PROPOSED REMEDIAL ACTION PLAN
FORMER GRANT HARDWARE
West Nyack, Rockland County, New York
Site No. 344031

February 2010

Prepared by:

Division of Environmental Remediation
New York State Department of Environmental Conservation

PROPOSED REMEDIAL ACTION PLAN

FORMER GRANT HARDWARE

West Nyack, Rockland County, New York
Site No. 344031
February 2010

SECTION 1: <u>SUMMARY AND PURPOSE OF THE PROPOSED PLAN</u>

The New York State Department of Environmental Conservation (the Department), in consultation with the New York State Department of Health (NYSDOH), is proposing a remedy for the Former Grant Hardware site. The disposal of hazardous waste at the site resulted in a significant threats to human health and/or the environment that would be addressed by this proposed remedy. As more fully described in Sections 3 and 5 of this document, vapor degreasing of metal, metal plating, and the generation of waste-oil from metal cutting and stamping operations have resulted in the disposal of hazardous wastes, including volatile organic compounds (VOCs). These wastes have contaminated the soil, groundwater and soil vapor at the site, resulting in:

- a significant threat to human health associated with potential exposure to soil and soil vapor.

- a significant environmental threat associated with the impacts of contaminants to groundwater and potential impacts of contaminants to surface water.

To eliminate or mitigate these threats, the Department proposes excavation with off-site disposal and soil vapor extraction (SVE) for source area soil and soil vapor; bioremediation for plateau groundwater and flood plain groundwater with mandatory yearly contamination reduction goals, and contingency plans for flood plain groundwater.

The proposed remedy, discussed in detail in Section 8, is intended to attain the remedial action objectives identified for this site in Section 6. This remedy selection does not constitute an assessment of, or any determination with respect to, any injury to or loss of natural resources that has or may have resulted from releases at or from the site. This Proposed Remedial Action Plan (PRAP) identifies the preferred remedy, summarizes the other alternatives considered, and discusses the reasons for the preferred remedy. The Department will select a final remedy for the site only after careful consideration of all comments received during the public comment period.

The Department has issued this PRAP in accordance with the requirements of 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 July 2004 “Revised Remedial Investigation (RI) Report”, the July 2006 “RI Addendum”, the July 2009 “Feasibility Study (FS) Report” and other relevant documents. The public is encouraged to review these and other project documents, which are available at the following repositories:

West Nyack Free Library
65 Strawtown Road
West Nyack, NY 10994
Phone: (845) 358-6081

NYSDEC Central Office
Attn: Mr. Chek Beng Ng
Division of Environmental Remediation
NYS Dept. of Environmental Conservation
625 Broadway, 11th Floor
Albany, NY 12233-7015
Phone: (518) 402-9620

The Department seeks input from the community on all PRAPs. A public comment period has been set from February 27, 2010 to March 27, 2010 to provide an opportunity for public participation in the remedy selection process. A public meeting is scheduled for March 17, 2010 at the Town of Clarkstown Auditorium beginning at 7:00 pm.

At the meeting, the findings 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. Chek Beng Ng at the above address through March 27, 2010.

The Department 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 Department's final selection of the remedy for this site.

SECTION 2: SITE LOCATION AND DESCRIPTION

As shown in Figure 1, this site is in an urban setting, located in West Nyack, Rockland County, NY, south of State Route 59. The site is approximately 17 acres in size and is bounded by State Route 59 to the north, the Hackensack River to the east and southeast and an Orange & Rockland (O&R) Substation and CONRAIL right-of-way to the west. There is a West Nyack municipal well upstream intake from the Hackensack River approximately 600 feet northeast of the site. The southern portion of the site is undeveloped. Currently, the site is zoned industrial and the surrounding parcels are used for a combination of commercial, industrial and utility uses. The surface elevation of the site is broadly divided into two areas. The former Grant Hardware building and its associated parking lots are situated on the higher elevation or 'plateau' area. A topographically lower 'flood plain' area near and along the Hackensack River is located east of and adjacent to the 'plateau' area.

The following State Superfund sites are located within 0.5 miles away from this site:

a) Old Nyack/Dexter Landfill (Site ID: 344012) - 0.5 miles northeast
b) Clarkstown Town Landfill (Site ID: 344001) - 0.5 miles southeast
c) Orange & Rockland Utilities (Site ID: 344014) - 0.2 miles northwest (directly across the street)
d) Chromalloy (Site ID: 344039) - 0.5 miles south

The subsurface stratigraphy beneath the site is comprised of varying amounts of fill materials, roughly 2 feet to 4 feet in thickness which overlay glacial sediments. On the ‘plateau’ area of the site, weathered bedrock was encountered at an average depth of about 15 feet to 20 feet below the ground surface (bgs). On the ‘flood plain’, bedrock was encountered at an average depth of 17 feet bgs.

On the ‘plateau’ area, groundwater is found within the bedrock between 24 to 30 feet bgs. On the ‘flood plain’ area, groundwater is located within 2 feet to 9 feet bgs and is significantly influenced by the river’s water level. There is an elevation difference of 35 feet between the plateau and the flood plain area. Groundwater flow is generally towards the northeast direction into the Hackensack River at the plateau, and in the easterly direction as it nears the Hackensack River. Due to the close proximity of the site to the river and the underlying bedrock, it is possible that some portion of the groundwater is flowing in a radial direction from the site into the river. Figure 2 shows the groundwater contour diagram for the site.

The site is currently managed as a single operable unit under a Consent Order from the Potentially Responsible Parties (PRPs).

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

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

The subject site was formerly occupied by the Grant Hardware Company which operated at the site from approximately 1957 to 1990. Grant Hardware manufactured metal drawer slides for commercial office furniture. Manufacturing operations of potential environmental concern included the vapor degreasing of metal, metal plating, and the generation of waste oil from metal cutting and stamping operations. Two incidences of surface spills were reported. The first release occurred approximately in 1976, and the second release was reported about 1978. On both occasions, it was reported that a fork-lift collided with the support structure of the waste-oil tank which resulted in the tank collapse and discharges of waste oil to the ground surface.

Grant Hardware ceased operations at the site in 1990 and the site remained unoccupied until the use of the building by the General Bearing Corporation beginning in 1993. General Bearing’s operations include offices and repacking of bearings manufactured at other locations. General Bearing does not conduct vapor degreasing or metal plating operations such as those conducted by Grant Hardware. According to the property owner, no products containing trichloroethene (TCE) or tetrachloroethene (PCE) have been used, handled or stored by General Bearing.

3.2: Remedial History

Based on an anonymous report of a waste-oil and TCE spill at the site, the Department first listed the site as a Class 2a site in the Registry of Inactive Hazardous Waste Disposal Sites in New York (the Registry) in 1985. Class 2a was a temporary classification assigned to a site that had inadequate and/or insufficient data for inclusion in any of the other classifications.

Site Characterization (SC) was performed in two separate events, June 1994 and January 1995. The results indicated that petroleum hydrocarbons and chlorinated VOCs were present within the shallow subsurface soils. TCE was also found to leach out from the on-site soils. The investigations also found TCE in the on-site and down-gradient groundwater.

As a result of the SC, the Department listed the site as a Class 2 site in the Registry in January 1996. 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.

The major chronological events that lead to the site listing and eventually, the basis for this PRAP:

- Site Characterization Report completed in June 1994
- Expanded Subsurface Investigation Report completed on January 1995
- Revised Remedial Investigation Report completed on July 2004
- Final Feasibility Study Report completed on July 2009

SECTION 4: ENFORCEMENT STATUS

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

The Department and Gussack Realty, the site owner, entered into a Consent Order on July 28, 1995. The Order obligates the responsible parties to implement a full remedial program. After the remedy is selected, the Department will approach the PRPs to implement the selected remedy.

SECTION 5: SITE CONTAMINATION

A remedial investigation/feasibility study (RI/FS) has been conducted to determine the nature and extent of contamination and to evaluate the alternatives for addressing the significant threats to human health or the environment.

