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Feasibility Study
Cauterskill Road Site
Catskill, New York

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REMEDIAL ACTION

Work Assignment No.: 0003493-12
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Prepared for:

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Table of Contents

Section **Page**

1 **Introduction** **1-1**
- 1.1 Purpose of the Feasibility Study 1-1
- 1.2 Site Description 1-1
- 1.3 Site History 1-2
- 1.4 Previous Site Investigations 1-2

2 **Development of Remedial Action Objectives and Definition of Contaminated Media of Concern** **2-1**
- 2.1 Introduction 2-1
- 2.2 Soils 2-3
  - 2.2.1 Surface Soils 2-3
  - 2.2.2 Subsurface Soils 2-4
  - 2.2.3 Selection of Soil Cleanup Goals 2-5
- 2.3 Selection of Groundwater Cleanup Goals 2-8
  - 2.3.1 Standards 2-8
  - 2.3.2 Background 2-9
  - 2.3.3 Selection of Groundwater Cleanup Goals 2-9
- 2.4 Surface Water 2-10
  - 2.4.1 Selection of Surface Water Cleanup Goals 2-10
- 2.5 Sediments 2-12
  - 2.5.1 Selection of Sediment Cleanup Goals 2-13

3 **Identification of Technologies and Development of Alternatives** **3-1**
- 3.1 Identification of Technologies 3-1
  - 3.1.1 General Response Actions 3-1
  - 3.1.2 Selection of Technologies 3-2
    - 3.1.2.1 Mobility Reduction 3-2
    - 3.1.2.2 Barriers to Exposure 3-3
- 3.2 Development of Alternatives 3-4

4 **Detailed Analysis of Alternatives** **4-1**
- 4.1 Alternative 1: No Action 4-2
  - 4.1.1 Description 4-2
  - 4.1.2 Analysis 4-2
    - 4.1.2.1 Compliance with SCGs 4-2

Table of Contents (Cont.)

Section **Page**

4.1.2.2 Overall Protection of Human Health and the Environment 4-2
4.1.2.3 Short-Term Impacts and Effectiveness 4-3
4.1.2.4 Long-Term Impacts and Effectiveness 4-3
4.1.2.5 Reduction of Toxicity, Mobility, and Volume 4-3
4.1.2.6 Implementability 4-3
4.1.2.7 Cost 4-3
4.2 Alternative 2: Covering of Soils Exceeding Cleanup Goals 4-3
4.2.1 Description 4-3
4.2.2 Analysis 4-4
4.2.2.1 Compliance with SCGs 4-4
4.2.2.2 Overall Protection of Human Health and the Environment 4-4
4.2.2.3 Short-Term Impacts and Effectiveness 4-4
4.2.2.4 Long-Term Impacts and Effectiveness 4-5
4.2.2.5 Reduction of Toxicity, Mobility, and Volume 4-5
4.2.2.6 Implementability 4-5
4.2.2.7 Cost 4-5
4.3 Alternative 3: Removal of Group 1 Contaminated Soils 4-5
4.3.1 Description 4-5
4.3.2 Analysis 4-6
4.3.2.1 Compliance with SCGs 4-6
4.3.2.2 Overall Protection of Human Health and the Environment 4-7
4.3.2.3 Short-Term Impacts and Effectiveness 4-7
4.3.2.4 Long-Term Impacts and Effectiveness 4-7
4.3.2.5 Reduction of Toxicity, Mobility, and Volume 4-8
4.3.2.6 Implementability 4-8
4.3.2.7 Cost 4-8
4.4 Alternative 4: Removal of Group 2 Contaminated Soils 4-8
4.4.1 Description 4-8
4.4.2 Analysis 4-9
4.4.2.1 Compliance with SCGs 4-9
4.4.2.2 Overall Protection of Human Health and the Environment 4-9
4.4.2.3 Short-Term Impacts and Effectiveness 4-10
4.4.2.4 Long-Term Impacts and Effectiveness 4-10
4.4.2.5 Reduction of Toxicity, Mobility, and Volume 4-10
4.4.2.6 Implementability 4-11
4.4.2.7 Cost 4-11
4.5 Alternative 5: Removal of All Soils Above Cleanup Goals 4-11
4.5.1 Description 4-11
4.5.2 Analysis 4-12
4.5.2.1 Compliance with SCGs 4-12

Section Page

4.5.2.2 Overall Protection of Human Health and the Environment 4-12
4.5.2.3 Short-Term Impacts and Effectiveness 4-12
4.5.2.4 Long-Term Impacts and Effectiveness 4-12
4.5.2.5 Reduction of Toxicity, Mobility, and Volume 4-12
4.5.2.6 Implementability 4-13
4.5.2.7 Cost 4-13
4.6 Comparison of Alternatives 4-13
4.6.1 Compliance with SCGs 4-13
4.6.2 Overall Protection of Human Health and the Environment 4-13
4.6.3 Short-Term Impacts and Effectiveness 4-13
4.6.4 Long-Term Effectiveness and Permanence 4-14
4.6.5 Reduction of Toxicity, Mobility, and Volume 4-14
4.6.6 Implementability 4-14
4.6.7 Cost 4-14

5 References 5-1

Appendix

A Cost Estimate Calculations A-1

List of Tables

Table **Page**

2-1 Cleanup Goal Screening Process for Soils; Cauterskill Road Site; Catskill, New York 2-15

2-2 Contaminants Above Soil Cleanup Goals 2-19

2-3 Effective Level of Cleanup for Different Remediation Scenarios 2-21

2-4 Volumes of Each Group of Contaminated Soil 2-22

2-5 Cleanup Goal Screening Process for Groundwater; Cauterskill Road Site; Catskill, New York 2-23

2-6 Metals Above Cleanup Goals in Groundwater; Cauterskill Road Site; Catskill, New York 2-25

2-7 Cleanup Goal Screening Process for Surface Water; Cauterskill Road Site; Catskill, New York 2-26

2-8 Contaminants Above Cleanup goals in Surface Water; Cauterskill Road Site; Catskill, New York 2-28

2-9 Cleanup Goal Screening process for Sediments; Cauterskill Road Site; Catskill, New York 2-29

2-10 Contaminants in Sediments Above Cleanup Goals; Cauterskill Road Site; Catskill, New York 2-32

4-1 Cost of Alternative Two - Covering 4-15

4-2 Cost for Alternative Three - Excavation of Group 1 Soils 4-16

4-3 Comparison of Maximum Remaining Metals Concentrations; Cauterskill Road Site; Catskill, New York 4-17

4-4 Cost for Alternative Four - Excavation of Group 2 Soils 4-18

List of Tables (Cont.)

Table **Page**

4-5 Cost for Alternative Five - Excavation of Group 3 Soils 4-19

List of Illustrations

Figure **Page**

1-1 Cauterskill Road Site Location Map 1-5

1-2 Site Plan; Cauterskill Road Site; Catskill, New York 1-7

2-1 Phase I RI Sample Locations; Cauterskill Road Site; Catskill, New York 2-33

2-2 Surface Soil Sample Results Exceeding Cleanup Goals; Cauterskill Road Site; Catskill, New York 2-35

2-3 Subsurface Soil Sample Results Exceeding Cleanup Goals; Cauterskill Road Site; Catskill, New York 2-37

2-4 Group 1 Soils 2-39

2-5 Group 2 Soils 2-41

2-6 Group 3 Soils 2-43

2-7 Groundwater Sample Results Exceeding Cleanup Goals; Cauterskill Road; Catskill, New York 2-45

2-8a Surface Water Sample Results Exceeding Cleanup Goals (Phase I RI); Cauterskill Road; Catskill, New York 2-47

2-8b Surface Water Sample Results Exceeding Cleanup Goals) (Phase II RI) Cauterskill Road, Catskill, New York 2-49

2-9 Sediment Sample Results Exceeding Cleanup Goals (Phase I RI); Cauterskill Road 2-51

2-10 Sediment Sample Results Exceeding Cleanup goals; Cauterskill Road; Catskill, New York 2-53

4-1 Area to be Covered for Alternative 2 4-21

1

Introduction

E & E
Ecology and Environment Engineering, P.C.

NYSDEC
New York State Department of Environmental Conservation

FS
feasibility study

EPA
United States Environmental Protection Agency

TAGM
Technical and Administrative Guidance Memorandum

RAO
remedial action objective

1.1 Purpose of the Feasibility Study

Ecology and Environment Engineering, P.C., (E & E) under the State Superfund Contract, New York State Department of Environmental Conservation (NYSDEC), Work Assignment No. D003493-12, was tasked to perform a feasibility study (FS) at the Cauterskill Road Site (NYSDEC Site No. 4-20-024) in Catskill, New York, (see Figure 1-1) in order to determine what areas of the site may require cleanup and to evaluate alternative approaches to meeting cleanup objectives. This FS was conducted in substantial accordance with the United States Environmental Protection Agency's (EPA's) *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA 540/G-89/004) and NYSDEC's Technical and Administrative Guidance Memorandum (TAGM) 4030, *Selection of Remedial Actions at Inactive Hazardous Waste Sites.* However, because of the rather small size of the site and the limited range of contaminants, the process was streamlined. Rather than screening the entire realm of potential applicable technology types, only those technologies that are applicable to the contaminant types and site conditions were considered after an evaluation of the options with respect to technical implementability.

The development of remedial action objectives (RAOs) is presented in Section 2. The identification of appropriate technologies and development of alternatives are presented in Section 3, and the analysis of remedial alternatives is presented in Section 4.

1.2 Site Description

The Cauterskill Road Site is a private residence located at 5040 and 5048 Cauterskill Road in the Town of Catskill, Greene County, New York (see Figures 1-1 and 1-2). The site is located in a rural area of Catskill, just east of the northbound lanes of the New York State (NYS) Thruway (Route 87), on the east side of Cauterskill Road (County Highway 47) north of State Route 23A.

The original 13.3-acre parcel has been subdivided into two parcels (5.4 acres to the north [5040 Cauterskill Road] and 7.9 acres to the south [5048 Cauterskill Road]). The southern parcel is partially wooded and contains a log house, a two-story brick house, a shed, and a garage. The northern parcel is also partially wooded and contains a one-story frame house, a garage, two wood barns, and a chicken coop (see Figure 1-2). A north/south-trending ravine, approximately 15 feet deep, traverses through the center of both parcels. The ravine contains an intermittent tributary to Kaaterskill Creek. Kaaterskill Creek is located approximately 0.7 mile north of the site property.

RI
remedial investigation

This site includes all areas of the property used for the storage and disposal of off-spec plating solutions and untreated plating sludges before 1993. The plating wastes originated from the former Catskill Chrome Plating Company (NYSDEC Site No. 4-20-023) located at 370 West Bridge Street in the southwest corner of the Village of Catskill. Wastes are believed to have been stored and disposed of on slightly over one-half acre of the northern parcel. Some portions of the property are covered with various fill materials including asphalt, metal debris, tires, domestic trash, and empty steel drums. Drums of waste and off-spec material also are believed to be buried at the site. During the remedial investigation (RI), exposed wastes, metallic machinery, and other debris were noted along the embankment adjacent to the intermittent tributary between the base of the slope next to the 5040 residence and a dirt road along the tributary (see Figure 1-2).

Private residences are located immediately north of the site, and the Town of Catskill Highway Department is located immediately south along Cauterskill Road. The land east of the property is undeveloped and owned by Peckham Materials Corp.

1.3 Site History

The Cauterskill Road Site was the location of the residence of Henry Helmedach Jr. and his wife Evelyn Helmedach, the former owners of the Catskill Chrome Plating Company. The plating company, located at 370 West Bridge Street, operated from 1948 to January 1993. Wastes from the facility reportedly were disposed of at the Cauterskill Road Site from the mid-1980s to December 1992. These wastes consisted of an undetermined amount of off-spec plating solutions; untreated plating sludges containing cyanide, chromium, cadmium, copper, nickel, and zinc; and tanks of acid and rinse water. In 1994, Evelyn Helmedach and her son, Paul Helmedach, pleaded guilty to disposing of these wastes in more than one-half acre of the site. The site currently is owned by Patricia Helmedach.

1.4 Previous Site Investigations

Several investigations into the site's environmental conditions have been conducted. These investigations included testing of residential wells by the New York State Department of Health

NYSDOH
New York State Department of Health

VOC
volatile organic compound

(NYSDOH), soil and water sampling conducted by or for NYSDEC, and soil sampling conducted by EPA.

Drinking water samples were collected from several residences on Cauterskill Road by NYSDOH as early as May 9, 1989, and submitted for metals and volatile organic compound (VOC) analyses. The only compound reportedly detected above regulatory limits was sodium.

In March 1993, Roy F. Weston, Inc., under contract to EPA, collected several soil samples from the site and submitted them for metals analyses. High levels of several metals were detected, including cyanide.

An investigation of the site by the law enforcement division of NYSDEC culminated with an application for a search warrant submitted on April 22, 1993. The investigation included interviews with several former employees of Paul Helmedach, all of whom confirmed the dumping of wastes from the plating company at the residence. Drums of material allegedly were either emptied over the embankment of the tributary to Kaaterskill Creek that runs along the eastern side of the property, or buried at the site. Dumped wastes identified by these former employees included spent plating solutions, unidentified acids, old chrome stripping solution, and old potash. During the investigation, it also was discovered that when activities at West Bridge Street terminated in December 1992, some of the operations were moved to the garage next to the Helmedach residence. In January 1993, when equipment was being moved to the garage, a large (approximately 4,000 pounds) pile of hardened cyanide waste was dumped in a clearing behind the barns at the site. Interviewees also stated that waste from a Schenectady electroplater was dumped at the property. Analysis of aerial photographs taken of the property, and an independent investigation performed at about the same time by the office of the Attorney General of the State of New York, confirmed some of these activities.

In April 1993, execution of the search warrant resulted in the sampling of containers, soil, surface water, and sediment, performed by the Division of Environmental Enforcement, Bureau of Technical Services Central Office and Central Field Unit, accompanied by NYSDEC personnel. This effort also confirmed the dumping of rubbish along the embankment of the stream.

In December 1993, NYSDEC collected two surface water samples, one upstream and one downstream of the site, and analyzed them for cadmium, copper, nickel, zinc, and cyanide. Only low levels of zinc were detected. Additionally, two surface soil samples, one from a depression at the north end of the site and one from a stained area near a tractor trailer at the south end of the site, were collected and analyzed for the same suite of metals. Concentrations of all of these metals were determined to be high in both samples.

On January 20, 1994, NYSDOH collected samples of drinking water from the Helmedach and surrounding residences and submitted them for VOC, ketone, inorganic, and cyanide analyses. Only sodium was determined to be present at elevated levels.

On February 10, 1997, a NYSDEC site investigation was conducted to confirm the presence of high levels of cyanide, cadmium, and chromium in soil. Additionally, surface water samples were collected from the tributary to Kaaterskill Creek. Based on the results of this investigation, the site was classified as a Class 2 hazardous waste site.

On February 21, 1997, NYSDOH conferred the Class 2 classification of the site.

In December 1998 and January and March 1999, E & E conducted RI field investigations that consisted of surface soil, subsurface soil, groundwater, surface water, sediment, and exposed waste investigation and sampling. A fish and wildlife impact analysis also was conducted, as was a site reconnaissance, a geophysical survey, and a records search. Results of this RI are presented in the Cauterskill Road RI report (E & E 1999a, 1999b). During this time period, NYSDEC performed a removal action of chemicals reported to be stored at the site.

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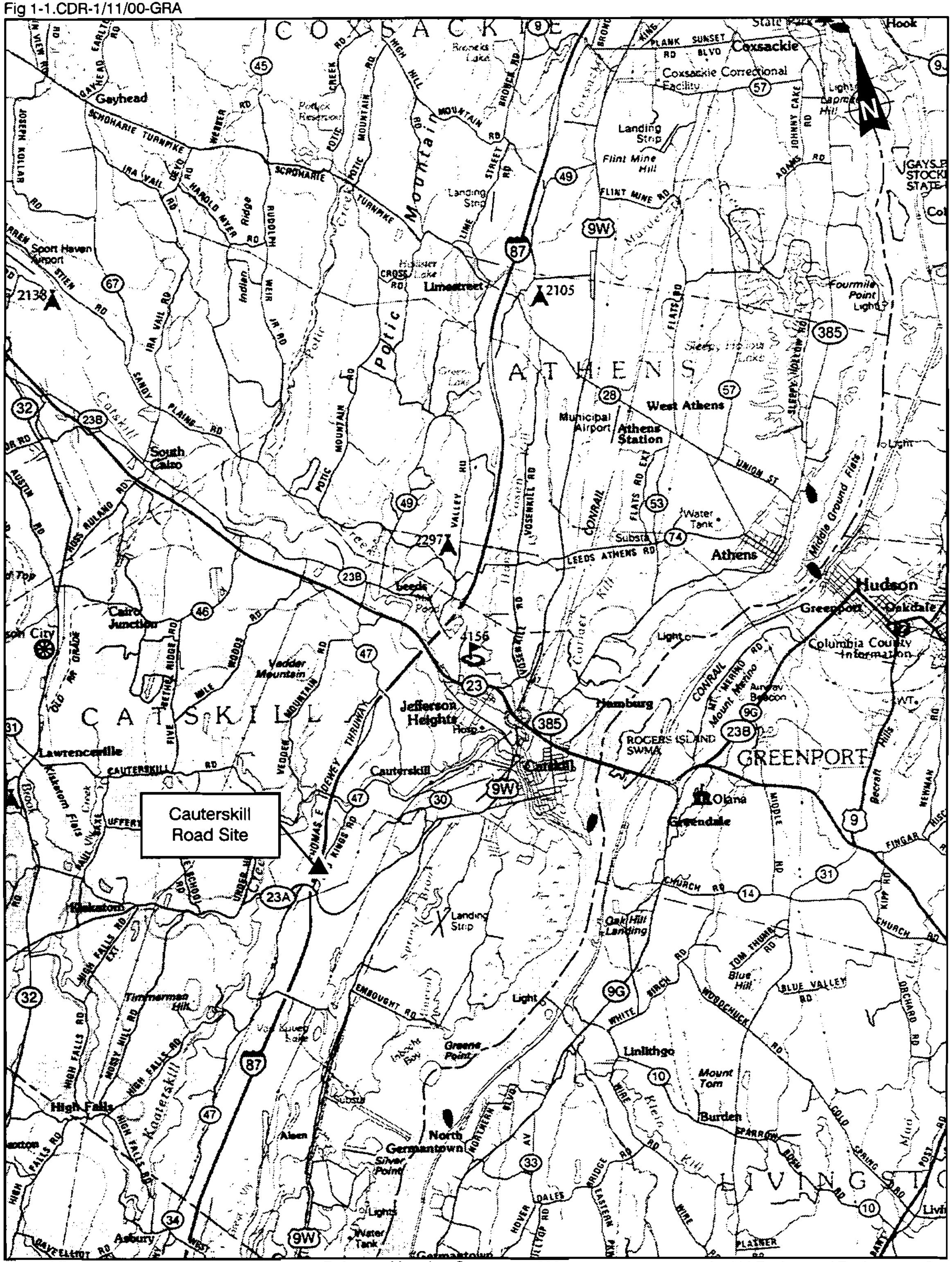
Fig 1-1.CDR-1/11/00-GRA



SOURCE: *New York State Atlas and Gazetteer*, DeLorme Mapping Company, 1988.

