REMEDIAL DESIGN WORK PLAN

OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA SITE
TOWN OF NIAGARA, NEW YORK

APRIL 2007
REF. NO. 019867 (11)

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1.0 INTRODUCTION

1.1 GENERAL

The Vanadium Corporation of America (Vanadium) site is located in the Town of Niagara, Niagara County, New York. The Vanadium site location is presented on Figure 1.1 and the site plan is presented on Figure 1.2. The Vanadium site includes property owned by Airco Properties, Inc. (Airco), CC Metals and Alloys, Inc. (CCMA), the New York Power Authority (NYPA), and Niagara Mohawk Power Corporation (NiMo). The New York State Department of Environmental Conservation (NYSDEC) has designated the Vanadium site as a Class 2 inactive hazardous waste disposal site. NYSDEC has designated the CCMA parcel as Operable Unit 1 (OU1); the Airco parcel as Operable Unit 2 (OU2); and the NYPA and NiMo parcel as Operable Unit 3 (OU3). NYSDEC published the selected remedy for the three operable units comprising the Vanadium site in a Record of Decision (ROD) (NYSDEC, March 2003). This Remedial Design (RD) Work Plan deals solely with OU3.

1.2 REPORT ORGANIZATION

This RD Work Plan is organized as follows:

Section 1.0 Introduction;

Section 2.0 Vanadium site background information;

Section 3.0 Remedial Action (RA) objectives;

Section 4.0 RA components;

Section 5.0 Pre-design data collection activities;

Section 6.0 RD activities;

Section 7.0 System performance monitoring; and

Section 8.0 Schedule for completing the RD.

2.0 VANADIUM SITE BACKGROUND

2.1 HISTORICAL VANADIUM SITE OPERATIONS

The Vanadium site (consisting of OU1, OU2, and OU3) is estimated to consist of approximately 150 acres. From 1920 to 1964, Vanadium owned the Vanadium site and constructed and operated a ferroalloy production plant. Portions of the Vanadium site were used to dispose of wood, brick, ash, lime slag (calcium hydroxide), ferrochromium silicon slag, and ferrochromium silicon dust (ABB, 1993). Vanadium ceased operations in 1964.

NYPA purchased the eastern 88 acres of the Vanadium Site now known as OU3 from Vanadium in 1959 to construct a portion of the Niagara Power Project, which included two underground power conduits. A portion of OU3 was subsequently sold to NiMo. Both NYPA and NiMo installed several high voltage transmission lines on OU3.

Airco purchased the western 62 acres of the Vanadium site now known as OU1 and OU2 in 1964. Airco or its affiliates continued ferrochromium manufacturing operations and disposed of wastes similar to those disposed by Vanadium (ABB, 1993). Additionally, between 1971 and 1979, Airco disposed of baghouse dust containing ferrochromium silicon dust on OU2. Between 1981 and 1988, Airco operated a permitted landfill on OU2 for disposal of industrial wastes resulting from off-site manufacturing operations. An Interim Remedial Measure (IRM) for the OU2 landfill was completed in 2001.

In 1979, SKW Metals and Alloys, Inc (SKW), purchased the western 37 acres of the Airco property, now known as OU1 (NYSDEC, 1997). SKW operated a solid waste disposal facility consisting of two landfill cells. The facility was designed for the disposal of ferrochromium silicon baghouse dust and ferrosilicon baghouse dust wastes. An IRM for the OU1 landfill was completed in 1999.

2.2 OU3 SITE DESCRIPTION

The 150-acre Vanadium site is bounded on the north by an automobile depot and vacant property, to the west by Witmer Road (Route 31), on the east by Interstate 190, and on the south by vacant land and industrial facilities. The nearest water bodies are the Lower Niagara River located approximately 1.4 miles west of the property, the NYPA reservoir, located approximately 0.8 miles north of the property, and Gill Creek located approximately 1,000 feet east of OU3. Water transfer units (conduits) are located

beneath the NYPA property. These conduits transfer water from the Upper Niagara River, located to the south, to the NYPA reservoir. Numerous high voltage electrical transmission towers are located on OU3 and overhead electrical transmission lines cross OU3.

OU3 consists of a relatively large central area containing the main slag mound area and two long narrow legs that extend west of the central area. The north leg is located immediately north of OU1 and OU2 and the south leg is located immediately south of OU1 and OU2.

A drainage ditch traverses the central area of OU3 from north to south and then drains in a westerly direction along the south leg where it ultimately discharges into a wetland located south of OU1. Several areas of OU3 are poorly drained and an intermittent pond exists west of the main slag mound.

2.3 OU3 SITE INVESTIGATIONS

This section presents a brief summary of the investigation activities that have been performed at OU3.

NYSDEC Investigations - 1996

In 1996, NYSDEC performed an investigation under the Immediate Investigative Work Assignment (IIWA) program to evaluate OU3. The investigation by NYSDEC included installing eight monitoring wells for groundwater sampling, 12 soil borings for soil sampling, two test pit samples to investigate the waste piles, and the collection of surface water and sediment samples from an intermittent pond located near soil boring SB-2. The results are presented in the IIWA Report (NYSDEC, 1997).

NYSDEC Investigations – 1999/2000

In 1999 and 2000, NYSDEC performed an IIWA Investigation for the NiMo Right of Way (ROW) to determine the presence and location of any waste/fill areas and to determine if the NiMo ROW is the source of the volatile organic contamination found in the Union Carbide (UCAR) well BW-4 located south of the south leg of OU3. The first phase of the investigation consisted of the installation of two overburden and bedrock groundwater monitoring well pairs and subsequent groundwater sampling. The second phase included an OU3 soil/waste investigation, survey/mapping, soil/waste sampling, and

laboratory analysis. The results of these investigations are presented in the IIWA Report, Niagara Mohawk Right of Way Site (NYSDEC, 2001).