5.1: Summary of the Remedial Investigation

The purpose of the Remedial Investigation (RI) was to define the nature and extent of any contamination resulting from previous activities at the site. The RI was conducted between February 1995 and October 1999. The field activities and findings of the investigation are described in the RI Report.

The following activities were conducted prior to the writing of this PRAP:

- Bedrock fracture-trace analysis
- Geophysical investigations
- Soil boring and soil sampling
- Bedrock and Overburden groundwater monitoring wells installation
- Hydraulic conductivity testing
- Groundwater sampling and analysis
- Soil vapor investigation

5.1.1: Standards, Criteria, and Guidance (SCGs)

The remedy must conform to 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.

To determine whether the contaminants identified by the RI are present in the soil, groundwater and soil vapor at levels of concern, the data from the investigation were compared to the following SCGs:

- Groundwater, drinking water, and surface water SCGs are based on the Department's "Ambient Water Quality Standards and Guidance Values" (TOGs 1.1.1), "Use and Protection of Waters" (6 NYCRR Part 608), and Part 5 of the New York State Sanitary Code.

- Soil SCGs are based on the Soil Cleanup Objectives (SCO) Tables found in 6 NYCRR Part 375-6.8.

- Background soil samples were taken from one location. This location was west of the building within the site boundary, and were claimed to be unaffected by historic or current site operations. The samples were analyzed for inorganic compounds. The results of the background sample analysis were compared to relevant RI data to determine appropriate site remediation goals.

- Concentrations of VOCs in air were evaluated using the air guidelines provided in the NYSDOH guidance document titled "Guidance for Evaluating Soil Vapor Intrusion in the State of New York," dated October 2006.

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 in Section 5.1.2. More complete information can be found in the RI Report.

5.1.2: Nature and Extent of Contamination

This section describes the findings of the investigation for all environmental media that were evaluated. As described in the RI report, soil, soil vapor and groundwater were collected to characterize the nature and extent of contamination. As seen in Figure 3 and summarized in Table 1, the main categories of contaminants that exceed their SCGs are volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) and inorganics (metals). For comparison purposes, where applicable, SCGs are provided for each medium.

Chemical concentrations are reported in parts per billion (ppb) for water and parts per million (ppm) for waste, soil, and sediment. Soil vapor and/or indoor air samples are reported in micrograms per cubic meter ($\mu g/m^3$).

Table 1 summarizes the degree of contamination for the contaminants of concern in shallow soil, subsurface soil, groundwater and soil vapor and compares the data with the SCGs for the site. The following are the media which were investigated and a summary of the findings of the investigation.

Soil

Soil samples from 0 – 10 feet below ground surface (bgs) were collected at the site in the plateau area during the RI. The results indicate that soils at the site exceeded the Unrestricted SCO for volatile organic compounds, semi-volatile organic compounds and metals. PCBs and Pesticides were also sampled, but none were detected above the Unrestricted SCOs.

Table 1 - Soil

Detected Constituents	Concentration Range Detected (ppm)[a]	Unrestricted SCO[b] (ppm)	Frequency Exceeding Unrestricted SCO	Restricted SCO[c] (ppm)	Frequency Exceeding Restricted SCO
VOCs					
Trichloroethene	ND - 97	0.47	10 of 43	0.47	10 of 43
Tetrachloroethene	ND - 11	1.3	3 of 43	1.3	3 of 43
Xylenes	ND – 0.775	0.26	1 of 43	1,000	0 of 43
SVOCs					
Benzo[a]anthracene	ND – 2.73	1	1 of 17	11	0 of 17
Chrysene	ND – 2.92	1	1 of 17	110	0 of 17
Benzo[b]fluoranthene	ND – 1.15	1	1 of 17	11	0 of 17
Benzo[k]fluoranthene	ND – 1.6	0.8	1 of 17	110	0 of 17
Benzo[a]pyrene	ND – 1.6	1	1 of 17	1.1	1 of 17
Indeno[1,2.3-cd]pyrene	ND – 0.781	0.5	1 of 17	11	0 of 17
Pentachlorophenol	ND – 2.8	0.8	1 of 17	55	0 of 17

Metals					
Arsenic	21 – 64	13	9 of 9	16	9 of 9
Lead	ND – 1100	63	3 of 6	3,900	0 of 6
Total Chromium	16 – 140	22[d]	3 of 6	800[d]	0 of 6
Cadmium	ND – 3	2.5	1 of 9	60	0 of 9
Selenium	4.4 – 15.1	3.9	9 of 9	6,800	0 of 9

a - ppm: parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil;
b - SCO: Part 375-6.8(a), Unrestricted Soil Cleanup Objectives.
c - SCO: Part 375-6.8(b), Restricted Industrial Soil Cleanup Objectives.
d – SCO for hexavalent chromium is used.

Elevated concentrations of metals found on site are not consistent with either products or wastes which were used and produced by Grant Hardware. The consistent observation of these metals in each of the soil samples collected, including the background sample collected from 4’ to 12’ bgs, is interpreted to be representative of site background soil conditions (may be a result of historic fill activities) and are not related to activities at the Former Grant Hardware facility.

To further evaluate the presence of metals in soil and determine if soil remediation or management was required, groundwater samples were collected at locations representative of areas where elevated metals in soil were observed. The analysis showed that metals found in the soil were not observed in the groundwater above the groundwater quality standards. These results were consistent with the historical interpretation of elevated background concentrations of metals at the site. Based on these results, the remediation and/or management of metals in the soil are not warranted.

SVOCs that were detected in the on-site soil are not considered in the soil remediation due to their low number of exceedances above the unrestricted SCGs. Only one SVOC contaminant exceeded the restricted SCGs with a frequency of 1 out of 17.

Some soil samples were also collected at depths greater than 10 feet bgs. However, the contaminants were found to be below the unrestricted SCOs. As such, they will not be evaluated in the remedy selection process. No soil samples were collected in the flood plain area of the site since it was not historically developed.

Figure 3 showed that the most significant VOCs contamination in the soil is located within the same vicinity, which is the southwest area of the building. The VOCs found in the soil during the RI/FS will be addressed in the remedy selection process.

Groundwater

Groundwater samples were collected from the overburden and bedrock monitoring wells. The samples were collected to assess the groundwater conditions on-site. The principal contaminants identified in the site groundwater are trichloroethene (TCE) and its breakdown products, cis-1,2 dichloroethene (cis

1,2-DCE), 1,1-dichloroethene (1,1-DCE) and vinyl chloride (VC). Low concentrations of tetrachloroethene (PCE) have also been identified in the groundwater. The results indicate that groundwater in the plateau and flood plain areas at the site exceed the Department's "Ambient Water Quality Standards and Guidance Values" (TOGs 1.1.1) for volatile organic compounds.

Off-site groundwater wells north of the site, where the Orange and Rockland Operations Center (O&R) Building is located, were also sampled in January 2009. The highest TCE reading was recorded at 480 ppb. The groundwater contour map suggests a small northerly component to the groundwater flow.

For the purposes of this discussion, the groundwater results will be divided into the plateau and flood plain regions in Table 2. The physical demarcation of the two areas is shown in Figure 1. Figure 4 shows the VOC groundwater concentration contours.