APPROXIMATE SCALE
0 1 2 Miles

Figure 1-1 CAUTERSKILL ROAD SITE LOCATION MAP

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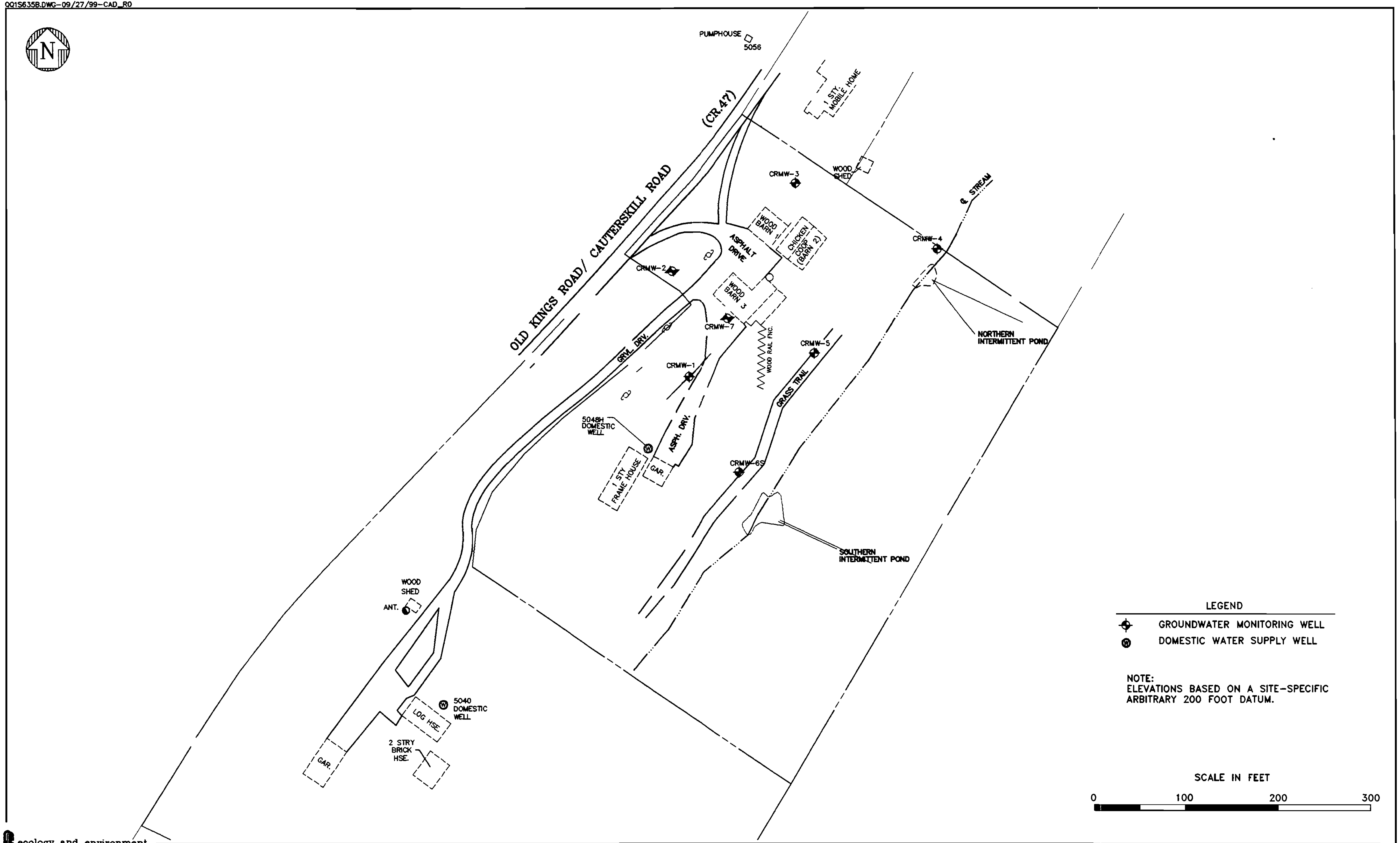

Figure 1-2 SITE PLAN
CAUTERSKILL ROAD SITE
CATSKILL, NEW YORK

2

Development of Remedial Action Objectives and Definition of Contaminated Media of Concern

2.1 Introduction

SVOC
semivolatile organic compound

pest/PCBs
pesticides/polychlorinated biphenyls

SCGs
standards, criteria, and guidance

CERCLA
Comprehensive Environmental Response, Compensation, and Liability Act

This FS addresses contamination in surface water, sediment, surface soils, subsurface soils, and groundwater at the Cauterskill Road Site. Chemicals analyzed for at this site include VOCs, semivolatile organic compounds (SVOCs), pesticides/polychlorinated biphenyls (pest/PCBs), and metals.

A fish and wildlife impact analysis was performed at this site to evaluate possible negative effects that the site may be exerting on biota of the surrounding area. Based on information collected during the field surveys, terrestrial wildlife, plants, and invertebrates could be impacted by soil contamination at the site, particularly PCBs and certain metals such as cadmium, chromium, lead, and zinc. These potential impacts were identified using a wildlife risk analysis and by screening contaminant data against available benchmarks.

The RAOs for this site are to reduce exposure to contamination either by restricting access to contaminants or reducing contaminant concentrations to acceptable levels.

To define the area or volume of each medium that must be addressed to meet the RAOs, chemical-specific cleanup goals were developed for each medium at this site. These cleanup goals were developed based on an evaluation of standards and other criteria and guidance (SCGs). This evaluation determined those levels at which the contaminants can be present but that are still deemed protective of human health and the environment.

Standards refer to promulgated and legally enforceable rules or regulations. *Criteria* and *guidance* refer to policy documents that are nonpromulgated and are therefore not legally enforceable.

The SCGs presented in this report are in accordance with Section 121(d)(2) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). They are also consistent with EPA guidance values set forth in the CERCLA Oil

CFR
Code of Federal Regulations

OSWER
Office of Solid Waste and Emergency Response

and Hazardous Substances National Oil and Hazardous Substances Pollution Contingency Plan (40 Code of Federal Regulations [CFR] 300; the two-part document entitled, *CERCLA Compliance with Other Laws Manual* (Office of Solid Waste and Emergency Response [OSWER] Directives 9234.1-01 [Draft], August 8, 1988, and 9234.1-02, August 1989); and the document entitled, *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA-540/G-89/004).

There are three types of SCGs:

- **Chemical-Specific SCGs.** Usually health- or risk-based numerical values or methodologies that establish an acceptable amount or concentration of a chemical in the ambient environment;
- **Action-Specific SCGs.** Usually technology- or activity-based requirements for remedial actions; and
- **Location-Specific SCGs.** Restrictions placed on the concentration of hazardous substances or the conduct of activity solely because the activities occur in special locations.

Only chemical-specific SCGs address cleanup goals. Action-specific and location-specific SCGs, if applicable, are discussed in Section 4 in relation to specific remedial alternatives.

Cleanup goals are established by evaluating the available SCGs for each contaminant. In general, this process selects standards as preliminary screening values. If no standards exist for a given contaminant, the most appropriate criterion or guidance value is selected as a preliminary screening value. The preliminary screening values then are compared to site-specific background values to ensure that no preliminary screening value is set below background concentrations. If the site-specific background concentration is higher than the SCG-based preliminary screening value, then the background concentration is selected as the preliminary screening value instead. These preliminary screening values then are compared to site data to identify which contaminants may require cleanup. These contaminants then are considered with regard to other factors influencing the need for cleanup, including comparison to regional background levels and an evaluation of contamination. The cleanup goals set by this process then are compared again to site data in order to identify areas that must be addressed in the FS.

This process is completed for each medium. Because the nature of the SCGs is different for each medium, the details of this process are medium-specific. These details are presented in each medium-specific section below. Each section describes and presents illustrations showing the extent of contamination exceeding the cleanup goals, and these areas and volumes form the basis for the remedial technology selection and alternative development sections in this FS.

2.2 Soils

2.2.1 Surface Soils

JCL
Joseph C. Lu Engineering

BGS
below ground surface

TCL
Target Compound List

TAL
Target Analyte List

COC
contaminant of concern

On December 10 and 11, 1998, 42 surface soil samples (CRSS-1 through CRSS-42) were collected by the E & E and Joseph C. Lu Engineers (JCL) field team. At that time, the ambient temperature was above the freezing point, so the ground was not yet frozen. The samples were collected from 0 inches to 2 inches below ground surface (BGS) at randomly selected nodes along a grid with 25-foot spacing, as indicated in the work plan (see Figure 2-1). Table 2-2 of the RI report summarizes the surface soil sample identification number, collection date and location, analyses, and lithology. Although only 41 samples were to be collected according to the work plan, a supplementary sample was added at the request of the NYSDEC project manager. This sample, CRSS-42, was collected from the floor inside Barn 3 (see Figure 2-1). Soil samples CRSS-6, CRSS-11, CRSS-19, CRSS-26, CRSS-27, CRSS-34, CRSS-37, and CRSS-41 were analyzed for Target Compound List (TCL) VOCs, TCL SVOCs, TCL pest/PCBs, Target Analyte List (TAL) metals (consisting of 23 metals), cyanide, and hexavalent chromium. The rest of the surface soil samples were analyzed for cadmium, chromium, copper, nickel, lead, zinc, and cyanide.

The main contaminants of concern (COCs) in surface soils at this site are metals. The evaluation of metals is complicated by the natural presence of metal in soil. Therefore, to ensure that the evaluation of metals in soils at this site was meaningful, an average background soil concentration was established through collection of five off-site background surface soil samples (CRSS-BG-1 through CRSS-BG-5). These samples were collected from the site property along hill slopes south and east (east side of the tributary to Kaaterskill Creek) of the disposal areas (see Figure 2-1). These sample locations are topographically upgradient of the site; thus, it is highly unlikely that they ever receive solid or liquid effluent from the disposal areas. Background surface soil sample CRSS-BG-1 was analyzed for TCL VOCs, TCL SVOCs, TCL pest/PCBs, TAL metals, cyanide, and hexavalent chromium. The other four background samples were tested for cadmium, chromium, copper, nickel, lead, zinc, and cyanide.

Analytical surface soil and sediment results are shown in Tables 5-2 and 5-3, respectively, of the RI report for the Cauterskill Road Site.

2.2.2 Subsurface Soils

Subsurface soil samples were collected during two investigative activities at the site: test pit excavations and monitoring well boreholes. Each activity is described below.

Test Pits

Ten test pits (CRTP-1 through CRTP-10) were excavated and backfilled from January 5 to 8, 1999, by SJB Services, Inc., under the supervision of the E & E and JCL field team. The test pits were excavated in order to determine the composition of the subsurface, and to delineate possible areas of contamination through visual observations and chemical analyses. The test pit locations were selected based on physical site features and geophysical survey results. The subsurface soil samples were collected directly from the backhoe bucket using a dedicated stainless-steel spoon.

At least one soil sample was collected from all but two of the 10 test pits. CRTP-1 did not present any unusual soil conditions; therefore, a sample was not collected from this pit. At the direction of the NYSDEC site manager, two samples were collected from CRTP-8 and CRTP-9. The reason was the extended length of the test pits (i.e., 36 feet and 43 feet, respectively).

All test pit samples were analyzed for TCL VOCs, TCL SVOCs, TCL pest/PCBs, TAL metals, cyanide, and hexavalent chromium. Locations of all of the test pit samples collected at this site are shown in Figure 2-1, and the sample analytical results are presented in Table 5-3 of the RI report for the Cauterskill Road Site.

Monitoring Well Boreholes

Six monitoring wells (CRMW-1 through CRMW-6) were drilled and installed from January 8 to January 25, 1999, by SJB Services, Inc., under the supervision of the E & E and JCL field team (see Figure 2-1). The purpose of the installation was to evaluate the groundwater conditions in the shallowest aquifer. One subsurface soil sample was planned to be collected from each borehole; however, because of the shallow nature of the bedrock (i.e., 1.25 feet to 6 feet BGS) and poor sample recovery, only two subsurface soil samples (CRMW-5SB and CRMW-6SB) were collected.

Subsurface soil sample CRMW-5SB was analyzed for TCL VOCs, TCL SVOCs, TCL pest/PCBs, TAL metals, and hexavalent chromium, and subsurface soil sample CRMW-6SB was analyzed for TCL VOCs only. The analytical results are shown in Table 5-3 of the RI report for the Cauterskill Road Site.

2.2.3 Selection of Soil Cleanup Goals

TSCA
Toxic Substances Control Act

USC
United States Code

mg/kg
milligrams per kilogram

ppm
parts per million

RBC
risk-based concentration

SSL
soil screening level

Standards

Based on the Toxic Substances Control Act (TSCA) surface soil criterion (15 United States Code [USC] 2601), a standard was identified for PCBs in soil at the Cauterskill Road Site. The recommended screening levels for the two PCBs detected, Aroclor 1254 and Aroclor 1260, is 1.0 milligram per kilogram (mg/kg).

Criteria and Guidance Values

The main criteria and guidance values identified for soils at the Cauterskill Road Site include the TSCA surface soil criterion (5 USC 2601); EPA's *Revised Soil Lead Guidance* (OSWER Directive) 9355.4-1, July 1994), which recommends a screening level of 400 parts per million (ppm) for lead in soil for residential land use; EPA, Region III, risk-based concentrations (RBCs; April 1999); EPA soil screening levels (SSLs; 1996); and NYSDEC TAGM 4046 (1994). Criteria and guidance values for contaminants detected at this site are shown in Table 2-1. Hexavalent chromium was not detected in any surface soil sample. Furthermore, laboratory hexavalent chromium spike recoveries were rather low, suggesting that there are naturally occurring reducing agents present in the soil that can convert hexavalent chromium to trivalent chromium naturally. Thus, trivalent chromium guidance values were used for screening total chromium concentrations.

The TAGM 4046 value for cadmium was updated from the 1994 value of 1 mg/kg (or site background) to 10 mg/kg (or site background). This update has not been published in a revised TAGM but is included pursuant to directions by NYSDEC staff.

Background

Site-specific background surface soil sample data are used to ensure that the preliminary screening values are not set below background levels. In addition, many of the metals screening values recommended by TAGM 4046 are based on background concentrations. The background values were calculated as twice the arithmetic mean of the concentrations of the five background surface soil samples. This was done in order to provide an estimate of the mean plus three standard deviations. These background values are shown in Table 5-1 of the RI report for the Cauterskill Road Site.

Selection Process

The cleanup goal screening process for surface soil is presented in Table 2-1. The following logical basis was used to select the preliminary cleanup values presented in this table:

- The lowest of the EPA, Region III, RBCs; EPA SSLs; or NYSDEC TAGM 4046, where they existed, was selected as the preliminary cleanup value, except for lead. For lead, the EPA *Revised Soil Lead Guidance* value was used. Because lead is a common contaminant at many waste sites, this metal has received increased attention, resulting in this commonly accepted value for site cleanups. Thus, this value is used instead of the TAGM 4046 value (site background), which is lower:
- For PCBs, the TSCA standard was selected;
- This value then was compared to the background value to ensure that the preliminary cleanup values are not set below the background concentration;
- The preliminary cleanup values then were compared to the maximum observed concentrations for each compound in order to determine whether each compound may require cleanup; and
- Finally, the contaminants identified for cleanup were reviewed to determine whether they are site-related or whether cleanup actually is warranted.

Based on this process, it was found that in the surface soil, subsurface soil, and sediment samples, eight SVOCs (di-n-butyl phthalate, benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, chrysene, dibenzo[a,h]anthracene, and indeno[1,2,3-cd]pyrene), two PCBs (Aroclor 1254 and Aroclor 1260), and 15 metals (arsenic, cadmium, calcium, chromium, copper, iron, lead, magnesium, nickel, potassium, selenium, silver, sodium, thallium, and zinc) were detected above cleanup goals, as summarized in Table 2-2.

Figures 2-2 and 2-3 show these contaminants and their associated concentrations above cleanup goals.

Table 2-2 shows that 15 metals were found to exceed background concentrations or other values used as cleanup goals. Of these 15, calcium is presumed to be present mainly from the limestone (calcium carbonate) bedrock outcropping at the site.

The magnesium, iron, potassium, and likewise sodium likewise could be considered to be naturally occurring, despite being above the estimated background concentrations. Of the remaining 10 metals, four (arsenic, selenium, silver, and thallium) were present only at very low levels (less than 25 µg/kg) that are only marginally above the background levels, so these metals should not be the main drivers for remediation. The six other metals (cadmium, chromium, copper, lead, nickel, and zinc) were found well above their background levels/cleanup goals, are associated with plating wastes, and are the main drivers for determining which areas require cleanup.

Even if only these six metals were to be considered when evaluating the scope of the cleanup, many surface and subsurface samples still would be considered contaminated because of the presence of one or more of these metals above cleanup goals, as evident in Figures 2-2 and 2-3. To gain a better perspective on the extent of contamination, the data presented in these illustrations can be examined more subjectively by evaluating not simply whether a sample exceeded a single metals cleanup goal, but also the number of different metals that were present and the degree to which cleanup goals were exceeded. For this analysis, soil samples above cleanup goals were placed into three groups.

The first group comprises surface soil samples CRSS-5, CRSS-14, CRSS-20, CRSS-25, CRSS-34, CRSS-39, and CRSS-41, and test pit samples CRTP-5 and CRTP-7. These samples present the highest levels of most metals contamination present at the site, including zinc at 5,760 mg/kg in CRSS-25, nickel at 9,840 mg/kg in CRSS-34, lead at 1,160 mg/kg in CRSS-20, copper at 4,600 mg/kg in CRSS-14, and cadmium at 39.3 mg/kg in CRSS-14. In addition, all of these samples contained two or more of the main metals of concern above cleanup goals. CRTP-7 also included elevated polycyclic aromatic hydrocarbons (PAHs), and CRSS-14 also contained Aroclor 1260 at 4,900 micrograms per kilogram.

PAHs
polycyclic aromatic hydrocarbons

The second group includes all of the first group, plus surface soil samples CRSS-6, CRSS-8, CRSS-11, CRSS-17, CRSS-18, CRSS-19, CRSS-22, and CRSS-26. These soils are characterized by an exceedance of only one metal of main concern, or by containing more than one metal of concern but not at concentrations greatly exceeding cleanup goals.

The third group includes all of the second group, plus surface soil samples CRSS-10, CRSS-15, CRSS-24, CRSS-27, CRSS-37, and CRSS-42; test pit samples CRTP-2, CRTP-3, CRTP-4, CRTP-5, CRTP-6, CRTP-8, CRTP-9, and CRTP-10; and monitoring well soil boring CRMW-5SB. This group includes all soil samples above cleanup goals. Many of these sample locations, including the test pit areas CRTP-2, CRTP-3, CRTP-5, and CRTP-8, are included for their exceedances of selenium, silver, and/or thallium, which (as noted above) were never found more than slightly above the background-based cleanup goals and therefore are not considered major COCs.

The definition of these three groups is based on the overall levels of contamination, not on specific contaminant concentrations of specific metals. However, the effective levels of cleanup for each metal for each scenario (addressing Groups 1, 2, or 3) are presented in Table 2-3.

Volumes of contaminated soil associated with each group were estimated. The contamination depth was assumed to be 6 inches for surface soil samples and 6 feet for subsurface soil samples (test pits and monitoring well boreholes). Furthermore, the areas of contamination assumed to be associated with contaminated samples were estimated depending on the concentration level: the higher the concentration, the bigger the area to be excavated around each sampling point. Figures 2-4 to 2-6 present the areas represented by each of the three scenarios.

Table 2-4 summarizes the calculation of the volumes corresponding to each scenario. This table shows that the first group, comprising the most heavily contaminated soils, represents an estimated 475 cubic yards of contaminated soil, while adding the second group (the next most heavily contaminated soils) increases the volume to an estimated 1,039 cubic yards. This contrasts with the total volume of soil present above background-based cleanup goals (Group 3) of about 1,937 cubic yards.

Because of the dramatic variation in the amount of soil that would be addressed by each scenario, each group is evaluated in separate remedial alternatives in Section 4.

2.3 Selection of Groundwater Cleanup Goals

2.3.1 Standards

Standards identified for groundwater at the Cauterskill Road Site are the NYSDEC Class GA maximum contaminant levels (June 1998). These standards are shown in Table 2-5.

2.3.2 Background

Site-specific background groundwater data are used to ensure that the preliminary cleanup values are not set below background levels. Data from monitoring well sample CRMW-2 was used as background values, because this sample was upgradient of the site. These background values also are shown in Table 2-5.

2.3.3 Selection of Groundwater Cleanup Goals

The cleanup goal screening process for groundwater is presented in Table 2-5. The following logical basis was used to select the preliminary cleanup values presented in this table:

- As the sole standard, the NYSDEC Class GA guidance value was selected as the preliminary cleanup value, where it existed;
- This value then was compared to the background value to ensure that the preliminary cleanup values are not set below the background concentration. For example, at this site, sodium was found at high levels in the background well, possibly because of the use of salt for deicing operations in the region;
- The preliminary cleanup values then were compared to the maximum observed concentrations for each compound in order to determine whether each compound may require cleanup; and
- Finally, the contaminants identified for cleanup were reviewed to determine whether they are site-related or whether cleanup actually is warranted.

Based on this process, it was concluded that four metals (iron, mercury, sodium, and thallium) were detected above cleanup goals in the groundwater of the Cauterskill Road Site, as shown in Table 2-6.

Iron was located in monitoring well samples in the north-northwest section of the site. The single monitoring wells that contained mercury and thallium at levels above cleanup goals are located in the northwest portion of the site. Figure 2-7 shows these metals and their associated concentrations above cleanup goals.

Iron is a naturally occurring component of the soils and underlying bedrock of the site and does not appear to increase across the site, suggesting that it is wholly naturally occurring. Thus, iron is not addressed further in this FS. Additionally, thallium and mercury were detected in only one groundwater sample location each at concentrations only marginally above their cleanup goals.

Designing a remediation program around these single samples is not warranted, especially because these metals do not appear to be related to any pattern of contamination at the site. Therefore, groundwater contamination at this site does not need to be addressed.

2.4 Surface Water

Nine surface water samples (CRSW-1 through CRSW-9) were collected on January 26, 1999, and two more surface water samples (CRSW-11 and CRSW-12) were collected on June 30, 1999.

The following surface water samples were analyzed for TCL VOCs, TCL SVOCs, TCL pest/PCBs, hardness, pH, TAL metals, cyanide, and hexavalent chromium: CRSW-1, CRSW-3, CRSW-6, CRSW-6/D (field duplicate of CRSW-6), and CRSW-9.