Golder Associates Inc. - 2001

In 2001, Golder Associates performed supplemental investigations at OU3 that included a Fish and Wildlife Impact Analysis (FWIA), wetland delineation, and groundwater well sampling and analyses. Golder collected groundwater samples and water level measurements from the existing OU3 monitoring wells. Seven water samples were collected and analyzed for TAL metals and hexavalent chromium. The results of the Golder OU3 investigations are presented in their report entitled "Delineation of Surface Water Bodies, Wetlands, and Ecological Receptors at the Former Vanadium Corporation of America Site" (Golder, 2001).

Conestoga-Rovers & Associates – 2003/2004

On September 27, 2002, Conestoga-Rovers & Associates (CRA) prepared and submitted a Phase I Work Plan to NYSDEC. The Work Plan was approved by NYSDEC on December 4, 2002. In 2003/2004, CRA implemented the Phase I Investigation. The investigation included the following tasks:

Task 1 Shallow Monitoring Well Inventory, Survey, and Water Levels;
Task 2 Test Pit Excavations;
Task 3 Boreholes and Subsurface Soil Sampling and Analysis;
Task 4 Monitoring Well Installation;
Task 5 Hydraulic Water Level Measurements;
Task 6 Shallow Groundwater Sampling and Analysis;
Task 7 Surface Soil Sampling and Analysis;
Task 8 Surface Water and Sediment Sampling and Analysis;
Task 9 Community Air Monitoring; and
Task 10 Topographic/Property Survey.

During 2003/2004, 15 soil borings were completed, 14 shallow groundwater monitoring wells were installed, hydraulic water level measurements were obtained, 21 test pits were excavated to delineate the extent of slag, 31 surface soil, and 30 subsurface soil samples were collected and submitted for analyses, 2 rounds of groundwater samples were collected and submitted for analyses, and 4 rounds of surface water and 1 round of sediment samples were collected from 17 locations and submitted for analyses. All

samples were analyzed for TAL metals, hexavalent chromium, and pH. A total of 7 groundwater samples were analyzed for dissolved TAL metals and dissolved hexavalent chromium. In addition, 3 samples were collected from the soil cover material on OU3 and analyzed for physical parameters including particle size distribution, liquid limit, plastic limit, plasticity index, and hydraulic conductivity.

The results of the 2003/2004 CRA Phase I Investigation are presented in the Phase I Letter Report (CRA, 2004b).

Conestoga-Rovers & Associates – 2005/2006

In 2005, CRA completed a remedial investigation and feasibility study (RI/FS) and the results were presented in the report entitled "Remedial Investigation and Remedial Analysis/ Feasibility Study" (CRA, 2005). The RI/FS recommended Remedial Alternative 3, which included the following components:

- consolidation of OU3 soils/slag and sediment;
- containment of consolidated materials using an engineered cap;
- institutional controls to restrict OU3 groundwater use and future development; and
- a long-term groundwater and surface water monitoring program to monitor the effectiveness of the remedy.

Figure 2.1 presents a conceptual illustration of Alternative 3.

CRA performed additional investigation activities during 2005 in accordance with the Addendum I Phase I Work Plan dated November 14, 2005. The additional investigation included the following tasks:

- topographic survey;
- additional delineation sampling;
- additional cap evaluation;
- borrow area investigation;
- investigation east of the slag mound;
- sampling the drainages beyond the OU3 boundary; and
- electrical transmission line survey.

During the Addendum I additional investigation, a total of 68 soil and sediment samples were collected and submitted for analyses for TAL metals, hexavalent chromium, and pH, and 17 soil samples were submitted for geotechnical analyses.

On May 19, 2006, CRA prepared and submitted a RI/FS Addendum II Work Plan for additional data collection at OU3. The Addendum II work included the following tasks:

- sediment sampling for AVS/SEM and pore water analyses;
- surface water sampling from the wetland area;
- sediment treatability testing;
- wetland delineation and wetland function and values assessment; and
- additional piezometer installation and water level monitoring.

The Addendum I and Addendum II field work results will be presented in a letter report to NYSDEC and be incorporated into the Remedial Design.

2.4 SELECTED REMEDIAL ALTERNATIVE

The NYSDEC ROD identified Alternative 3 as the selected remedial alternative for OU3. The remedial alternative components, as specified in the ROD, are as follows:

- *A remedial design program to provide the details for the construction, operation, maintenance and monitoring (OM&M) necessary to implement the remedial program;*
- *Partial excavation of soil/slag and sediment, and on-site consolidation and capping of these materials with alternative cap designs evaluated to select a cap that meets the capping objectives, including proper drainage and giving consideration to constraints with working around and beneath the electrical transmission towers and wires;*
- *Collection of confirmatory soil samples from excavation areas;*
- *Development of a site management plan to address residual contamination, any use restrictions and provide for the O&M of the components of the remedy;*
- *Imposition of an institutional control in the form of an environmental easement to restrict groundwater use, limit the use and development of the property and ensure compliance with an approved site management plan;*
- *Certification of, and the use of institutional and engineering controls; and*
- *Long term monitoring program with periodic reporting maintained to include results of groundwater and surface water monitoring, inspections and maintenance activities.*

3.0 RA OBJECTIVES

As specified in the ROD, the remedial goals for OU3 are to eliminate or reduce, to the extent practicable:

- *exposure of persons at or around the site to the potential for the dermal contact with, ingestion of, or inhalation of contaminated soil/slag from or at the site that could result in unacceptable risk to human health;*
- *the potential for migration of contaminants from soil/slag to surface water or sediments by runoff that could result in exceeding surface water SCGs;*
- *the potential for dermal contact with, or inadvertent ingestion of contaminated sediment and surface water from or at the site that could result in unacceptable risk to human health;*
- *exposure to contaminants in the sediments that exceed applicable SCGs;*
- *exposure to groundwater that would result in unacceptable risk to human health;*
- *to restore surface water quality in the drainage ditches to a level suitable for intermittent birds and mammal use;*
- *environmental exposures of flora or fauna to high pH leachate and inorganic compounds in the exposed waste and sediments;*
- *the release of contaminants from soil into groundwater that may create exceedances of groundwater quality standards; and*
- *the release of contaminants from surface soil, exposed waste, leachate and sediments into the ambient air and surface water through storm water erosion and wind borne dust.*

Specific RA objectives for each medium of interest are presented in the FS as follows:

Soil/Slag

- prevent the potential for dermal contact with, ingestion of, or inhalation of contaminated soil/slag from or at OU3 that could result in unacceptable risk to human health; and
- prevent the potential for migration of contaminants from soil/slag to surface water or sediments by runoff that could result in exceeding surface water SCGs.

Sediment

- prevent the potential for dermal contact with, or inadvertent ingestion of contaminated sediment from or at OU3 that could result in unacceptable risk to human health; and

- prevent exposure to COPCs in the sediment that exceed applicable SCGs.

Groundwater

- prevent exposure to groundwater that would result in unacceptable risk to human health; and
- prevent further degradation of the bedrock groundwater beneath OU3.

Surface Water

- prevent the potential for dermal contact with, or ingestion of contaminated surface water from or at OU3 that could result in unacceptable risk to human health; and
- restore surface water quality in the drainage ditches to a level suitable for intermittent bird or mammal use.

4.0 RA COMPONENTS

The major components of the selected OU3 remedial alternative are as follows:

- sediment and erosion control plan;
- relocation of existing local electrical distribution line;
- soil/slag excavation and consolidation;
- sediment excavation and consolidation;
- regrading of the existing slag mound;
- cap construction;
- confirmatory sampling;
- surface water drainage;
- wetland mitigation, if necessary;
- OU3 restoration;
- institutional controls to restrict groundwater use and future development; and
- long-term OM&M.

Each of these components and the design considerations affecting each of the components are discussed in the following sections.

4.1 SEDIMENT AND EROSION CONTROL PLAN

A sediment and erosion control plan will be prepared that will specify the measures to be taken to prevent erosion and sediment transport from the work area. The sediment and erosion control plan will, at a minimum, meet the substantive requirements of the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity.

4.2 RELOCATION OF EXISTING ELECTRICAL DISTRIBUTION LINE

A pole-mounted electrical distribution line is located on OU3 between the existing slag mound and OU2. This line will be relocated to the west to allow for consolidation of excavated soil, slag, and sediment in this area. The relocated distribution line will be designed in accordance with applicable NiMo requirements.

4.3 SOIL/SLAG EXCAVATION AND CONSOLIDATION

Testing conducted during the RI identified the extent of soil and slag material requiring remediation. It is estimated that up to approximately 90,000 cubic yards of soil/slag will need to be excavated and consolidated on OU3. The RD will evaluate the cost of consolidating material versus capping in place in order to optimize the final consolidation/cap area. The initial excavations will be based on the results of the RI and visual observations of slag material in the field. Confirmatory sampling will be conducted as described in Section 4.7 to confirm that the remediation goals have been met in the excavation areas.

4.4 SEDIMENT EXCAVATION AND CONSOLIDATION

Sediment in the OU3 ditches and pond will be excavated and consolidated on OU3. Sampling conducted during the RI and subsequent sampling conducted in December 2005 for the Addendum I Work Plan identified areas in the wetland south of OU1 with metals concentrations exceeding the NYSDEC Sediment Quality Benchmarks (SQBs). Additional sampling is being conducted in accordance with the Addendum II Work Plan to assess the bioavailability and toxicity of the metals in the sediments. These data will be used to identify areas requiring remediation, if any.

Measures will be taken as necessary to allow sediments in the ditches, ponds, and wetlands to be excavated under dry conditions to the extent possible. Possible measures include rerouting surface water drainage around the remediation area and pumping the water from the remediation area prior to excavation. The pumped water would be discharged onto the slag pile or to an adjacent wetland area or otherwise handled in accordance with applicable regulatory requirements, if necessary. Samples will be collected of the surface water in the wetland south of OU1 to be used in the evaluation of water handling options. Depending on OU3 conditions at the time of the remediation, several of the OU3 ditches and pond may be dry.

The excavated sediment will likely need to be dewatered and solidified prior to placement in the consolidation area. Treatability testing will be conducted in accordance with the Addendum II Work Plan to evaluate various means of dewatering and solidifying the sediment from the wetland prior to consolidation.