Table 2A
Groundwater (Plateau Area)

Detected Constituents	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)	Frequency of Exceeding SCG
VOCs			
Trichloroethene	ND - 2,360	5	9 of 11
Tetrachloroethene	ND - 5	5	1 of 11
cis 1,2-dichloroethene	ND - 47,700	5	9 of 11
Vinyl Chloride	ND - 25,100	2	4 of 11
1,1-dichloroethene	ND - 12	5	1 of 11
Benzene	ND - 2	1	1 of 11

Table 2B
Groundwater (Flood Plain Area)

Detected Constituents	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)	Frequency of Exceeding SCG
VOCs			
Trichloroethene	ND - 36,400	5	9 of 17
Tetrachloroethene	ND - 359	5	6 of 17
cis 1,2-dichloroethene	ND - 18,000	5	8 of 17
trans 1,2-dichloroethene	ND - 8.2	5	1 of 17
Vinyl Chloride	ND - 134	2	3 of 17
1,1,1-trichloroethane	ND - 7.97	5	1 of 17

a - ppb: parts per billion, which is equivalent to micrograms per liter, ug/L, in water.
b- SCG: standards, criteria, and guidance values; NYSDEC Divison of Water Technical and Operational Guidance Series (1.1.1) "Ambient Water Quality Standards and Guidance Values"

During the RI, groundwater contamination identified in the plateau area was addressed by the IRM described in Section 5.2. However, no IRM has yet been performed for the groundwater contamination found in the flood plain area or any component of groundwater contamination that may have migrated to the northern portion of the site. Based on the findings of the Remedial Investigation and as described in Section 3.1, the disposal of trichloroethene has resulted in the contamination of groundwater. The site contaminants listed in Tables 2A and 2B are found in groundwater and are considered to be the primary contaminants of concern which need to be addressed by the remediation. Hence, they will be addressed in the remedy selection process.

Soil Vapor/Sub-Slab Vapor/Air

The evaluation of the potential for soil vapor intrusion resulting from the presence of site related soil or groundwater contamination was evaluated by the sampling of sub-slab soil vapor under structures and indoor air inside the structures. At this site, due to the presence of buildings in the impacted area, a full suite of samples were collected to evaluate whether soil vapor intrusion was occurring.

Sub-slab soil vapor, indoor air and outdoor air samples were collected from the Former Grant Hardware building footprint as well as the other two nearby structures. Results from the Former Grant Hardware building indicate trichloroethene (TCE) and its associated breakdown products were detected in the on-site sub-slab vapor and indoor air. However, only one of the two nearby structures detected TCE and its associated breakdown products in both the sub-slab vapor and indoor air.

Based on the findings of the Remedial Investigation and as described in Section 3.1, the disposal of TCE has resulted in the contamination of soil vapor. Figure 5 shows the nature and extent of the indoor air contamination found within the on-site building, with the current installed sub-slab depressurization systems turned on. Indoor air concentrations exceeded the NYSDOH air guideline for TCE at several locations within the on-site building.

The detected soil vapor concentration was compared with the NYSDOH Soil Vapor Intrusion Guidance. Soil vapor contamination identified during the RI in the Former Grant Hardware building and one of the two nearby structures was addressed during the IRM described in Section 5.2.

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.

A 12-month pilot study was initiated at the beginning of December 2006 to assess whether it was possible to reduce the excessive TCE contamination in the groundwater. This pilot study was conducted for the groundwater in the plateau portion of the site and involved the injection of a proprietary bio-stimulant compound into the groundwater at two locations in the plateau area to enhance the anaerobic bioremediation to aid the complete breakdown of TCE into ethene, ethane and methane. The pilot study data have shown over fifty percent reduction in TCE in less than six months and reductions of greater than ninety nine percent of total chloroethenes achieved within seventeen months.

Mitigation measures were taken at the on-site buildings and a nearby residential structure to address the soil vapor intrusion associated with the on-site VOCs contamination in soil and groundwater media. However, subsequent testing of the effectiveness of these systems indicates that the installed systems do not fully address certain areas within the on-site buildings. No additional action is required at the nearby residential structure since confirmation testing indicated effective operation of the installed SSDS.

5.3: Summary of Human Exposure Pathways:

This section describes the current or potential human exposures (the way people may come in contact with contamination) that may result from the site contamination. A more detailed discussion of the human exposure pathways can be found in the RI report and the Final Feasibility Report available at the document repository. 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.

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.

Groundwater

Drinking contaminated groundwater is not expected because the on-site buildings and immediately adjacent properties are connected to the available public water supply. Exposure to contaminated groundwater through direct contact or incidental ingestion is not expected.

Soil

Dermal contact with, or incidental ingestion of, contaminated soil is not expected as buildings and parking lots cover the area of concern. During construction activities, where soils are disturbed or removed, workers could be exposed to residual contaminants in soil through dermal contact or incidental ingestion.

Soil Vapor

Sub-slab depressurization systems have been installed within the existing on-site building to prevent exposure to site contaminants entering the buildings via soil vapor intrusion, however, confirmation testing of the systems indicates that they are not completely effective in reducing indoor air contaminant concentrations. Facility employees and visitors to the site may be exposed to site contaminants in indoor air.

A sub-slab depressurization system has been installed at one off-site residence to mitigate exposure to site contaminants that could potentially enter the building via soil vapor intrusion. The potential for soil vapor intrusion to occur at an off-site adjacent commercial property was evaluated and no further actions were deemed necessary.

5.4: Summary of Environmental Assessment

This section summarizes the assessment of existing and potential future environmental impacts presented by the site. Environmental impacts include existing and potential future exposure pathways to fish and wildlife receptors, groundwater aquifers, surface water, and wetlands.

No Fish and Wildlife Impact Analysis (FWIA) was conducted during the RI. Surface water samples taken from upstream and downstream of the site indicated no observable impacts to the river. Consequently, no impact on the fish and wildlife was inferred. Therefore, no remedial alternatives need to be evaluated for the protection of ecological resources.

Surface water resources at or near the site includes the Hackensack River, which is used as a source of drinking water just upstream of the site and downstream of the site. By addressing the impact of the groundwater that feeds into the Hackensack River, the potential for the surface water contamination is averted. The groundwater contamination identified during the RI was addressed during the IRM for the plateau region. Even though significant reductions in the total chloroethenes were observed via the IRM, the groundwater contamination in the plateau area still exceeds the SCGs. Due to the groundwater flow direction, the groundwater from the plateau area flows into the flood plain region. As such, the remediation of the groundwater in the flood plain region is crucial in ensuring that the contaminated groundwater is contained on-site. The groundwater contamination in the flood plain region will be addressed through the remedy selection in Section 7.

SECTION 6: SUMMARY OF THE REMEDIATION OBJECTIVES

The objectives for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375. The goal for the remedial program is to restore the site to pre-disposal conditions to the extent practicable. At a minimum, the remedy shall eliminate or mitigate all significant threats to public health and/or the environment presented by the contamination identified at the site through the proper application of scientific and engineering principles.

The remedial objectives for this site are:

Public Health Protection

Groundwater

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards in surface water/groundwater.

- Prevent contact with contaminated groundwater.
- Prevent inhalation of contaminants from groundwater.

Soil

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of contaminants from the soil.

Soil Vapor

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at a site.

Environmental Protection

Groundwater

- Restore the groundwater aquifer to meet ambient groundwater quality criteria to the extent practicable.
- Prevent discharge of contaminated groundwater to surface water.

Soil

- Prevent migration of contaminants that would result in groundwater or surface water contamination.
- Prevent impacts to biota from ingestion/direct contact with soil causing toxicity or impacts from bioaccumulation through the terrestrial food chain.

SECTION 7: <u>SUMMARY OF THE EVALUATION OF ALTERNATIVES</u>

To be selected the 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 Site were identified, screened and evaluated in the feasibility study which is available at the document repositories established for this site.

A summary of the remedial alternatives that were considered for this site is presented below. Cost information is presented in the form of present worth, which 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: <u>Description of Remedial Alternatives</u>

The following alternatives were considered to address the contaminated media identified at the site as describe in Section 5:

Alternative 1: No Further Action

The No Further Action Alternative recognizes the remediation of the site completed by the IRM(s) described in Section 5.2. This alternative leaves the site in its present condition and does not provide any additional protection of the environment. A long term institutional control (easement) would be required to prohibit groundwater use. A engineering easement to limit the land use to industrial use only for the long term would also be required.