The surface water samples CRSW-11 and CRSW-12 were analyzed for PAHs, pest/PCBs, TAL metals, cyanide, and hexavalent chromium. All of the other samples were analyzed for hardness, pH, Cd, Cr, Cu, Ni, Pb, Zn, and total cyanide. Analytical surface water sample results are shown in Table 5-5 of the RI report for the Cauterskill Road Site.

2.4.1 Selection of Surface Water Cleanup Goals

Standards

Standards identified for surface water at the Cauterskill Road Site include the EPA Ambient Water Quality Criteria (AWQC) for the protection of aquatic life, the EPA AWQC for the protection of human health, and the NYSDEC Class C surface water standards. Standards for contaminants detected at this site are shown in Table 2-7.

AWQC
Ambient Water Quality Criteria

Criteria and Guidance Values

The only guidance values identified for the Cauterskill Road Site are the EPA Ecotox threshold values (January 1996). Guidance values for contaminants detected at this site also are shown in Table 2-7.

Background

Samples CRSW-1 and CRSW-13 were collected upstream of the site and may be considered representative of background concentrations. However, the values of metals and compounds in these samples were not used as specific criteria for evaluating and selecting cleanup goals.

Selection Process

The cleanup goal screening process for surface water is presented in Table 2-7. The following logical basis was used to select the preliminary cleanup values presented in this table:

- The most stringent of the standards, the EPA AWQC for protection of aquatic life, the EPA AWQC for protection of human health, or the NYSDEC Class C surface water standards was selected as the preliminary cleanup value, where they existed;
- If none of the standards listed above existed, the EPA Ecotox threshold guidance value was selected as the preliminary cleanup value;
- The preliminary cleanup values then were compared to the maximum observed concentrations for each compound in order to determine whether each compound may require cleanup; and
- Finally, the contaminants identified for cleanup were reviewed to determine whether they are site-related or whether cleanup actually is warranted.

Based on this process, it was concluded that one SVOC (bis[2-ethylhexyl]phthalate) and six metals (aluminum, barium, cadmium, iron, silver, and cyanide) were detected above cleanup goals, as shown in Table 2-8 and in Figures 2-8a and 2-8b. Not all samples were analyzed for all analytes, as reflected in the denominator of "Number of Exceedances."

Except for barium (which exceeded standards in all samples for which this metal was analyzed), most of the surface water samples (8/13, including duplicates) did not exceed the standards. Because barium was present in all samples, including the upgradient sample CDSW-1, it is not considered site-related. Barium concentrations were higher downgradient in samples CRSW-11 and CRSW-12; however, CRSW-11 was collected from a tributary to the pond that has not received runoff from, or is otherwise impacted by, the site, and CRSW-12 was collected from a pond that has received water from the main tributary and this secondary tributary. Thus, these higher levels downstream of the site cannot be interpreted as meaning that the site contributed these metals to the surface water.

The samples that exceeded other metals primarily exceeded the iron and aluminum standards, indicating the presence of suspended materials, those that are likely naturally occurring. Silver also was detected in surface water, but it was present in the upgradient samples as well, indicating that it is not site-related. For these reasons, metals contamination of surface water is not addressed in this FS.

Unlike the metals, cyanide contamination appears to be site-related. This contamination was found in samples collected adjacent to the site. While cyanide was not identified as a COC in the soil based on direct contact exposure scenarios inherent in the evaluated TBC criteria, it was present in more than half the surface soil samples at concentrations mostly in the 1- to 10-mg/kg range, with the highest result of 48.5 mg/kg. Not only was cyanide not present in soils at levels that could pose direct exposure hazards, it also was not generally collocated with the metals contamination discussed in Section 2.2.

Although cyanide in soils appears to be the source of cyanide contamination in the surface water, there is no need to address it as a remediation requirement in this FS for either the soil or the groundwater, based on two considerations:

- The creek segments where the cyanide has been observed are intermittent streams. The Class C standards are set for protection of aquatic life, yet the existence of aquatic life is limited much more severely by the fact that the creek is often dry. Farther downstream, where water is permanently present, cyanide concentrations do not exceed standards; and
- The detected cyanide concentrations (10 micrograms per liter [µg/L] to 11 µg/L) exceed the Class C standard of 5.2 µg/L, which is based on the EPA quality standard for continuous exposure (chronic value). However, based on the intermittent nature of the creek, a more appropriate value would be the acute exposure level, which is calculated by EPA as 22 µg/L. The fact that the levels are only marginally above the chronic standard and are actually below the acute level indicates that cyanide is not a concern.

µg/L
Micrograms per liter

2.5 Sediments

Seventeen sediment samples (CRSD-1 through CRSD-17) and three duplicate samples (CRSD-5D, CRSD-12D, and CRSD-17D) were collected from December 11, 1998, to June 30, 1999.

The following analyses were performed for the sediment samples: TOC, TCL VOC, SVOC, pesticide, PCB, TAL metals (consisting of 23 metals), cyanide, hexavalent chromium, and percent solids.

Table 2-12 of the RI report for the Cauterskill Road Site summarizes the tests run on each sediment sample.

Analytical sediment results are shown in Table 5-6 of the RI report for the Cauterskill Road Site.

2.5.1 Selection of Sediment Cleanup Goals

Standards

There are no standards identified for sediments.

Criteria and Guidance Value

ER-L
effects range-low

LEL
lowest effect level

The main criteria and guidance values identified for sediments are the NYSDEC *Technical Guidance for Screening Contaminated Sediments*, January 1999; the EPA OSWER January 1996 *ECO Update* Ecotox thresholds; the effects range-low (ER-L) values of Long and Morgan (1991) used by the National Oceanic and Atmospheric Administration; and the Ontario Ministry of Environment Proposed Sediment Quality Criteria, lowest effect level (LEL), 1988.

Background

Samples CRSD-1 and CRSD-13 were collected upgradient of the site and may be considered representative of background concentrations. However, the values of metals and compounds in these samples were not used as specific criteria for evaluating and selecting cleanup goals.

Selection Process

The cleanup goal screening process for sediment is presented in Table 2-9. The following basis was used to select the preliminary cleanup values presented in this table:

- The lowest of the Ecotox threshold, the Long and Morgan ER-L, the NYSDEC sediment screening level (for organics) or LEL (for metals), or the Ontario Ministry of Environment LEL, where they existed, was selected as the preliminary cleanup value;
- The preliminary cleanup values then were compared to the maximum observed concentrations for each compound in order to determine whether each compound may require cleanup; and
- Finally, the contaminants identified for cleanup were reviewed to determine whether they are site-related or whether cleanup actually is warranted.

TEA
toxic effect analysis

Figures 2-9 and 2-10 show these contaminants and their associated concentrations above cleanup goals. A diverse set of contaminants exceeded the identified criteria. However, because these cleanup goals are set on generic criteria, not site-specific analyses, a site-specific toxic effect analysis (TEA) was performed for the sediments at this site. The results of the TEA are presented in Section 6 of the RI report. This analysis found that there was no adverse impact on the stream posed by the sediment contaminants. Because the site-specific impacts are estimated to be negligible, no remedial efforts are required, especially considering that most remedial efforts would inflict damages on the habitat by their implementation.

Based on this process, it was found that in the sediment samples, a wide variety of PAHs and nine metals (antimony, arsenic, cadmium, copper, iron, lead, magnesium, nickel, and zinc) were detected above cleanup goals, as summarized in Table 2-10. sediments at this site. The results of the TEA are presented in Section 6 of the RI report. This analysis found that there was no adverse impact on the stream posed by the sediment contaminants. Because the site-specific impacts are estimated to be negligible, no remedial efforts are required, especially considering that most remedial efforts would damage the habitat.

Table 2-1 Cleanup Goal Screening Process for Soils; Cauterskill Road Site; Catskill, New York (Concentrations in mg/kg Unless Noted)

	Standards	Criteria and Guidance Values							
	Federal	Federal			State				
Contaminants	TSCA [a]	Soil Lead Guidance	EPA, Region III, RBCs [c]	EPA Soil Screening Levels [d]	NYSDEC TAGM 4046	Background	Preliminary cleanup value	Maximum Conc.	Cleanup Goal
Volatiles									
Methylene chloride	—	—	85	85	0.1	NA	0.1	0.002	—
Acetone	—	—	7,800	7,800	0.20	—	0.20	0.086	—
Toluene	—	—	16,000	16,000	1.5	—	1.5	0.002	—
Semivolatiles									
Bis(2-ethylhexyl)phthalate	—	—	46	46	50	NA	46	3.2	—
Butylbenzyl phthalate	—	—	16,000	16,000	50	NA	50	0.14	—
Di-n-butyl phthalate	—	—	—	7,800	8.1	NA	8.1	14	8.1
Diethyl phthalate	—	—	63,000	63,000	7.1	—	7.1	0.082	—
Dibenzofuran	—	—	310	—	6.2	NA	6.2	0.48	—
Carbazole	—	—	32	32	—	NA	32	1.5	—
2-Methyl-naphthalene	—	—	1,600	—	36.4	—	36.4	0.74	—
Acenaphthylene	—	—	—	—	41	NA	41	0.81	—
Acenaphthene	—	—	4,700	4,700	50	NA	50	1.3	—
Anthracene	—	—	23,000	23,000	50	NA	50	3.5	—
Benzo(a)anthracene	—	—	0.87	0.90	0.224	NA	0.224	11	0.224
Benzo (a)pyrene	—	—	0.087	0.09	0.061	NA	0.061	11	0.061
Benzo(b)fluoranthene	—	—	0.87	0.90	1.1	NA	0.87	9.7	0.87
Benzo(k)fluoranthene	—	—	8.7	9.0	1.1	0.13	1.1	7.7	1.1
Benzo(g,h,i)perylene	—	—	—	—	50	NA	50	1.6	—
Chrysene	—	—	87	88	0.40	0.18	0.40	12	0.40

Table 2-1 Cleanup Goal Screening Process for Soils; Cauterskill Road Site; Catskill, New York (Concentrations in mg/kg Unless Noted)

	Standards	Criteria and Guidance Values							
	Federal	Federal			State				
Contaminants	TSCA [a]	Soil Lead Guidance	EPA, Region III, RBCs [c]	EPA Soil Screening Levels [d]	NYSDEC TAGM 4046	Background	Preliminary cleanup value	Maximum Conc.	Cleanup Goal
Dibenzo(a,h)anthracene	—	—	0.087	0.09	0.014	NA	0.014	0.83	0.014
Fluoranthene	—	—	3,100	3,100	50	0.30	50	22	—
Fluorene	—	—	3,100	3,100	50	NA	50	1.1	—
Indeno(1,2,3-cd)pyrene	—	—	0.87	0.90	3.2	NA	0.87	1.8	0.87
Naphthalene	—	—	1,600	3,100	13	—	13	0.47	—
Pentachlorophenol	—	—	5.3	3.0	1.0	—	1.0	0.20	—
Phenanthrene	—	—	—	—	50	0.22	50	12	—
Pyrene	—	—	2,300	2,300	50	0.22	50	13	—
Pest/PCBs									
Aldrin	—	—	0.038	0.04	0.04	—	0.038	0.013	—
Dieldrin	—	—	0.04	0.04	0.044	NA	0.04	0.016	—
Endrin	—	—	23	23	0.10	NA	0.10	0.04	—
Methoxychlor	—	—	390	390	—	NA	390	0.18	—
Endrin ketone	—	—	—	—	—	NA	—	0.08	—
alpha-Chlordane	—	—	1.8	0.50	0.54	NA	0.50	0.008	—
gamma-Chlordane	—	—	1.8	0.50	0.54	NA	0.50	0.013	—
Heptachlor epoxide	—	—	0.07	0.07	0.02	NA	0.02	0.087	—
4,4'-DDT	—	—	1.9	2.0	2.1	NA	1.9	0.04	—
Aroclor 1254	1.0	—	0.32	1.0	1.0	NA	1.0	1.2	1.0
Aroclor 1260	1.0	—	0.32	1.0	1.0	NA	1.0	4.9	1.0

Table 2-1 Cleanup Goal Screening Process for Soils; Cauterskill Road Site; Catskill, New York (Concentrations in mg/kg Unless Noted)

	Standards	Criteria and Guidance Values							
	Federal	Federal			State				
Contaminants	TSCA[a]	Soil Lead Guidance	EPA, Region III, RBCs[c]	EPA Soil Screening Levels[d]	NYSDEC TAGM 4046	Background	Preliminary cleanup value	Maximum Conc.	Cleanup Goal
Metals									
Aluminum	—	—	78,000	—	—	20,800	78,000	21,800	—
Antimony	—	—	31	31	—	9.45	31	6.2	—
Arsenic	—	—	0.43	0.40	7.5	19.4	19.4	21.2	19.4
Barium	—	—	5,500	5,500	300	600	600	329	—
Beryllium	—	—	160	0.10	0.14	3.0	3.0	1.4	—
Cadmium	—	—	39	78	10	4.2	10	39.3	10
Calcium	—	—	—	—	SB	33,400	33,400	158,000	33,400
Chromium	—	—	120,000	390	SB	25.8	24.8	865	25.8
Cobalt	—	—	4,700	—	SB	25	25	14.9	—
Copper	—	—	3,100	—	SB	64.4	59.9	4,600	64.4
Iron	—	—	23,000	—	SB	34,600	34,600	61,600	34,600
Lead	—	400	—	400	SB	187	400	1,160	400
Magnesium	—	—	—	—	SB	3,060	3,060	10,800	3,060
Manganese	—	—	1,600	—	SB	17,960	17,960	4,570	—
Mercury	—	—	—	—	0.10	0.54	0.54	0.25	—
Nickel	—	—	1,600	1,600	SB	75.6	70.7	9,840	75.6
Potassium	—	—	—	—	SB	2,780	2,780	3,290	2,780
Selenium	—	—	390	390	SB	3.8	3.8	14.9	3.8
Silver	—	—	390	390	0.1[e]	0.5	0.5	3.4	0.5
Sodium	—	—	—	—	SB	171	171	184	171
Thallium	—	—	5.5	—	0.1[e]	0.5	0.5	5.9	0.5

Table 2-1 Cleanup Goal Screening Process for Soils; Cauterskill Road Site; Catskill, New York (Concentrations in mg/kg Unless Noted)

	Standards	Criteria and Guidance Values							
	Federal	Federal			State				
Contaminants	TSCA [a]	Soil Lead Guidance	EPA, Region III, RBCs [c]	EPA Soil Screening Levels [d]	NYSDEC TAGM 4046	Background	Preliminary cleanup value	Maximum Conc.	Cleanup Goal
Vanadium	—	—	550	550	SB	54.2	54.2	30.6	—
Zinc	—	—	23,000	23,000	SB	325	305	5,760	325
Cyanide	—	—	1,600	1,600	—	3.2	1,600	48.5	—

[a] EPA OSWER, July 1994, OSWER Directive 9355.4-12, *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities.*

[b] TSCA (15 USC 2601) surface soil criterion.

[c] EPA, Region III, Risk-Based Concentration Tables, April 1999.

[d] EPA OSWER, July 1996 soil screening guidance levels.

[e] TAGM 404 b guidance value: SB. Because background value was nondetect, the contract-required detection limit is listed.

Key:

— = No screening value available or applicable.
Conc. = Concentration.
EPA = United States Environmental Protection Agency.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
NYSDEC = New York State Department of Environmental Conservation.
OSWER = Office of Solid Waste and Emergency Response.
Pest/PCBs = Pesticides/polychlorinated biphenyls.
RBCs = Risk-based concentrations.
SB = Site background.
TAGM = Technical and Administrative Guidance Memorandum.
TSCA = Toxic Substances Control Act.
USC = United States Code.

Table 2-2 Contaminants Above Soil Cleanup Goals

Contaminant	Cleanup Goal (mg/kg)	Number of Exceedances	Concentration Range (mg/kg)
Semivolatiles			
Di-n-butyl phthalate	8.1	1 - Surface soil	14.0
Benzo(a)anthracene	0.224	2 - Surface soil 3 - Subsurface soil	0.23 - 1.6 1 - 11
Benzo(a)pyrene	0.061	5 - Surface soil 4 - Subsurface soil	0.078 - 1.8 0.069 - 11
Benzo(b)fluoranthene	0.87	1 - Surface soil 1 - Subsurface soil	2.3 9.7
Benzo(k)fluoranthene	1.1	1 - Surface soil 1 - Subsurface soil	1.8 7.7
Chrysene	0.40	1 - Surface soil 3 - Subsurface soil	1.9 1.1 - 12
Dibenzo(a,h)anthracene	0.014	3 - Surface soil 3 - Subsurface soil	0.050 - 0.260 0.11 - 0.83
Indeno(1,2,3-cd)pyrene	0.87	1 - Subsurface soil	1.8
PCBs			
Aroclor 1254	1.0	1 - Surface soil	1.2
Aroclor 1260	1.0	1 - Surface soil	4.9
Metals			
Arsenic	19.4	1 - Subsurface soil	21.2
Cadmium	10	7 - Surface soil 2 - Subsurface soil	14.1 - 39.3 10.4 - 11.2
Calcium	33,400	3 - Subsurface soil 1 - Subsurface soil	39,400 - 158,000 53,500
Chromium	25.8	11 - Surface soil 3 - Subsurface soil	30.7 - 865 27.2 - 81.7
Copper	64.4	12 - Surface soil 2 - Subsurface soil	68 - 4,600 180 - 1,130
Iron	34,600	3 - Surface soil 2 - Subsurface soil	37,400 - 55,800 42,500 - 61,600
Lead	400	2 - Surface soil	527 - 1,160
Magnesium	3,060	8 - Surface soil 9 - Subsurface soil	3,310 - 7,000 3,970 - 10,800

Table 2-2 Contaminants Above Soil Cleanup Goals

Contaminant	Cleanup Goal (mg/kg)	Number of Exceedances	Concentration Range (mg/kg)
Nickel	75.6	8 - Surface soil 2 - Subsurface soil	88.4 - 9,840 108 - 1,200
Potassium	2,780	1 - Subsurface soil	3,290
Selenium	3.8	11 - Subsurface soil 1 - Subsurface soil	5.7 - 14.9 4.8
Silver	0.5	7 - Subsurface soil 1 - Subsurface soil	0.64 - 3.4 1.1 J
Sodium	171	1 - Subsurface soil	184
Thallium	0.5	12 - Subsurface soil 1 - Subsurface soil	0.94 - 8.5 2.2
Zinc	325	11 - Surface soil	348 - 5,760

Key:

mg/kg = Milligrams per kilogram.
PCBs = Polychlorinated biphenyls.

Table 2-3 Effective Level of Cleanup for Different Remediation Scenarios

Selected Metals of Main Concern	Maximum Concentration Remaining in Soil Following Remediation of Group 1 Soils (mg/kg)	Maximum Concentration Remaining in Soil Following Remediation of Group 2 Soils (mg/kg)	Group 3 Soils Include All Soils Above These Cleanup Goals Identified in Table 2-1 (mg/kg)
Cadmium	39.1	11.2	10
Chromium	86.5	81.7	24.8
Copper	1,130	71.5	59.9
Lead	<400	<400	400
Nickel	611	108	70.7
Zinc	1,540	386	305

Key:

mg/kg = Milligrams per kilogram.

Table 2-4 Volumes of Each Group of Contaminated Soil

Sample	Area (square feet)	Depth (feet)	Volume (cubic feet)
Group 1 Soils			
SS- 5	900	0.5	450
SS - 14	1,500	0.5	750
SS - 20	800	0.5	400
SS - 25D	1,800	0.5	900
SS - 34	1,600	0.5	800
SS - 41	1,000	0.5	500
TP - 5	780	6.00	4,680
TP - 7	525	6	3,150
Adjustment	2,385	0.5	1,193
	11,290		12,823
Group 2 is Group 1 Plus These Soils			
SS - 6	850	0.5	425
SS - 8	600	0.5	300
SS - 11	2,000	0.5	1,000
SS - 17	1,800	0.5	900
SS - 18	1,800	0.5	900
SS - 19	900	0.5	450
SS - 22	1,100	0.5	550
SS - 26	850	0.5	425
TP - 10	1,700	6.0	10,200
Adjustment	175	0.5	88
	11,775		15,238
Group 3 is Group 2 Plus These Soils			
SS-10	300	0.5	150
SS - 15	700	0.5	350
SS - 24	445	0.5	223
SS - 27	700	0.5	350
SS - 37	500	0.5	250
SS - 42	370	0.5	185
TP - 2	300	6.0	1,800
TP - 3	350	6.0	2,100
TP - 4	350	6.0	2,100
TP - 6	365	6.0	2,190
TP - 8	300	6.0	1,800
TP - 9-2	1,750	6.0	10,500
MW - 5	300	6.0	1,800
Adjustment	875	0.5	438
	7,605		24,235

Notes: Adjustment: inclusion of areas between adjacent samples, and exclusion of areas that overlap between closely spaced samples.

Group 1 soils volume (yd^3)	475	Group 1 soils area (ft^2)	11,290
Group 2 soils volume (yd^3)	1,039	Group 2 soils area (ft^2)	23,065
Group 3 soils volume (yd^3)	1,937	Group 3 soils area (ft^2)	30,670

Key:

ft^2 = Square feet.

yd^3 = Cubic yards.