4.5 REGRADING OF THE EXISTING SLAG MOUND

The existing slag mound has a relatively flat top surface with steep slopes along the edges. The final design will include grading the existing slag mound top surface to achieve a minimum 3 percent slope to promote surface water runoff and minimize infiltration. The final cap design will have a maximum 4:1 horizontal to vertical side slopes to minimize erosion and allow access for maintenance vehicles. The final contours for the existing slag mound and the consolidation areas will be constrained by the minimum clearance required beneath the existing high-voltage electrical transmission lines and the presence of the existing electrical towers. The transmission lines have been surveyed and maximum elevations for the final cap have been provided by NiMo/NYPA. These maximum elevations will be incorporated into the final design for the slag mound and consolidation areas. In areas where slag material is to be removed from around electrical tower footings, the contractor will be required to bring the grade up to an elevation that will maintain the foundation integrity.

4.6 CAP CONSTRUCTION

The purpose of the final cap is to prevent direct contact with contaminated slag, soil, and sediment; eliminate the potential transport of contaminants in surface water runoff by eliminating surface water runoff contact with soil, slag, and sediment; and reduce infiltration to the extent necessary to achieve the groundwater and surface water RA objectives. Various alternative cap designs will be evaluated during the remedial design phase and a cap will be selected for the final design that meets the capping objectives.

The maximum height restrictions on the final cap required to maintain adequate clearance beneath the transmission wires could affect the selection of the cap design as some designs require a greater thickness than others.

A gas venting system is a standard component of a landfill cap where there is the potential for landfill gas to accumulate beneath the cap. The slag material and soil has a very low organic content and, therefore, will not decompose with time and generate significant gas beneath the cap. However, sediment from the wetland does have a higher organic content and could generate gas during decomposition. Depending upon the final cap design, a passive gas venting system may be incorporated into the design, specifically for the area where wetland sediments will be placed and capped. Landfill gas will not be vented in areas in close proximity to the electrical transmission lines.

4.7 CONFIRMATORY SAMPLING

The remedial design will specify the procedures and frequency for collecting confirmatory samples from the excavation areas. It is anticipated that confirmatory samples would be collected at a frequency of approximately one sample per 200- by 200-foot area. Samples will be analyzed for the following metals:

- arsenic
- cadmium
- chromium (total)
- chromium (hexavalent)
- copper
- nickel
- vanadium
- zinc

The confirmatory sample results will be compared to the soil cleanup criteria in accordance with 6 NYCRR Subpart 375-6 (restricted use soil cleanup objectives for an industrial site and protection of ecological resources) and site background levels. During the sampling for Addendum I, four soil samples were collected from two test pits (TP41 and TP42) and eight samples were collected from seven test pits (TP-1 through TP-6 and TP-8) that are deemed to be representative of background conditions for the Vanadium site. The maximum concentrations detected in the background samples and the 6 NYCRR Subpart 375-6 soil cleanup levels for OU3-specific metals are presented in Table 4.1. The proposed soil cleanup levels are the most stringent of the values for protection of human health and the protection of ecological resources. For total chromium and vanadium, which do not have values listed in 6 NYCRR Subpart 375-6, the recommended soil cleanup levels of 50 mg/kg and 150 mg/kg as listed in the NYSDEC TAGM 4046 are used as the proposed soil cleanup levels. For zinc, the maximum site background level of 268 mg/kg is used as the proposed soil cleanup level.

Where verification sampling determines that material with concentrations exceeding the soil cleanup levels will be left in place, the selected cap design will be placed over these areas.

4.8 SURFACE WATER DRAINAGE

Under existing conditions, there are several drainage ditches and several areas of ponded water on OU3. The remedial design will include relocation of the drainage ditch that runs along the west side of the slag mound, and elimination of the pond that is present in this area. The drainage ditch will be relocated further west, adjacent to the

OU2/OU3 boundary to allow for consolidation of excavated soil, slag, and sediment west of the existing mound. The relocated ditch will be designed to convey the flow from a 25-year storm event. The ditch lining will be designed to convey the design flow without erosion of the channel.

Grading of the existing slag mound and construction of the cap will increase surface water runoff from the capped areas. Perimeter ditches and drainage swales will be designed to convey the surface water runoff from the capped areas.

4.9 WETLAND MITIGATION

Remedial activities may involve some disturbance of the wetlands south of OU1. The need for and extent of the remedial activities in this area will be dependent upon the analytical results received for the additional sampling to be performed in accordance with the Addendum II Work Plan. Wetland delineation and a function-and-values assessment of the wetlands will also be performed in accordance with the Addendum II Work Plan. Upon determining the extent of remedial activities in this area, if any, and completing the function-and-values assessment, the New York State Fish and Wildlife Department and the US Army Corps of Engineers (USACOE) will be contacted to determine what mitigation will be required.

4.10 OU3 SITE RESTORATION

Following completion of remedial activities, all disturbed areas will be graded as necessary to provide adequate surface water drainage and covered with topsoil and hydroseeded to provide a stable vegetated cover. The design will include a final grading plan and specifications for topsoil and hydroseeding.

4.11 INSTITUTIONAL CONTROLS

Institutional controls are required to restrict future groundwater use on OU3 and to restrict the future land use to industrial/commercial. The institutional controls will take the form of deed restrictions on the property title.

4.12 LONG-TERM OM&M

A long-term OM&M Plan will be developed that will include the following:

- inspection checklist and schedule for inspecting the cap for damage, settlement, erosion, and leachate seeps;
- groundwater and surface water monitoring program; and
- reporting requirements to NYSDEC.

5.0 PRE-DESIGN DATA COLLECTION

Pre-design data collection activities will be undertaken to obtain sufficient detailed information, as necessary, to complete the engineering design work. Several of the pre-design data collection tasks have been undertaken in accordance with Addendum I and Addendum II to the Phase I Work Plan. The pre-design data collection tasks are as follows:

- topographic survey (Addendum I Work Plan);
- additional delineation sampling (Addendum I Work Plan);
- borrow area investigation (Addendum I Work Plan);
- electrical transmission line survey (Addendum I Work Plan);
- AVS/SEM and porewater sampling in wetland area (Addendum II Work Plan);
- wetland surface water sampling (Addendum II Work Plan);
- sediment treatability testing (Addendum II Work Plan); and
- wetlands delineation and function and values assessment (Addendum II Work Plan).