Annual Cost:……………………………………………………………………………………………..$0

Alternative 2: Restoration to Pre-Disposal or Unrestricted Use Conditions

This alternative achieves all of the SCGs discussed in Section 5.1.1 and soil meets the unrestricted soil clean objectives listed in Part 375-6.8 (a). This alternative would include excavation and off-site disposal of all soil contamination above the unrestricted soil cleanup objectives. In cases where the excavation affects the foundation of the existing building, extra bracing would be used to support the affected foundation. In addition, the groundwater contamination would be addressed through an extraction well which pumps sufficient volumes of water to affect a change in the groundwater flow contour. The pumping rate and volume would be adjusted such that the groundwater would flow into the site from all directions, hence containing the contamination and preventing any off-site migration. The extracted groundwater would be shipped to an off-site treatment and/or disposal facility. Once sufficient volume of contaminated soil and groundwater has been removed, the site would be returned to its pre-disposal condition. The remedy would rely on an institutional control (environmental easement) to prohibit groundwater use until the groundwater has been fully remediated. For cost estimation purposes, it is assumed that this remedy would be implemented for ten years. Since this remedy would remove all contaminated soils, no vapor mitigation system would be required.

Present Worth:………………………………………………………………………………………. $8,400,000
Capital Cost:... $7,940,000
Annual Cost:………………………………………………………………………………………. $60,000

Alternative 3: Excavation with Off-Site Disposal of Source Area Soil; Soil Vapor Extraction (SVE) for Soil and Soil Vapor; Bioremediation for Plateau and Flood Plain Groundwater with Contingency Plans for Flood Plain Groundwater

Soil/Soil Vapor Remedy
The soil remedy included in this alternative would consist of a three-phase approach for treating contaminated soils located in the source area. The first phase would involve limited excavation of the most heavily contaminated soil, located at a shallow depth, in an estimated area measuring 20 feet by 25 feet at a depth of 1.5 feet. Based on visual observations and PID readings in the field, deeper excavation depths may be warranted. The excavated soil would be characterized for off-site disposal at a permitted storage, treatment and disposal facility.

The second phase involves installation of an SVE system in the area where impacted soil is reported to exist at depths down to bedrock. The SVE system would remove any remaining contamination not readily accessible through excavation due to the proximity of the contamination to the building foundations.

The third phase of the soil remedy is the expansion of the SVE system to include additional areas of impacted soil to the bedrock depth (15 feet). Additional data would be collected to optimize the design of the system expansion, either through increased vacuum horsepower or additional extraction wells, to ensure adequate and effective coverage. After installation of each phase of the SVE system, quarterly sampling and reporting would be included to monitor system performance.

It would take six months to design and implement the first and second phase of the proposed soil remedy. The design and implementation of the third phase would start approximately three months after the SVE is installed. Overall, it would take two additional years after the SVE installation to meet remediation goals and objectives. The completion of soil cleanup would be defined as the soil meeting the SCO for groundwater protection prior to the decommissioning of the SVE system.

The existing sub-slab depressurization systems (SSDS) which were installed during the RI would continue to be operated. Furthermore, additional SSDS would be required to cover areas that were inadequately remediated by the current SSDS. Continued efforts to seal cracks, joints and gaps in the floor slab would be needed, to the extent practicable, to maintain an effective vacuum field in the vadose zone. Confirmation testing would be required to ensure the implemented SSDS is functioning as intended. It is anticipated that the SVE system would also beneficially impact sub-slab soil vapor. After installation and operation of the SVE, SSDS would be re-evaluated to assess improvements. In addition, data would be collected and reviewed to assess the need for the expansion of existing SSDS or the installation of additional SSDS.

Plateau Groundwater Remedy
The existing bioremediation IRM pilot study would be expanded to a full-scale implementation. Three additional injection wells would be included in the source area. A series of bedrock injection wells located perpendicular to the primary axis of the groundwater plume in a down-gradient location at the plateau would be constructed as part of the full-scale implementation.

The existing groundwater monitoring well network would be used to evaluate the progress of the remedy. The groundwater would be periodically monitored for VOCs.

Flood Plain Groundwater Remedy
This element would consist of the installation of additional deep overburden treatment wells parallel to the river to create a bio-barrier. A proprietary bio-stimulant compound would be injected into the treatment wells. A monitoring program would be instituted in conjunction with the treatment program, to assist in determining the appropriate doses of the bio-stimulant liquid into the treatment well network and to monitor the progress of the remedy. A pilot study is not needed for the bioremediation of this area since a similar study has already been conducted in the plateau area. Similar to the plateau groundwater monitoring, the groundwater in the flood plain would be monitored.

Flood Plain Groundwater Remedy Contingency
If the bioremediation of the flood plain groundwater failed to reduce the total chloroethene groundwater concentrations by 50% in twelve months after the start of the remedy implementation, a contingency remedy is planned to prevent further migration of the VOCs into the river. Based on the analysis, this

contingency plan may include the installation of additional injection wells along the river bio-barrier or an alternate groundwater treatment system.

The estimated costs presented below include the stated remedies for the soil, soil vapor and groundwater for the plateau and the flood plain areas. It does not include the costs associated with the contingency plan for the flood plain groundwater remedy and any additional SSDS for soil vapor mitigation. An institutional control (environmental easement) to prohibit groundwater use would be required until the groundwater has been fully remediated. An environmental easement to limit the land use to industrial use only for the long term would also be required due to the presence of elevated metal concentrations in the historic fill. A site management plan and periodic certification of institutional controls and engineering controls would also be needed.

The present worth costs are calculated based on the assumption of four years of annual operation costs for the SVE systems, plateau and flood plain groundwater treatment systems.

Present Worth:……………………………………………………………………………….$622,000
Capital Cost:………………………………………………………………………………...$268,000
Annual Costs:………………………………………………………………………………..$100,000

Alternative 4: Excavation with Off-Site Disposal of Source Area Soil and Soil Vapor Extraction for Soil and Soil Vapor; Bioremediation for Plateau Groundwater and Flood Plain Groundwater with Mandatory Yearly Contamination Reduction Goals, and Contingency Plans for Flood Plain Groundwater

The soil remedy for Alternative 4 is identical to Alternative 3, except that the area and depth of the soil in the source area would be excavated, to the extent practicable, to meet the soil cleanup objectives for the protection of groundwater outlined in 6 NYCRR Part 375, Table 6.8 (a).

This alternative would also include the identical remedy for the plateau and flood plain groundwater as stated in Alternative 3. However, Alternative 4 differs from Alternative 3 in two ways:

i) Alternative 4 would require consecutive reductions in total chloroethene in the bedrock and overburden groundwater concentrations in the flood plain area by 50% from one year to the next, for a period of seven years. For instance, a total chloroethene concentration of 50,000 ppb in Year 1 would be reduced to 25,000 ppb in Year 2 and 12,500 ppb in Year 3, and so on. At minimum, annual groundwater results from all on-site groundwater monitoring wells would be provided to NYSDEC for review and comment. The goal of the remediation would be to meet the applicable SCGs;

ii) Alternative 4 would require that the series of bedrock injection wells located perpendicular to the primary axis of the groundwater plume in a down-gradient location (from Alternative 3) to be extended to include the northwest portion of the site, as illustrated in Figure 6, to remediate any component of groundwater contamination migration in the direction of the public municipal water intake north of the site. A groundwater monitoring program would be implemented to prevent any inadvertent ‘spreading’ of the contaminants as a result of the injection activities.

If the bioremediation of the flood plain failed to achieve the required percentage reductions within the period of seven years, a contingency plan would be evaluated. This plan would require an alternate remediation system to be installed to reduce the total chloroethene in the bedrock groundwater in the flood plain area to achieve the required reduction goals. Pilot studies would be conducted to demonstrate the efficacy of the new remediation system in meeting the required reduction goals.

The estimated costs presented below include the stated remedies for the soil, soil vapor, and groundwater for the plateau and the flood plain areas. It does not include the costs associated with the contingency plan for the flood plain groundwater remedy and any additional SSDS for soil vapor mitigation. An interim institutional control (easement) to prohibit groundwater use would be required until the groundwater has been fully remediated. An environmental easement to limit the land use to industrial use only for the long term would also be required due to the presence of elevated metal concentrations in the historic fill.

The present worth costs are calculated based on the assumption of four years of annual operation costs for the SVE systems and plateau groundwater treatment systems. Due to the required contamination reduction goals, an assumption of seven years is used for the annual operation costs for the flood plain groundwater treatment systems.

