PROPOSED REMEDIAL ACTION PLAN
Vanadium Corporation of America
Operable Units 1, 2 and 3
Town of Niagara, Niagara County New York
Site No. 9-32-001

February 2006

Prepared by:

Division of Environmental Remediation
New York State Department of Environmental Conservation

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SECTION 1: SUMMARY AND PURPOSE OF THE PROPOSED PLAN

The New York State Department of Environmental Conservation (NYSDEC), in consultation with the New York State Department of Health (NYSDOH), is proposing a remedy for the Vanadium Corporation of America site (Vanadium). The Vanadium site has been divided into 3 operable units (OUs) based on current property ownership. OU#1 is owned by CC Metals and Alloys (formerly SKW Metals and Alloys), OU#2 is owned by Airco Properties, Inc., a U.S. subsidiary of The BOC Group, Inc., and OU#3 is owned by National Grid (formerly Niagara Mohawk Power Corporation) and the New York Power Authority. The presence of hazardous waste has created significant threats to human health and/or the environment that are addressed by this proposed remedy. As more fully described in Sections 3 and 5 of this document, portions of the Vanadium site have been used for the disposal of waste from the on-site and off-site manufacturing of speciality steel products. These activities resulted in the disposal of hazardous wastes, containing ferromanganese slag, calcium hydroxide, and ferrochromium dust, and ferrochromium silicon dusts. These wastes have contaminated the surface soils, subsurface soils, shallow groundwater, surface water run-off, sediments and drainage pathways at the site, and have resulted in:

- a significant threat to human health associated with current and potential exposure to surface soil, exposed waste, leachate and sediments.

- a significant environmental threat associated with the impacts of contaminants to intermittent surface water drainage pathways.

During the course of the investigation certain actions, known as interim remedial measures (IRMs), were undertaken at the Vanadium Site in response to the threats identified above. An IRM is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before completion of the remedial investigation/feasibility study (RI/FS). The IRMs undertaken at this site included a storm water control and soil cover on OU#1 and a landfill closure on OU#2.

Based on the implementation of the above IRMs, the findings of the investigation of this site indicate that OU#1 and OU#2 no longer pose a significant threat to human health or the environment, therefore, No Further Action with continued operation of the site Operation Maintenance and Monitoring (OM&M) plans for the respective OUs and the continued operation of the groundwater collection and treatment system at OU#2 is the preferred alternative for these OUs.

With respect to OU#3, and to eliminate or mitigate the threats, the NYSDEC proposes the following remedy:

- A remedial design program to provide the details necessary to implement the remedial program;
- Partial excavation of soil/slag and sediment, and on-site consolidation and capping of these materials;
- Collection of confirmatory soil samples from excavations;
- Development of a site management plan to address residual contamination and any use restrictions;
- Imposition of an environmental easement to restrict groundwater use and ensure compliance with an approved site management plan;
- Certification of, and the use of institutional and engineering controls; and
- Long term monitoring program would be instituted. A periodic report would be prepared that would include results of groundwater and surface water monitoring, inspections and maintenance activities.

The proposed remedy, discussed in detail in Section 8, is intended to attain the remediation goals identified for this site in Section 6. The remedy must conform with officially promulgated standards and criteria that are directly applicable, or that are relevant and appropriate. The selection of a remedy must also take into consideration guidance, as appropriate. Standards, criteria and guidance are hereafter called SCGs.

This Proposed Remedial Action Plan (PRAP) identifies the preferred remedy, summarizes the other alternatives considered, and discusses the reasons for this preference. The NYSDEC will select a final remedy for the site only after careful consideration of all comments received during the public comment period.

The NYSDEC has issued this PRAP as a component of the Citizen Participation Plan developed pursuant to the New York State Environmental Conservation Law and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR) Part 375. This document is a summary of the information that can be found in greater detail in the:

- February 19, 1999 Interim Remedial Measure Completion Report for OU#1;
- January 2001 Interim Remedial Measure Report for OU#2; and,
- November 2005 Remedial Investigation and Remedial Alternatives Analysis/Feasibility Study for OU#3.

and other relevant documents. The public is encouraged to review the project documents, which are available at the following repositories:

Town of Niagara Town Hall
Clerks Office
7105 Lockport Road
Niagara Falls, New York 14302
716-297-2150 ext 131

New York State Department of Environmental Conservation Region 9 Office
Mr. Michael J. Hinton Project Manager
270 Michigan Ave
Buffalo, New York 14203-2999
716-851-7220

The NYSDEC seeks input from the community on all PRAPs. A public comment period has been set from February 23 thru March 24, 2006 to provide an opportunity for public participation in the remedy selection process. A public meeting is scheduled for March 8, 2006 at the Town of Niagara Town Hall beginning at 6:30 PM.

At the meeting, the results of the RI/FS will be presented along with a summary of the proposed remedy. After the presentation, a question-and-answer period will be held, during which verbal or written comments may be submitted on the PRAP. Written comments may also be sent to

Mr. Michael J. Hinton, at the above address through March 24, 2006.

The NYSDEC may modify the proposed remedy or select another of the alternatives presented in this PRAP, based on new information or public comments. Therefore, the public is encouraged to review and comment on all of the alternatives identified here.

Comments will be summarized and addressed in the responsiveness summary section of the Record of Decision (ROD). The ROD is the NYSDEC's final selection of the remedy for this site.

SECTION 2: <u>SITE LOCATION AND DESCRIPTION</u>

The property encompasses approximately 150 acres in the Town of Niagara, Niagara County, New York (the "Site"). The Site location is presented on Figure 1, and the Site Map is presented on Figure 2. An aerial photo of the present site conditions is presented in Figure 6. The Site is bounded on the north by an automobile depot and vacant property; on 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 New York Power Authority (NYPA) reservoir, located approximately 0.8 miles north of the property; and Gill Creek, located approximately 1,000 feet east of the Site. 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 the Site and overhead electrical transmission lines cross the Site. The Vanadium site is also near the Union Carbide site #932035 and The Carborundum Globar site #932036, inactive hazardous waste disposal sites. To facilitate the investigation and remediation, the Vanadium site was divided into three operable units based on site ownership. An operable unit represents a portion of the site remedy that for technical or administrative reasons can be addressed separately to eliminate or mitigate a release, threat of release or exposure pathway resulting from the site contamination. The three operable units are:

Operable Unit #1 is a 37 acre parcel on the western portion of the site that is currently owned by CC Metals and Alloys Inc (formerly SKW Metals and Alloys Inc.) SKW purchased the property from Airco Properties, Inc. in 1979. SKW constructed a two cell Part 360 landfill on OU#1 to dispose of waste generated by the SKW facility. SKW generated waste similar to the waste generated by the Vanadium Corporation of America. The SKW property was historically the manufacturing area of the former Vanadium facility. As a result no significant waste disposal occurred on OU#1 outside of the landfill cells. Investigations on OU#1 indicated evidence of building rubble from the former manufacturing facility. An Interim Remedial Measure (IRM) was performed to install a soil cover and to control surface storm water runoff from OU#1. The IRM was completed in 1998. Investigations to assess the extent and significance of contamination found on OU#1 were conducted during the Preliminary Site Assessment (PSA) and the implementation of the IRM.

Operable Unit #2 is a 25 acre landfill that is currently owned by Airco Properties, Inc. In 1964, the parent corporation to Airco Properties, Inc., The Air Reduction Company, purchased the remaining 62 acres of the former Vanadium site and subsequently sold the western 37 acres to SKW(OU#1). Wastes similar to the Vanadium wastes were generated and disposed onsite. Investigations to assess the extent and significance of contamination found on OU#2 were conducted during the PSA.

In 2000, Airco Properties Inc. performed an IRM closure of the landfill that required the consolidating and shaping of the existing waste, placement of a 6" soil bedding layer, installation of 40 mil LLDPE liner, installation of a high density polyethylene drainage net-geotextile geocomposite, placement of 12" of barrier protection and 6" of topsoil and seed. A groundwater collection and treatment system was constructed in 2002 to address a groundwater seep discovered in the southwest corner of OU#2. An OM&M Plan is in effect for OU#2.

Operable Unit (OU) No. 3, consists of approximately 88 acres of the eastern portion of the Vanadium site. The NYPA purchased the property from the Vanadium Corporation of America in 1959 for the construction of the Niagara Power Project and the associated underground conduits. A portion of this property was subsequently sold to the Niagara Mohawk Power Corporation (now National Grid).

SECTION 3: <u>SITE HISTORY</u>

3.1: <u>Operational/Disposal History</u>

circa 1920: The Vanadium Corporation of America (Vanadium) acquired the Site to construct and operate a ferroalloy production plant. Portions of the Site were used to dispose of wood, brick, ash, lime slag (calcium hydroxide), ferrochromium silicon slag, and ferrochromium silicon dust. Vanadium ceased operations in 1964.

1959: NYPA purchased what is now known as OU-3 for the construction of the Niagara Power Project, which included two underground water conduits. A portion of the NYPA property was subsequently sold to Niagara Mohawk. Niagara Mohawk installed several high voltage electrical transmission towers and overhead electrical transmission lines on OU-3.

1964: A corporate predecessor of Airco, Inc. (Airco) purchased the remaining 62 acres located on the western portion of the Site. Airco and/or its affiliates continued ferrochromium manufacturing operations and disposed of wastes on Site similar to those disposed by Vanadium. Additionally, between 1971 and c. 1979, Airco disposed of approximately 70,000 tons of baghouse dust containing ferrochromium silicon dust. Between 1981 and 1988, Airco operated a permitted landfill on OU-2 for disposal of industrial wastes resulting from off-site manufacturing operations. In 1994, Airco Properties, Inc, adopted the name of its parent corporation, The BOC Group, Inc.

1967: Vanadium merged into Foote Mineral Company. In 1998, Cyprus Amax Minerals Company ("Cyprus Amax") sold the corporate successor to Foote Mineral Company, Cyprus Foote Mineral Company, to Chemetall GmbH. Cyprus Foote Mineral Company was then renamed Chemetall Foote Corporation.

1979: SKW Alloys, Inc. (SKW) purchased OU-1, which consisted of the western 37 acres of the Airco Properties, Inc. parcel. SKW operated a solid waste disposal facility on OU-1 consisting of two landfill cells. SKW used the facility to dispose of ferrochromium silicon baghouse dust and ferrosilicon baghouse dust wastes. In 1999, SKW changed its name to CC Metals and Alloys, Inc.

2001: Deed restriction for OU#1 filed with the Niagara County Clerk on May 3, 2001.

2002: Site Boundary description revised in response to de-list petition from CC Metals and Alloys Inc for OU#1. OU#1 re-defined to include only the existing Part 360 approved landfill cells, approximately 10 acres. The remaining property was removed from the site description but remains under the deed restriction filed on May 3, 2001.

3.2: <u>Remedial History</u>

In 1985, the NYSDEC first listed the site as a Class 2a site in the Registry of Inactive Hazardous Waste Disposal Sites in New York (the Registry). Class 2a is a temporary classification assigned to a site that has inadequate and/or insufficient data for inclusion in any of the other classifications. In 1995, the NYSDEC listed the site as a Class 2 site in the Registry of Inactive Hazardous Waste Disposal Sites in New York. A Class 2 site is a site where hazardous waste presents a significant threat to the public health or the environment and action is required.

Remedial action at this site prior to the preparation of the Proposed Remedial Action Plan included:

- OU#1 -Interim Remedial Measure completed in 1999.
- OU#2- Interim Remedial Measure completed in 2001.

SECTION 4: ENFORCEMENT STATUS

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers.

The NYSDEC and SKW Metals and Alloys (now CC Metals and Alloys) entered into a IRM Consent Order on July 7, 1998. The Order obligated SKW Metals and Alloys to implement an IRM remedial program. The IRM was completed in 1999.

The NYSDEC and Airco Properties Inc entered into a IRM Consent Order on May 30, 2000. The Order obligated Airco to implement an IRM remedial program. The IRM was completed in 2001.

The NYSDEC and National Grid, NYPA and Cyprus Amax entered into a Consent Order on June 11, 2002 for OU#3. The Order obligates the responsible parties to implement a remedial program After the remedy is selected, the NYSDEC will approach the PRPs to implement the selected remedy under an Order on Consent.

SECTION 5: SITE CONTAMINATION

A remedial investigation/feasibility study (RI/FS) has been conducted on OU#3 to evaluate the alternatives for addressing the significant threats to human health and the environment.