Table 2-5 Cleanup Goal Screening Process for Groundwater; Cauterskill Road Site; Catskill, New York (Concentrations in µg/L Unless Noted)

	Standards				
	State				
Contaminant	NYSDEC Class GA MCL	Background (CRMW-2)	Preliminary Screening Value	Maximum Concentration	Cleanup Goal
Volatiles					
Toluene	5.0	ND	5.0	1.0	—
Trichloroethene	5.0	ND	5.0	2.0	—
Semivolatiles					
Bis(2-ethylhexyl) phthalate	5.0	3.0	5.0	5.0	—
Butylbenzyl phthalate	50[a]	ND	50	2.0	—
Di-n-butylphthalate	50	ND	50	3.0	—
Metals					
Aluminum	—	247	—	2,490	—
Arsenic	25	4.8	25	4.8	—
Barium	1,000	123	1,000	221	—
Cadmium	5.0	ND	5.0	0.53	—
Calcium	—	75,700	—	148,000	—
Chromium	50	ND	50	48.4	—
Cobalt	—	ND	—	22.7	—
Copper	200	ND	200	43.6	—
Iron	300[b]	607	607	2,510	607
Lead	25	ND	25	5.9	—
Magnesium	35,000[a]	9,850	35,000	35,000	—
Manganese	300[b]	18.8	300	197	—
Mercury	0.7	ND	0.7	1.1	0.7
Nickel	100	1.2	100	98.2	—
Potassium	—	1,180	—	13,300	—
Silver	50	ND	50	1.9	—
Sodium	20,000	12,200	20,000	226,000	20,000
Thallium	0.5[a]	ND	0.5	5.2	0.5
Vanadium	—	0.92	—	4.4	—
Zinc	2,000[a]	7.1	2,000	64.7	—

Table 2-5 Cleanup Goal Screening Process for Groundwater; Cauterskill Road Site; Catskill, New York (Concentrations in µg/L Unless Noted)

	Standards				
	State				
Contaminant	NYSDEC Class GA MCL	Background (CRMW-2)	Preliminary Screening Value	Maximum Concentration	Cleanup Goal
Cyanide	200	ND	200	14	—
Hexavalent chromium	50	ND	50	50	—

[a] Guidance value. No standard exists.

[b] Standard corresponds to protection for aesthetics (fresh water). No standard exists for protection of source of drinking water (groundwater).

Key:

— = No screening value available or applicable.
MCL = Maximum contaminant level.
µg/L = Micrograms per liter.
ND = Not detected.
NYSDEC = New York State Department of Environmental Conservation.

Table 2-6 Metals Above Cleanup Goals in Groundwater; Cauterskill Road Site; Catskill, New York

Contaminant	Cleanup Goal (µg/L)	Number of Exceedances	Concentration Range (µg/L)
Iron	607	3/10	785 - 2,510
Mercury	0.7	1/10	1.1
Sodium	20,000	9/10	32,200 - 226,000
Thallium	0.5	1/10	5.2

Key:

µg/L = Micrograms per liter.

Table 2-7 Cleanup Goal Screening Process for Surface Water; Cauterskill Road Site; Catskill, New York (Concentrations in µg/L Unless Noted)

	Standards			Guidance Values			
	Federal		State	Federal			
Contaminant	EPA AWQC for Protection of Aquatic Life	EPA AWQC for Protection of Human Health	NYSDEC Class C Surface Water Standards	Ecotox Threshold [a]	Preliminary Screening Value	Maximum Concentration	Cleanup Goal
Semivolatiles							
Bis(2-ethylhexyl)phthalate	—	5.9	0.6	32	0.6	5.0	0.6
Butylbenzyl phthalate	—	—	—	19	19	1.0	—
Metals							
Aluminum	—	—	100	—	100	435	100
Antimony	—	4,300	—	—	4,300	3.5	—
Barium	—	—	—	3.9	3.9	88.1	3.9
Calcium	—	—	—	—	—	96,200	—
Iron	—	—	300	1,000	300	547	300
Magnesium	—	—	—	—	—	9,740	—
Manganese	—	—	—	80	80	244	—
Nickel	160	4,600	149	160	149	1.3	—
Potassium	—	—	—	—	—	2,250	—
Silver	—	—	0.1	—	0.1	1.8	0.1
Sodium	—	—	—	—	—	250,000	—
Vanadium	—	—	14	19	14	0.88	—

Table 2-7 Cleanup Goal Screening Process for Surface Water; Cauterskill Road Site; Catskill, New York (Concentrations in µg/L Unless Noted)

Contaminant	Standards			Guidance Values	Preliminary Screening Value	Maximum Concentration	Cleanup Goal
	Federal		State	Federal			
	EPA AWQC for Protection of Aquatic Life	EPA AWQC for Protection of Human Health	NYSDEC Class C Surface Water Standards	Ecotox Threshold [a]			
Zinc	110	—	30	100	30	7.1	—
Cyanide	5.2	220,000	5.2	5.2	5.2	11.0	5.2

[a] EPA OSWER, January 1996, ECO Update Ecotox thresholds.

Key:

— = No guidance value available or applicable.
AWQC = Ambient Water Quality Criteria.
EPA = United States Environmental Protection Agency.
µg/L = Micrograms per liter.
NYSDEC = New York State Department of Environmental Conservation.
OSWER = Office of Solid Waste and Emergency Response.

Table 2-8 Contaminants Above Cleanup Goals in Surface Water; Cauterskill Road Site; Catskill, New York

Contaminant	Cleanup Goal (µg/L)	Number of Exceedances	Concentration Range (µg/L)
Semivolatiles			
Bis(2-ethylhexyl)phthalate	0.6	2/5	3 - 5
Metals			
Aluminum	100	5/8	312 - 435
Barium	3.9	8/8	24.9 - 88.1
Iron	300	5/8	325 - 547
Silver	0.1	5/8	1.5 - 1.7
Cyanide	5.2	3/13	10 - 11

Key:

µg/L = Micrograms per liter.

Table 2-9 Cleanup Goal Screening Process for Sediments; Cauterskill Road Site; Catskill, New York (Concentrations in mg/kg Unless Noted)

	Standards								
	Federal Guidance		State Guidance[a]			Other Guidance			
Contaminants	Ecotox Threshold[b]	Long and Morgan (ER-L)[c]	Sediment Screening Level	Lowest Effect Level	Severe Effect Level	Ontario Ministry of Environment[d] (LEL)	Preliminary cleanup value	Maximum Concentration	Cleanup Goal
Semivolatiles									
Bis(2-ethylhexyl)phthalate	—	—	12.4[e]	—	—	—	12.4	0.11	—
Acenaphthene	0.016	0.15	8.8[e]	—	—	—	0.016	2.7	0.016
Acenaphthylene	—	—	—	—	—	—	—	0.39	—
Anthracene	—	0.09	6.7[e]	—	—	—	0.09	0.33	0.09
Benzo(a)anthracene	—	0.23	0.75[e]	—	—	—	0.23	1.3	0.23
Benzo(a)pyrene	0.43	0.40	0.08[f]	—	—	—	0.08	1.42	0.08
Benzo(b)fluoranthene	—	—	0.08[f]	—	—	—	0.08	0.94	0.08
Benzo(g,h,i)perylene	—	—	—	—	—	—	—	0.755	—
Benzo(k)fluoranthene	—	—	0.08[f]	—	—	—	0.08	0.94	0.08
Carbazole	—	—	—	—	—	—	—	0.075	—
Chrysene	—	0.40	0.08[f]	—	—	—	0.08	1.8	0.08
Dibenzo(a,h)anthracene	—	0.06	—	—	—	—	0.06	0.25	0.06
Fluoranthene	0.6	0.6	63.5[e]	—	—	—	0.6	4.56	0.6
Fluorene	0.54	0.04	0.50[e]	—	—	—	0.04	0.28	0.04
Indeno(1,2,3-cd)pyrene	—	—	0.08[f]	—	—	—	0.08	0.869	0.08
Phenanthrene	0.24	0.23	7.47[e]	—	—	—	0.23	1.76	0.23
Pyrene	0.66	0.35	59.8[e]	—	—	—	0.35	2.29	0.35
Pest/PCBs									
Aroclor 1254	0.023	0.05[h]	0.09[g]	—	—	1.7[i]	0.023	0.084	0.023
Aldrin	—	—	0.05[g]	—	—	0.002	0.002	0.02	0.002

Table 2-9 Cleanup Goal Screening Process for Sediments; Cauterskill Road Site; Catskill, New York (Concentrations in mg/kg Unless Noted)

	Standards								
	Federal Guidance		State Guidance[a]			Other Guidance			
Contaminants	Ecotox Threshold[b]	Long and Morgan (ER-L)[c]	Sediment Screening Level	Lowest Effect Level	Severe Effect Level	Ontario Ministry of Environment[d] (LEL)	Preliminary cleanup value	Maximum Concentration	Cleanup Goal
DDE	—	0.002	0.06[c,g]	—	—	0.005	0.002	0.015	0.002
Heptachlor Epoxide	—	—	0.002[g]	—	—	—	0.002	0.14	0.002
Methoxychlor	0.019	—	0.037	—	—	—	0.019	0.26	0.019
Metals									
Aluminum	—	—	—	—	—	—	—	26,300	—
Antimony	—	2.0	—	2.0	25	—	2.0	2.7	2.0
Arsenic	8.2	33	—	6.0	33	5.5	5.5	15	5.5
Barium	—	—	—	—	—	—	—	263	—
Beryllium	—	—	—	—	—	—	—	1.5	—
Cadmium	1.2	5.0	—	0.6	9.0	1.0	0.6	5.4	0.6
Calcium	—	—	—	—	—	—	—	33,100	—
Chromium	81	80	—	26	110	31	26	30.6	26
Cobalt	—	—	—	—	—	—	—	14.2	—
Copper	34	70	—	16	110	25	16	52.4	16
Iron	—	—	—	20,000	40,000	30,000	20,000	46,200	20,000
Lead	47	35	—	31	110	31	31	79	31
Magnesium	—	—	—	—	—	—	—	4,540	—
Manganese	—	—	—	460	1,100	457	457	1,990	457
Mercury	0.15	0.15	—	0.15	1.3	0.12	0.12	0.083	—
Nickel	21	30	—	16	50	31	16	68.8	16
Potassium	—	—	—	—	—	—	—	2,820	—

Table 2-9 Cleanup Goal Screening Process for Sediments; Cauterskill Road Site; Catskill, New York (Concentrations in mg/kg Unless Noted)

	Standards								
	Federal Guidance		State Guidance[a]			Other Guidance			
Contaminants	Ecotox Threshold[b]	Long and Morgan (ER-L)[c]	Sediment Screening Level	Lowest Effect Level	Severe Effect Level	Ontario Ministry of Environment[d] (LEL)	Preliminary cleanup value	Maximum Concentration	Cleanup Goal
Selenium	—	—	—	—	—	—	—	11.3	—
Silver	—	1	—	1	1	—	1	0.7	—
Sodium	—	—	—	—	—	—	—	202	—
Thallium	—	—	—	—	—	—	—	2.9	—
Vanadium	—	—	—	—	—	—	—	39.5	—
Zinc	150	120	—	120	270	110	110	201	110
Cyanide	—	—	—	—	—	—	—	4.51	—

[a] NYSDEC *Technical Guidance for Screening Contaminated Sediments*, January 1999 (using the average of the measured TOC results (62,250 ppm).

[b] EPA OSWER, January 1996 *ECO Update* Ecotox thresholds.

[c] Long and Morgan, ER-L, 1991.

[d] Ontario Ministry of Environment Proposed Sediment Quality Criteria, LEL, 1988.

[e] NYSDEC site-specific criterion for benthic aquatic life chronic toxicity was used.

[f] NYSDEC site-specific criterion for human health bioaccumulation was used.

[g] NYSDEC site-specific criterion for wildlife bioaccumulation was used.

[h] Value is for total PCBs.

[i] Value assumes 5% TOC.

Key:

— = No screening value available or applicable.
ER-L = Effects range-low.
LEL = Lowest effect level.
mg/kg = Milligrams per kilogram.
NYSDEC = New York State Department of Environmental Conservation.
OSWER = Office of Solid Waste and Emergency Response.
PCBs = Polychlorinated biphenyls.
Pest/PCBs = Pesticides/polychlorinated biphenyls.
ppm = Parts per million.
TOC = Total organic carbon.

Table 2-10 Contaminants in Sediments Above Cleanup Goals; Cauterskill Road Site; Catskill, New York

Contaminant	Cleanup Goal (mg/kg)	Number of Exceedances	Concentration Range (mg/kg)
Semivolatiles			
Acenaphthene	0.016	4/20	0.21 - 2.7
Anthracene	0.09	6/20	0.120 - 0.330
Benzo(a)anthracene	0.23	7/20	0.081 - 1.3
Benzo(a)pyrene	0.08	10/20	0.045 - 1.42
Benzo(b)fluoranthene	0.08	7/20	0.200 - 0.94
Benzo(k)fluoranthene	0.08	8/20	0.201 - 0.94
Chrysene	0.08	11/20	0.126 - 1.8
Dibenzo(a,h)anthracene	0.06	3/20	0.12 - 0.25
Fluoranthene	0.6	5/20	0.787 - 4.56
Fluorene	0.04	6/20	0.041 - 0.28
Indeno(1,2,3-cd)pyrene	0.08	8/20	0.041 - 0.869
Phenanthrene	0.23	6/20	0.325 - 1.76
Pyrene	0.35	6/20	0.4 - 2.29
Aroclor	0.023	1/9	0.077
Aldrin	0.002	2/9	0.0039-0.02
DDE	0.002	1/9	0.015
Heptachlor Epoxide	0.002	6/9	0.0023-0.14
Methoxychlor	0.019	2/9	0.024-0.26
Metals			
Antimony	2.0	2/20	2.3 - 2.7
Arsenic	5.5	8/20	7.6 - 15
Cadmium	0.6	17/20	0.83 - 5.40
Copper	16	18/20	16.1 - 52.4
Iron	20,000	12/20	20,700 - 46,200
Lead	31	8/20	32.2 - 79.0
Manganese	457	8/20	463 - 1,990
Nickel	16	16/20	17.9 - 68.8
Zinc	110	7/20	143 - 201

Key:

mg/kg = Milligrams per kilogram.

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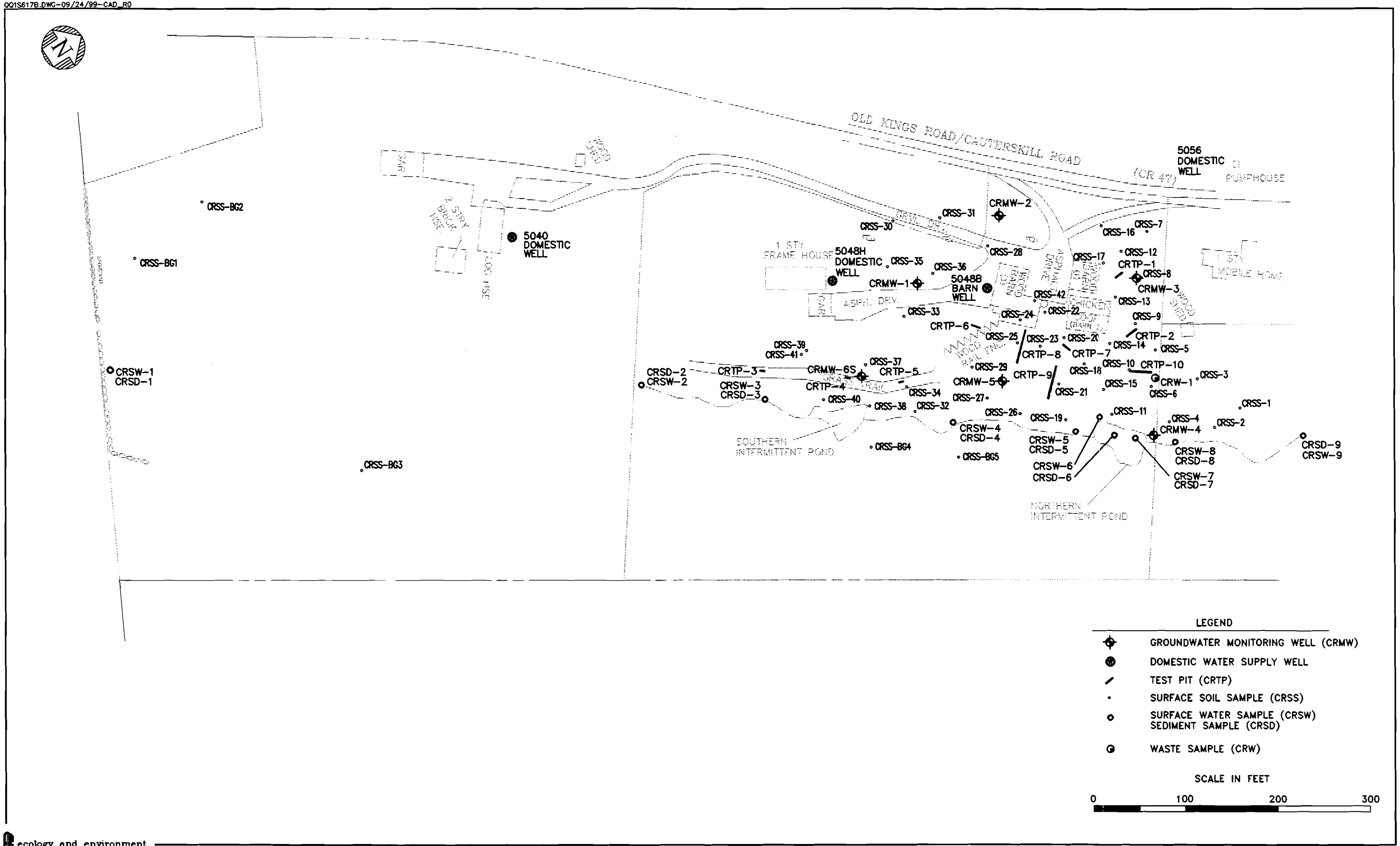

Figure 2-1 PHASE I RI SAMPLE LOCATIONS
CAUTERSKILL ROAD
CATSKILL, NEW YORK

BUFF PLOTTED 1/13/2000 DDL

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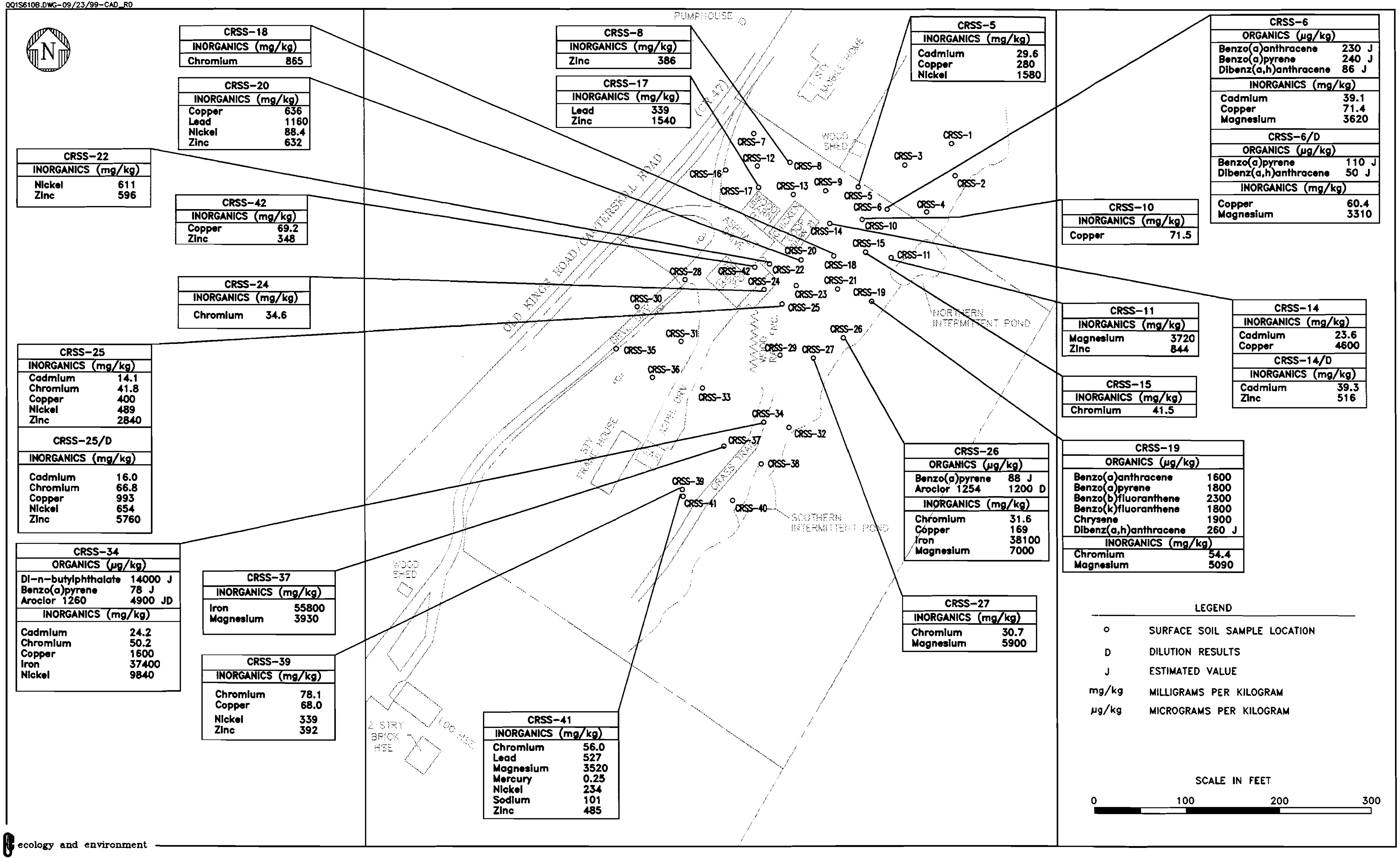