Present Worth:……………………………………………………………………………………$ 679,000
Capital Cost:……………………………………………………………………………………..$ 268,000
Annual Costs:…………………………………………………………………………………….$ 100,000

7.2 <u>Evaluation of Remedial Alternatives</u>

The criteria to which potential remedial alternatives are compared are defined in 6 NYCRR Part 375, which sets forth the requirements for the remediation of inactive hazardous waste disposal sites in New York. A detailed discussion of the evaluation criteria and comparative analysis is included in the feasibility study 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. <u>Protection of Human Health and the Environment</u>. This criterion is an overall evaluation of each alternative’s ability to protect public health and the environment.

2. <u>Compliance with New York State Standards, Criteria, and Guidance (SCGs)</u>. 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 Department has determined to be applicable on a case-specific basis.

The next six “primary balancing criteria” are used to compare the positive and negative aspects of each of the remedial strategies.

3. <u>Long-term Effectiveness and Permanence</u>. 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.

4. 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.

5. Short-term Impacts and 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.

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-Effectiveness. Capital costs and annual 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 the Remedial Alternatives Cost Table 3.

Table 3
Remedial Alternative Costs

Remedial Alternative	Capital Cost ($)	Annual Costs ($)	Total Present Worth ($)
No Further Action	0	0	0
Restoration to Pre-Disposal or Unrestricted Conditions	7,940,000	60,000	8,400,000
Excavation and SVE for Soil; Bioremediation for Plateau and Flood Plain Groundwater	268,000	100,000	622,000
Excavation and SVE for Soil; Bioremediation for Plateau and Flood Plain Groundwater with Mandatory Yearly Contamination Reduction Goals	268,000	100,000	679,000

8. Land Use. When cleanup to pre-disposal conditions is determined to be infeasible, the Department may consider the current, intended, and reasonable anticipated future land use of the site and its surroundings in the selection of the soil remedy.

The final criterion, Community Acceptance, 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.

9. Community Acceptance. Concerns of the community regarding the investigation, the evaluation of alternatives, and the PRAP are evaluated. A responsiveness summary will be prepared that describes public comments received and the manner in which the Department 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

The Department is proposing Alternative 4, Excavation with Off-Site Disposal and Soil Vapor Extraction for Soil and Soil Vapor; Bioremediation for Plateau Groundwater and Flood Plain Groundwater with Mandatory Contamination Reduction Goals, and Contingency Plans for Flood Plain Groundwater, as the remedy for this site. The elements of this remedy are described at the end of this section.

8.1 Basis for Selection

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

Alternative 4 is being proposed because, as described below, it satisfies the threshold criteria and provides the best balance of the balancing criterion described in Section 7.2. It would achieve the remediation goals for the site by removing the all source area soils which are contaminated above the groundwater protection SCOs, and remediating the rest of the soil contamination via SVE without compromising the foundation of the existing building. Source removal would create conditions necessary to restore groundwater quality to the extent practicable, and would eventually eliminate the source of groundwater contamination. Bioremediation of the contaminated groundwater in both the overburden and bedrock in the plateau area would ensure an eventual and complete return of the groundwater to comply with the SCGs. A series of bioremediation wells located near the Hackensack River bank would provide a suitable method to treat any contaminated groundwater in the bedrock which was not treated completely by the bioremediation activities in the plateau area. The requirement for the reduction of total chloroethene in groundwater for seven consecutive years, and the associated contingency plans ensure the eventual return of the groundwater to a predisposal condition.

Alternative 1 would not provide any protection to public health and the environment and will not be evaluated further. Alternative 2, by removing all soil contaminated above the unrestricted soil cleanup objectives and all contaminated groundwater removal above SCGs, would meet the threshold criteria. Alternatives 3 and 4 eventually remediate the VOC contaminated soil in the source area to meet the groundwater protection SCOs through a combination of excavation and SVE. However, Alternative 4 would meet the groundwater protection SCOs in a shorter time period since all soils above the groundwater protection SCOs would be excavated in comparison to Alternative 3, where only the highest contaminated soil would be excavated. Because Alternatives 2, 3 and 4 would satisfy the threshold criteria, the remaining criteria are particularly important in selecting a final remedy for the site.

Alternatives 2, 3 and 4 all would have short-term impacts which could easily be controlled. However, Alternative 2 would have a more significant short-term impact due to the huge energy requirement for the extraction and treatment operations. Alternative 3 and 4 would have the same short-term impact since the implementation of all three alternatives involve well installation and do not involve chemicals which are highly reactive, corrosive, or toxic. However, the time needed to achieve the remediation goals may be longer for Alternative 3 compared to Alternative 4 since Alternative 3 would not include requirements for further contamination reduction after the first year of remedy implementation. Alternative 2 would take the longest to achieve the remediation goals since it returns the site to pre-disposal condition.

The long-term effectiveness and permanence is the same for Alternatives 2, 3 and 4. Alternative 2 would return the site to unrestricted use, while Alternatives 3 and 4 would return the site to industrial use, same as the current zoned site land use. The long term groundwater goal for Alternatives 2, 3 and 4 would be to return the site groundwater to meet drinking water standards. Since the goal of Alternatives 2, 3 and 4 is to clean up the site to meet conditions per the appropriate SCGs, no long term engineering controls are required. However, a groundwater use restriction would be required while the remedy is implemented for Alternatives 2, 3 and 4. An environmental easement to limit the land use to industrial use only for the long term would also be required for Alternatives 3 and 4.

Alternative 2 would significantly reduce the toxicity, mobility and volume of the wastes at the site by preventing any outward migration of the groundwater plume away from the site. Alternative 3 would not be required to reduce the toxicity, mobility and volume of the wastes at the site after the first year of implementation. However, Alternative 4 would ensure the continuous reduction of the toxicity, mobility and volume of the wastes at the site, in both bedrock and overburden groundwater, since it requires yearly contamination reduction goals to be met.

Alternative 3 and 4 would be readily implementable. The bio-barrier option for Alternative 3 requires the least infrastructure to be installed in the flood plain area since no piping or mechanical systems are required and the injection product could be applied to the wells through temporary hoses from a delivery vehicle. Alternative 2 is the least implementable since it would require a constant supply of trucks for the transportation of contaminated groundwater, and the continuous maintenance of all extraction equipment for a period of ten years.

The costs of the alternatives vary significantly. With the construction of an extraction and treatment system to contain the large volume groundwater on-site, Alternative 2 (restoration to pre-disposal condition) would have the highest present worth cost. Alternative 4 has a slightly higher cost compared to Alternative 3 since Alternative 4 has a more rigorous contamination reduction goals compared to Alternative 3.

The current land use for the site is industrial. Even though Alternative 2 restores the site to predisposal conditions, the soil remedy proposed in Alternatives 3 and 4 meets the industrial use criteria.

The estimated present worth cost to implement the remedy is $679,000. The cost to construct the remedy is estimated to be $268,000 and the estimated average annual costs for 7 years is $100,000.

8.2 **Elements of the Proposed Remedy**

The elements of the proposed restricted use remedy are as follows. Figure 6 shows the corresponding elements of the proposed remedy.

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. Excavation of the contaminated soil at the source area, to the extent practicable, to meet the soil cleanup objectives for the protection of groundwater outlined in 6 NYCRR Part 375, Table 6.8 (a). Excavated soil would be disposed at a permitted facility. A soil vapor extraction system (SVE) would remediate the remaining low level and/or deeper VOC-contaminated soils at the source area.

3. Continued operation of the existing sub-slab depressurization systems (SSDS) which were installed during the RI. Furthermore, additional SSDS would be required to cover areas that were inadequately remediated by the current SSDS. Continued efforts to seal cracks, joints and gaps in the floor slab would be needed, to the extent practicable. Confirmation testing would be required to ensure the implemented SSDS is functioning as intended.

4. Expansion of the existing bioremediation pilot study to a full-scale implementation. Three additional injection wells would be included in the source area. Construction of a series of approximately forty-five bioremediation treatment wells perpendicular to the primary axis of the groundwater plume at a down-gradient location on the plateau, and also to the northwest portion of the site.