5.1: Summary of the Remedial Investigation

The remedial investigations conducted on OU#1 included the installation of groundwater monitoring wells, 1995 Preliminary Site Investigation and the IRM test pit investigations. These investigations included:

- 3 shallow groundwater monitoring wells;
- 6 deep groundwater monitoring wells;
- 1 bedrock groundwater well;
- 59 test pits;
- 12 surface soil samples;
- 2 surface water and sediment samples;
- 1 waste pile sample;
- collection of landfill leachate samples; and
- groundwater sampling.

The remedial investigations conducted on OU#2 included the installation of groundwater monitoring wells and 1995 Preliminary Site Investigation. These investigations included:

- 4 shallow groundwater monitoring wells;
- 4 deep groundwater monitoring wells;
- 3 surface water and sediment samples;
- 5 waste pile samples; and
- groundwater sampling.

The purpose of the RI on OU#3 was to define the nature and extent of any contamination resulting from previous activities at the site. The RI was conducted between June 2002 and November 2005. The field activities and findings of the investigation are described in the Phase 1 and RI/FS report.

The following activities were conducted during the RI on OU#3:

- 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;
- 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 Target Analyte List (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 Site, and analyzed for physical parameters including particle size distribution, liquid limit, plastic limit, plasticity index, and hydraulic conductivity;
- Research of historical information;
- Excavation of 23 test pits to delineate the extent of slag material;
- Installation of 27 soil borings and 26 monitoring wells for analysis of soils and groundwater as well as physical properties of soil and hydrogeologic conditions;
- Sampling of 26 new and existing monitoring wells;
- Collection of 61 discrete surface soil/slag samples;
- Collection of 80 discrete subsurface soil/slag samples;
- Collection of 159 surface water samples from ponds and drainage ditches; and
- Collection of 24 sediment samples. from ponds and drainage ditches.
- Phase I Investigation prepared by CRA for Cyprus-Foote Mineral Corporation, Niagara Mohawk and NYPA.
- Phase II Human Health Risk Assessment prepared by CRA for Cyprus-Foote Mineral Corporation, Niagara Mohawk and NYPA.

In addition the following investigations were conducted at the Vanadium site:

- 1988 - Final Draft Site Inspection Report prepared by the NUS Corporation for the USEPA on OU#1 and OU#2;

- 1989 - Phase I Investigation Report prepared by Ecology and Environment for the NYSDEC on OU#1 and OU#2;

- 1993 - Preliminary Site Assessment Report prepared by ABB Environmental Services for the NYSDEC on OU#1 and OU#2;

- 1997 - Immediate Investigative Work Assignment prepared by the NYSDEC Region 9 for OU#3.

- 2003 - Focused Groundwater Feasibility Study OU#2 prepared by EA Engineers P.C. for The BOC Group.

To determine whether the soil/slag, sediment, groundwater, and surface water contain contamination at levels of concern, data from the investigation were compared to the following SCGs:

- Groundwater, drinking water, and surface water SCGs are based on NYSDEC "Ambient Water Quality Standards and Guidance Values" and Part 5 of the New York State Sanitary Code.
- Soil SCGs are based on the NYSDEC "Technical and Administrative Guidance Memorandum (TAGM) 4046; Determination

of Soil Cleanup Objectives and Cleanup Levels".

- Sediment SCGs are based on the NYSDEC "Technical Guidance for Screening Contaminated Sediments." Portions of the ditches and ponds at the Site can be dry for extended periods of time and are not capable of supporting aquatic species. Therefore, the sediment SCGs for these areas are based on NYSDEC "Technical and Administrative Guidance Memorandum (TAGM) 4046; Determination of Soil Cleanup Objectives and Cleanup Levels."

Based on the RI results, in comparison to the SCGs and potential public health and environmental exposure routes, certain media and areas of the site require remediation. These are summarized below. More complete information can be found in the RI report.

5.1.1: Site Geology and Hydrogeology

Site Geology:

The geologic structure beneath OU#3consists of four units and includes, in descending order: fill material, glaciolacustrine deposits, glacial till, and bedrock.

Fill

Fill material overlies much of the Site. Where encountered, the thickness of the fill material generally ranges from 1 to 21 feet. The predominant fill material consists of whitish gray slag; cinders; and whitish gray, fine-grained, lime-like material. In most areas, the slag is covered by soil fill. In other areas, the slag is present at the ground surface.

Glaciolacustrine Deposits

The glaciolacustrine deposits consist of laminated silty clays, clayey silts, sandy silts, and silty sands. The thickness of this unit generally ranges from 2 to 26 feet.

Glacial Till

The glacial till unit consists of a dense heterogeneous mixture of clay, silt, sand, gravel, and dolostone rock fragments; but is predominantly silt and clay. The thickness of this unit ranges from 1 to 7 feet.

Bedrock

The bedrock immediately underlying the glacial till is the dolostone of the Eramosa Formation of the Middle Silurian Lockport Group. The Eramosa Formation beneath the Site is nearly flat-lying but contains erosional features evidenced by variations in thickness of the glacial deposits. The Eramosa Formation is described as dolostone/limestone that is weathered to dense, and thin to massively bedded. In the vicinity of the Site, the depth to the top of the Eramosa Formation dolostone generally ranges from 7 to 32 feet below ground surface (bgs). Vertical fractures and weathered horizontal bedding planes were observed in previous investigations in the upper 45 feet of bedrock in the eastern portion of the Site.

Site Hydrogeology:

The hydrogeologic structure beneath the Site consists of four units and includes, in descending order:

- shallow hydrogeologic zone consisting of perched groundwater present in the fill material and the upper portion of the glaciolacustrine deposit;
- intermediate hydrogeologic zone consisting of the deeper portion of the glaciolacustrine deposit and characterized as a confining unit;
- a deep hydrogeologic zone consisting of the glacial till and the fragment-rich contact zone between the till and the weathered bedrock surface; and
- the upper bedrock hydrogeologic zone.

Shallow Hydrogeologic Zone

The groundwater in the shallow hydrogeologic zone is mainly in the fill material, perched on top of the glaciolacustrine deposit, and within the upper portion of the glaciolacustrine deposit. Water levels in this zone exhibit wide fluctuations due to precipitation. Water levels are higher during wet weather conditions, and lower during dry weather conditions. The water level data suggest that the overall flow direction in the shallow hydrogeologic zone is to the south and southwest, and that a groundwater high exists in the general area of the pond and slag mound area on OU#3.

Intermediate Hydrogeologic Zone

During historical investigations, ten soil borings were advanced into the glaciolacustrine deposit at the Site, from which soil samples were collected for hydraulic conductivity testing. With estimates of vertical hydraulic conductivity ranging from 1.00×10^{-9} centimeters per second (cm/sec) to 3.50×10^{-6} cm/sec, this zone is considered a confining layer, restricting downward movement of groundwater from the shallow to the deep hydrogeologic zone.

Deep Hydrogeologic Zone

Historical groundwater data for monitoring wells completed in the glacial till indicate the presence of a groundwater divide that generally trends northwest-southeast through the Airco landfill (OU#2). From the groundwater divide, groundwater in the deep hydrogeologic zone flows northeast towards the Power Conduits and southwest to the Niagara River. Horizontal hydraulic conductivity estimates for this unit range from 1.24×10^{-2} to 1.0×10^{-6} cm/sec. Monitoring wells completed in the glacial till in the eastern portion of the Site have typically been dry due to the dewatering effect of the NYPA Power Conduits.

Upper Bedrock Hydrogeologic Zone

Historical groundwater data for monitoring wells completed in the upper bedrock (Eramosa Formation) indicate the presence of a groundwater divide, generally coincident with the groundwater divide in the deep hydrogeologic zone. From the groundwater divide, groundwater in the upper bedrock hydrogeologic zone flows toward the northeast and southwest. Water level measurements collected in bedrock monitoring wells located on the east side of the divide indicated a steep horizontal gradient in the upper bedrock groundwater flow as it approaches the NYPA Power Conduits.

There are no current users of groundwater at the Site. Regionally, groundwater yields from overburden deposits are too low for domestic or industrial purposes. The bedrock has the capability to produce high yields; however, the bedrock groundwater is typically very hard and highly mineralized and is not used as a drinking water source in the area.

5.1.2: <u>Nature of Contamination</u>

As described in the RI report, many soil, groundwater, surface water and sediment samples were collected to characterize the nature and extent of OU#3 contamination. As summarized in Table 1, the main category of contaminants that exceed their SCGs is inorganics (metals).

The inorganics (metals) of concern are primarily chromium and hexavalent chromium; and to a lesser extent, beryllium, copper, nickel, and zinc. High pH levels were measured in samples collected from the slag, ditch/pond sediment and surface water, and shallow groundwater. The high pH is generated as precipitation (rain water and snow melt) migrates through the fill materials and leaches out into the ditches and low areas on the site.

Similar contamination is present on both OU#1 and OU#2.

5.1.3: Extent of Contamination

This section describes the findings of the investigation for all environmental media that were investigated.

Chemical concentrations are reported in parts per billion (ppb) for water, parts per million (ppm) for waste, soil, and sediment. For comparison purposes, where applicable, SCGs are provided for each medium.

Table 1 summarizes the degree of contamination for the contaminants of concern in surface soil/slag, subsurface soil/slag, groundwater, surface water, and sediment; the analytical results are compared with the SCGs for the site. The following are the media which were investigated and a summary of the findings of the investigation.

Waste Materials

Surface Slag Material

Over the majority of the area of OU-3, the slag material has a soil cover. However, there are areas where the slag is exposed at the surface (see Figure 2). A total of 18 surface slag samples were collected from the areas where the slag is not covered with soil.

The highest concentrations of total chromium [maximum of 11,800 parts per million (ppm)] were detected south of the Pond. The highest concentrations of hexavalent chromium (maximum of 91.6 ppm) were detected at MW-19 and WI-108-92.

Nickel (maximum of 5,160 ppm) and zinc (maximum of 1,400 ppm) were detected at concentrations exceeding the screening criteria across the exposed slag areas. The highest concentrations of vanadium (maximum of 263 ppm) were detected in the area of exposed slag south of the Pond.

Samples collected during 1996 and 2000 were analyzed for SVOCs. The highest concentrations of SVOCs (benzo(a)anthracene at 2.2 ppm, benzo(a)pyrene at 2.3 ppm, benzo(b)fluoranthene at 2.5 ppm) were detected in samples from SB-3A collected at the edge of the Pond.

The only elevated pH values (maximum of 10.51) were detected in samples collected in 1992 (WT-106-92 and WT-107-92). The pH values for the more recent surface slag samples collected in 2003 were relatively neutral, ranging from 7.5 to 8.0.

Subsurface Slag Material

A total of 38 subsurface slag samples were collected on OU#3 and submitted for laboratory analyses. The highest concentrations of total chromium (maximum of 7,550 ppm) were detected beneath the exposed slag area, and in the eastern portion of the mounded slag area. Elevated concentrations of hexavalent chromium (maximum of 170 ppm) were detected beneath the area of exposed slag, north of the exposed slag area, and in the eastern portion of the mounded slag area.

Nickel (maximum of 1,220 ppm) and zinc (maximum of 1,160 ppm) were detected at concentrations exceeding the applicable soil screening criteria across the slag area. Two vanadium exceedances (maximum of 278 ppm) were detected beneath the area of exposed slag south of the Pond.

Samples collected during 1996 and 2000 were analyzed for SVOCs. The highest concentrations of SVOCs (benzo(b)fluoranthene at 1.4 ppm, chrysene at 1.3 ppm) were detected beneath the area of exposed slag, and southeast of the exposed slag area at TP-2.

High pH values, up to a maximum of 12.3, were detected in the majority of the subsurface slag samples.

Surface Soil

A total of 43 surface soil samples were collected from OU#3 and submitted for laboratory analyses. The highest values of total chromium (maximum of 2,260 ppm) and hexavalent chromium (maximum of 24.6 ppm) in the surface soil samples were detected within the area of slag on Site, in samples collected during 1996. It was suspected that some of these samples may have contained some slag material. Lower concentrations of total chromium (maximum of 326 ppm) and hexavalent chromium (maximum of 1.8J ppm) were typically reported in the surface soil samples collected during 2003, when samples were visually screened to specifically differentiate between surface soil and slag material. The majority of the total chromium and hexavalent chromium concentrations in the surface soil samples collected within the slag area during 2003 are similar to the concentrations reported in surface soil samples collected from outside the slag area.