The results for the Addendum I and Addendum II data collection tasks will be submitted to NYSDEC in a separate letter report.

The pre-design data will be used as appropriate to complete the remedial design.

6.0 REMEDIAL DESIGN ACTIVITIES

The RD activities that are to be completed are discussed in the following subsections:

- Section 6.1 – Design Elements;
- Section 6.2 - Draft RD Report;
- Section 6.2 - Final RD Report;
- Section 6.4 - Permitting Requirements; and
- Section 6.5 - Progress Reports.

6.1 DESIGN ELEMENTS

RD activities consist of preparing engineering drawings, specifications, and supporting calculations for the various components of the RA. The design of each RA component also reflects the requirements imposed by all applicable local, state, and federal laws, regulations, and permits (substantive requirements). The major components of the RD are identified below:

- Design Plans and Specifications;
- Project Schedule;
- Construction Quality Assurance (CQA) Plan;
- Construction Health and Safety (H&S) Plan; and
- OM&M Plan.

6.2 DRAFT RD REPORT

A Draft RD Report will be submitted to NYSDEC for review and comment. The Draft RD Report will present sufficient detail to facilitate only one round of review and comments by NYSDEC to generate a Final Design submittal that can be approved by NYSDEC. It is anticipated that at least one interim meeting will be scheduled with NYSDEC to review conceptual and preliminary design information as it is generated. It is also assumed that a meeting with NYSDEC will be scheduled to review NYSDEC's comments on the Draft RD Report.

The Draft RD Report will include verification of existing conditions and the results of the pre-design activities and evaluation. It should be noted that the evaluation of the

pre-design activities will allow the potential for optimization of certain RA components. The design will be supported by calculations and documentation defining the functional aspects of the remedy. As well, the Draft RD Report will address all technical requirements of the project so that these aspects may be reviewed to confirm that the remedial design is consistent with all Standards, Criteria, and Guidelines (SCGs) and will provide an operable and usable RA.

The remedial design will identify any restrictions or design aspects that must be accounted for future OU3 Site activities (i.e., maintenance of transmission wires and towers) to ensure that these activities do not negatively affect the performance of remediation.

The Draft RD Report will include construction plans that provide a sufficient level of detail to allow NYSDEC to understand the various components of the proposed remedial components. The draft design will reflect a level of effort such that all the technical requirements of the RA selected for OU3 have been addressed, and outlined such that it may be reviewed to determine substantial compliance with applicable requirements of the Order.

The Draft RD Report will include the following:

1. Discussion of the design strategy and the design basis, including:
    a. compliance with all applicable and relevant and appropriate environmental and public health standards; and
    b. minimization of adverse environmental and public impacts.
2. Discussion of the technical factors of importance including:
    a. use of currently accepted environmental control measures and technology;
    b. constructability of the design; and
    c. use of currently acceptable construction practices and techniques.
3. Descriptions of assumptions made and detailed justification of these assumptions.
4. Detailed drawings of the proposed design (taken to approximately 50 percent detailed design level).
5. Appendices including:
    a. sample calculations (one example presented and explained clearly for significant or unique design calculations);

b. derivation of equations essential to understanding the report;

c. results of laboratory and field tests.

A Project Schedule will be submitted simultaneously with the Final RD Report.

6.3 FINAL RD REPORT

The Final RD Report will be submitted for review and approval by NYSDEC prior to construction. It is anticipated that NYSDEC comments on the Draft RD Report will be addressed in the Final RD Report.

The Final Design submittal will include a complete set of construction-ready drawings and project specifications. The Final RD Report will include and build upon the Draft RD Report, providing an additional level of detail and addressing any comments received from NYSDEC on the Draft RD Report. A project schedule will be provided with the Final RD Report. The Final RD Report also will include project support plans necessary to complete the RA. The anticipated project support plans are outlined as follows:

A. Construction Quality Assurance (CQA) Plan

Identify and document the objectives and framework for the development of a CQA program including, but not limited to, the following:

1. Responsibility and authority:
   a. description of all organizations and key personnel; and
   b. identification of CQA officer and supporting inspection staff.
2. Personnel qualifications:
   a. qualifications of CQA officer and supporting staff; and
   b. required training and experience.
3. Inspection activities:
   a. description of observations and tests required to monitor the construction and/or installation of the RA components;
   b. description of scope and frequency of each type of inspection to verify compliance with SCGs and health and safety procedures;
   c. attend pre-construction meeting with representatives of NYSDEC to review methods for documenting and reporting inspection data, discuss appropriate modifications to CQA plan, and conduct

facility walk-around to verify that the design criteria and plans and specifications are understood;

d. conduct pre-final inspection to determine whether construction is complete and consistent with the plans and specifications, with any outstanding items and deficiencies being documented for completion prior to final inspection; and

e. conduct final inspection following the checklist generated during the pre-final inspection to confirm that outstanding items and deficiencies have been resolved.

4. Sampling requirements:

   a. description of sampling activities, sample size, sample locations, and frequency of testing;

   b. description of criteria for acceptance or rejection of data; and

   c. plans for correcting problems as addressed by specifications.