5. Construction of a series of approximately fifteen bioremediation treatment well units along the Hackensack River bank with the requirement of consecutive reductions in total chloroethene in the bedrock and overburden groundwater concentrations in the flood plain area by 50% from one year to the next, for a period of seven years. Implementation of a contingency remediation plan would be evaluated should the bioremediation fail to achieve the required percentage reductions within the period of seven years.

6. Green remediation and sustainability efforts are considered in the design and implementation of the remedy to the extent practicable, including;
   - energy efficiency and green building design
   - using renewable energy sources
   - reducing green house gas emissions
   - encouraging low carbon technologies
   - foster green and healthy communities
   - conserve natural resources
   - increase recycling and reuse of clean materials
   - preserve open space and working landscapes

7. Imposition of an institutional control in the form of an environmental easement for the controlled property that:

(a) requires the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3).
(b) the remedy allows the use and development of the controlled property for industrial use, subject to local zoning laws;
(c) restricts the use of groundwater and/or surface water as a source of potable or process water, without necessary water quality treatment as determined by the Department, NYSDOH or County DOH;
(d) prohibits agriculture or vegetable gardens on the controlled property;
(e) requires compliance with the Department approved Site Management Plan;
(f) requires any excavated soil to be tested, and properly handled to protect the health and safety of workers and the nearby community, and would be properly managed in a manner acceptable to the Department. Backfilling will employ clean soil that meets the Division of Environmental Remediation's criteria for backfill or local Site background;
(g) requires grass or asphalt cover on any areas not currently covered by building or asphalt to minimize direct contact with the surface soil.

8. Since the remedy results in contamination remaining at the site that does not allow for unrestricted use, a Site Management Plan is required, which includes the following:

(a) a Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the site and details the steps and media-specific requirements necessary to assure the following institutional and/or engineering controls remain in place and effective:

Institutional Controls: The Environmental Easement discussed in Paragraph 7 above.
Engineering Controls: The soil vapor mitigation systems discussed in Paragraph 3 above.

This plan includes, but may not be limited to:

(i) descriptions of the provisions of the environmental easement including any land use and groundwater use restrictions;
(iii) provisions for the management and inspection of the identified engineering controls;
(iv) maintaining site access controls and Department notification; and
(v) the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls;

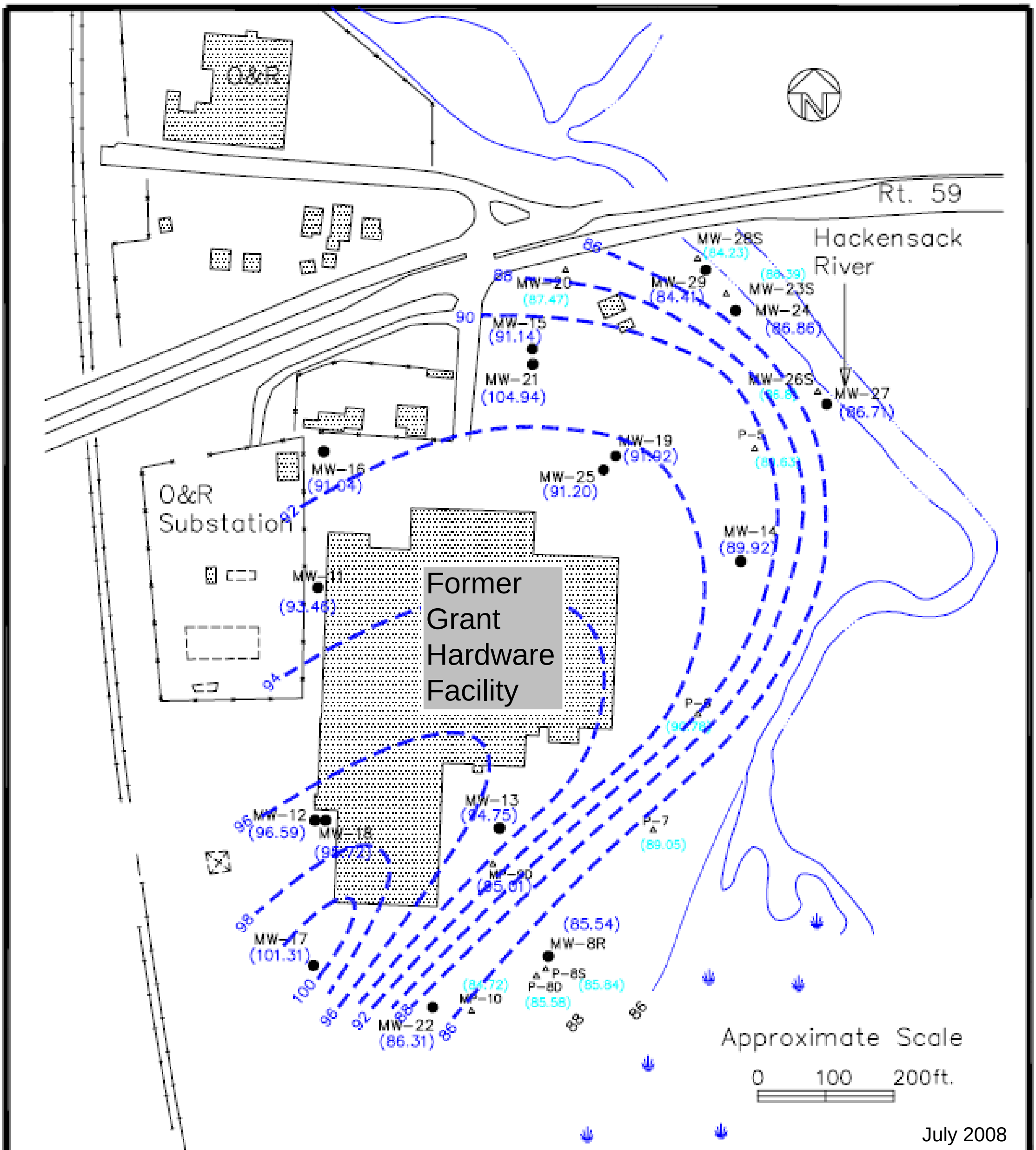
(b) a Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but not be limited to:

(i) monitoring of groundwater and soil vapor to assess the performance and effectiveness of the remedy;
(ii) a schedule of monitoring and frequency of submittals to the Department;
(iii) provision to evaluate the potential for vapor intrusion for any buildings developed on the site, including provision for mitigation of any impacts identified;
(iv) provision to evaluate the potential for soil vapor intrusion for existing buildings if building use changes significantly or if a vacant building become occupied.