Other parameters that frequently exceed the screening criteria in the surface soil samples include beryllium (maximum of 0.868 ppm), iron (maximum of 48,200 ppm), nickel (maximum of 54.1 ppm), and zinc (maximum of 633 ppm). The surface soil samples with the highest chromium concentrations (maximum of 2,260 ppm) have relatively low concentrations of nickel, iron, and zinc compared to many of the other surface soil samples.

Samples collected during 1996 and 2000 were analyzed for semi-volatile organic carbons (SVOCs). The highest concentrations of SVOCs (fluoranthene at 240D ppm, benzo(b)fluoranthene at 200D ppm) were detected in the southern portion of the Site between the Airco (OU#2) and Union Carbide properties. These same samples had relatively low concentrations of total chromium and hexavalent chromium indicating that the polyacyclicromatic hydrocarbons (PAHs) are likely unrelated to the slag material on OU#3.

Surface soil samples collected during 2003 were analyzed for pH and the pH values detected were all relatively neutral, ranging from 6.5 to 8.0.

Subsurface Soil

A total of 42 subsurface soil samples were collected from OU#3 and submitted for laboratory analyses. As discussed previously, the main contaminants associated with the slag material that was placed on OU#3 are total chromium, hexavalent chromium, and high pH. The highest values of total chromium (maximum of 855 ppm) and hexavalent chromium (maximum of 1.6 ppm) in the subsurface soil samples were detected north of the exposed slag area at MW-104A (8 to 10 feet and 16 to 18 feet bgs), at the eastern end of the Site at SB-8C (17 to 19 feet bgs), and in the southern portion of the Site, between the Airco and Union Carbide properties (C-5-GRID and MOUND1-GRID). Lower concentrations of these parameters were typically reported in the subsurface soil samples collected during 2003 when samples were visually screened to specifically segregate between subsurface soil and slag material. Other parameters that frequently exceed screening criteria in the subsurface soil samples include beryllium (maximum of 1.4 ppm), iron (maximum of 123,000 ppm), nickel (maximum of 51.4 ppm), and zinc (maximum of 1,090 ppm).

Samples collected during 2000, in the southern portion of the Site between the Airco and Union Carbide properties were analyzed for SVOCs. The concentrations of PAHs (e.g., fluoranthene at 1J ppm, benzo(b)fluoranthene at 1.3J ppm) in the shallow (i.e., approximately 0 to 2 ft bgs) subsurface soil samples are very similar to the concentrations detected in the surface soil samples collected in this same area. However, significantly lower concentrations were detected in the deeper (i.e., approximately 2 to 10 ft bgs) subsurface soil samples.

High pH values (maximum of 11 at MW-26) were detected within the slag area to depths up to

24 feet (MW-23). The pH values detected outside the slag area were relatively neutral.

Groundwater

Shallow Overburden Groundwater

A total of 14 shallow overburden wells were installed at OU#3. These wells are completed in the shallow hydrogeologic zone. Monitoring well locations are presented on Figure 3. The groundwater sampling data indicate that the majority of the samples do not exceed the applicable criteria for the main contaminants in the slag material (i.e., chromium and hexavalent chromium). The highest concentrations of these parameters (maximum of 358 ppb for chromium and 134 ppb for hexavalent chromium) were detected beneath the area of exposed slag in the center of the Site (MW-19, MW-20, MW-22, and MW-23), and beneath the southern portion of the mound area (MW-18 and MW-21). High pH values (maximum of 12.76) were detected in the samples from wells completed within the slag area, with the exception of wells MW-25, MW-28, and MW-26.

Shallow overburden groundwater isoconcentration contours for total chromium, hexavalent chromium, and pH for both the August and October 2003 sampling rounds indicate that the areas with the highest concentrations of total chromium and hexavalent chromium are in the vicinity of the pond and at the southern end of the mound area near MW-18. The area with elevated pH values is generally limited to beneath the mound area and beneath the Pond and exposed slag between the Airco property (OU#2) and the mound area.

Deep Overburden Groundwater

A total of five deep overburden wells were installed at OU#3. These wells are completed in the deep hydrogeologic zone. Monitoring well locations are shown on Figure 3.

The concentrations of primary contaminants detected in the slag materials are significantly lower in the deep overburden groundwater than in the shallow overburden groundwater. The groundwater criterion for hexavalent chromium was exceeded in only one of the deep overburden groundwater samples(concentration at MW-105A in August 2003 [59 ppb)] marginally exceeds the criterion of 5 ppb).

Other parameters that were detected above the groundwater criteria are antimony (maximum of 8.56 ppb), arsenic (maximum of 26.2 ppb), iron (maximum of 24,800 ppb), lead (maximum of 230 ppb), manganese (maximum of 1,800 ppb), selenium (maximum of 54.7 ppb), and sodium (maximum of 139,000 ppb). Antimony and arsenic were only detected in two samples at concentrations that marginally exceeded the groundwater criterion for these parameters.

In general, the data indicate that the deep overburden groundwater quality is not significantly impacted by previous operations and waste disposal at the Site. Although the concentrations of some inorganic parameters exceed the groundwater criteria at some locations, the magnitudes of the exceedances are relatively small.

Bedrock Groundwater

A total of six bedrock groundwater monitoring wells were installed at OU#3. Monitoring well locations are shown on Figure 3. The bedrock groundwater results indicate that the only exceedances of groundwater criteria in bedrock groundwater were for antimony (maximum of 17.9 ppb), iron (maximum of 325 ppb), manganese (maximum of 598 ppb), sulfate (maximum of 350,000 ppb), and sodium (maximum of 232,000 ppb). Since the main constituents in the slag material (i.e., chromium, hexavalent chromium, copper, nickel, zinc, and vanadium) are not detected at concentrations above NYSDEC groundwater standards, it appears that the groundwater quality in the bedrock is not significantly impacted by previous operations and waste disposal at the Site.

Surface Water

A total of 159 surface water samples were collected from the pond and drainage ditches located on OU#3. Figure 4 presents the surface water hydrology, and the associated nomenclature for describing the existing ditches on Site. The primary contaminants in the on-Site surface water are total chromium (maximum of 6,390 ppb), hexavalent chromium (maximum of 571 ppb) and elevated pH values (maximum of 12.41).

The surface water results indicate that the highest concentrations of total chromium in the on-Site surface water were detected at the western end of the SW Ditch (SW-11) and next to the SE corner of the Airco property (i.e., OU#2) at SW-15. The highest concentrations of hexavalent chromium were detected in the Pond (SW-19 and SW-20), at the southeastern end of the Site at SW-16, and in the SW Ditch next to the Airco property (OU#2) (SW-13 and SW-14). These compounds are in exceedance of the surface water screening criteria.

Iron was detected at concentrations exceeding the surface water screening criterion at the majority of the on-site sampling locations, with the highest concentrations (maximum of 151,000 ppb) detected in the Central Ditch at SW-22 and in the SW Ditch. The highest pH values (maximum of 12.41) were detected in the Pond, at the southeastern end of the Site, in the SW Ditch, and next to the SE corner of the Airco property (OU#2).

Sediments

A total of 24 sediment samples were collected from the pond and drainage ditches located on OU#3. Figure 4 presents the surface water hydrology, and the associated nomenclature for describing the existing ditches on Site. The primary contaminants in the on-Site sediment are total chromium (maximum of 2,380 ppm), hexavalent chromium (maximum of 6.83J ppm), nickel (maximum of 216 ppm), and zinc (maximum of 2,200 ppm).

The highest concentrations of total chromium in on-Site sediments were detected north of and within the Pond and at the western end of the SW Ditch next to SKW property (OU#1). The highest concentrations of hexavalent chromium were detected in the NE Ditch, in the Central Ditch, and next to the SE corner of the Airco property (OU#2) .

Copper, iron, nickel, manganese, and zinc were all detected at high concentrations at the western end of the SW Ditch next to SKW.

The highest concentrations of zinc were detected in the NW Ditch, the NE Ditch, in the Pond , and in the SW Ditch.

Elevated pH values were detected in the NW Ditch, in the Pond, at the southeastern end of the Site, and in the SW Ditch.

Sediment samples were also collected from two off-site locations, located on the west side of Witmer Road. Total chromium and selenium were detected at lower concentrations at the off-site locations than at the on-site locations. Hexavalent chromium was not detected at either of the off-site locations. Cadmium, lead, mercury, and zinc were detected at higher concentrations at the off-site locations than at the on-site locations. The pH values detected at the off-site locations were lower than the majority of the pH values detected on Site.

Soil Gas/Sub-Slab Vapor/Air

No soil gas, sub-slab vapor or air samples were collected as part of this investigation as the site does not contain any structures nor are volatile organic compounds a contaminant of concern at the site.

5.2: Interim Remedial Measures

An interim remedial measure (IRM) is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before completion of the RI/FS.

No Interim Remedial Measures have been conducted at OU#3 to date beyond the partial consolidation of waste materials and limited soil cover placed over the waste materials, conducted between 1958 and 1962 as part of the Niagara Power Project.

As indicated in Section 2 and 3.2, IRMs were completed on OU#1 and OU#2.

At OU#1 an An Interim Remedial Measure (IRM) was performed to install a soil cover and to control surface storm water runoff from the site. The IRM was completed in 1998.

At OU#2 an IRM was performed requiring closure of the landfill that included the consolidating, shaping and capping of the existing waste. The IRM closure was completed in 1991. A groundwater collection and treatment system was constructed in 1993 as an addendum to the IRM work plan. An Operation Monitoring and Maintenance Plan is in effect for the site.

5.3: Summary of Human Exposure Pathways:

This section describes the types of human exposures that may present added health risks to persons at or around the site. For OU#3 a summary of the Evaluation of Human Health Impacts can be found in Section 3.4 of the RI Report. A more detailed discussion of the human exposure pathways can be found in the Human Health Risk Assessment Report (HHRA) for OU#3 dated April 7, 2005.

An exposure pathway describes the means by which an individual may be exposed to contaminants originating from a site. An exposure pathway has five elements: [1] a contaminant source, [2] contaminant release and transport mechanisms, [3] a point of exposure, [4] a route of exposure, and [5] a receptor population.

The source of contamination is the location where contaminants were released to the environment (any waste disposal area or point of discharge). Contaminant release and transport mechanisms carry contaminants from the source to a point where people may be exposed. The exposure point is a location where actual or potential human contact with a contaminated medium may occur. The route of exposure is the manner in which a contaminant actually enters or contacts the body (e.g., ingestion, inhalation, or direct contact). The receptor population is the people who are, or may be, exposed to contaminants at a point of exposure.

An exposure pathway is complete when all five elements of an exposure pathway exist. An exposure pathway is considered a potential pathway when one or more of the elements currently does not exist, but could in the future.

At OU#3, contamination exists in the surface soils and exposed slag areas, as well as in sediments, subsurface soils, and groundwater. For a complete exposure pathway to occur, persons would have to come into contact with the waste, contaminated soil and sediment, or groundwater. Exposure to these media could occur through trespassing and subsurface excavation activities at the site. Currently, the only potential pathways of exposure are for trespassers, and workers involved in excavations within these areas of contamination. These potential pathways are:

- Dermal (skin) contact with exposed waste material, and contaminated subsurface soils, sediment, and groundwater.
- Inhalation and incidental ingestion of dusts containing elevated levels of metals.

OU#3 is located in an industrial area with unrestricted access. Much of the site is covered with vegetation except in areas of exposed slag or where the cover has been worn by riders of all terrain vehicles. Completed pathways may occur in the future for utility workers or site workers during subsurface construction activities and routine work.

For OU#1, a previously implemented interim remedial measure prevents exposure to waste materials and controls surface storm water from the site. For OU#2, a previously implemented interim remedial measure, similar to the proposed remedy for OU#3, prevents exposure to waste through consolidation, shaping, and capping of the waste. A groundwater collection and treatment system was constructed at a later date to supplement the work performed under the interim remedial measure. Completed pathways may occur in the future at OU#1 and OU#2 for utility workers or site workers during subsurface construction activities and routine work.

5.4: <u>Summary of Environmental Impacts</u>

This section summarizes the existing and potential future environmental impacts presented by the site. Environmental impacts include existing and potential future exposure pathways to fish and wildlife receptors, as well as damage to natural resources such as aquifers and wetlands.