CRSS-18	
INORGANICS (mg/kg)	
Chromium	865

CRSS-20	
INORGANICS (mg/kg)	
Copper	636
Lead	1160
Nickel	88.4
Zinc	632

CRSS-22	
INORGANICS (mg/kg)	
Nickel	611
Zinc	596

CRSS-42	
INORGANICS (mg/kg)	
Copper	69.2
Zinc	348

CRSS-24	
INORGANICS (mg/kg)	
Chromium	34.6

CRSS-25	
INORGANICS (mg/kg)	
Cadmium	14.1
Chromium	41.8
Copper	400
Nickel	489
Zinc	2840
CRSS-25/D	
INORGANICS (mg/kg)	
Cadmium	16.0
Chromium	66.8
Copper	993
Nickel	654
Zinc	5760

CRSS-34	
ORGANICS (µg/kg)	
Di-n-butylphthalate	14000 J
Benzo(a)pyrene	78 J
Aroclor 1260	4900 JD
INORGANICS (mg/kg)	
Cadmium	24.2
Chromium	50.2
Copper	1600
Iron	37400
Nickel	9840

CRSS-37	
INORGANICS (mg/kg)	
Iron	55800
Magnesium	3930

CRSS-39	
INORGANICS (mg/kg)	
Chromium	78.1
Copper	68.0
Nickel	339
Zinc	392

CRSS-41	
INORGANICS (mg/kg)	
Chromium	56.0
Lead	527
Magnesium	3520
Mercury	0.25
Nickel	234
Sodium	101
Zinc	485

CRSS-8	
INORGANICS (mg/kg)	
Zinc	386

CRSS-17	
INORGANICS (mg/kg)	
Lead	339
Zinc	1540

CRSS-5	
INORGANICS (mg/kg)	
Cadmium	29.6
Copper	280
Nickel	1580

CRSS-6	
ORGANICS (µg/kg)	
Benzo(a)anthracene	230 J
Benzo(a)pyrene	240 J
Dibenz(a,h)anthracene	86 J
INORGANICS (mg/kg)	
Cadmium	39.1
Copper	71.4
Magnesium	3620
CRSS-6/D	
ORGANICS (µg/kg)	
Benzo(a)pyrene	110 J
Dibenz(a,h)anthracene	50 J
INORGANICS (mg/kg)	
Copper	60.4
Magnesium	3310

CRSS-10	
INORGANICS (mg/kg)	
Copper	71.5

CRSS-11	
INORGANICS (mg/kg)	
Magnesium	3720
Zinc	844

CRSS-14	
INORGANICS (mg/kg)	
Cadmium	23.6
Copper	4600
CRSS-14/D	
INORGANICS (mg/kg)	
Cadmium	39.3
Zinc	516

CRSS-15	
INORGANICS (mg/kg)	
Chromium	41.5

CRSS-26	
ORGANICS (µg/kg)	
Benzo(a)pyrene	88 J
Aroclor 1254	1200 D
INORGANICS (mg/kg)	
Chromium	31.6
Copper	169
Iron	38100
Magnesium	7000

CRSS-19	
ORGANICS (µg/kg)	
Benzo(a)anthracene	1600
Benzo(a)pyrene	1800
Benzo(b)fluoranthene	2300
Benzo(k)fluoranthene	1800
Chrysene	1900
Dibenz(a,h)anthracene	260 J
INORGANICS (mg/kg)	
Chromium	54.4
Magnesium	5090

CRSS-27	
INORGANICS (mg/kg)	
Chromium	30.7
Magnesium	5900

LEGEND

o	SURFACE SOIL SAMPLE LOCATION
D	DILUTION RESULTS
J	ESTIMATED VALUE
mg/kg	MILLIGRAMS PER KILOGRAM
µg/kg	MICROGRAMS PER KILOGRAM

Figure 2-2 SURFACE SOIL SAMPLE RESULTS EXCEEDING CLEANUP GOALS CAUTERSKILL ROAD CATSKILL, NEW YORK

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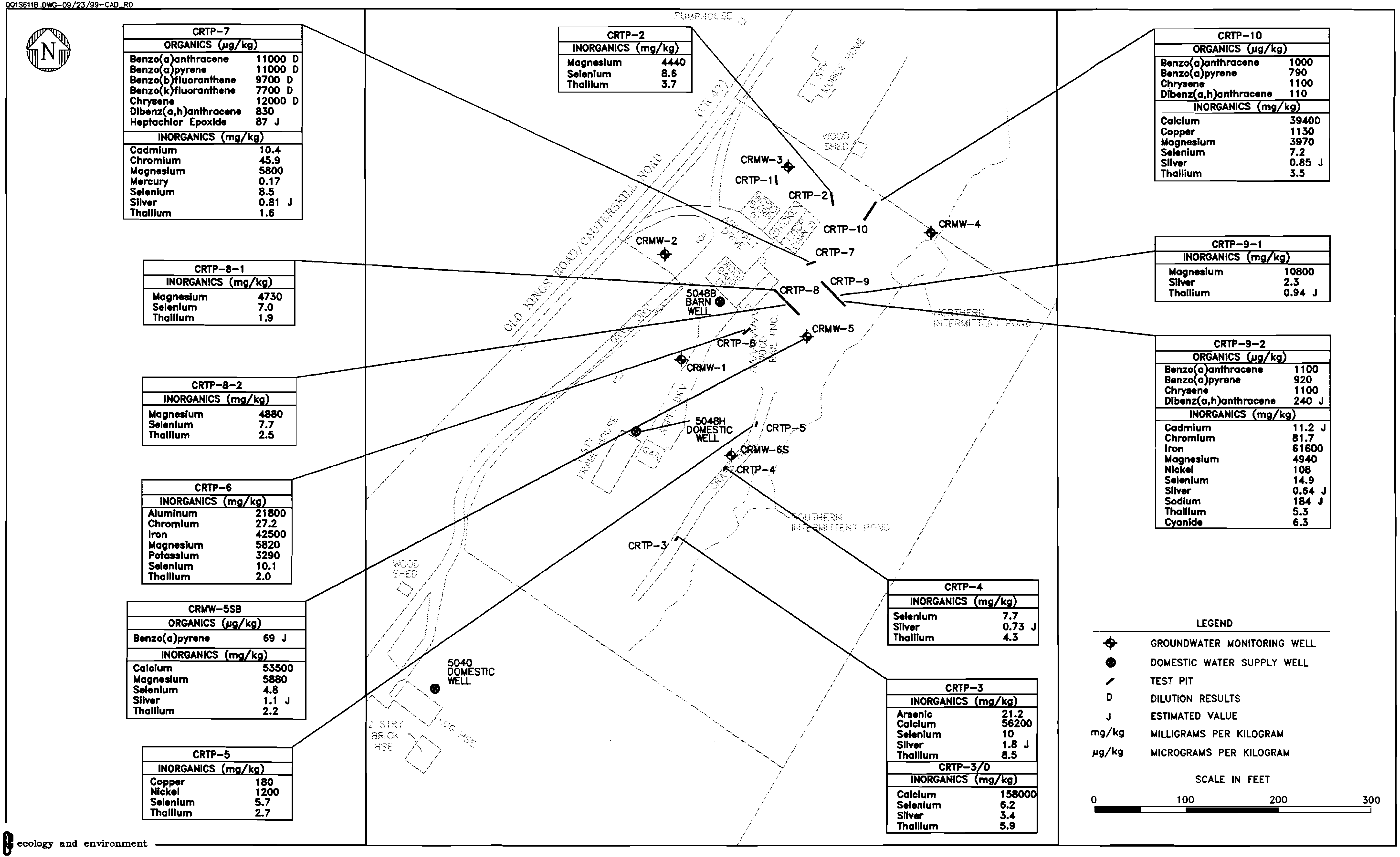

CRTP-7	
ORGANICS (µg/kg)	
Benzo(a)anthracene	11000 D
Benzo(a)pyrene	11000 D
Benzo(b)fluoranthene	9700 D
Benzo(k)fluoranthene	7700 D
Chrysene	12000 D
Dibenz(a,h)anthracene	830
Heptachlor Epoxide	87 J
INORGANICS (mg/kg)	
Cadmium	10.4
Chromium	45.9
Magnesium	5800
Mercury	0.17
Selenium	8.5
Silver	0.81 J
Thallium	1.6

CRTP-2	
INORGANICS (mg/kg)	
Magnesium	4440
Selenium	8.6
Thallium	3.7

CRTP-10	
ORGANICS (µg/kg)	
Benzo(a)anthracene	1000
Benzo(a)pyrene	790
Chrysene	1100
Dibenz(a,h)anthracene	110
INORGANICS (mg/kg)	
Calcium	39400
Copper	1130
Magnesium	3970
Selenium	7.2
Silver	0.85 J
Thallium	3.5

CRTP-8-1	
INORGANICS (mg/kg)	
Magnesium	4730
Selenium	7.0
Thallium	1.9

CRTP-9-1	
INORGANICS (mg/kg)	
Magnesium	10800
Silver	2.3
Thallium	0.94 J

CRTP-8-2	
INORGANICS (mg/kg)	
Magnesium	4880
Selenium	7.7
Thallium	2.5

CRTP-9-2	
ORGANICS (µg/kg)	
Benzo(a)anthracene	1100
Benzo(a)pyrene	920
Chrysene	1100
Dibenz(a,h)anthracene	240 J
INORGANICS (mg/kg)	
Cadmium	11.2 J
Chromium	81.7
Iron	61600
Magnesium	4940
Nickel	108
Selenium	14.9
Silver	0.64 J
Sodium	184 J
Thallium	5.3
Cyanide	6.3

CRTP-6	
INORGANICS (mg/kg)	
Aluminum	21800
Chromium	27.2
Iron	42500
Magnesium	5820
Potassium	3290
Selenium	10.1
Thallium	2.0

CRTP-4	
INORGANICS (mg/kg)	
Selenium	7.7
Silver	0.73 J
Thallium	4.3

CRMW-5SB	
ORGANICS (µg/kg)	
Benzo(a)pyrene	69 J
INORGANICS (mg/kg)	
Calcium	53500
Magnesium	5880
Selenium	4.8
Silver	1.1 J
Thallium	2.2

CRTP-3	
INORGANICS (mg/kg)	
Arsenic	21.2
Calcium	56200
Selenium	10
Silver	1.8 J
Thallium	8.5
CRTP-3/D	
INORGANICS (mg/kg)	
Calcium	158000
Selenium	6.2
Silver	3.4
Thallium	5.9

CRTP-5	
INORGANICS (mg/kg)	
Copper	180
Nickel	1200
Selenium	5.7
Thallium	2.7

LEGEND

⌖	GROUNDWATER MONITORING WELL
●	DOMESTIC WATER SUPPLY WELL
/	TEST PIT
D	DILUTION RESULTS
J	ESTIMATED VALUE
mg/kg	MILLIGRAMS PER KILOGRAM
µg/kg	MICROGRAMS PER KILOGRAM

SCALE IN FEET

0 100 200 300

ecology and environment

Figure 2-3 SUBSURFACE SOIL SAMPLE RESULTS EXCEEDING CLEANUP GOALS CAUTERSKILL ROAD CATSKILL, NEW YORK

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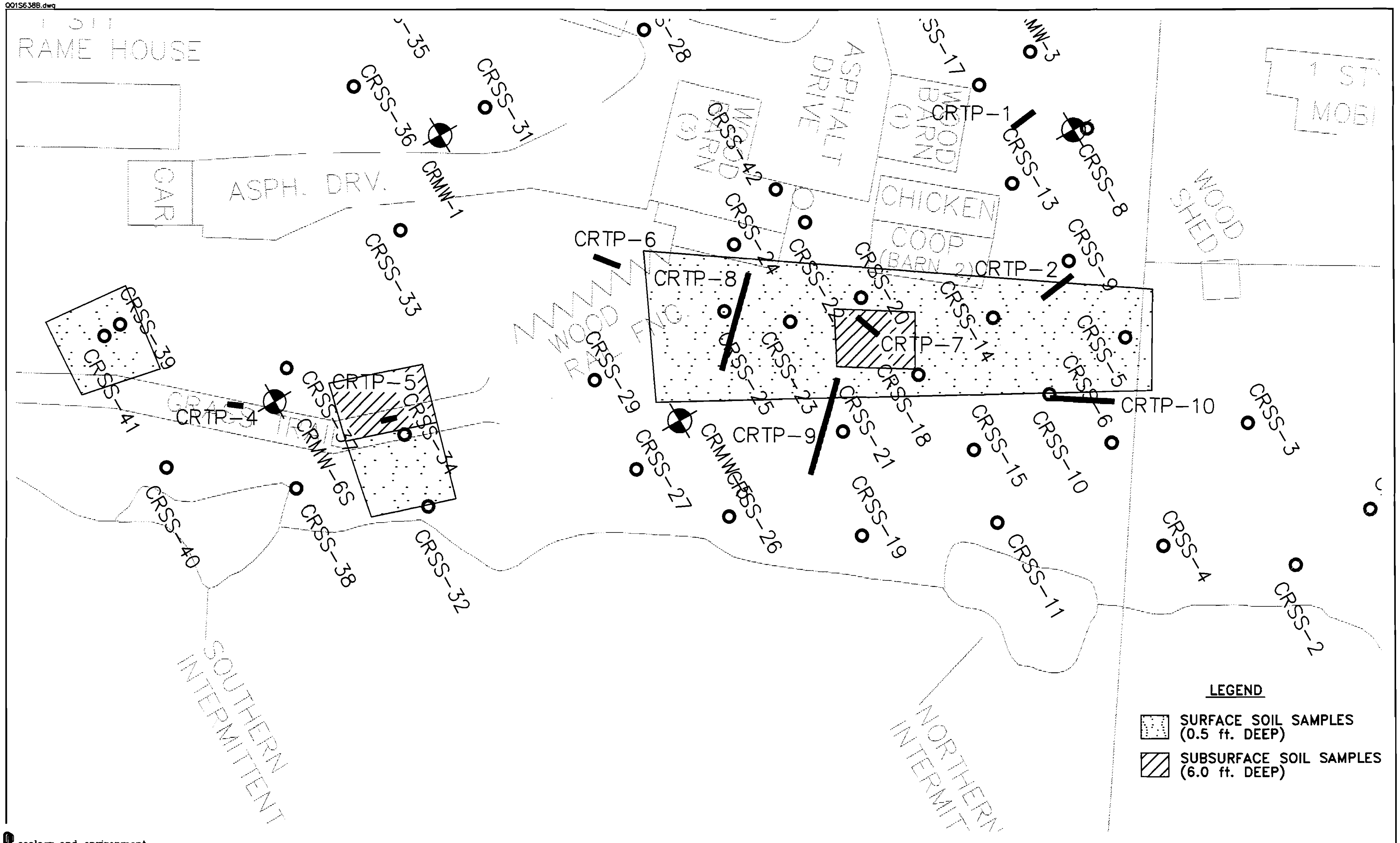