5. Documentation:

   a. description of reporting requirements including daily summary reports, inspection data sheets, problem identification and corrective measure reports, design acceptance reports and final documentation; and

   b. provision for final storage of all records.

6. Certification:

   a. description of methodology for certification that all of the requirements of the design have been met; and

   b. monitor the construction to make sure all permit requirements are being complied with.

B. Health and Safety (H&S) Plan

Develop a Construction H&S Plan to address the activities to be performed at OU3 to implement the RA. This H&S Plan will be designed to protect on-site personnel and area residents from physical, chemical, and other hazards posed during implementation of the RA. The Construction H&S Plan will address the following items:

1. General requirements

2. Hazard analysis;

3. Safety procedures for working in the vicinity of the electrical transmission lines and towers;
4. Levels of protection;
5. Safety work practices and safeguards;
6. Medical surveillance;
7. Personnel and environmental air monitoring;
8. Personal protective equipment;
9. Personal hygiene;
10. Decontamination of personal and equipment;
11. Site work zones;
12. Contaminant migration control;
13. Contingency and emergency planning;
14. Air monitoring plan;
15. Dust control plan; and
16. Logs, reports, and recordkeeping.

C. OM&M Plan

Prepare an OM&M Plan to provide for the long-term maintenance of the RA. A detailed Contingency Plan will be included in the OM&M Plan outlining the procedures to be implemented should operating problems be encountered or it is determined that any of the components of the remedial system do not meet the performance objectives. The OM&M plan shall be composed of the following elements:

1. Description of normal operation and maintenance:
    a. description of tasks for operation;
    b. description of tasks for maintenance; and
    c. schedule showing frequency of each OM&M task.
2. Description of potential problems:
    a. description and analysis of potential problems and contingency plans;
    b. sources of information regarding problems;
    c. contingency measures identified to deal with potential problems; and
    d. common and/or anticipated remedies.

3. Description of routine monitoring and laboratory testing:
    a. description of monitoring tasks;
    b. description of required laboratory tests and their interpretation;
    c. required data collection, Quality Assurance Project Plan (QAPP);
    d. schedule of monitoring frequency and date, if appropriate, when monitoring may cease; and
    e. description of triggering mechanisms for groundwater/surface water monitoring results.
4. Description of alternate OM&M:
    a. should systems fail, alternate procedures to prevent releases or threatened releases to protect public health and the environment; and
    b. analysis of vulnerability and additional resource requirements should a failure occur.
5. Corrective action:
    a. description of corrective action to be implemented in the event that any components of the remedial system do not meet performance objectives; and
    b. schedule for implementing these corrective actions.
6. Safety and Contingency Plan:
    a. description of standard safety practices for site personnel, including, without limitation, precautions and necessary safety equipment; and
    b. safety tasks and contingency measures to be implemented in the event of a systems failure or accidental release.
7. Records and reporting mechanisms required:
    a. operating logs;
    b. laboratory records;
    c. records for operating costs upon takeover;
    d. mechanism for reporting emergencies;
    e. personnel and maintenance records;
    f. monthly/annual reports;
    g. list of personnel contacts and numbers for the operators of the groundwater containment/treatment system; and

h. annual certification by a professional engineer of the continued effectiveness of the remedy.

8. Post-construction performance monitoring program:

   a. description of the monitoring system necessary to insure the performance of the system after it is built; and

   b. groundwater compliance monitoring activities.

A draft level OM&M Plan shall be submitted simultaneously with the Final RD Report and the Final OM&M Plan shall be submitted upon completion of construction. The Final OM&M Plan will include updated information supplied by vendors for the various components of the remedy.

The Final RD Report will be prepared, signed, and sealed by a professional engineer. The Final RD Report will include a certification by a professional engineer that all requirements of the RD Work Plan have been complied with and all activities have been performed in full accordance with the RD Work Plan.

6.4 PERMITTING REQUIREMENTS

During the design phase, each component of the remedy will be evaluated to determine which permit programs are potentially applicable. This will be accomplished through discussion with local, State, and Federal Agencies.

At this time, permit requirements that may be applicable are identified as follows:

- Town of Niagara sewer discharge permit;
- NYSDEC General Permit for Stormwater Discharges from Construction Activity;
- U.S. Army Corps of Engineers NWP 38;
- NYSDEC Freshwater Wetlands Permit; and
- NYPA Permit prior to entering on NYPA property to construct the remedy.

The design requirements imposed by the applicable permit programs will be incorporated in the final design submission.

6.5 CONSTRUCTION PROGRESS REPORTS

Monthly progress reports will be provided to NYSDEC during construction and will include the following major items:

- activities conducted during the previous month, attaching copies of appropriate supporting documentation such as invoices, contract documents, and photographs;
- submission of sampling and testing data received during the course of the work which has passed quality assurance and quality control procedures;
- description of any problems encountered and schedule variances during the previous month and plans for resolution/corrective action, if necessary;
- description of all actions, data, and plans which are scheduled for the next month and provide other information relating to the progress of associated work; and
- summarize percentage of completion, including unresolved delays encountered or anticipated that may affect the future schedule for implementation of the design, and a description of efforts made to mitigate those delays or anticipated delays.

7.0 SYSTEM PERFORMANCE MONITORING

Following construction, performance monitoring will be conducted to ensure that the selected remedy is meeting its design and performance objectives. Details of the performance monitoring program will be developed during the remedial design and will be presented in the OM&M Plan. The performance monitoring will, at a minimum, include monitoring the cap to ensure that it is providing an effective barrier to direct contact with the waste material, groundwater monitoring to ensure that groundwater conditions do not deteriorate, and surface water monitoring to ensure that surface water continues to be suitable for intermittent bird and mammal use.