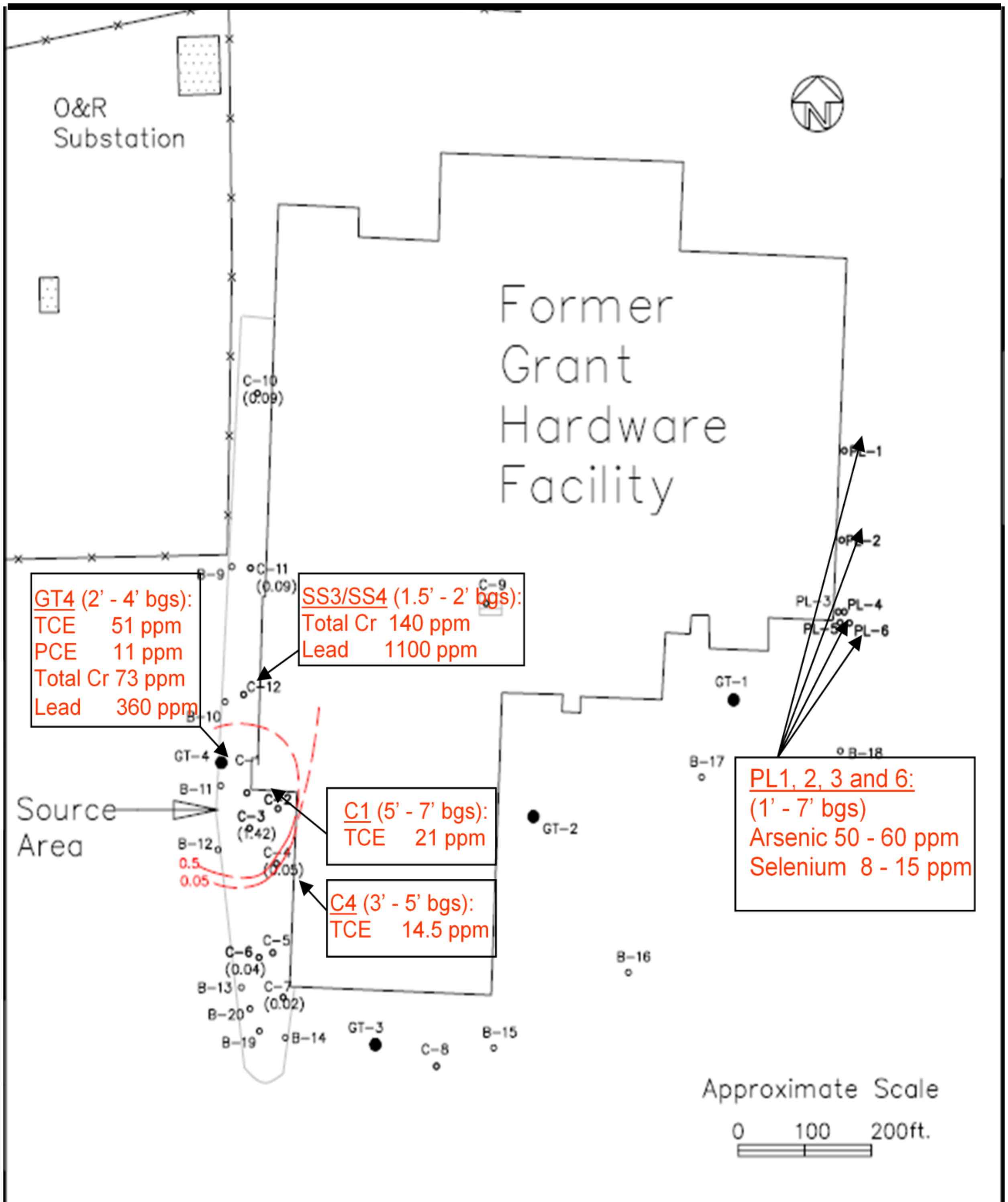
(c) an Operation and Maintenance Plan to assure continued operation, maintenance, monitoring, inspection, and reporting of for any mechanical or physical components of the remedy. The plan includes, but is not limited to:

(i) compliance monitoring of treatment systems to assure proper O&M as well as providing the data for any necessary permit or permit equivalent reporting;
(ii) maintaining site access controls and Department notification; and
(iii) providing the Department access to the site and O&M records.

Former Grant Hardware Facility
Site ID: 344031
Site Location
Figure 1

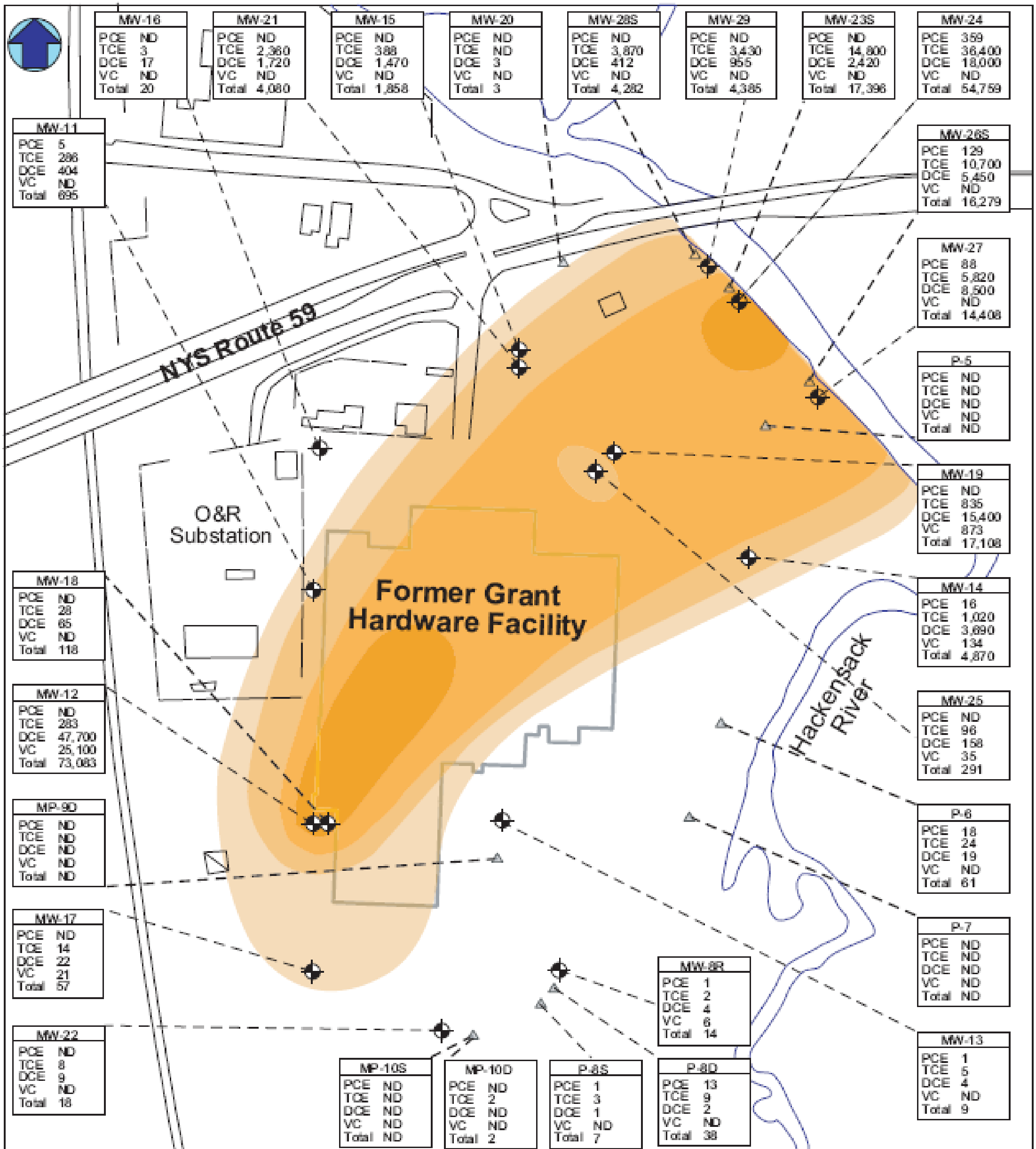


Former Grant Hardware Facility
Site ID: 344031
Groundwater Contour Diagram
Figure 2



Former Grant Hardware Facility
Site ID: 344031
Shallow Soil Contamination Exceedances
Figure 3

Samples collected June 1994



LEGEND

MW-8R Bedrock monitor well locations

P-5 Overburden piezometer / monitor well locations

Buildings

Total VOCs in GW (ug/L)

50 5,000

500 50,000+

Approximate Scale

0 100 200ft.

