal of materials

Cement-Kiln Dust

Silica-based materials primarily consisting of cement and kiln dusts are mixed with impacted soils to bind metallic ions and reduce solubility, and inhibit the leaching potential of compounds. Similar to EcoBond, total metals concentrations in treated materials will be unchanged. The process is completed onsite as an *ex-situ* treatment, and treated soils would either be disposed of onsite or transported to landfill as a non-hazardous material depending on the regulatory criteria. Depending on the buffering capacity of the onsite soils, additional treatments may be necessary to reach regulatory standards. The presence of organic compounds including PCBs and SVOCs may complicate the treatment and would increase the cost significantly. These prices assume that organics concentrations are in concentrations that will not affect the treatment or could be segregated prior to treatment. Table 2 summarizes the estimated costs to treat impacted soils with CKD onsite. Costs do not include transportation and disposal of materials

SUMMARY OF COSTS FOR TREATMENT AND DISPOSAL OPTIONS

Table 3 summarizes the various options available using combinations of excavation, treatment, and disposal alternatives. For this comparison, EA assumed that all excavated materials are hazardous waste and will not be separated into non-hazardous and hazardous waste streams prior to treatment. Differential costs for following listed items are included in the summary table:

- Treatability Studies

- Excavation of Materials Prior to Treatment
- Stabilization Treatment Options (EcoBond and CKD)
- Offsite disposal
- Onsite disposal
- Restoration Backfill
- Soil Cover

The table provides a comparison of estimated conservative costs for stabilization treatment and disposal options at the Tract II site. Costs were based on current vendor quotes and 2009 RS MEANS construction estimates. Other variables including costs for a soil cover, costs to stage and separate materials and treatability studies were included in the comparisons. In most scenarios, a soil cover designed to, at a minimum, protect against direct exposure contact will be a necessary part of remedial action at the site and is included in the summary table.

REGULATORY CRITERIA

Disposal of hazardous waste materials at regulated landfills are determined by TCLP limits and facility specific waste characterization requirements. The U.S. Environmental Protection Agency established TCLP concentrations based on leaching potential of materials in municipal landfills. Any materials that are disposed of offsite will have to meet these criteria; the TCLP limit for lead is 5 mg/L.

In addition, materials left onsite are also required to meet TCLP lead criteria and Part 375 cleanup objectives for commercial use. Pre-testing and treatability studies designed for the selected treatment option should be completed to determine efficacy of potential treatment options prior to selecting final remedial design.

BASIS OF DESIGN REPORT

EA is currently working on the Basis of Design Report; however would like to discuss the items in this memorandum and selected remedial alternative for the site prior to submittal. Please contact me at your earliest convenience to schedule a teleconference.

Attachments

TABLE 1 DISPOSAL CONTRACTOR BID UNIT PRICE TABLE
BASIS OF DESIGN REPORT
TRACT II HIGLAND AVENUE

Item	Quantity	Unit	Unit Cost	Subtotal Cost
Transportation fees - included in estimates	1800	per trip	$240.00	$432,000.00
Soil disposal - non haz	91000	ton	$31.00	$2,821,000.00
Soil disposal - hazardous	91000	ton	$165.00	$15,015,000.00
Clean Harbors - Total				
Transportation fees - included in estimates	0	per trip	$0.00	$0.00
Soil disposal - non haz	91000	ton	$49.00	$4,459,000.00
Soil disposal - hazardous	91000	ton	$222.00	$20,202,000.00
Optech Environmental - Total				
Transportation Environmental fees	1800	per trip	$9.75	$17,550.00
Soil disposal - non haz	91000	ton	$49.00	$4,459,000.00
Soil disposal - hazardous	91000	ton	$245.00	$22,295,000.00
Environmental Products and Services - Total				
Soil assumed to be impacted with metals only.				

TABLE 2 SOIL TREATMENT OPTIONS - CONTRACTOR BID UNIT PRICE TABLE
BASIS OF DESIGN REPORT
TRACT II HIGLAND AVENUE

Item	Quantity	Unit	Unit Cost	Subtotal Cost
Schnabel - Cement/Kiln Dust				
Treatability Study	1	LS	$100,000.00	$100,000.00
Soil Treatment - low estimate*	91000	ton	$50.00	$4,550,000.00
Soil Treatment - high estimate*	91000	ton	$120.00	$10,920,000.00
MT2 - Ecobond				
Treatability Study	1	LS	$5,000.00	$5,000.00
Soil Treatmetnt - low estimate*	91000	ton	$50.00	$4,550,000.00
Soil Treatment -high estimate*	91000	ton	$75.00	$6,825,000.00

Estimated tonnage for wastes assumes all excavated material is hazardous.
Costs do not include transportation and disposal
Low estimate assumes metals only, high estimate includes SVOCs organics, etc.

TABLE 3 TRACT II HIGLAND AVENUE
SUMMARY OF COSTS FOR TREATMENT AND DISPOSAL OPTIONS
BASIS OF DESIGN REPORT
TRACT II HIGLAND AVENUE

Remedial Option	Quantity	Unit	Unit Cost	Subtotal Cost
1. Excavate and Dispose of as Hazardous Waste at Landfill				
Excavate and load	91,000	tons	$10.00	$910,000.00
Soil disposal - hazardous waste	91,000	tons	$245 00	$22,295,000.00
Offsite Restoration Backfill	53,507	CY	$23.35	$1,249,388.45
				$24,454,388.45
2. Excavate and Treat with EcoBond Dispose of as Non-Hazardous Waste at Landfill				
Treatability Study	1	LS	$5,000.00	$5,000.00
Excavate and stage	91,000	tons	$15.00	$1,365,000 00
Ecobond treatment* and disposal as non hazardous waste	95,550	tons	$75.00	$7,166,250 00
Offsite Restoration backfill	53,507	CY	$23 35	$1,249,388.45
				$9,785,638.45
3. Excavate and Treat with EcoBond and Dispose of on site with Cover				
Treatability Study	1	LS	$5,000.00	$5,000 00
Excavate and stage	91,000	tons	$15 00	$1,365,000 00
Ecobond treatment * and dispose of onsite	95,550	tons	$50 00	$4,777,500 00
Onsite Restoration Backfill	53,507	CY	$15.00	$802,605.00
Soil Cover	1	LS	$600,000 00	$600,000 00
				$7,550,105.00
4. Excavate and Treat with Cement-Kiln Dust Dispose of as Non-Hazardous Waste at Landfill				
Treatability Study	1	LS	$100,000.00	$100,000.00
Excavate and stage	91,000	tons	$15.00	$1,365,000 00
CKD Treatment* (metals compounds only) and dispose	95,550	tons	$99 00	$9,459,450.00
Offsite Restoration Backfill	53,507	CY	$23.35	$1,249,388.45
Soil Cover	1	LS	$600,000 00	$600,000.00
				$12,773,838.45
5. Excavate and Treat with Cement-Kiln Dust Dispose of on site with Cover				
Treatability Study	1	LS	$100,000 00	$100,000.00
Excavate and stage	91,000	tons	$15 00	$1,365,000 00
CKD Treatment* (metals compounds only) and dispose onsite	95,550	tons	$99 00	$9,459,450.00
Onsite Restoration Backfill	53,507	CY	$15 00	$802,605.00
Soil Cover	1	LS	$600,000 00	$600,000 00
				$12,327,055.00

NOTES.
*5% weight added after treatment