The Fish and Wildlife Impact Analysis (FWIA) for OU#3 was completed in 2001, and the findings are presented in the report entitled "Delineation of Surface Water Bodies, Wetlands and Ecological Receptors at the Former Vanadium Corporation of America Site" which is summarized in the RI report in Section 3.4.2, presents a detailed discussion of the existing and potential impacts from the site to fish and wildlife receptors. The following environmental exposure pathways and ecological risks have been identified:

- There are no permanent surface water bodies at OU#3; and therefore, no aquatic (fish) or wildlife species that rely on permanent aquatic habitat;
- Although wildlife does exist on OU#3, there are no threatened or endangered species at or in the vicinity of the Site;
- No significant habitats, federally designated wild, scenic, and recreational rivers, or significant coastal zone areas occur at or in the vicinity of OU#3;
- There are no exceedances of NYSDEC fish and wildlife regulatory criteria that are applicable to OU#3;
- Rights-of-ways containing several high voltage transmissions towers make up a large portion of OU#3, and will likely be present for the foreseeable future. Therefore, future land use is limited to commercial/industrial use, as opposed to other potential land development that might be more beneficial to wildlife;
- There are no permanent hydrologic features at OU#3, which limits wildlife accessibility to potential contaminants in surface water or sediment; and
- Much of the slag material on OU#3 is covered with soil and vegetated. The slag in exposed areas is a hard, rocky material that does not readily break down. Therefore, ingestion, dermal contact, or inhalation of slag material by wildlife would not easily occur.

Although sampling conducted in the pond and ditches at OU#3 indicate elevated concentrations of metals and high pH in the surface water and sediments, these drainage features are not permanent aquatic habitat and environmental impacts due to these contaminants are not significant. Similarly, environmental exposure to contaminants in the surface soil/slag and subsurface soil/slag is not significant due to the limited habitat afforded by the Site.

Site contamination has also impacted the groundwater resource in the shallow overburden zone. The deep overburden groundwater and bedrock groundwater are minimally impacted by site contamination. No off-site groundwater impacts are detected nor has any source of drinking water been impacted.

SECTION 6: SUMMARY OF THE REMEDIATION GOALS

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375-1.10. At a minimum, the remedy selected must eliminate or mitigate all significant threats to public health and/or the environment presented by the hazardous waste disposed at the site through the proper application of scientific and engineering principles.

For OU#1 and OU#2 the NYSDEC believes that the IRMs have accomplished these remediation goals provided that they continue to be operated and maintained in a manner consistent with the design and approved Operation, Maintenance and Monitoring (OM&M) Plans.

The remediation goals for OU#3 are to eliminate or reduce to the extent practicable:

- exposures 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.

SECTION 7: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy must be protective of human health and the environment, be cost-effective, comply with other statutory requirements, and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. Potential remedial alternatives for the OU#3 of the Vanadium Corporation of America Site were identified, screened and evaluated in the FS report which is available at the document repositories identified in Section 1.

A summary of the remedial alternatives that were considered for OU#3 are discussed below. The present worth represents the amount of money invested in the current year that would be sufficient to cover all present and future costs associated with the alternative. This enables the costs of remedial alternatives to be compared on a common basis. As a convention, a time frame of 30 years is used to evaluate present worth costs for alternatives with an indefinite duration. This does not imply that operation, maintenance, or monitoring would cease after 30 years if remediation goals are not achieved.

7.1: Description of Remedial Alternatives - OU#3

The following potential remedies were considered to address the contaminated soil/slag, sediment, and surface water at OU#3 of the Vanadium site.

Alternative 1: No Action

The No Action Alternative is evaluated as a procedural requirement and as a basis for comparison. It requires continued monitoring only, allowing the site to remain in an unremediated state. This alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment.

Present Worth: $17,400
Capital Cost: $0
Annual O&M (Years 1- 30): $0

This alternative would be re-evaluated every 5 years.

Alternative 2: Institutional Controls

Present Worth: $672,000
Capital Cost: $67,500
Annual O&M (Years 1-30): $39,290

Alternative 2 would involve implementation of institutional controls to restrict access (all or portions), restrict the use of the property (via environmental easement); restrict access to the property using fencing; require notice to construction workers of the status of the area; and restrict groundwater use. The majority of the area is currently fenced to restrict unauthorized entry; however, trespassers continue to gain access. Alternative 2 would involve installing additional fencing around the areas with exposed slag material to further restrict trespasser use of this area.

Institutional controls could be structured, if necessary, to ensure that the property could only be developed or constructed upon with appropriate environmental controls in place.

Long-term groundwater and surface water monitoring would be implemented to assess post-remediation conditions and to monitor for potential changes and evaluate the effectiveness of the remedy.

Alternative 3
On-Site Consolidation/Physical Containment of Soils, Slag, and Sediments/Institutional Controls

Present Worth: $12,091,400
Capital Cost: $11,180,000
Annual O&M (Years 1-30): $59,290

Alternative 3 would involve on-site consolidation of soils/slag and sediments, and physical containment utilizing a capping technology. Land use restrictions in the form of institutional controls as described for Alternative 2, would be implemented to maintain the cap and provide environmental safeguards in those instances where future excavation could potentially expose human receptors to contaminants. Environmental Easements would control any excavation below the cap. The use of groundwater would also be restricted as described for Alternative 2.

Portions of the slag/soil and sediment would be excavated and consolidated adjacent to the west side of the existing slag mound. The area to be capped is approximately 33 acres.

The cap would be designed to prevent direct contact with the contaminated slag, soils, and sediment and to reduce infiltration to achieve the groundwater and surface water remedial objectives. For Alternative 3, the feasibility Study evaluated a cap consisting of a geosynthetic clay liner (GCL), geonet drainage layer, 18 inches of common fill, and 6 inches of topsoil; however, other capping alternatives that meet the capping objectives would be considered and evaluated during detailed design.

Once in place, the cap would isolate soils with chemical concentrations above the soil cleanup objectives from human receptors and the environment, and reduce infiltration into the contaminated slag.

Following excavation, confirmation samples would be collected to ensure that the cleanup goals had been met.

Institutional controls would be implemented for maintenance of the cap, and to establish safety procedures to be followed if it became necessary to excavate through the cap into the underlying soils/slag.

Long-term groundwater and surface water monitoring would be implemented to assess post-remediation conditions and monitor for potential changes and evaluate the effectiveness of the remedy.

Alternative 4
Limited Excavation and Off-Site Disposal/Physical Containment of Soils, Slag, and Sediments/Institutional Controls

Present Worth: $59,728,400
Capital Cost: $58,817,000
Annual O&M (Years 1-30): $59,290

Alternative 4 is similar to Alternative 3 except that the soils/slag and sediments outside the main mound area would be excavated and disposed of off-site. The existing mound area would be graded and capped similar to Alternative 3.

Alternative 4 would involve excavation and off-site disposal of approximately 174,000 cubic yards of soil/slag and sediments. The excavated material would be characterized and disposed of off-site. Following excavation, confirmation samples would be collected to ensure that the cleanup goals had been met. Once the cleanup levels had been met, the excavation areas would be regraded to provide proper drainage. If necessary, additional clean fill would be used to backfill excavation areas in order to provide proper drainage.

The slag mound area would be graded to provide proper drainage and then be capped. Similar to Alternative 3, the total area that would be capped is approximately 27 acres.

Once in place, the cap would isolate soils with chemical concentrations above the soil cleanup objectives from human receptors and the environment, and reduce infiltration into the contaminated slag.

Institutional controls would be implemented for maintenance of the cap and to establish safety procedures to be followed if it is necessary to excavate through the cap into the underlying soils.

Long-term groundwater and surface water monitoring would be implemented to assess post-remediation conditions and to monitor for potential changes and evaluate the effectiveness of the remedy.

Alternative 5
Soil/Slag and Sediment Removal/Off-Site Disposal

Present Worth: $189,490,000
Capital Cost: $188,960,000
Annual O&M (Years 1-30): $34,290

Alternative 5 would involve excavation of all soil/slag and sediment materials and off-site disposal in an attempt to return the Site to predevelopment conditions, to the extent possible.

For Alternative 5, soil, slag and sediment would be excavated and disposed of off-site. Following excavation, confirmation samples would be collected to ensure that the cleanup goals had been met. Once the cleanup levels had been met, the excavation areas would be graded to provide adequate drainage.

Currently, there are 19 electrical transmission towers that are built in the existing slag mound area. In order to excavate and remove all of the slag from the Site, some of these towers would need to be either removed or, at a minimum, temporarily relocated.

Following removal of the soil/slag and sediment, long-term groundwater and surface water monitoring would be implemented to assess conditions and to monitor for potential changes and evaluate the effectiveness of the remedy.

7.2 Evaluation of Remedial Alternatives

The criteria to which potential remedial alternatives are compared are defined in 6 NYCRR Part 375, which governs the remediation of inactive hazardous waste disposal sites in New York State. A detailed discussion of the evaluation criteria and comparative analysis is included in the FS report.

The first two evaluation criteria are termed "threshold criteria" and must be satisfied in order for an alternative to be considered for selection.

1. Protection of Human Health and the Environment. This criterion is an overall evaluation of each alternative's ability to protect public health and the environment.

2. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether a remedy will meet environmental laws, regulations, and other standards and criteria. In addition, this criterion includes the consideration of guidance which the NYSDEC has determined to be applicable on a case-specific basis.

The next five "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

3. Short-term Effectiveness. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

4. Long-term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on-site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the engineering and/or institutional controls intended to limit the risk, and 3) the reliability of these controls.

5. Reduction of Toxicity, Mobility or Volume. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

6. Implementability. The technical and administrative feasibility of implementing each alternative are evaluated. Technical feasibility includes the difficulties associated with the construction of the remedy and the ability to monitor its effectiveness. For administrative feasibility, the availability of the necessary personnel and materials is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, institutional controls, and so forth.

7. Cost-Effectivness. Capital costs and operation, maintenance, and monitoring costs are estimated for each alternative and compared on a present worth basis. Although cost-effectiveness is the last balancing criterion evaluated, where two or more alternatives have

met the requirements of the other criteria, it can be used as the basis for the final decision. The costs for each alternative are presented in Table 2.

This final criterion is considered a "modifying criterion" and is taken into account after evaluating those above. It is evaluated after public comments on the Proposed Remedial Action Plan have been received.

8. Community Acceptance - Concerns of the community regarding the RI/FS reports and the PRAP are evaluated. A responsiveness summary will be prepared that describes public comments received and the manner in which the NYSDEC will address the concerns raised. If the selected remedy differs significantly from the proposed remedy, notices to the public will be issued describing the differences and reasons for the changes.

SECTION 8: SUMMARY OF THE PROPOSED REMEDY

Operable Unit #3

For OU#3 the NYSDEC is proposing Alternative 3, On-Site Consolidation/Physical Containment of Soils, Slag and sediment/Institutional Controls as the remedy for this site. The elements of this remedy are described at the end of this section.

The proposed remedy is based on the results of the RI and the evaluation of alternatives presented in the FS.

Alternative 3 is being proposed because, as described below, it satisfies the threshold criteria and provides the best balance of the primary balancing criteria described in Section 7.2. It would achieve the remediation goals for the site by conducting limited excavation of soil/slag and sediment, consolidating this material on and adjacent to the existing waste mound, and capping the mound. The soil/slag and sediment would be secured under the cap, and therefore, greatly reduce the threat to public health and the environment. The containment of the soil/slag and sediments would reduce infiltration and limit the potential for vertical migration of contaminants to the groundwater and meet the remedial objectives for surface water in the on-site ditches. Therefore, restrictions on the use of the property would be needed.

Alternatives 4 and 5 would also comply with the threshold selection criteria. Alternatives 1 (no action) and 2 (institutional controls), however, would not fully comply with the threshold criteria, as existing chemical concentrations exceeding SCGs in the soil/slag and sediment would still be available for exposure for humans and environmental receptors.

For Alternatives 3 and 4, chemical concentrations in the shallow groundwater directly beneath the slag mound would continue to exceed SCGs; however, the only exposure pathway would be to workers on Site, in which case institutional controls would mandate adequate safeguards.

Because Alternatives 3, 4, and 5 satisfy the threshold criteria, the five balancing criteria are particularly important in selecting a final remedy for the Site.

Alternative 3 (consolidation and capping) and Alternative 4 (limited excavation, off-Site disposal, and capping) would have similar short-term impacts. These alternatives would potentially expose soil/slag and sediments contaminated with metals for short durations and Alternative 4 would have the additional short term public exposure of haul trucks traveling from the Site to an off-Site Subtitle D landfill; however, for both Alternatives 4 and 5, appropriate controls would be implemented to ensure proper protection of workers, the public and the environment. Alternative 5 would have a longer short-term impact as it would take the longest time to complete the excavation activities, haul materials to an off-site Subtitle D landfill and relocate the existing electrical transmission towers.