ecology and environment

FIGURE 2-4 GROUP I SOILS

001S639B.dwg

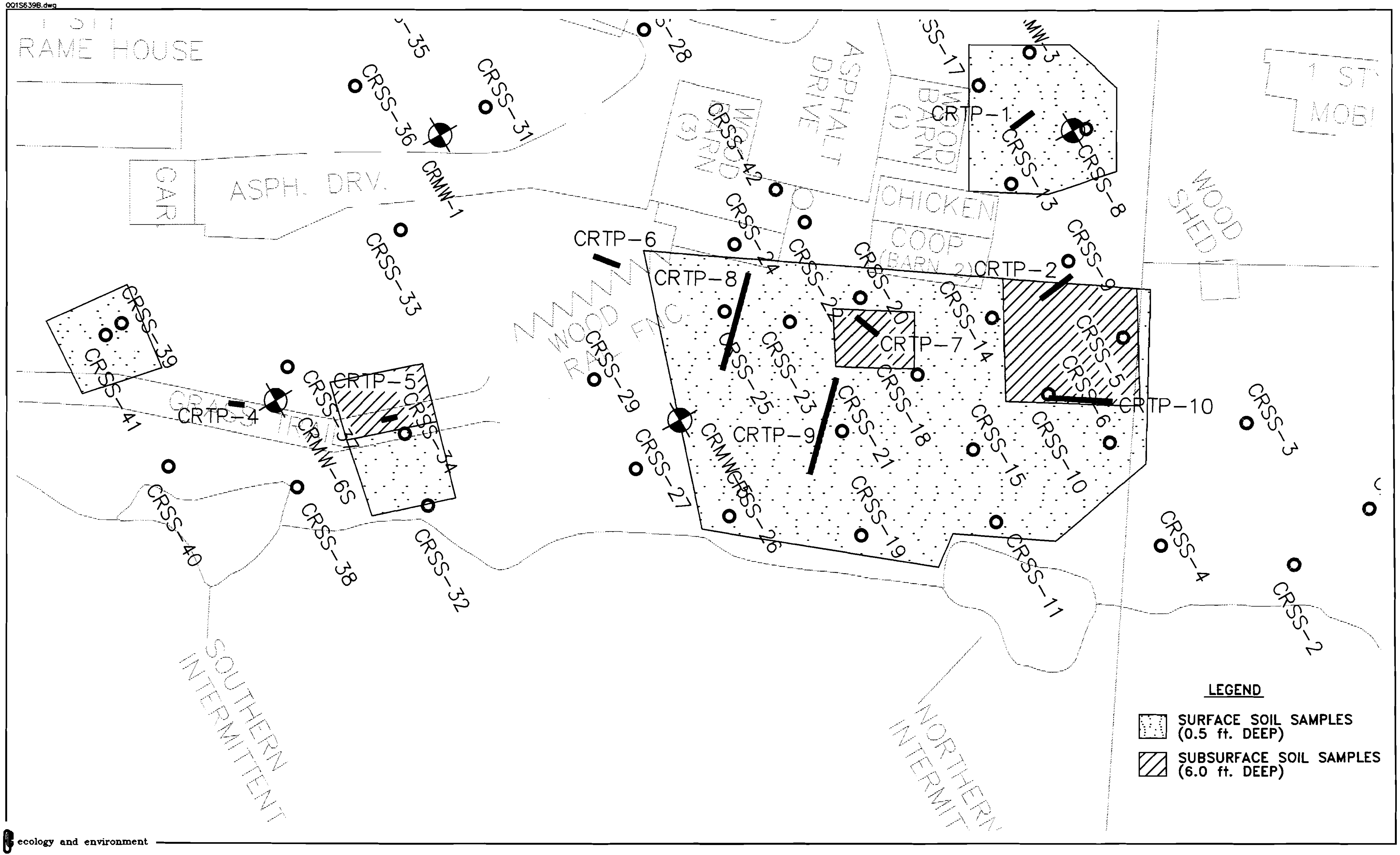


FIGURE 2-5 GROUP 2 SOILS

QQ1S640B.dwg

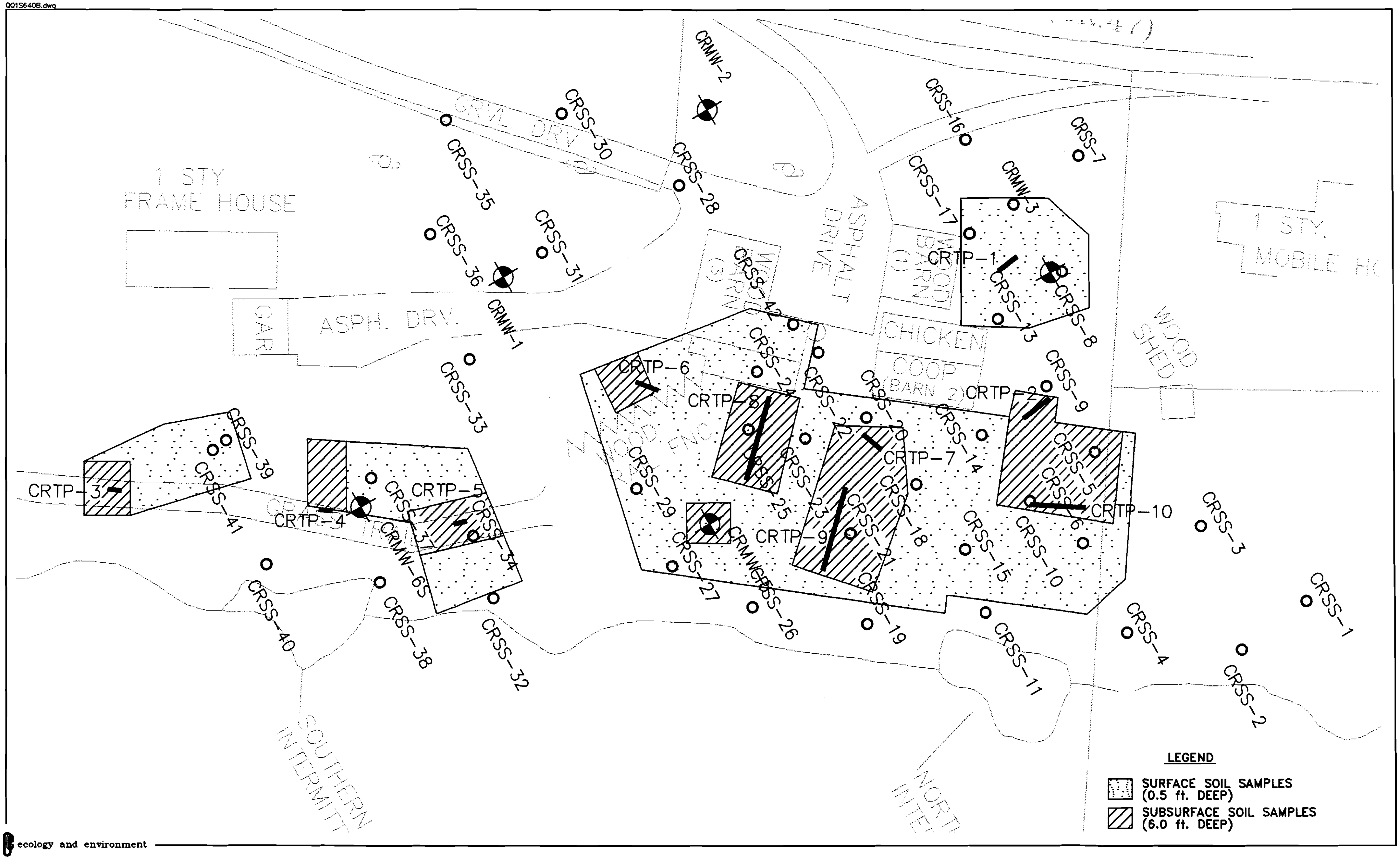


FIGURE 2-6 GROUP 3 SOILS

02: 000699_0001_00_32_00-B0000
0Q1S612B.DWG-06/23/99-CAD_R0

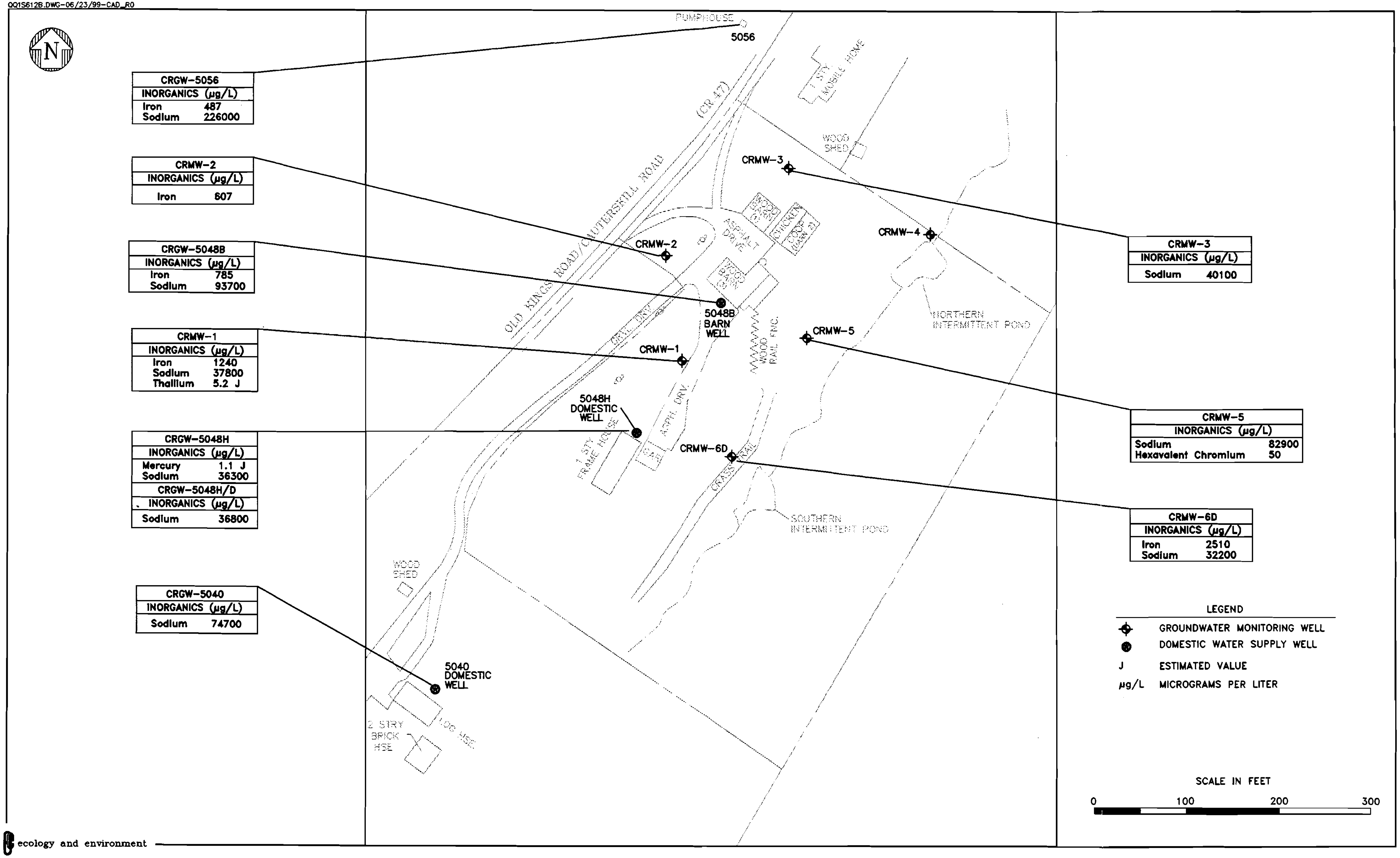
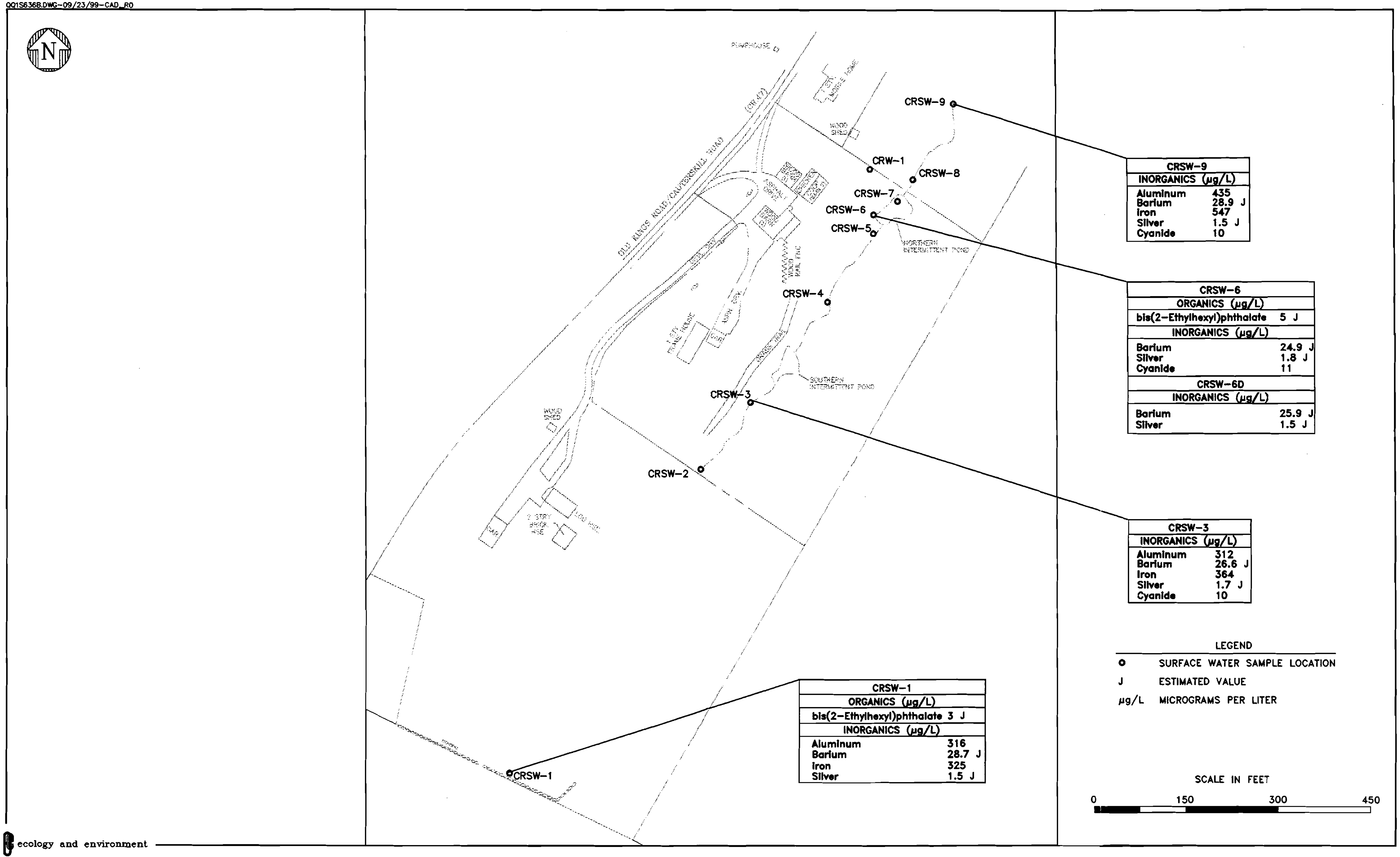


Figure 2-7 GROUNDWATER SAMPLE RESULTS EXCEEDING CLEANUP GOALS CAUTERSKILL ROAD CATSKILL, NEW YORK

02:000699_QQ01_00_32_00-B0000
QQ1S636B.DWG-09/23/99-CAD_R0



CRSW-9	
INORGANICS (µg/L)	
Aluminum	435
Barium	28.9 J
Iron	547
Silver	1.5 J
Cyanide	10

CRSW-6	
ORGANICS (µg/L)	
bis(2-Ethylhexyl)phthalate	5 J
INORGANICS (µg/L)	
Barium	24.9 J
Silver	1.8 J
Cyanide	11
CRSW-6D	
INORGANICS (µg/L)	
Barium	25.9 J
Silver	1.5 J

CRSW-3	
INORGANICS (µg/L)	
Aluminum	312
Barium	26.6 J
Iron	364
Silver	1.7 J
Cyanide	10

CRSW-1	
ORGANICS (µg/L)	
bis(2-Ethylhexyl)phthalate	3 J
INORGANICS (µg/L)	
Aluminum	316
Barium	28.7 J
Iron	325
Silver	1.5 J

LEGEND

o	SURFACE WATER SAMPLE LOCATION
J	ESTIMATED VALUE
µg/L	MICROGRAMS PER LITER

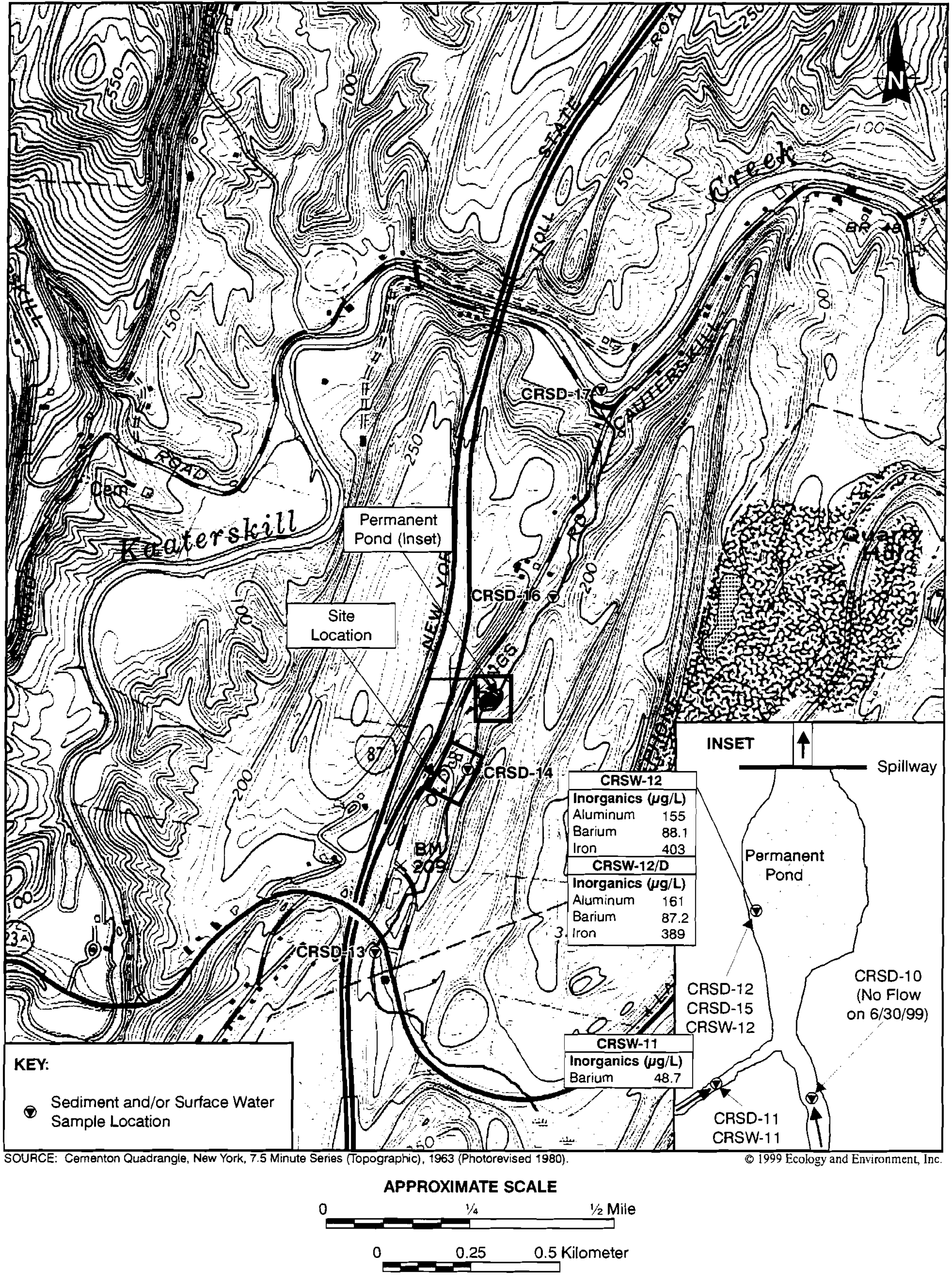
SCALE IN FEET

0 150 300 450

BUFF PLOTTED 1/18/2000 DDL

Figure 2-8a SURFACE WATER SAMPLE RESULTS
EXCEEDING CLEANUP GOALS
(PHASE I RI)
CAUTERSKILL ROAD
CATSKILL, NEW YORK

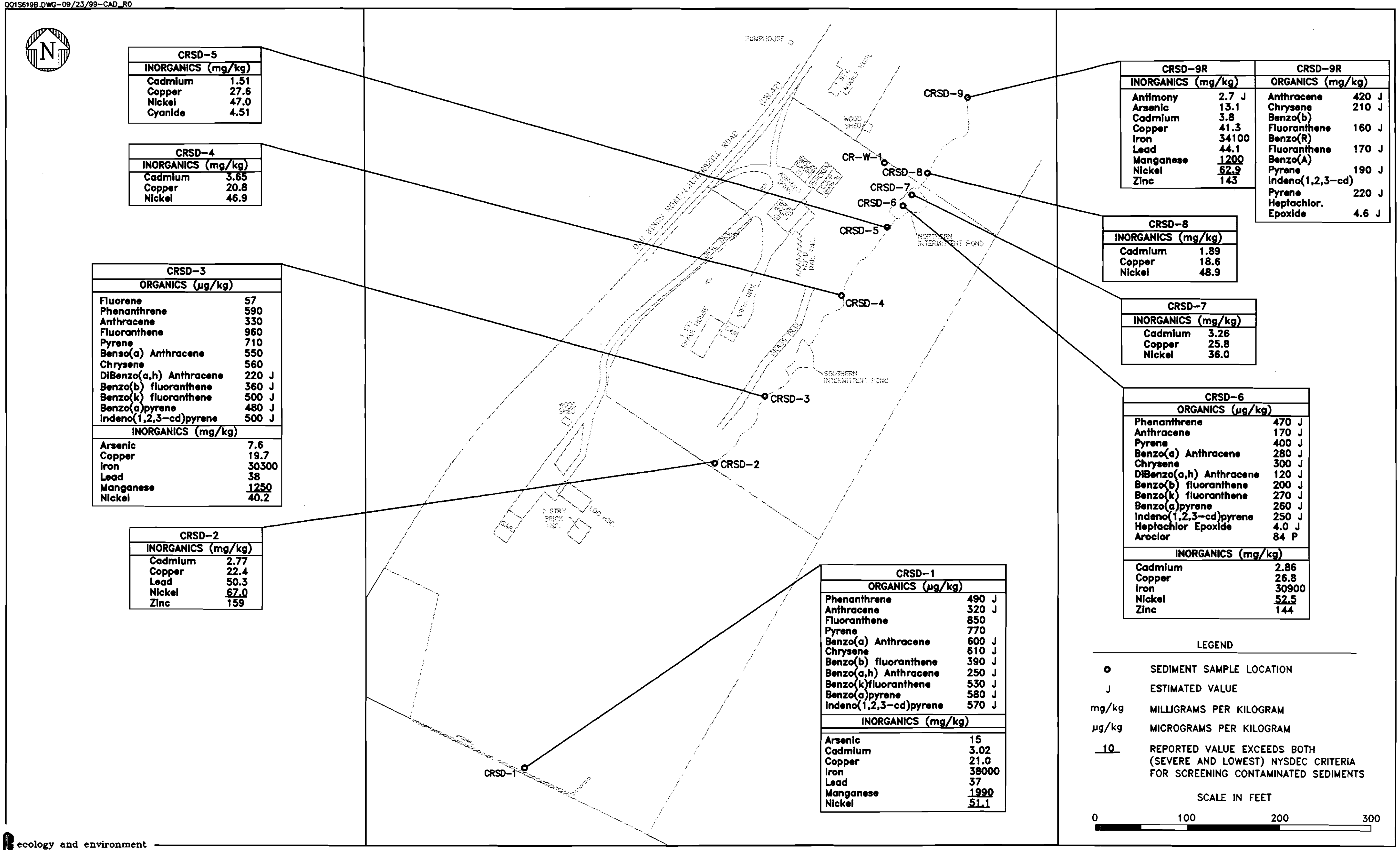
02:000699_QQ01_00_32_90-B0109
Fig2-8B.CDR-1/12/00-GRA



SOURCE: Cementon Quadrangle, New York, 7.5 Minute Series (Topographic), 1963 (Photorevised 1980).