8.0 PROPOSED REMEDIAL DESIGN SCHEDULE

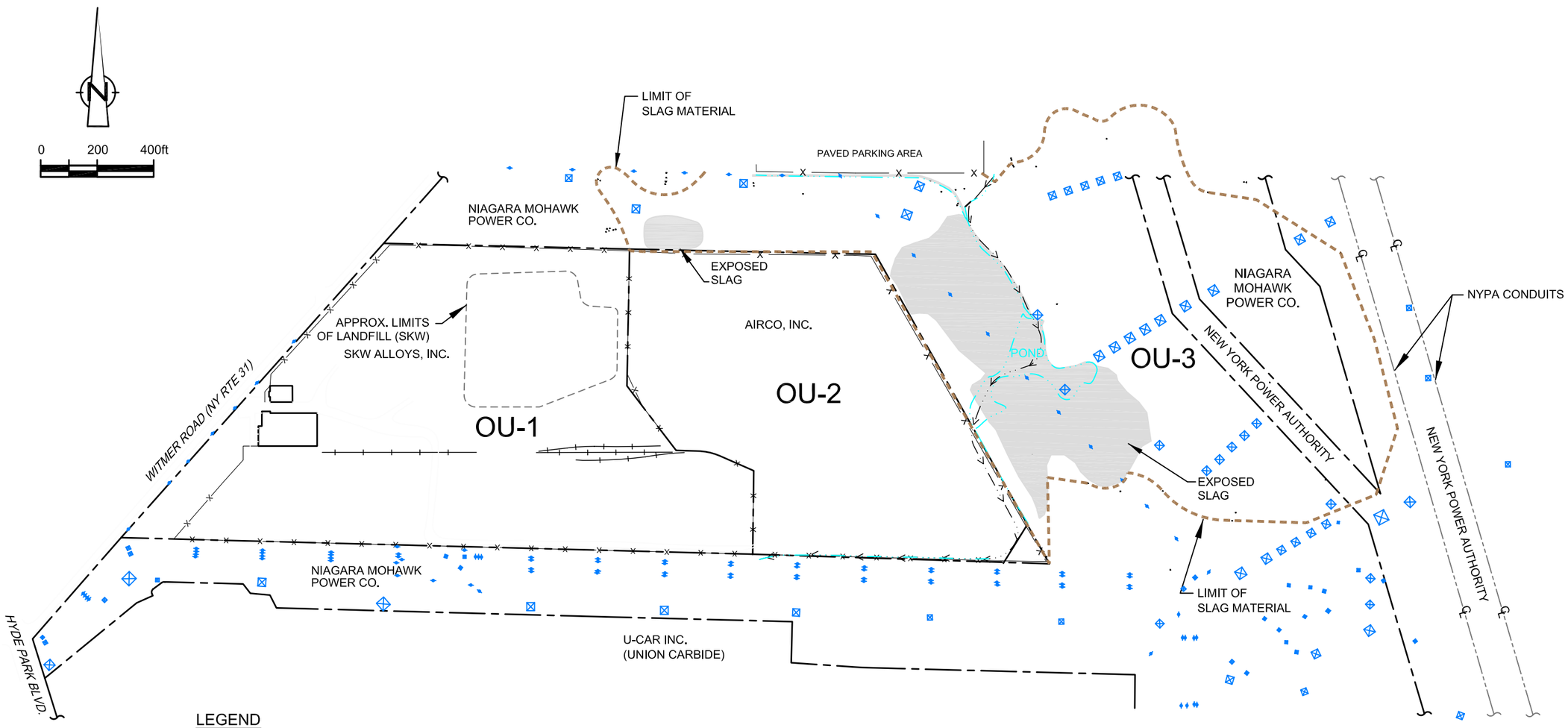
The RD schedule is anticipated to proceed as follows:

- Draft Final RD Report Submittal – May 1, 2007;
- NYSDEC Design Meeting – May 1, 2007; and;
- Final RD Report Submittal – 2-3 weeks after receiving NYSDEC comments on the Draft Final RD Report submittal.

SOURCE:
DELORME MAPPING ATLAS,
UPSTATE NEW YORK, CITY STREET MAPS

figure 1.1

SITE LOCATION
REMEDIAL DESIGN WORK PLAN
VANADIUM CORPORATION OF AMERICA SITE
Town of Niagara, NY



LEGEND

- PROPERTY LINE
- UTILITY POLE
- TOWER
- FENCE
- RAILROAD
- LIMIT OF SLAG MATERIAL

NOTES:

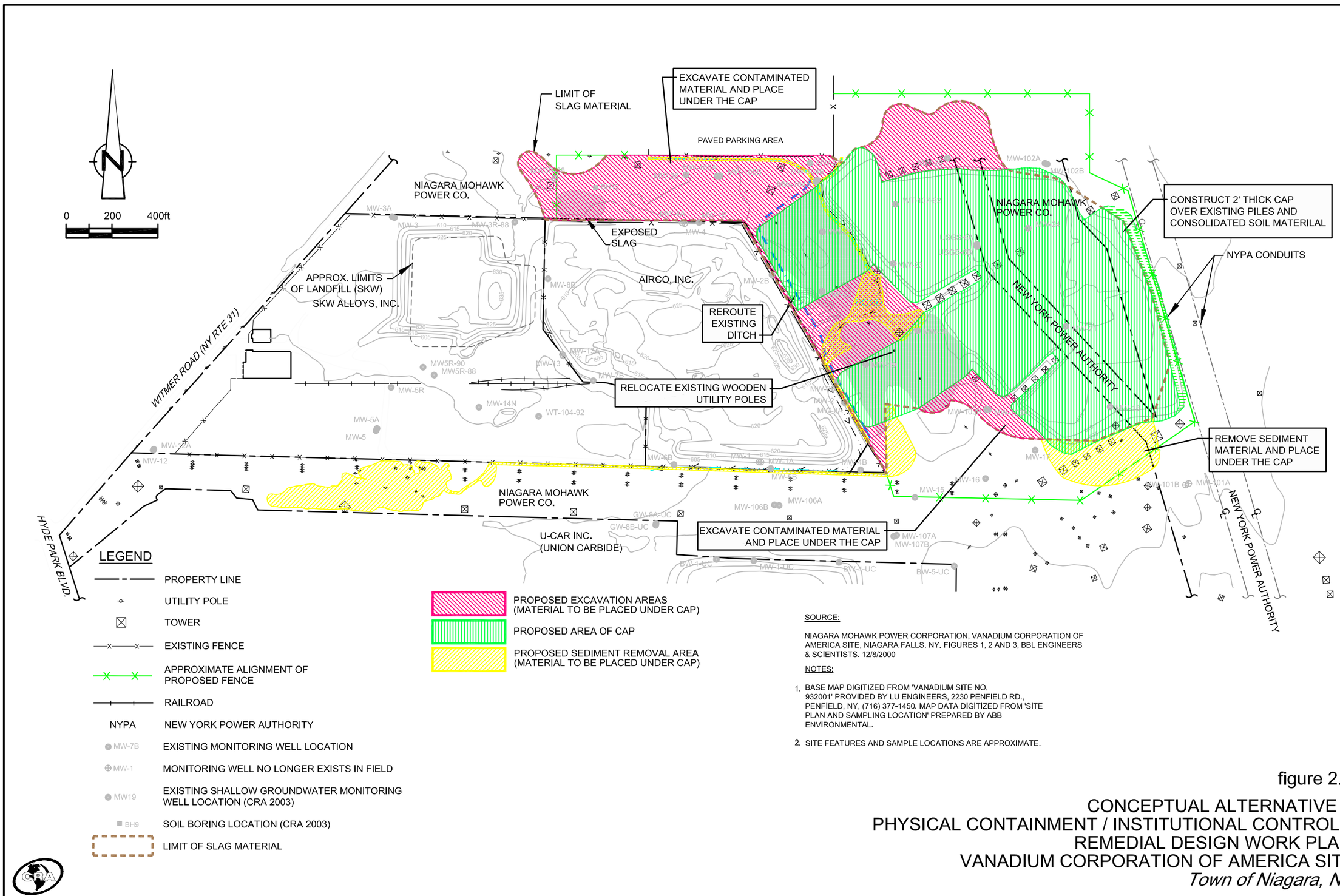
1. BASE MAP DIGITIZED FROM 'VANADIUM SITE NO. 932001' PROVIDED BY LU ENGINEERS, 2230 PENFIELD RD., PENFIELD, NY, (716) 377-1450. MAP DATA DIGITIZED FROM 'SITE PLAN AND SAMPLING LOCATION' PREPARED BY ABB ENVIRONMENTAL.
2. SITE FEATURES AND SAMPLE LOCATIONS ARE APPROXIMATE.

SOURCE:

NIAGARA MOHAWK POWER CORPORATION, VANADIUM CORPORATION OF AMERICA SITE, NIAGARA FALLS, NY. FIGURES 1, 2 AND 3, BBL ENGINEERS & SCIENTISTS. 12/8/2000

figure 1.2

SITE PLAN
REMEDIAL DESIGN WORK PLAN
VANADIUM CORPORATION OF AMERICA SITE
Town of Niagara, NY



SOURCE:

NIAGARA MOHAWK POWER CORPORATION, VANADIUM CORPORATION OF AMERICA SITE, NIAGARA FALLS, NY. FIGURES 1, 2 AND 3, BBL ENGINEERS & SCIENTISTS. 12/8/2000

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2. SITE FEATURES AND SAMPLE LOCATIONS ARE APPROXIMATE.

figure 2.1

CONCEPTUAL ALTERNATIVE 3
PHYSICAL CONTAINMENT / INSTITUTIONAL CONTROLS
REMEDIAL DESIGN WORK PLAN
VANADIUM CORPORATION OF AMERICA SITE

Town of Niagara, NY

TABLE 4.1

PROPOSED SOIL CLEANUP LEVELS
REMEDIAL DESIGN WORK PLAN
VANADIUM CORPORATION OF AMERICA
TOWN OF NIAGARA, NEW YORK

	Protection of Ecological Resources [1]	*Restricted Industrial Use Soil cleanup Objectives* [1]	*Maximum Detected in Background Samples (mg/kg)*	*Proposed Soil Cleanup Level (mg/kg)*
Arsenic	13	16	6.4	13
Cadmium	4	60	1.3	4
Chromium (total)	NA	NA	34.9	50[2]
Chromium (hexavalent)	1	800	ND	1
Copper	50	10,000	24.6	50
Nickel	30	10,000	29	30
Vanadium	NA	NA	39	150[2]
Zinc	109	10,000	268	268

Notes:

ND - Not detected
NA - Not available
(1) - Remedial Program Soil Cleanup Objectives, 6 NYCRR Subpart 375.6, December 14, 2006.
(2) - Proposed soil cleanup levels for Chromium and Vanadium are taken from NYSDEC TAGM 4046.