Long-term effectiveness for Alternatives 3, 4 and 5 would be similar, as long as the integrity of the cap is maintained for Alternatives 3 and 4. An operation and maintenance program would be implemented to ensure proper care of the cap, for both Alternatives 3 and 4.

Implementability of Alternatives 3 and 4 would be very similar and involve standard construction equipment and readily available technology. The main concern with these two alternatives would be working around existing high voltage electrical towers and transmission wires. Implementability of Alternative 5 would be more difficult since some of the towers and wires would have to be temporarily relocated in order to remove all the slag. Alternative 5 would also require more extensive environmental controls due to the larger scale of the work.

Alternative 3 would not reduce the volume of soil/slag and sediment, but would reduce the mobility by consolidating the material under a cap. Alternative 4 would reduce the volume of soil/slag and sediment compared to Alternative 3. The remaining volume would be secured under a cap, as in Alternative 3, thus reducing mobility. Alternative 5 would reduce the toxicity, mobility, and volume of soil/slag and sediment by removing all of approximately 634,000 cubic yards of impacted material.

Alternative 3 would have the lowest present worth cost of the three Alternatives (3, 4, 5). Alternative 4 costs would be higher than Alternative 3 to provide for removal and off-site disposal of the soil/slag and sediment outside the mound area. Alternatives 3 and 4 would require similar long-term operation and maintenance costs for the capping system and monitoring. Alternative 5 would have the highest present worth costs.

The estimated present worth cost to implement the remedy (Alternative 3) is $12,091,000. The cost to construct the remedy is estimated to be $11,179,000 and the estimated average annual operation, maintenance, and monitoring costs for 30 years is $59,290.

The elements of the proposed remedy are as follows:

1. A remedial design program would be implemented to provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program.

2. Soil/Slag and sediment in areas around the existing slag mound would be excavated and consolidated adjacent to the west side of the mound. The majority of the slag in the mound area would remain in place; however, grading of this area would be required prior to placement of the cap in order to provide proper drainage. The material to be consolidated would be placed in areas such that work around the transmission towers would be minimized. Following consolidation and grading, the cap would be constructed. Alternative cap designs would be evaluated in the detailed design phase to select a cap that meets the capping objectives and can be constructed on the existing slag mound, giving consideration to the constraints with working next to and beneath the electrical transmission towers and wires.

3. Confirmatory soil samples would be collected from the excavations. Further excavation would be conducted in areas where the analytical results exceed the cleanup goals followed by another round of confirmatory soil sampling in that area. Excavated areas determined to have achieved the cleanup goals would

be backfilled with clean soil and graded to ensure proper drainage.

4. Development of a site management plan to address residual contaminated soils that may be excavated from the site during future redevelopment. The plan would require soil characterization and, where applicable, disposal/reuse in accordance with NYSDEC regulations, identify any use restrictions; and provide for the operation and maintenance of the components of the remedy.

5. Imposition of an institutional control in the form of an environmental easement that would require compliance with the approved site management plan; limit the use and development of the property to commercial or industrial uses only, restrict the use of groundwater as a source of potable water, without necessary water quality treatment as determined by NYSDOH, restrict access to the property, maintain a fence around the areas of concern and require the property owners to complete and submit to the NYSDEC a periodic certification.

6. The property owner would provide a certification, prepared and submitted by a professional engineer or such other expert acceptable to the NYSDEC, until the NYSDEC notifies the property owner in writing that this certification is no longer needed. This submittal would contain certification that the institutional controls and engineering controls, are still in place, allow the NYSDEC access to the site, and that nothing has occurred that would impair the ability of the control to protect public health or the environment, or constitute a violation or failure to comply with the site management plan.

7. Since the remedy results in untreated hazardous waste remaining at the site, a long term monitoring program would be instituted. This program would allow the effectiveness of the Vanadium Site OU#3 to be monitored and would be a component of the operation, maintenance, and monitoring for the site. A periodic report would be prepared that would include results of groundwater and surface water monitoring, and descriptions of Site inspections and maintenance activities. The monitoring well network would include select shallow, deep aquifer, and bedrock wells located in OU-3. The surface water monitoring locations would include the drainage ditch that passes through the Site. The Site also would be inspected to ensure that perimeter fencing was secure, and to determine if there were any changes to the condition of the Site relative to the remedial program.

Operable Unit #1

For OU#1, based on the results of the investigations, the IRM that has been performed, and the evaluation presented here, the NYSDEC is proposing No Further Action with continued operation of the site OM&M.

The basis for this proposal is the NYSDEC's conclusion that for OU#1 No Further Action would be protective of human health and the environment and would satisfy all SCGs, as described above. Overall protectiveness is achieved through meeting the remediation goals listed above.

Therefore, the NYSDEC concludes that No Further Action is needed for OU#1 other than OM&M and the institutional and engineering controls listed below;

OU#1 CC Metals and Alloys

1. A site grading plan was developed and implemented that controlled site run-off to prevent contaminated surface water from leaving the site;

2. A soil cover was constructed over all vegetated areas to prevent exposure to contaminated soils. The cover consists of 6 inches of clean soil and of sufficient quality to support vegetation. Clean soil containing no analytes in exceedance of NYSDEC TAGM 4046 soil cleanup objectives.

3. Imposition of an institutional control in the form of a deed restriction filed in the Niagara County Clerk's office in May 2001 that limits the use and development of the property to commercial or industrial uses only.

4. A periodic report would be prepared and submitted to the NYSDEC Division of Solid and Hazardous Materials (DSHM) that would include results of groundwater and surface water monitoring, and descriptions of Site inspections and maintenance activities.

<u>Operable Unit #2</u>

For OU#2, based on the results of the investigations, the IRM that has been performed, and the evaluation presented here, the NYSDEC is proposing No Further Action with continued operation of the site OM&M and the continued operation of the groundwater collection and treatment system as the preferred alternative for the site.
The basis for this proposal is the NYSDEC's conclusion that No Further Action with continued operation of the groundwater collection and treatment system would be protective of human health and the environment and would satisfy all SCGs, as described above. Overall protectiveness is achieved through meeting the remediation goals listed above.

Therefore, the NYSDEC concludes that No Further Action is needed for OU#2 other than OM&M and the institutional and engineering controls listed below;

<u>OU#2 Airco Properties</u>

1. An IRM landfill closure plan was developed in conjunction with the DSHM to properly close the landfill that constituted OU#2;

2. A modified Part 360 landfill cap was constructed over all waste areas to prevent exposure to contaminated soils;

3. Development of a site management plan to address residual contaminated soils that may be excavated from the site during future redevelopment. The plan would require soil characterization and, where applicable, disposal/reuse in accordance with NYSDEC regulations and maintenance of the components of the remedy;

4. Imposition of an institutional control in the form of an environmental easement that would limit the use and development of the property to commercial or industrial uses only;

5. Periodic reports are prepared that would include results of groundwater and surface water monitoring, and descriptions of Site inspections, groundwater treatment system performance monitoring and maintenance activities.

6. The property owner would provide a periodic certification, prepared and submitted by a professional engineer or such other expert acceptable to the NYSDEC, until the NYSDEC notifies the property owner in writing that this

certification is no longer needed. This submittal would contain certification that the institutional controls and engineering controls, are still in place, allow the NYSDEC access to the site, and that nothing has occurred that would impair the ability of the control to protect public health or the environment, or constitute a violation or failure to comply with the site management plan.

TABLE 1
Nature and Extent of Contamination

WASTE - Surface Slag	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	NA	NA	NA	NA
	None detected during the investigation of OU#3			
Semivolatile Organic Compounds (SVOCs)	Benzo(a)anthracene	0.009 - 2.2	0.224	2 of 6
	Benzo(a)pyrene	0.042 - 2.3	0.061	3 of 6
	Benzo(b)fluoranthene	0.022 - 2.6	1.1	2 of 6
	Benzo(k)fluoranthene	0.042 - 1.8	1.1	1 of 5
	Chrysene	0.017 - 1.9	0.04	4 of 6
	Dibenze(a,h)anthrace	0.55 - 0.88	0.014	2 0f 6
PCB/Pesticides	NA	NA	NA	NA
	None detected during the investigation of OU#3			
Inorganic Compounds	Arsenic	2.46 - 45.3	7.5	5 of 19
	Barium	31.4 - 675	300	2 of 19
	Berylium	0.186 - 1.1	0.16	13 of 19
	Cadmium	0.191 - 141	1	3 of 19
	Chromium (total)	278 - 11,800	50	17 of 17
	Chromium (hex)	0.5 - 91.6	NS	NA
	Cobalt	2.9 - 72.3	30	5 of 19
	Copper	7 - 5,420	25	15 of 19
	Iron	2,850 - 52,200	2,000	19 of 19
	Lead	3.6 - 1760	400	1 of 19
	Mercury	0.0115 - 0.375	0.1	3 of 19
	Nickel	8.6 - 5160	13	17 of 19
	Selenium	2 - 26.3	2	14 of 17
	Vanadium	5.4 - 263	150	5 of 19
	Zinc	9.7 - 1400	20	15 of 17
General Chemistry	pH	6.35 - 10.51	NS	NA

TABLE 1
Nature and Extent of Contamination (Continued)

WASTE - Sub-surface Slag	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	NA	NA	NA	NA
	None detected during the investigation of OU#3			
Semivolatile Organic Compounds (SVOCs)	Benzo(a)anthracene	0.064 - 1.2	0.224	1 of 5
	Benzo(a)pyrene	0.064 - 0.8	0.061	5 of 5
	Benzo(b)fluoranthene	0.054 - 1.4	1.1	1 of 7
	Bis(2-	0.06 - 62.05	50	1 of 15
	Chrysene	0.054 - 1.3	0.04	6 of 6
	Dibenze(a,h)anthracene	0.051 - 0.29	0.014	2 of 2
PCB/Pesticides	NA	NA	NA	NA
	None detected during the investigation of OU#3			
Inorganic Compounds	Arsenic	0.34 -70	7.5	5 of 37
	Barium	16.0 - 348	300	2 of 37
	Berylium	0.06 - 3.04	0.16	18 of 37
	Cadmium	0.429 - 3.75	1	8 of 37
	Chromium (total)	17.6 - 7,550	50	31 of 37
	Chromium (hex)	0.08 - 430	NS	NA
	Cobalt	0.265 - 132	30	3 of 37
	Copper	1.8 - 354	25	10 of 37
	Iron	533 - 65,500	2,000	27 of 37
	Lead	1.25 - 110	400	0 of 37
	Mercury	0.0228 - 0.166	0.1	21 of 37
	Nickel	7027 - 1,220	13	22 of 37
	Selenium	1.6 - 40.4	2	8 of 37
	Vanadium	15.7 - 278	150	2 of 37
	Zinc	4.7 - 1,160	20	23 of 37
General Chemistry	pH	8.8 - 12.3	NS	NA

TABLE 1
Nature and Extent of Contamination (Continued)

SURFACE SOIL	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Volatile Organic	Acetone	0.003 - 0.72	0.2	1 of 15
Semivolatile Organic Compounds (SVOCs)	Benzo(a)anthracene	0.067 – 120 D[5]	0.224	13 of 21
	Benzo(a)pyrene	0.084 – 22	0.061	21 of 21
	Benzo(b)fluoranthene	0.073 – 200 D	1.1	9 of 22
	Benzo(k)fluoranthene	0.13 – 56 D	1.1	6 of 15
	Chrysene	0.062 – 180 D	0.04	22 of 22
	Dibenz(a,h)anthracene	0.047 – 6.7	0.014	18 of 19
	Fluoranthene	0.099 – 240 D	50	2 of 22
	Indeno(1,2,3-cd)pyre	0.079 – 22	3.2	2 of 21
	Phenanthrene	0.055 – 61	50	2 of 22
	Pyrene	0.11 – 120 D	50	2 of 22
PCB/Pesticides	NA	NA	NA	NA
	None detected during the investigation of OU#3			
Inorganic	Arsenic	0.67 – 21.9	7.5	9 of 39
	Barium	35.3 – 1410	300	3 of 39
	Beryllium	0.09 – 3.5	0.16	35 of 39
	Cadmium	0.0696 – 4	1	10 of 39
	Chromium (total)	9.0 E[1]– 2260	50[2]	23 of 39
	Chromium (hex.)	0.15 – 24.6	NS[3]	NA[4]
	Cobalt	3.4 – 536	30	2 of 39
	Copper	3.7 – 104	25	19 of 39
	Iron	1890 – 48200 E	2,000	39 of 39
	Lead	6.25 - 187	400	0 of 39
	Mercury	0.0298 – 11.8	0.1	9 of 39
	Nickel	1.6 – 54.1	13	33 of 39
	Selenium	0.950 – 15.9	2	10 of 39
	Zinc	12.7 – 633 E	20	38 of 39
General Chemistry	pH	6.5 - 8.0	NS	NA