Figure 2-8B SURFACE WATER SAMPLE RESULTS EXCEEDING CLEANUP GOALS (PHASE II RI)
CAUTERSKILL ROAD
CATSKILL, NEW YORK

02:000699_QQ01_00_32_00-B0000
QQ1S619B.DWG-09/23/99-CAD_R0



CRSD-5	
INORGANICS (mg/kg)	
Cadmium	1.51
Copper	27.6
Nickel	47.0
Cyanide	4.51

CRSD-4	
INORGANICS (mg/kg)	
Cadmium	3.65
Copper	20.8
Nickel	46.9

CRSD-3	
ORGANICS (μg/kg)	
Fluorene	57
Phenanthrene	590
Anthracene	330
Fluoranthene	960
Pyrene	710
Benso(a) Anthracene	550
Chrysene	560
DiBenzo(a,h) Anthracene	220 J
Benzo(b) fluoranthene	360 J
Benzo(k) fluoranthene	500 J
Benzo(a)pyrene	480 J
Indeno(1,2,3-cd)pyrene	500 J
INORGANICS (mg/kg)	
Arsenic	7.6
Copper	19.7
Iron	30300
Lead	38
Manganese	1250
Nickel	40.2

CRSD-2	
INORGANICS (mg/kg)	
Cadmium	2.77
Copper	22.4
Lead	50.3
Nickel	67.0
Zinc	159

CRSD-9R	
INORGANICS (mg/kg)	
Antimony	2.7 J
Arsenic	13.1
Cadmium	3.8
Copper	41.3
Iron	34100
Lead	44.1
Manganese	1200
Nickel	62.9
Zinc	143

CRSD-9R	
ORGANICS (mg/kg)	
Anthracene	420 J
Chrysene	210 J
Benzo(b) Fluoranthene	160 J
Benzo(R) Fluoranthene	170 J
Benzo(A) Pyrene	190 J
Indeno(1,2,3-cd) Pyrene	220 J
Heptachlor. Epoxide	4.6 J

CRSD-8	
INORGANICS (mg/kg)	
Cadmium	1.89
Copper	18.6
Nickel	48.9

CRSD-7	
INORGANICS (mg/kg)	
Cadmium	3.26
Copper	25.8
Nickel	36.0

CRSD-6	
ORGANICS (μg/kg)	
Phenanthrene	470 J
Anthracene	170 J
Pyrene	400 J
Benzo(a) Anthracene	280 J
Chrysene	300 J
DiBenzo(a,h) Anthracene	120 J
Benzo(b) fluoranthene	200 J
Benzo(k) fluoranthene	270 J
Benzo(a)pyrene	260 J
Indeno(1,2,3-cd)pyrene	250 J
Heptachlor Epoxide	4.0 J
Aroclor	84 P
INORGANICS (mg/kg)	
Cadmium	2.86
Copper	26.8
Iron	30900
Nickel	52.5
Zinc	144

CRSD-1	
ORGANICS (μg/kg)	
Phenanthrene	490 J
Anthracene	320 J
Fluoranthene	850
Pyrene	770
Benzo(a) Anthracene	600 J
Chrysene	610 J
Benzo(b) fluoranthene	390 J
Benzo(a,h) Anthracene	250 J
Benzo(k)fluoranthene	530 J
Benzo(a)pyrene	580 J
Indeno(1,2,3-cd)pyrene	570 J
INORGANICS (mg/kg)	
Arsenic	15
Cadmium	3.02
Copper	21.0
Iron	38000
Lead	37
Manganese	1990
Nickel	51.1

LEGEND

○	SEDIMENT SAMPLE LOCATION
J	ESTIMATED VALUE
mg/kg	MILLIGRAMS PER KILOGRAM
μg/kg	MICROGRAMS PER KILOGRAM
10	REPORTED VALUE EXCEEDS BOTH (SEVERE AND LOWEST) NYSDEC CRITERIA FOR SCREENING CONTAMINATED SEDIMENTS

SCALE IN FEET

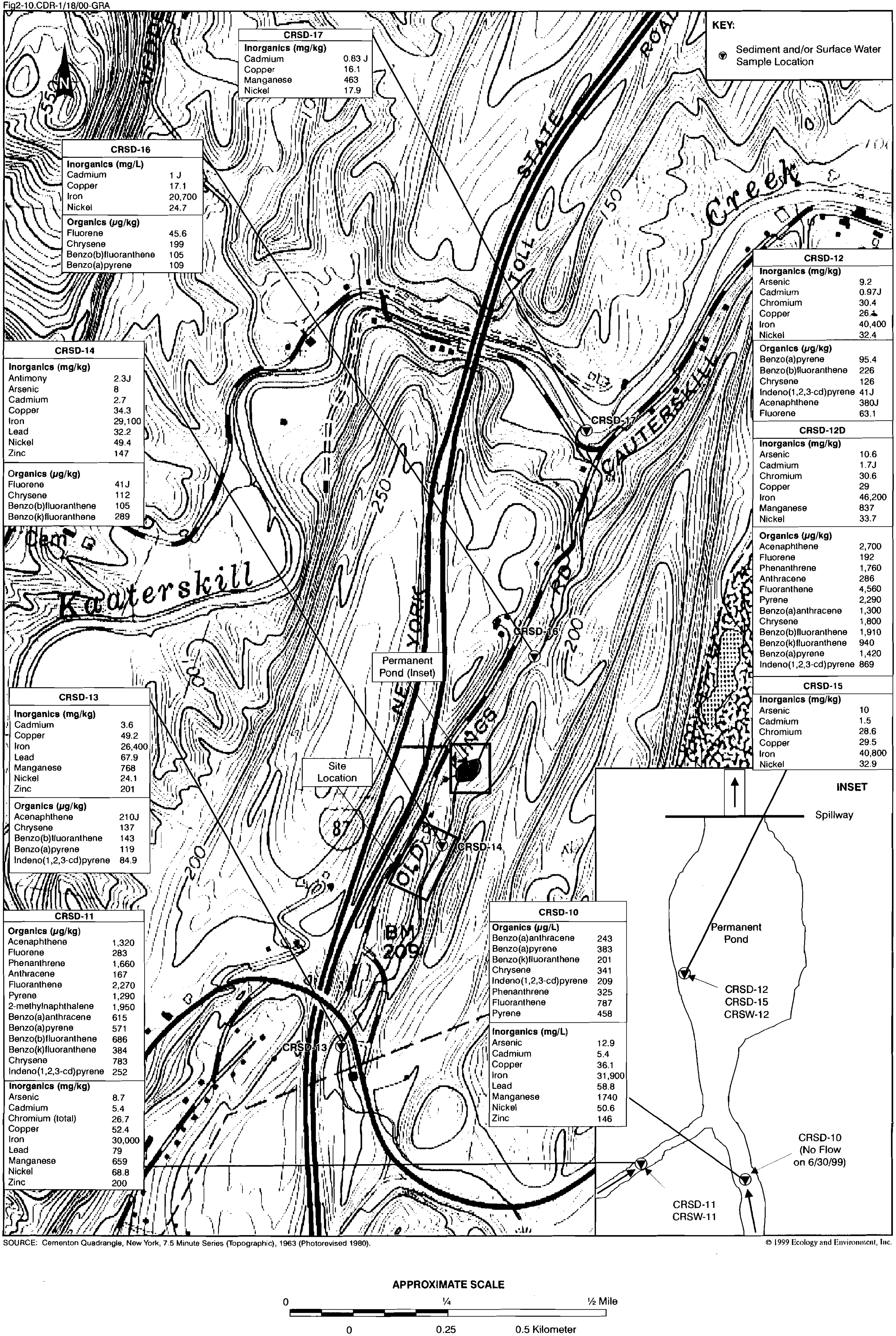
0 100 200 300

ecology and environment

Figure 2-9 SEDIMENT SAMPLE RESULTS EXCEEDING CLEANUP GOALS (PHASE I RI) CAUTERSKILL ROAD

buff plotted 1/17/2000 DDL

02:000699_QQ01_00_32_90-B0109
Fig2-10.CDR-1/18/00-GRA



CRSD-17

Inorganics (mg/kg)	
Cadmium	0.83 J
Copper	16.1
Manganese	463
Nickel	17.9

CRSD-16

Inorganics (mg/L)	
Cadmium	1 J
Copper	17.1
Iron	20,700
Nickel	24.7
Organics (µg/kg)	
Fluorene	45.6
Chrysene	199
Benzo(b)fluoranthene	105
Benzo(a)pyrene	109

CRSD-14

Inorganics (mg/kg)	
Antimony	2.3J
Arsenic	8
Cadmium	2.7
Copper	34.3
Iron	29,100
Lead	32.2
Nickel	49.4
Zinc	147
Organics (µg/kg)	
Fluorene	41J
Chrysene	112
Benzo(b)fluoranthene	105
Benzo(k)fluoranthene	289

CRSD-13

Inorganics (mg/kg)	
Cadmium	3.6
Copper	49.2
Iron	26,400
Lead	67.9
Manganese	768
Nickel	24.1
Zinc	201
Organics (µg/kg)	
Acenaphthene	210J
Chrysene	137
Benzo(b)fluoranthene	143
Benzo(a)pyrene	119
Indeno(1,2,3-cd)pyrene	84.9

CRSD-11

Organics (µg/kg)	
Acenaphthene	1,320
Fluorene	283
Phenanthrene	1,660
Anthracene	167
Fluoranthene	2,270
Pyrene	1,290
2-methylnaphthalene	1,950
Benzo(a)anthracene	615
Benzo(a)pyrene	571
Benzo(b)fluoranthene	686
Benzo(k)fluoranthene	384
Chrysene	783
Indeno(1,2,3-cd)pyrene	252
Inorganics (mg/kg)	
Arsenic	8.7
Cadmium	5.4
Chromium (total)	26.7
Copper	52.4
Iron	30,000
Lead	79
Manganese	659
Nickel	68.8
Zinc	200

CRSD-10

Organics (µg/L)	
Benzo(a)anthracene	243
Benzo(a)pyrene	383
Benzo(k)fluoranthene	201
Chrysene	341
Indeno(1,2,3-cd)pyrene	209
Phenanthrene	325
Fluoranthene	787
Pyrene	458
Inorganics (mg/L)	
Arsenic	12.9
Cadmium	5.4
Copper	36.1
Iron	31,900
Lead	58.8
Manganese	1740
Nickel	50.6
Zinc	146

CRSD-12

Inorganics (mg/kg)	
Arsenic	9.2
Cadmium	0.97J
Chromium	30.4
Copper	26.1
Iron	40,400
Nickel	32.4
Organics (µg/kg)	
Benzo(a)pyrene	95.4
Benzo(b)fluoranthene	226
Chrysene	126
Indeno(1,2,3-cd)pyrene	41J
Acenaphthene	380J
Fluorene	63.1

CRSD-12D

Inorganics (mg/kg)	
Arsenic	10.6
Cadmium	1.7J
Chromium	30.6
Copper	29
Iron	46,200
Manganese	837
Nickel	33.7
Organics (µg/kg)	
Acenaphthene	2,700
Fluorene	192
Phenanthrene	1,760
Anthracene	286
Fluoranthene	4,560
Pyrene	2,290
Benzo(a)anthracene	1,300
Chrysene	1,800
Benzo(b)fluoranthene	1,910
Benzo(k)fluoranthene	940
Benzo(a)pyrene	1,420
Indeno(1,2,3-cd)pyrene	869

CRSD-15

Inorganics (mg/kg)	
Arsenic	10
Cadmium	1.5
Chromium	28.6
Copper	29.5
Iron	40,800
Nickel	32.9

SOURCE: Cementon Quadrangle, New York, 7.5 Minute Series (Topographic), 1963 (Photorevised 1980).

Figure 2-10 SEDIMENT SAMPLE RESULTS EXCEEDING CLEANUP GOALS
CAUTERSKILL ROAD
CATSKILL, NEW YORK

3

Identification of Technologies and Development of Alternatives

3.1 Identification of Technologies

3.1.1 General Response Actions

The Cauterskill Road Site is contaminated primarily with metals contaminants. There is only isolated and limited contamination from organic compounds such as PAHs and PCBs. As elements, metals cannot be destroyed or rendered intrinsically harmless. Some metals can be transformed into less toxic forms. The best example of this is chromium, which can be transformed from the hexavalent oxidation state to its less toxic trivalent state. However, the data show that chromium is present in only the trivalent state at this site, and the poor spike recoveries of hexavalent chromium in spiked soils suggest that there is naturally present reducing power in the soils that limits the ability of released hexavalent chromium to remain in that oxidation state. Therefore, technologies that treat contaminants through destruction or conversion to less toxic forms are not applicable for this site.

All approaches to addressing the contamination at the Cauterskill Road Site therefore are based on preventing exposure to the contaminants at levels and/or durations that may be hazardous to human health or the environment. Preventing exposure can be accomplished through reducing the inherent mobility of the contaminants, by placing barriers to exposure, or both.

Mobility Reduction

Treatment to inherently reduce the mobility of (and hence exposure to) contaminants comprises several different stabilization technologies, including pozzolanic solidification, encapsulation, and complexation. In these approaches, various reagents are added to the soil to react with the metals, reducing the metals' mobility. In some cases, the technologies also produce a solidified monolith that further reduces the possibility of exposure by reducing the surface area available for direct contact or leaching.

Barriers to Exposure

Potential for exposure also can be reduced or eliminated without stabilizing the metals. This is achieved by either:

- Placing a barrier, such as a cap or a cover, over the soils to prevent direct exposure to the soils and to reduce infiltration through the soils;
- Removing the contaminated soils and placing them in an off-site engineered landfill meeting disposal requirements such as those outlined in 6 New York Code of Rules and Regulations (NYCRR) 360; or
- Selectively removing the metals from the soil, concentrating them in a residual that would require further treatment and disposal.

NYCRR
New York Code of Rules and Regulations

Therefore, the general response actions that can be taken to address the contamination at this site include reducing mobility through stabilization/solidification and preventing exposure through covering/capping or off-site disposal.

3.1.2 Selection of Technologies

3.1.2.1 Mobility Reduction

Various stabilization/solidification technologies are available for metals contamination. All of these technologies require mobilization of soil processing equipment to the site, mixing the soil with the stabilization reagents, allowing the soil/reagent mixture to cure, and then permanently storing the stabilized mixture on or off site. Because of the small size of the Cauterskill Road Site, stabilization/solidification is not appropriate. The stabilized soil needs to be stored and/or disposed of somewhere permanently. Also, because of the relatively small area of the site, and the proximity of residences, creating a permanent disposal area at the site is not practical. The alternative is to dispose of the material off site. However, if the soil is to be disposed of off site, then there is little need to stabilize it. Disposal in an approved solid waste facility would eliminate exposure hazards adequately, and solidification would not be necessary. The one exception would be if any soil were found to be hazardous. Soil is not a waste and therefore cannot be considered a hazardous waste. However, if soil exhibits the characteristics of a hazardous waste as defined in 40 CFR 261c, then it must be handled as hazardous waste. Any soil found to be characteristically hazardous (i.e., because of metals in toxicity characteristic leaching procedure leachate above standards) would have to be handled as hazardous waste and therefore treated at a disposal facility before disposal. Because any such stabilization treatment would occur as a component of off-site disposal, this technology is not considered to be a central part of remedial alternatives for this site.

3.1.2.2 Barriers to Exposure

Capping and Covering

Reducing exposure to contaminants in soil by a surface barrier will be incorporated in remedial alternatives for this site. *Capping* refers to a multiple-layer cap used to provide an effective barrier to infiltration of water. Capping, such as called for by 6 NYCRR 360 for solid waste landfills, calls for an impermeable layer of clay or a synthetic membrane. Above and below the impermeable layers are other layers of soil that provide protection of the clay or membrane and allow propagation of vegetation.

Capping is not considered in remedial alternatives for this site. Groundwater contamination has not been found to be a problem at this site. This reduces the need for technology that limits the infiltration of water through the cap. In addition, such caps are quite thick. Even using the thinner synthetic membrane as the impermeable layer, considering the subbase to the membrane, the protective layer above the membrane, and the topsoil for vegetation, a total thickness of at least 2 feet is required. Because of this thickness, such caps often are installed well beyond the edges of the contaminated area in order to provide the needed anchoring of the various layers. At the Cauterskill Road Site, the contamination extends nearly all the way to the tributary to Kaaterskill Creek in some instances. For these two reasons, capping is not considered in the remedial alternatives.

In contrast to capping, covering provides a simpler barrier to exposure to soils. *Covering*, as used here, refers to the placement of only soil (general fill plus topsoil) over the contaminated areas. Covers focus on eliminating direct-contact exposure scenarios. They do not address reduction of infiltration. However, as discussed above, infiltration is not a concern at this site based on the review of groundwater data. Covering calls for 6 inches of general soil fill and 6 inches of topsoil above to promote vegetative growth. Because of the simpler nature of a cover compared to a cap, the cover does not need to extend quite as far beyond the boundaries of the contamination, although some consolidation still could be required at the north and south edges of the property. Covering is included in the alternatives considered.

Off-Site Disposal

Off-site disposal calls for excavation of soil, loading the soil onto trucks, and disposal at a licensed solid waste landfill. This technology is retained in the remedial alternatives.

Selective Removal and Concentration

This response action takes large volumes of contaminated soils and selectively removes metals contaminants, concentrating them in a sludge or other concentrated fraction. Selectively removing metals is difficult. The methods most appropriate to waste disposal sites use separation based on size (using the premise that most of the adsorbed metals reside on the fines fraction of the soil) and through dissolution into an aqueous phase. Both approaches require extensive treatability testing and usually require development of specialized treatment trains specific to the site.

These technologies are most appropriate for sites with very large volumes of contaminated soils. This is particularly evident considering that the product of these technologies is a sludge or concentrate that in turn requires additional treatment and disposal. For rather small sites, such as the Cauterskill Road Site, reduction in the volume of contaminated material is less important and it is more appropriate to move directly to the treatment and disposal of the soils themselves. Therefore, these technologies are not considered in the remedial alternatives.

3.2 Development of Alternatives

Two main factors were considered in the development of alternatives for this site. First are the technologies presented in Section 3.1. These technologies could be combined in various ways to define alternatives. Second is the amount of soil that is addressed by the technologies.

cy
cubic yard

PRGs
preliminary remediation goals

Section 2.1.3 presents a summary of the soil contamination, including its distribution. This analysis shows that 1,937 cubic yards (cy) of contaminated soil is present above background levels. However, this analysis also shows that considering about half of this volume (i.e., the Group 2 scenario, covering 1,039 cy) would remove the vast majority of contamination, leaving concentrations of most metals of main concern only slightly above background levels. The analysis also suggests that as little as 475 cy (the Group 1 scenario) still would remove most of the contamination, although it would leave slightly higher concentrations of metals of concern unaddressed.

Although the Group 1 and 2 scenarios would leave metals contamination above background, the levels that remain still would be below generic human-health-based levels for these metals, such as those calculated by the EPA SSLs; the EPA, Region IX, preliminary remediation goals (PRGs); and the EPA, Region III, RBCs. All scenarios would remove lead below its TBC value of 400 mg/kg. While these generic screening levels do not necessarily apply to this site, they suggest that alternatives based on these reduced volumes are appropriate.

Considering these two main factors, the following alternatives were developed for the Cauterskill Road Site:

- Alternative 1: No Action;
- Alternative 2: Covering of Most Soils Exceeding Cleanup Goals;
- Alternative 3: Removal of Group 1 Contaminated Soils;
- Alternative 4: Removal of Group 2 Contaminated Soils; and
- Alternative 5: Removal of All Soils Above Cleanup Goals (Group 3 soils).

Each alternative is evaluated in Section 4.

4

Detailed Analysis of Alternatives

In this section, the five alternatives are evaluated against the seven criteria identified in NYSDEC's TAGM 4030, *Selection of Remedial Actions at Inactive Hazardous Waste Sites*. These criteria are summarized below:

Compliance with New York SCGs

This criterion evaluates compliance with SCGs that apply to this site. Standards are promulgated levels that apply directly to the media of interest, and are required to be met. Criteria and guidance levels are nonpromulgated levels that may be applicable and are to be considered. Attainment of criteria and guidance is not a legally required objective.

SCGs include chemical-specific values that address concentrations of contaminants in various media; action-specific requirements, such as requirements for handling hazardous waste; and location-specific requirements, such as wetlands regulations.

Overall Protection of Human Health and the Environment

This criterion provides an overall check regarding whether the alternative protects human health and the environment. The overall assessment of protection is based on a composite of factors assessed under other evaluation criteria, especially long-term effectiveness, short-term effectiveness, and compliance with SCGs.

Short-Term Impacts and Effectiveness

This criterion assesses the effects of the alternative during the construction and implementation phase until remedial objectives are met, including protection of the community during the action and the time required to complete the response.

Long-Term Effectiveness and Permanence

This criterion evaluates the permanence of the remedial alternative, the magnitude of the remaining risk, and the adequacy and reliability of the controls on any remaining contamination.

Reduction of Toxicity, Mobility, and Volume

This criterion assesses the extent to which material is treated to reduce toxicity, mobility, or volume. As discussed in Section 3.1.2, the nature of the contaminants at this site, the minimal amount of contamination in soil and debris media, and the small size of the site limit the applicability of treatment technologies at this site.

Implementability

This criterion assesses the technical and administrative feasibility of implementing an alternative, and the availability of various services required for the alternative's implementation.

Cost

Evaluated costs include capital, operation and maintenance (O & M), and present worth.

O & M
operation and maintenance

FWIA
Fish and Wildlife Impact Assessment

Following an individual evaluation of each alternative with respect to these costs, the alternatives are compared for selection of a preferred alternative.

4.1 Alternative 1: No Action

4.1.1 Description

Under this alternative, no action would be taken to address the contamination detected at the Cauterskill Road Site. Contaminated soil would continue to pose a direct-contact threat to the public.

4.1.2 Analysis

4.1.2.1 Compliance with SCGs

No standards apply to the contaminated media at the site. However, contaminated soil remaining at the site would exceed NYSDEC guidance for restoring a site to background levels for metals.