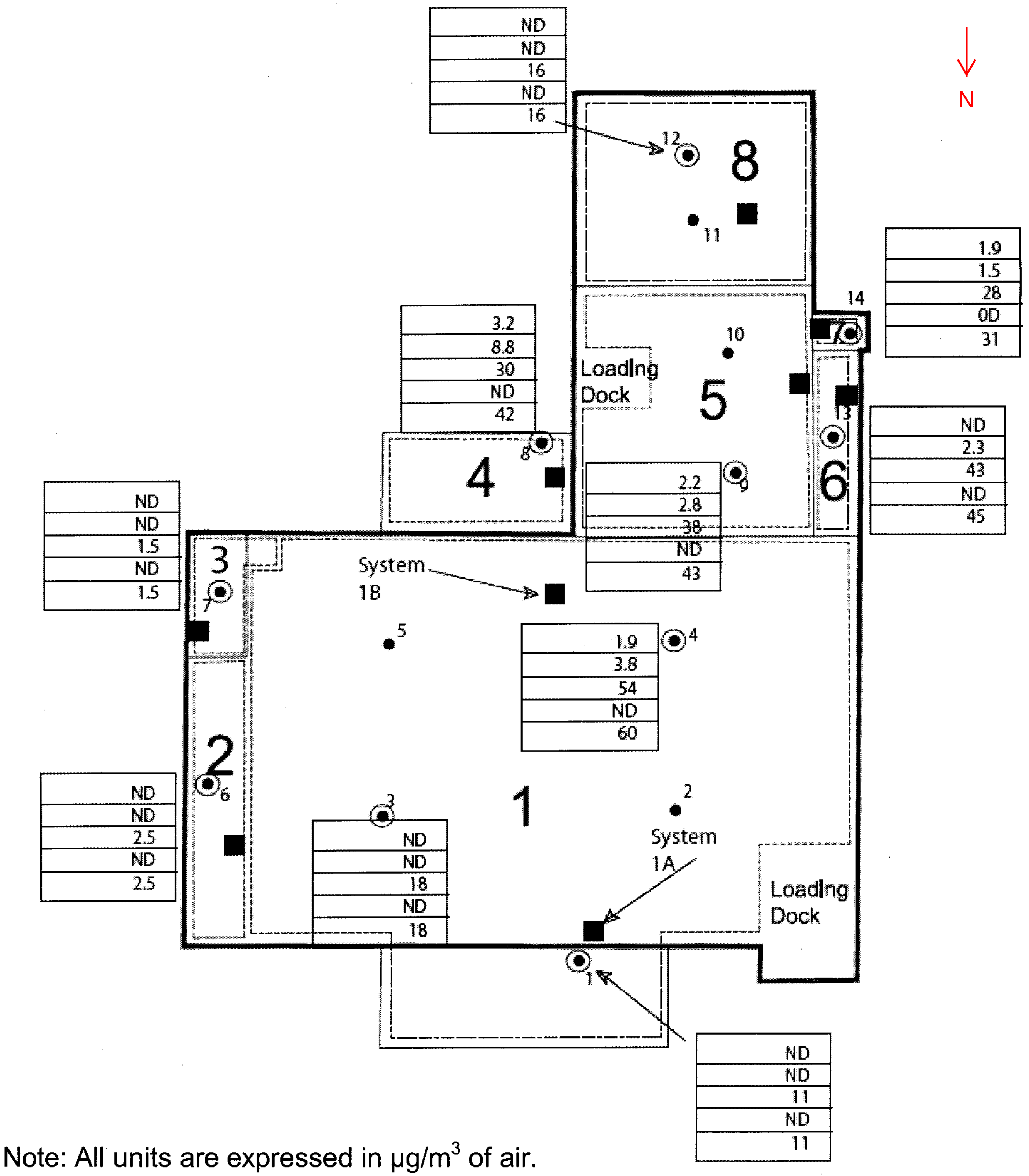
Former Grant Hardware Facility
West Nyack, New York

Site ID: 344031

Groundwater Contamination Exceedances

Figure 4

July 2008



Note: All units are expressed in μg/m^3 of air.

LEGEND

1 Area Defined by Footing Walls Designation and Approximate Size

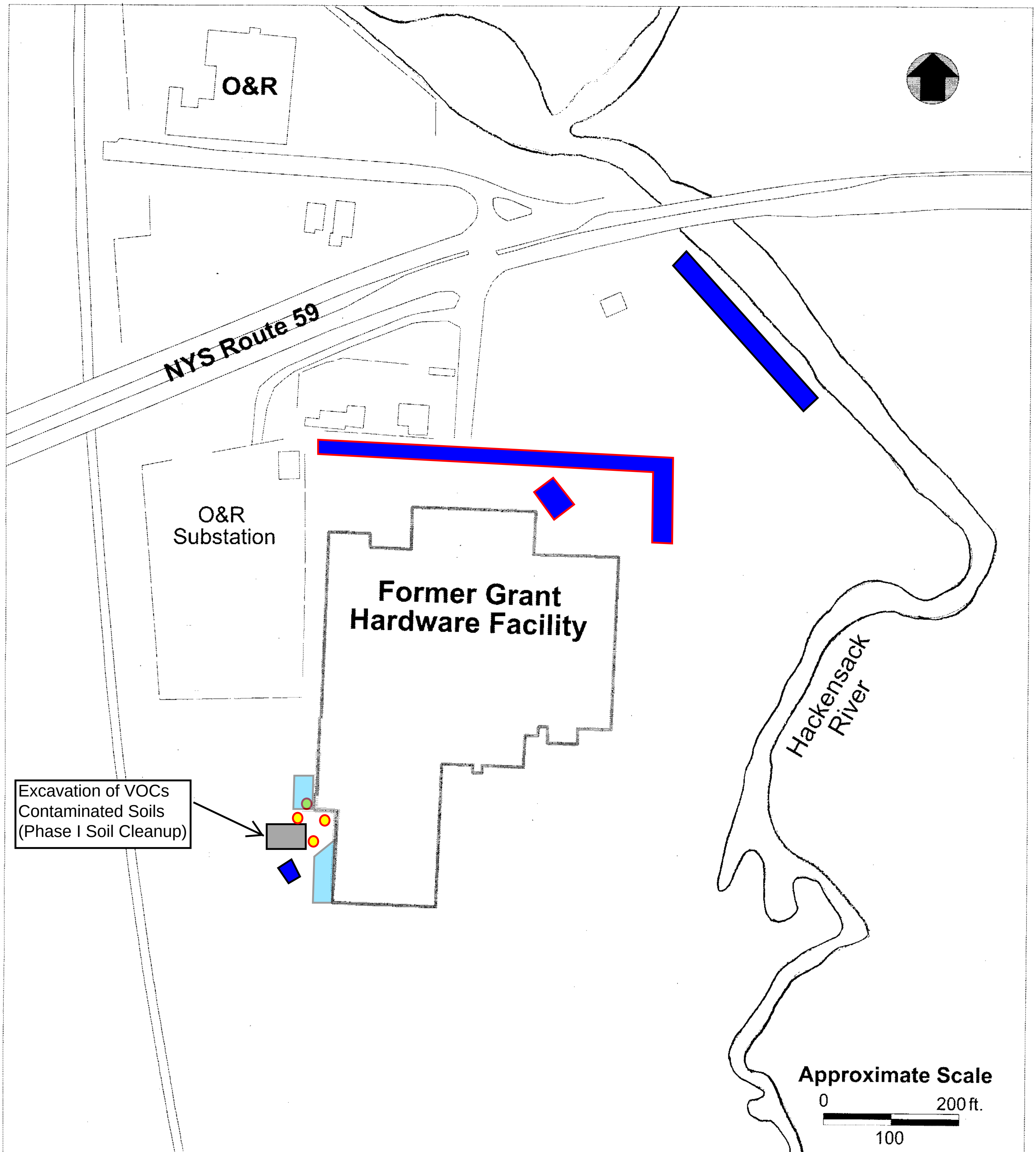
■ Location of Suction Pit for Sub-Slab Depressurization System and area of Vacuum greater than 0.02"

cis,1-2 DCE
PCE
TCE
VC
Total Above

Former Grant Hardware Facility
West Nyack, New York

Site ID: 344031
Indoor Air Results with Current Sub-Slab Depressurization Systems Turned On
Figure 5

March 2008



Location of Soil Vapor Extraction (SVE) wells for vapor mitigation and further soil cleanup (Phase II Soil Cleanup)

Bio-remediation Injection Areas

Proposed Expansion of SVE wells (Phase III Soil Cleanup)

Former Grant Hardware Facility
Site ID: 344031
Elements of the Proposed Remedy
Figure 6