TABLE 1
Nature and Extent of Contamination (Continued)

SUBSURFACE SOIL	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Volatile Organic	Acetone	6.1 - 11	0.2	1 of 15
Semivolatile Organic Compounds (SVOCs)	4-Methylphenol	0.22	0.09	1 of 8
	Benzo(a)anthracene	0.24 – 97 D	0.224	4 of 8
	Benzo(a)pyrene	0.47 – 88 D	0.061	3 of 8
	Benzo(b)fluoranthen	0.043 – 130 D	1.1	2 of 9
	Benzo(g,h,i)perylen	0.073 -- 83	50	1 of 8
	Benzo(k)fluoranthen	0.26 -- 26	1.1	1 of 8
	Chrysene	0.22 – 87 D	0.04	4 of 8
	Dibenz(a,h)anthrace	0.044 – 3.8	0.014	2 of 8
	Dibenzofuran	8.6	6.2	1 of 8
	Fluoranthene	0.043 – 180 D	50	1 of 10
	Indeno(1,2,3-cd)pyren	0.15 - 11	3.2	1 of 8
	Phenanthrene	0.22 – 130 D	50	1 of 8
	Phenol	0.047	0.03	1 of 8
	Pyrene	0.051 - 160	50	1 of 9
PCB/Pesticides	NA	NA	NA	NA
	None detected during the investigation of OU#3			
Inorganic Compounds	Arsenic	2.7 – 18.6	7.5	8 of 42
	Barium	11.3 – 473 E	300	2 of 42
	Beryllium	0.162 – 1.4	0.16	40 of 42
	Cadmium	0.0609 – 5.4	1	16 of 42
	Chromium (total)	4.9 – 855 E	50	7 of 42
	Chromium (hex.)	0.24 – 1.6 E	NS	NA
	Copper	6.55 - 257	25	19 of 42
	Iron	4,040 – 123,000 E	2,000	41 of 42
	Lead	5.1 - 1870	400	1 of 42
	Mercury	0.0108 – 16.8	0.1	6 of 42
	Nickel	6.21 – 51.4	13	39 of 42
	Selenium	1.2 – 6.21	2	14 of 42
	Zinc	46.9 – 1,090 E	20	42 of 42
General Chemistry	pH	6.3 - 11	NS	NA

TABLE 1
Nature and Extent of Contamination (Continued)

SEDIMENTS (on-site)	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Inorganic Compounds	Arsenic	4.2-27.9	7.5	6 of 21
	Barium	98.9 - 666	300	2 of 21
	Beryllium	0.0558 - 1.09	0.16	14 of 21
	Cadmium	0.0526-2.1	1	1 of 21
	Chromium (total)	7.17-2,380, N[6,7]	10	20 of 21
	Chromium (hex.)	0.45E[7]-6.83	NS	NA
	Copper	2.65-307	25	12 of 21
	Iron	417-42,600	2,000	18 of 21
	Lead	8.55 - 240	400	0 of 21
	Mercury	0.00865-0.42	0.1	5 of 21
	Nickel	1.63-216	13	14 of 21
	Selenium	2.2 - 25.1	2	16 of 19
	Zinc	16.5-798	20	20 of 21
General Chemistry	pH	6 - 12	NS	NA

TABLE 1
Nature and Extent of Contamination (Continued)

SHALLOW GROUNDWATER	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	NS	NS	NS	NS
Semivolatile Organic Compounds (SVOCs)	NS	NS	NS	NS
PCB/Pesticides	NS	NS	NS	NS
Inorganic Compounds	Antimony	6.83 - 19.4	3	9 of 28
	Antimony (dissolved)	9.15	3	1 of 10
	Arsenic	13.2 - 43.7	25	5 of 28
	Arsenic (dissolved)	11.2 - 23.2	25	0 of 10
	Barium	22.6 - 1,120	1000	1 of 28
	Barium (dissolved)	60 - 208	1000	0 of 10
	Chromium (total)	1.06 - 655	50	8 of 28
	Chromium (total)(dissolved)	0.859 - 106	50	1 of 10
	Chromium (hex)	8 - 181	50	3 of 28
	Chromium (hex)(dissolved)	8 - 90	50	1 of 10
	Iron	128 - 85,500	300	19 of 28
	Iron (dissolved)	495 - 2,010	300	4 of 10
	Lead	5.39 - 389	25	5 of 28
	Lead (dissolved)	4.67 - 7.51	25	0 of 10
	Manganese	2.03 - 2,470	300	10 of 28
	Manganese (dissolved)	3.16 - 421	300	2 of 10
	Selenium	6.69 - 73.9	10	18 of 28
	Selenium (dissolved)	7.25 - 19.5	10	4 of 10
	Sodium	29,800 - 191,000	20,000	28 of 28
	Sodium (dissolved)	30,100 - 192,000	20,000	10 of 10
General Chemistry	pH	6.76 - 12.76	6.5 - 8.5	21 of 35

TABLE 1
Nature and Extent of Contamination (Continued)

DEEP GROUNDWATER	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	1,2-Dichloroethene (total)	1J	5	0 of 5
Semivolatile Organic Compounds (SVOCs)	bis(2-ethylhexyl)Phthalate	1BJ - 2BJ[8]	5	0 of 5
PCB/Pesticides	NS	NS	NS	NS
Inorganic Compounds	Antimony	8.28 - 8.65	3	2 of 9
	Antimony (dissolved)	8.17	3	1 of 4
	Arsenic	10.4 - 26.2	25	2 of 9
	Arsenic (dissolved)	13.6 - 18.2	25	0 of 4
	Barium		1000	
	Barium (dissolved)		1000	
	Chromium (total)	1.16 - 43.8	50	0 of 9
	Chromium (total)(dissolved)	0.817	50	0 of 4
	Chromium (hex)	5 - 59	50	1 of 9
	Chromium (hex)(dissolved)	ND[9]	50	0 of 4
	Iron	762 - 40,900	300	8 of 9
	Iron (dissolved)	544 - 3,920	300	4 of 4
	Lead	5.51 - 230	25	3 of 9
	Lead (dissolved)	ND	25	0 of 4
	Manganese	45.6 - 1,800	300	7 of 9
	Manganese (dissolved)	88.9 - 858	300	2 of 4
	Selenium	22.8 - 50.3	10	8 of 9
	Selenium (dissolved)	22.3 - 54.7	10	3 of 4
	Sodium	7,180 - 139,000	20,000	7 of 9
	Sodium (dissolved)	48,000 - 139,000	20,000	4 of 4
General Chemistry	pH	6.65 - 7.29	6.5 - 8.5	0 of 12

TABLE 1
Nature and Extent of Contamination (Continued)

BEDROCK GROUNDWATER	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	NA	NA	NA	0 of 5
	No Volatile Organic Compounds Detected			
Semivolatile Organic Compounds (SVOCs)	bis(2-ethylhexyl)Phthalate	2BJ - 3BJ	5	0 of 5
PCB/Pesticides	NS	NS	NS	NS
Inorganic Compounds	Antimony	10.9 - 42.4	3	2 of 9
	Antimony (dissolved)		3	
	Arsenic		25	
	Arsenic (dissolved)		25	
	Barium		1000	
	Barium (dissolved)		1000	
	Chromium (total)		50	
	Chromium (total)(dissolved)		50	
	Chromium (hex)		50	
	Chromium (hex)(dissolved)		50	
	Iron	87.4 - 3,250	300	2 of 9
	Iron (dissolved)	6.2 - 2,690	300	1 of 5
	Lead		25	
	Lead (dissolved)		25	
	Manganese	3.1 - 598	300	1 of 9
	Manganese (dissolved)	3.2 - 588	300	1 of 5
	Selenium		10	
	Selenium (dissolved)		10	
	Sodium	28,000 - 222,000	20,000	9 of 9
	Sodium (dissolved)	47,400 - 232,000	20,000	5 of 5
General Chemistry	pH	7.3	6.5 - 8.5	0 of 1

TABLE 1
Nature and Extent of Contamination (Continued)

SURFACE WATER ON-SITE	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
Volatile Organic	Acetone	12	50	0 of 1
Semivolatile Organic	NA	ND	ND	0 of 1
	No SVOCs Detected			
PCB/Pesticides	NS	NS	NS	NS
Inorganic Compounds	Chromium (total)	0.768 - 6,390	NCV[10]	0 of 46
	Chromium (hex)	4 - 571	16	21 of 46
	Iron	53.3 - 151,000	300	24 of 46
	Thallium	7.76 - 93.6	20	8 of 46
	Vanadium	3.34 - 231	190	1 of 46
General Chemistry	pH	6016 - 12.41	NS	NA

[a] ppb = parts per billion, which is equivalent to micrograms per liter, ug/L, in water;
ppm = parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil;
ug/m^3 = micrograms per cubic meter

[b] SCG = standards, criteria, and guidance values;
Soil/Slag: "Determination of Soil Cleanup Objectives and Cleanup Levels", TAGM HWR-94-4046, January 24, 1994.
Sediment: "Determination of Soil Cleanup Objectives and Cleanup Levels", TAGM HWR-94-4046, January 24, 1994, "Technical Guidance for Screening Contaminated Sediments" November 22, 1993
Groundwater: NYSDEC Technical and Operation Guidance Series, Ambient Quality Standards for Class GA groundwater; NYSDEC AWQ Guidance Values for Class GA Groundwater (where no standard exists); NYSDOH Maximum Contaminant Levels (where no standard exists).
Surface Water: NYSDEC Technical and Operation Guidance Series, Ambient Quality Standards for consumption of fresh water fish.

[c] LEL = Lowest Effects Level and SEL = Severe Effects Level. A sediment is considered to be contaminated if either of these criteria is exceeded. If both criteria are exceeded, the sediment is severely impacted. If only the LEL is exceeded, the impact is considered to be moderate.

1. E – Concentration exceeds the calibration range.
2. TGM for chromium is 50 mg/kg, as per telephone conversation with Jim Harrington, NYSDEC, February 3, 2004.
3. NS – No Standard.
4. NA – Not Applicable.
5. D – Analysis at a secondary dilution factor.
6. N – Spike sample recovery was not within control limits.
7. Duplicate analysis not within the control limits.
8. J – Value is estimated.
9. ND -- Parameter was not detected.
10. NCV – No calculated value. Criterion is based on hardness.

Table 2
Remedial Alternative Costs

Remedial Alternative	Capitol Cost	Annual O&M Cost	Total Present Worth
Alternative 1 - No Action	$0	$0	$17,400
Alternative 2 - Institutional Controls	$67,500	$39,290	$672,000
Alternative 3 - Onsite Consolidation/Physical Containment of Soils, Slag and Sediments/Institutional Controls	$11,179,000	$59,290	$12,091,000
Alternative 4 - Limited Excavation and Off-site disposal/Physical Containment of Soils, Slag, and Sediments/Institutional Controls	$58,817,000	$59,290	$59,728,000
Alternative 5 - Soil/Slag and Sediment Removal/Off-site Disposal	$186,960,000	$34,290	$189,490,000

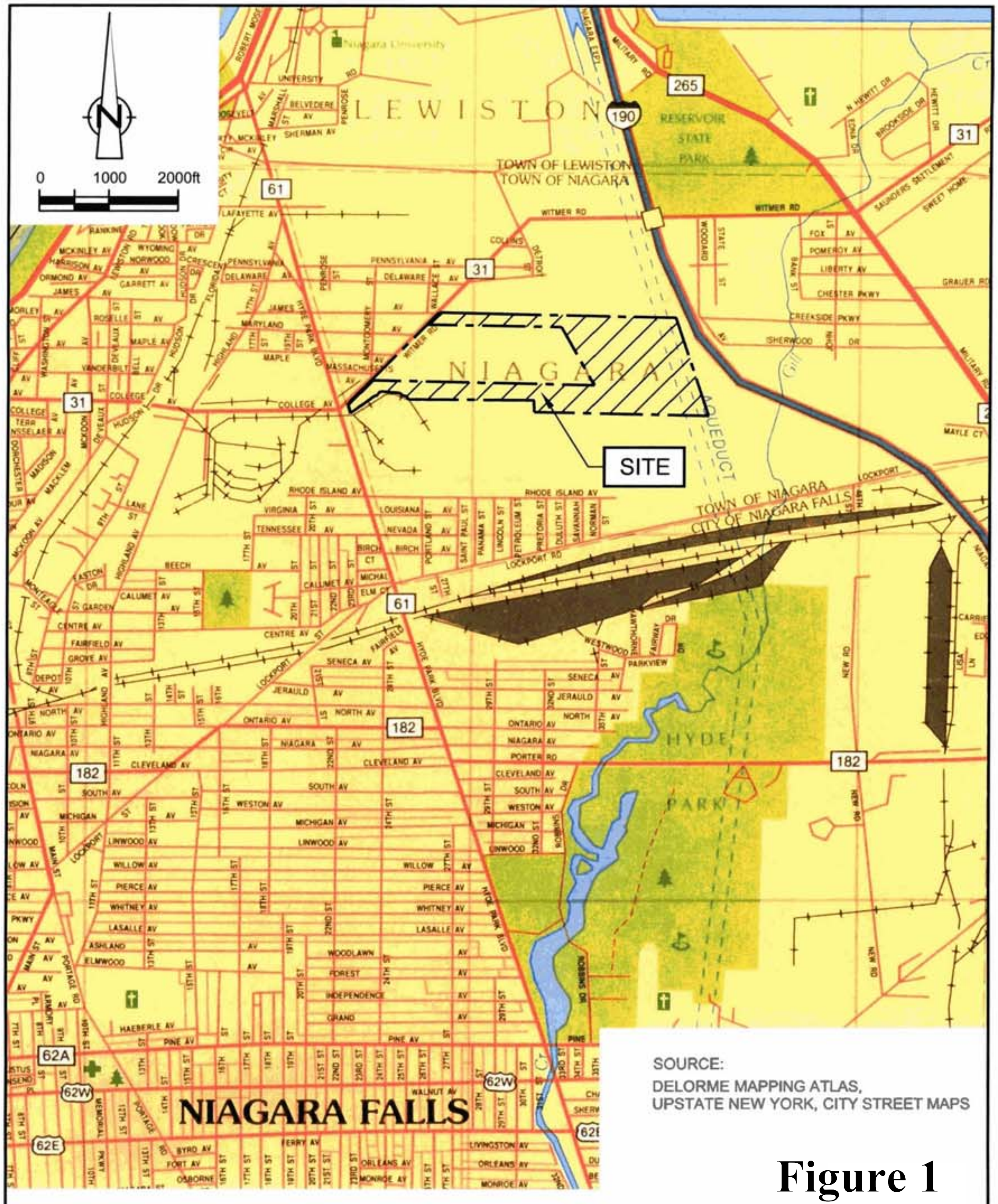
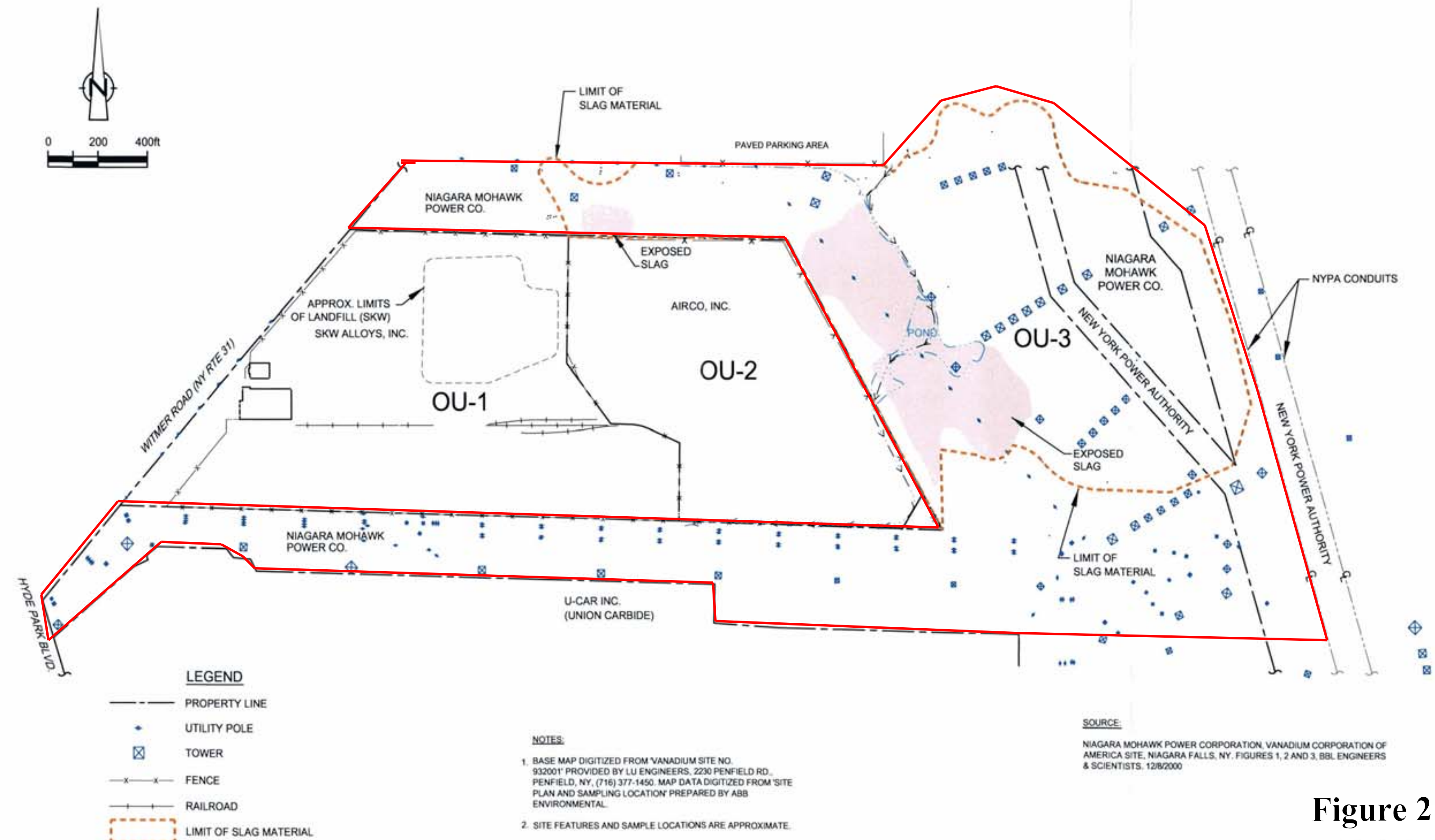


Figure 1

SITE LOCATION
PHASE III AND IV - RI/FS
VANADIUM CORPORATION OF AMERICA SITE
Niagara Falls, NY

19867-00(004)GN-WA001 OCT 31/2005



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 2

SITE PLAN
PHASE III AND IV - RI/FS
VANADIUM CORPORATION OF AMERICA SITE
Niagara Falls, NY

19867-00(004)GN-WA002 OCT 31/2005

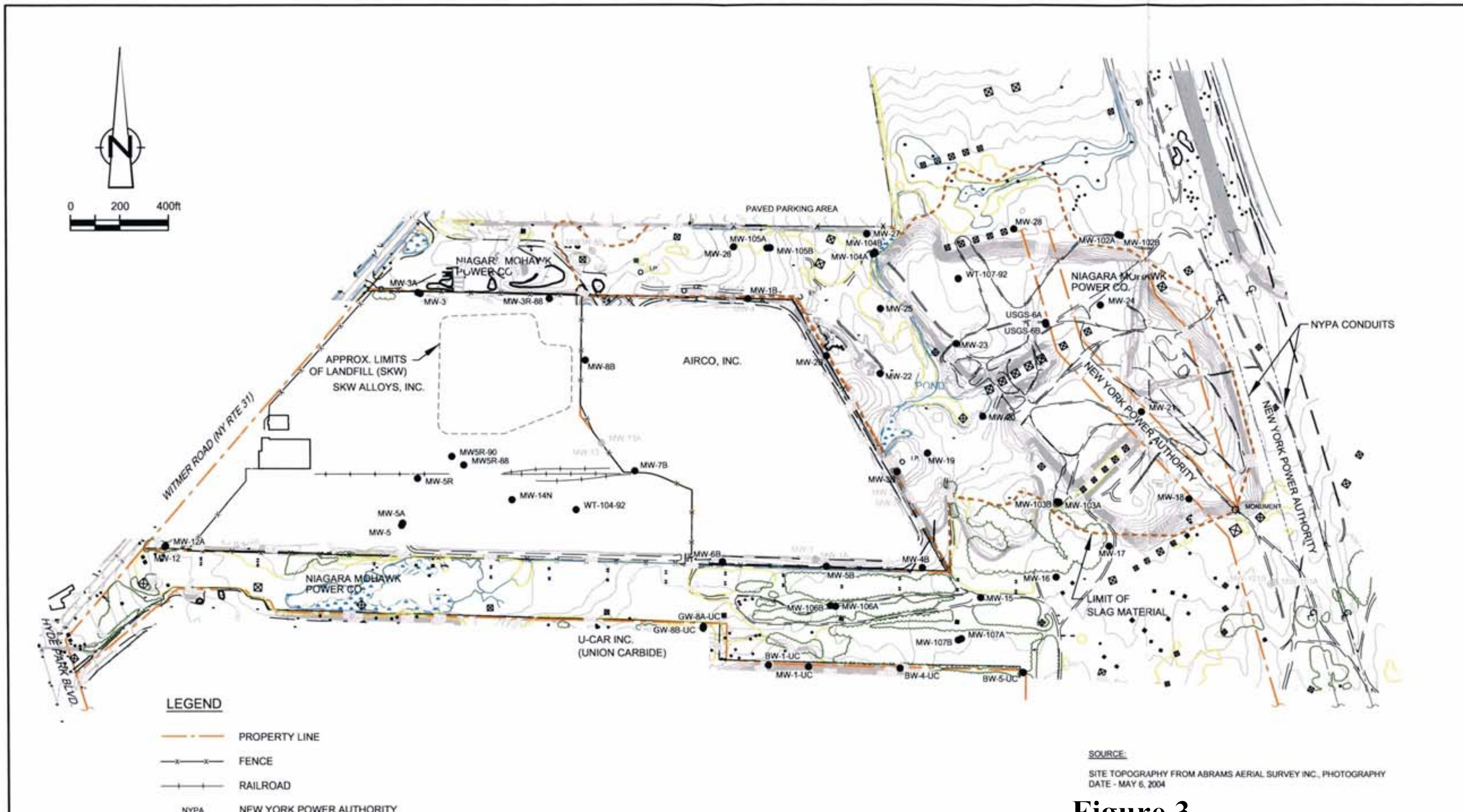


Figure 3
Monitoring Well Locations

SITE TOPOGRAPHIC PLAN
PHASE III AND IV - RI/FS
VANADIUM CORPORATION OF AMERICA SITE
Niagara Falls, NY

19867-00(004)GN-WA030 OCT 31/2005

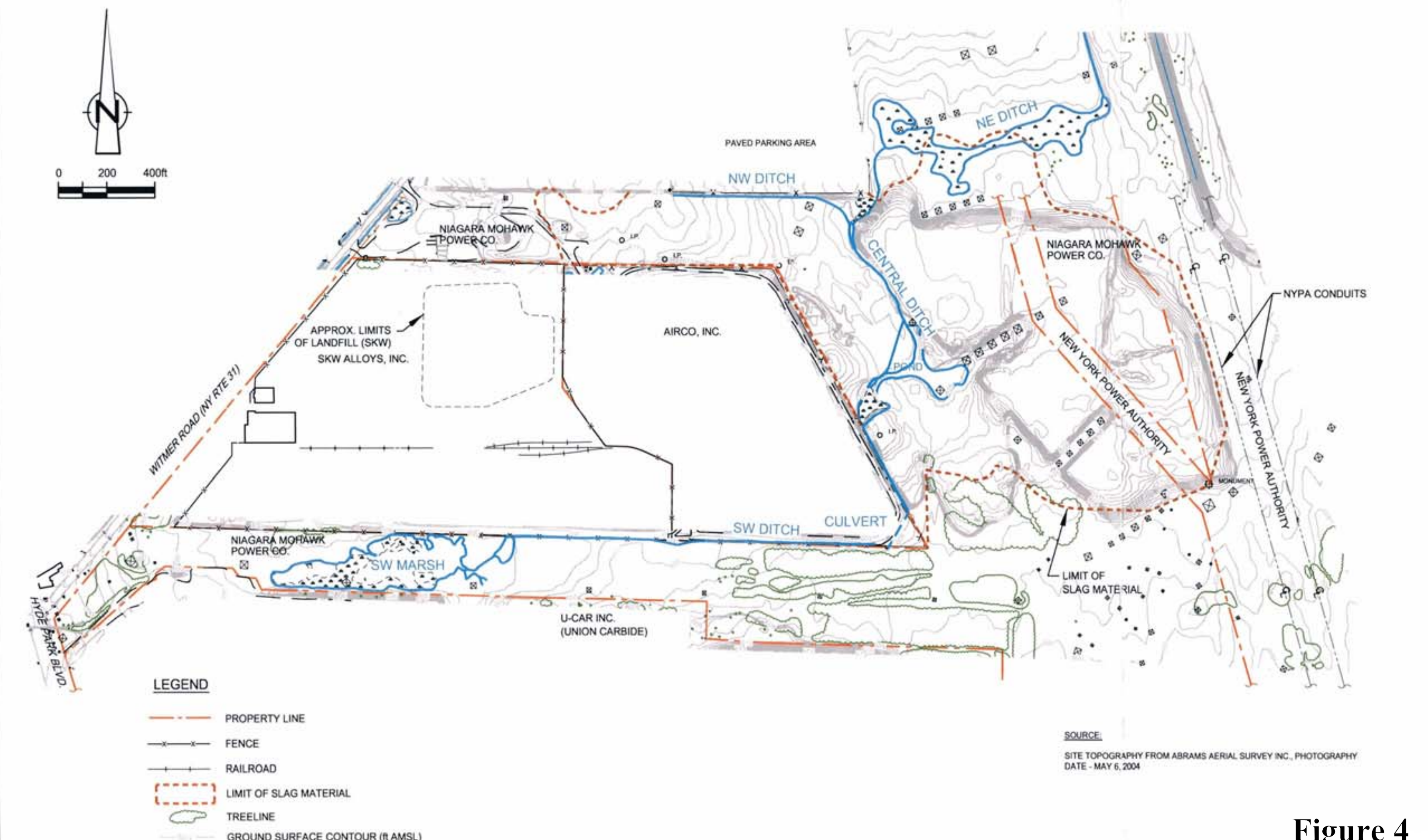
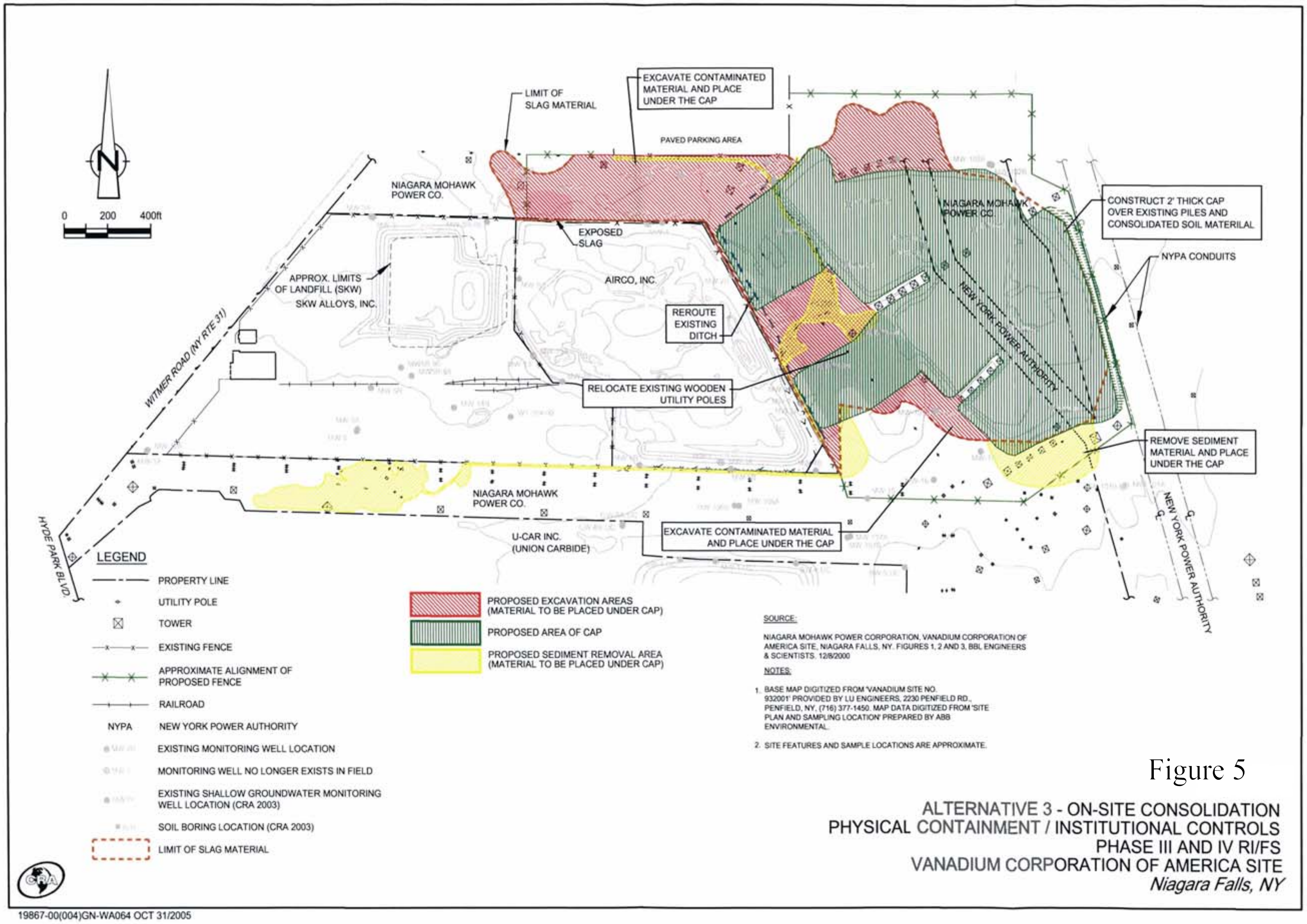


Figure 4

SURFACE WATER HYDROLOGY
PHASE III AND IV - RI/FS
VANADIUM CORPORATION OF AMERICA SITE
Niagara Falls, NY

19867-00(004)GN-WA057 OCT 31/2005



LIMIT OF SLAG MATERIAL
EXCAVATE CONTAMINATED MATERIAL AND PLACE UNDER THE CAP
PAVED PARKING AREA
NIAGARA MOHAWK POWER CO.
EXPOSED SLAG
APPROX. LIMITS OF LANDFILL (SKW)
SKW ALLOYS, INC.
AIRCO, INC.
REROUTE EXISTING DITCH
RELOCATE EXISTING WOODEN UTILITY POLES
WITMER ROAD (NY RTE 31)
HYDE PARK BLVD.
NIAGARA MOHAWK POWER CO.
U-CAR INC. (UNION CARBIDE)
EXCAVATE CONTAMINATED MATERIAL AND PLACE UNDER THE CAP
CONSTRUCT 2' THICK CAP OVER EXISTING PILES AND CONSOLIDATED SOIL MATERILAL
NYPA CONDUITS
NEW YORK POWER AUTHORITY
REMOVE SEDIMENT MATERIAL AND PLACE UNDER THE CAP
0 200 400ft
LEGEND
PROPERTY LINE
UTILITY POLE
TOWER
EXISTING FENCE
APPROXIMATE ALIGNMENT OF PROPOSED FENCE
RAILROAD
NYPA NEW YORK POWER AUTHORITY
EXISTING MONITORING WELL LOCATION
MONITORING WELL NO LONGER EXISTS IN FIELD
EXISTING SHALLOW GROUNDWATER MONITORING WELL LOCATION (CRA 2003)
SOIL BORING LOCATION (CRA 2003)
LIMIT OF SLAG MATERIAL
PROPOSED EXCAVATION AREAS (MATERIAL TO BE PLACED UNDER CAP)
PROPOSED AREA OF CAP
PROPOSED SEDIMENT REMOVAL AREA (MATERIAL TO BE PLACED UNDER CAP)
SOURCE:
NIAGARA MOHAWK POWER CORPORATION, VANADIUM CORPORATION OF AMERICA SITE, NIAGARA FALLS, NY. FIGURES 1, 2 AND 3, BBL ENGINEERS & SCIENTISTS. 12/8/2000
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.
ALTERNATIVE 3 - ON-SITE CONSOLIDATION
PHYSICAL CONTAINMENT / INSTITUTIONAL CONTROLS
PHASE III AND IV RI/FS
VANADIUM CORPORATION OF AMERICA SITE
Niagara Falls, NY
19867-00(004)GN-WA064 OCT 31/2005

Figure 5

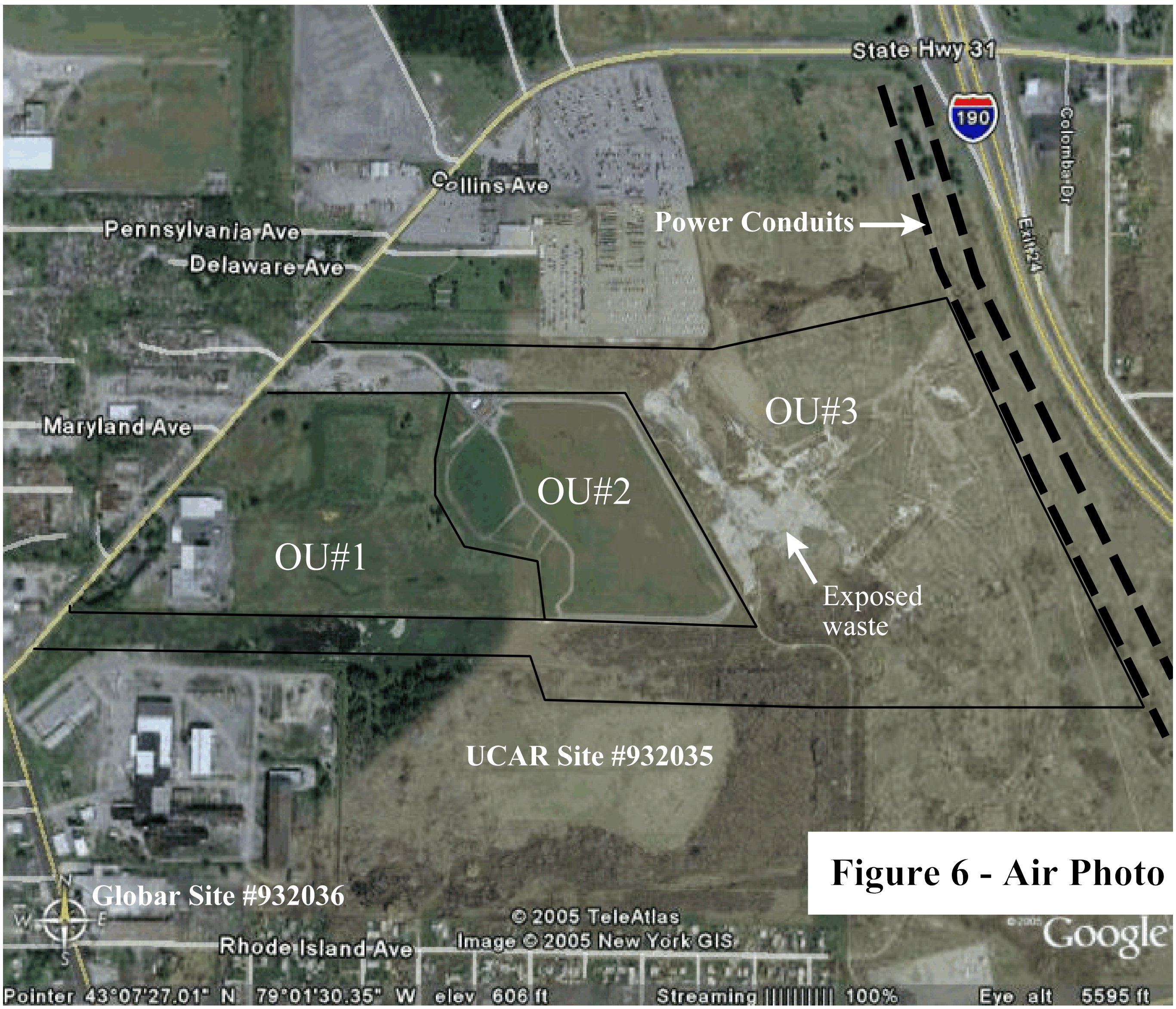


Figure 6 - Air Photo