4.1.2.2 Overall Protection of Human Health and the Environment

The Fish and Wildlife Impact Assessment (FWIA) TEA conducted during the RI found that there was no impact from the site despite adequate habitat and the presence of contaminants above TBC criteria. Potential threats would remain, however, to human health. No site-specific risk assessment was performed for this site. Exceedances of background levels of metals do not imply directly that a threat to human health exists. However, several samples exhibited high levels of metals that exceed generic health-based risk levels such as the EPA SSLs; the EPA, Region III, PRGs; and the EPA, Region III, RBCs. A continuing risk of people coming in direct contact with some site soils is expected. These people would include construction workers developing the site, and trespassers.

4.1.2.3 Short-Term Impacts and Effectiveness

Because this alternative would involve no action, there would be no short-term impacts.

4.1.2.4 Long-Term Impacts and Effectiveness

This alternative would not be effective in removing potential threats to human health and the environment, either in the short term or long term.

4.1.2.5 Reduction of Toxicity, Mobility, and Volume

This alternative would not reduce the toxicity, mobility, or volume of contamination.

4.1.2.6 Implementability

There would be no technical obstacles to implementing this alternative.

4.1.2.7 Cost

There would be no costs associated with this alternative.

4.2 Alternative 2: Covering of Soils Exceeding Cleanup Goals

4.2.1 Description

This alternative would place a cover over all soils exceeding cleanup goals. The area includes 23,065 square feet (ft^2) over the Group 2 soils, plus an additional 5,305 ft^2 over the rest of the soils above cleanup goals that are not along the creek bank, and 3,250 ft^2 along the creek bank. The areas that would be covered are depicted in Figure 4-1.

ft^2
square feet

yd^3
cubic yards

The cover would consist of 6 inches of clean soil, which in turn would be covered with 6 inches of topsoil. The topsoil would be seeded with grass to stabilize the soil. The area to be covered is shown in Figure 2-6. This area is the total area where metals were found above background. Approximately 0.65 acre of land would be covered, requiring 525 cubic yards (yd^3) of general fill soil and 525 yd^3 of topsoil.

The contamination at the Cauterskill Road Site is in part due to waste material used as fill adjacent to the tributary to Kaaterskill Creek. The placement of this material has resulted in a relatively steep bank from the edge of the flat "lawn" area and the creek. The slope of this bank varies but averages approximately 1:1, which is too steep to allow placement of a soil cover. Thus, instead of a soil cover over these areas, these materials will be covered with geofabric and riprap. This construction will prevent direct exposure to the contamination, while also resisting erosion that would otherwise occur along the steep bank. The area requiring geofabric/riprap construction is estimated at 3,250 ft^2, including 40% extra area than the plan view uses to account for the steep slope.

Because of the contamination remaining at the site, future use of the site would have to be limited to aboveground activities by deed restrictions.

Other than periodic mowing of the property, there would be no ongoing maintenance requirements associated with this alternative.

4.2.2 Analysis

4.2.2.1 Compliance with SCGs

No standards apply to the contaminated media at the site. Soil containing metals above cleanup goals would remain beneath the cover at the site. While most of this contamination would be covered, some portions on the bank and adjacent to the creek would remain uncovered. Because some soil containing metals above background concentrations would remain exposed at the site, soil guidance such as TAGM 4046 would not be met fully.

Because the soils are not considered to be hazardous wastes, the soil cover would not be subject to any action-specific SCGs. No location-specific SCGs apply to this site.

4.2.2.2 Overall Protection of Human Health and the Environment

The FWIA TEA conducted during the RI found that there was no impact from the site despite adequate habitat and the presence of contaminants above TBC criteria. The RI also found that contaminants are not leaching into the groundwater. Placement of the cover would minimize direct-contact exposure pathways. Therefore, this alternative would be protective of human health.

4.2.2.3 Short-Term Impacts and Effectiveness

There would be only limited short-term impacts from implementation of this alternative relating to the placement of geofabric, riprap, and cover soils. These short-term impacts would be limited to construction vehicle traffic and potential minor disruption to the creek bed during bank covering.

4.2.2.4 Long-Term Effectiveness and Permanence

All contaminants would remain at the site. Therefore, potential exists for future exposure should the cover be removed or damaged by construction, erosion, or other forces. However, with a regular program of monitoring the integrity of the cap, protection against direct exposure threats may be maintained indefinitely.

4.2.2.5 Reduction of Toxicity, Mobility, and Volume

As discussed in Section 3.1.2, the toxicity of the contaminants cannot be reduced, but mobility and volume can be reduced by technologies that actually are not appropriate for this site. This alternative, which simply would cover the contamination to prevent direct exposure, would not reduce mobility or volume.

4.2.2.6 Implementability

There would be no technical or administrative barriers to implementation of this alternative.

4.2.2.7 Cost

The capital cost for this alternative, $53,800, is estimated in Table 4-1. Because of the relatively small size of the site and the simplicity of the remedy, costs are expected to be only about $53,800. The main costs would be for the topsoil and riprap on the cover and for the building demolition and removal.

O & M costs would be minimal for this alternative. The only O & M requirements would be annual maintenance of the cover, if needed. For costing purposes, approximately $1,000 per year is estimated to be required. These annual costs are equivalent to a present worth value of $13,765, assuming a 6% interest rate for 30 years. The total present worth of this alternative, including capital costs and a contingency of 20%, therefore is estimated at about $81,100.

4.3 Alternative 3: Removal of Group 1 Contaminated Soils

4.3.1 Description

This alternative would consist of three components: removing Group 1 soil; backfilling excavated areas with clean soil; and covering those areas of the site where cleanup goals still are exceeded, to the extent possible.

Contaminated soil would be excavated from the areas shown in Figure 2-4. This illustration also indicates the depth of excavation required, based on RI data. This area and volume correspond to the highest levels of contamination at the site. These soils would

RCRA
Resource Conservation and Recovery Act

TSD
treatment, storage, and disposal

be excavated by conventional earth-moving equipment, such as backhoes and front-end loaders, and transferred to dump trucks for disposal off site. Excavated soil would be sent to a sanitary landfill for disposal. The material would have to be tested at the landfill for hazardous characteristics before acceptance. However, based on the levels of metals observed during the RI, the soil is not expected to exhibit any hazardous characteristics. Any soil that exhibits hazardous characteristics would have to be segregated and diverted to a Resource Conservation and Recovery Act (RCRA) treatment, storage, and disposal (TSD) facility. The hazardous soil would have to be treated before disposal to meet land disposal restriction requirements, most likely by solidification/stabilization. This treatment would take place at the TSD facility. For costing purposes, no soil is assumed to exhibit hazardous characteristics.

Soil excavation areas would be backfilled with clean soil to grade. Following backfilling, the areas of the site where contaminants continue to exceed background would be covered as described in Alternative 2. As described in Alternative 2, the contaminated areas along the bank of the filled area would be covered with geofabric and riprap. The soil cover, at an estimated 17,080 ft^2, would be smaller than the 28,060-ft^2 soil cover called for in Alternative 2. However, the same amount of topsoil and landscaping would be required because the excavated areas would have to be revegetated.

Because some contaminants would remain above background levels on site, future use of the site would have to be limited to aboveground activities by deed restrictions.

Other than periodic mowing of the property, there would be no ongoing maintenance requirements associated with this alternative.

4.3.2 Analysis

4.3.2.1 Compliance with SCGs

No standards apply to the contaminated media at the site. Some soil containing lower concentrations of contaminants above background would remain beneath the cover at the site. However, this contamination would be covered. No soil containing these metals above background concentrations would remain exposed at the site; therefore, soil guidance such as TAGM 4046 would be met substantially.

All soil disposed of off site would have to be shown to not exhibit any RCRA hazardous characteristics in order to be disposed of in a sanitary landfill. Because the soils are not considered to be hazardous wastes, the soil cover would not be subject to any action-specific SCGs. No location-specific SCGs apply to this site.

4.3.2.2 Overall Protection of Human Health and the Environment

Removal of most of the metals contaminants would eliminate potential for exposure, and therefore protect human health. The FWIA TEA conducted during the RI found that there was no impact from the site despite adequate habitat and the presence of contaminants above TBC criteria. The RI also found that contaminants were not leaching into the groundwater. Placement of the cover over most of the areas where contaminants continue to exceed background levels would minimize direct-contact exposure pathways to these remaining contaminants. In addition, concentrations of the remaining contaminants would be expected to present little to no risk through direct ingestion, based on comparison to guidance values for these metals based on generic direct-contact exposure scenarios such as the EPA SSLs; the EPA, Region IX, PRGs; and the EPA, Region III, RBCs. However, no site-specific risks have been calculated for this site.

4.3.2.3 Short-Term Impacts and Effectiveness

Excavation would create some short-term impacts. Excavation activity would create potential dust releases. Excavation equipment would frequent the site during soil removal, and truck traffic would increase. However, aside from the residence on the property and one immediately to the north, the vicinity is sparsely populated. Therefore, these impacts would not be considered major.

Care would be required during excavation to prevent tracking the contaminated soil off site. The tires of all equipment accessing the site during demolition would require decontamination before leaving the site. Decontamination water would be collected and discharged to the site before application of the cover.

4.3.2.4 Long-Term Effectiveness and Permanence

Removal of most of the contaminants would provide an almost permanent remedy for the site. Some contamination would remain above cleanup goals; therefore, potential for future exposure exists should the cover over these metals be removed or damaged by construction, erosion, or other forces. However, with a regular program of monitoring the integrity of the cover, protection against direct-exposure threats may be maintained indefinitely.

4.3.2.5 Reduction of Toxicity, Mobility, and Volume

As discussed in Section 3.1.2, the toxicity of the contaminants cannot be reduced, but mobility and volume can be reduced by technologies that actually are not appropriate for this site. This alternative, which simply would transfer contaminants to a landfill and cover virtually all of the remaining low-level contamination to prevent direct exposure, would not reduce mobility or volume. However, because of provisions such as impermeable liners and covers built in to permitted sanitary landfills to prevent migration of contaminants to groundwater, the mobility of soils disposed of off site may be considered to be reduced, if not intrinsically.

4.3.2.6 Implementability

There would be no technical or administrative barriers to implementation of this alternative. There are many sanitary landfills available to accept soil from this site.

4.3.2.7 Cost

The capital cost for this alternative, $128,800, is estimated in Table 4-2. About 33% of the cost is due directly to the excavation of contaminated soil and its off-site disposal and 28% for topsoil and riprap for covering.

O & M costs would be minimal for this alternative. The only O & M requirement would be annual maintenance of the cover, if needed. For costing purposes, approximately $1,000 per year is estimated to be required. These annual costs are equivalent to a present worth value of $13,765, assuming a 6% interest rate for 30 years. The total present worth of this alternative, including capital costs and a contingency, is estimated at about $171,100.

4.4 Alternative 4: Removal of Group 2 Contaminated Soils

4.4.1 Description

This alternative is identical to Alternative 3 except that additional soil (identified in the Group 2 scenario) would be excavated and removed from the site. Contaminated soil would be excavated from the areas shown in Figure 2-5. This illustration also indicates the depth of excavation required, based on RI data. This area and volume correspond to the highest levels of contamination present at the site, yet include more of the less-contaminated soil than what is addressed in Alternative 3.

In contrast to Alternative 3, no contaminated soils would remain at the areas along the bank of the filled area. The contaminated soils along this bank are included in the Group 2 soils and would be excavated under this alternative.

As with Alternative 3, soil excavation areas would be backfilled with clean soil to grade. Following backfilling, the areas of the site where contaminants continue to exceed background would be covered as described in Alternative 2 because contaminated soils along the fill bank would have been removed, only backfill, not a cover, would be required in this area. The cover, at an estimated 5,305 ft^2, would be much smaller than the 28,060-ft^2 cover called for in Alternative 2. However, the same amount of topsoil and landscaping would be required because the excavated areas would have to be revegetated.

Because of the contamination remaining at the site, future use of the site would have to be limited to aboveground activities by deed restrictions.

Other than periodic mowing of the property, there would be no ongoing maintenance requirements associated with this alternative.

4.4.2 Analysis

4.4.2.1 Compliance with SCGs

No standards apply to the contaminated media at the site. Some soil containing lower concentrations of contaminants above background would remain beneath the cover at the site. However, this contamination would be covered. No soil containing these metals above background concentrations would remain exposed at the site; therefore, soil guidance such as TAGM 4046 would be met substantially.

All soil disposed of off site would have to be shown to not exhibit any RCRA hazardous characteristics in order to be disposed of in a sanitary landfill. Because the soils are not considered to be hazardous wastes, the soil cover would not be subject to any action-specific SCGs. No location-specific SCGs apply to this site.

4.4.2.2 Overall Protection of Human Health and the Environment

Removal of most of the metals contaminants would eliminate potential for exposure, and therefore protect human health. This alternative would remove metals of concern to lower levels as summarized in Table 4-3. The FWIA TEA conducted during the RI found that there was no impact from the site despite adequate habitat and the presence of contaminants above TBC criteria. The RI also found that contaminants were not leaching into the groundwater. Placement of the cover over most of the areas where contaminants continue to exceed background levels would minimize direct-contact exposure pathways to these remaining contaminants. In addition, concentrations of the remaining contaminants would be expected to present little to no risk through direct ingestion, based on comparison to guidance values for these metals based on generic direct-contact exposure scenarios such as the EPA SSLs; the EPA, Region IX, PRGs; and the EPA, Region III, RBCs. However, no site-specific risks have been calculated for this site.

4.4.2.3 Short-Term Impacts and Effectiveness

Excavation would create some short-term impacts. Excavation activity would create potential dust releases. Excavation equipment would frequent the site during soil removal, and truck traffic would increase. However, aside from the residence on the property and one immediately to the north, the vicinity is sparsely populated. Therefore, these impacts would not be considered major.

Care would be required during excavation to prevent tracking the contaminated soil off site. The tires of all equipment accessing the site during demolition would require decontamination before leaving the site. Decontamination water would be collected and discharged to the site before application of the cover.

4.4.2.4 Long-Term Effectiveness and Permanence

Removal of most of the contaminants would provide an almost permanent remedy for the site. Some contamination would remain above cleanup goals; therefore, potential for future exposure exists should the cover over these metals be removed or damaged by construction, erosion, or other forces. However, with a regular program of monitoring the integrity of the cover, protection against direct-exposure threats may be maintained indefinitely.

4.4.2.5 Reduction of Toxicity, Mobility, and Volume

As discussed in Section 3.1.2, the toxicity of the contaminants cannot be reduced, but mobility and volume can be reduced by technologies that actually are not appropriate for this site. This alternative, which simply would transfer contaminants to a landfill and cover virtually all of the remaining low-level contamination to prevent direct exposure, would not reduce mobility or volume. However, because of provisions such as impermeable liners and covers built in to permitted sanitary landfills to prevent migration of contaminants to groundwater, the mobility of soils disposed of off site may be considered to be reduced, if not intrinsically.

4.4.2.6 Implementability

There would be no technical or administrative barriers to implementation of this alternative. There are many sanitary landfills available to accept soil from this site.

4.4.2.7 Cost

The capital cost for this alternative, $182,500, is estimated in Table 4-4. About 52% of the cost is due directly to the excavation of contaminated soil and its off-site disposal and 28% for topsoil and riprap for covering.

O & M costs would be minimal for this alternative. The only O & M requirement would be annual maintenance of the cover, if needed. For costing purposes, approximately $1,000 per year is estimated to be required. These annual costs are equivalent to a present worth value of $13,765, assuming a 6% interest rate for 30 years. The total present worth of this alternative, including capital costs and a contingency, is estimated at about $235,600.

Because a greater amount of soil would be excavated, the estimated costs of Alternative 4 are greater than those of Alternative 3. The capital cost for Alternative 4 is estimated to be about $182,500, as shown in Table 4-4. About 60% of the cost is due directly to the excavation of contaminated soil and its off-site disposal.

As with Alternative 3, O & M costs would be minimal for this alternative. The only O & M requirement would be annual maintenance of the cover, if needed. For costing purposes, approximately $1,000 per year is estimated to be required. These annual costs are equivalent to a present worth value of $13,765, assuming a 6% interest rate for 30 years. The total present worth of this alternative, including capital costs and a contingency, is estimated at about $235,600.

4.5 Alternative 5: Removal of All Soils Above Cleanup Goals

4.5.1 Description

This alternative is identical to Alternatives 3 and 4 except that all soil containing metals above background would be excavated and disposed of off site. No cover would be required for remaining soils, and no deed restrictions against future use would have to be implemented.

4.5.2 Analysis

4.5.2.1 Compliance with SCGs

No standards apply to the contaminated media at the site. No soil containing metals above background concentrations would remain exposed at the site. Therefore, soil guidance such as TAGM 4046 would be met.

All soil disposed of off site would have to be shown to not exhibit any RCRA hazardous characteristics in order to be disposed of in a sanitary landfill.

No location-specific SCGs apply to this site.

4.5.2.2 Overall Protection of Human Health and the Environment

Removal of all of the metals contaminants would eliminate potential for exposure, and therefore protect human health. The FWIA TEA conducted during the RI found that there was no impact from the site despite adequate habitat and the presence of contaminants above TBC criteria.

4.5.2.3 Short-Term Impacts and Effectiveness

Excavation would create some short-term impacts. Excavation activity would create potential dust releases. Excavation equipment would frequent the site during soil removal, and truck traffic would increase. However, aside from the residence on the property and one immediately to the north, the vicinity is sparsely populated. Therefore, these impacts would not be considered major.

Care would be required during excavation to prevent tracking the contaminated soil off site. The tires of all equipment accessing the site during demolition would require decontamination before leaving the site. Decontamination water would be collected and discharged to the site before application of the cover.

4.5.2.4 Long-Term Effectiveness and Permanence

Removal of all of the contaminants would provide a permanent remedy for the site.

4.5.2.5 Reduction of Toxicity, Mobility, and Volume

As discussed in Section 3.1.2, the toxicity of the contaminants cannot be reduced, but mobility and volume can be reduced only by technologies that actually are not appropriate for this site. This alternative, which simply would transfer contaminants to a landfill, would not reduce mobility or volume. However, because of provisions such as impermeable liners and covers built in to permitted sanitary landfills to prevent migration of contaminants to groundwater, the mobility of soils disposed of off site may be considered to be reduced, if not intrinsically.

4.5.2.6 Implementability

There would be no technical or administrative barriers to implementation of this alternative. There are many sanitary landfills available to accept soil from this site.

4.5.2.7 Cost

The cost for this alternative, $385,600, is estimated in Table 4-5. The capital cost of this alternative is estimated at about $321,300, including contingency. About 55% of the cost is due directly to the excavation of contaminated soil and its off-site disposal. Because there would be no cover to maintain, there would be no O & M costs.

4.6 Comparison of Alternatives

4.6.1 Compliance with SCGs

All alternatives except Alternative 1 would meet all chemical- and action-specific SCGs. However, Alternatives 2 and 3 would leave a small amount of contamination present along the fill slope that would remain following implementation of either alternative. Alternatives 4 and 5 would leave no soil uncovered: Alternative 4 would remove contamination along the fill bank, while Alternative 5 would remove all contaminated soil above cleanup goals.

No location-specific SCGs were identified for this site. Alternative 1 would not meet TAGM 4046 guidance for metals contamination.

4.6.2 Overall Protection of Human Health and the Environment

The FWIA TEA conducted during the RI found that there was no impact from the site despite adequate habitat and the presence of contaminants above TBC criteria. Therefore, all alternatives would be protective of the environment. Because of continuing direct-exposure potential, Alternative 1 would continue to pose potential threats to human health. All of the other alternatives would provide adequate protection of human health.

4.6.3 Short-Term Impacts and Effectiveness

There would be no short-term impacts associated with the implementation of Alternative 1. All of the other alternatives would require an equal amount of earth-moving operations during their implementation.

4.6.4 Long-Term Effectiveness and Permanence

Alternative 5, which would remove all soil containing metals above background, would provide the most permanent remedy for this site. Alternatives 3 and 4, which would leave some contamination on site (mostly covered under Alternative 3, and entirely covered under Alternative 4), would provide almost the same amount of permanence, especially considering that the remaining levels of these contaminants are not expected to pose a significant threat to human health. Alternative 2, which would rely solely on covering, could be effective in the long term but would require continued maintenance to ensure that exposure remains minimized. Neither Alternative 1 nor Alternative 2 could be considered a permanent remedy because all contamination would remain at the site.

4.6.5 Reduction of Toxicity, Mobility, and Volume

As discussed in Section 3.1.2, the toxicity of the contaminants cannot be reduced, but mobility and volume can be reduced only by technologies that actually are not appropriate for this site. Therefore, none of the alternatives would provide reduction in toxicity, mobility, or volume. However, because of provisions such as impermeable liners and covers built in to permitted sanitary landfills to prevent migration of contaminants to groundwater, the mobility of soils disposed of off site, as called for in Alternatives 3, 4 and 5, may be considered to be reduced, if not intrinsically.

4.6.6 Implementability

All alternatives are readily implementable.

4.6.7 Cost

The simplest alternative (besides no action), Alternative 2 (covering the entire site), would be the least expensive alternative at an estimated $45,100. Alternatives 3, 4, and 5 would be similar (soil excavation and disposal) but would differ in the extent of soil removed. By focusing on removing the highest levels of contamination, an estimated savings of $250,500 (with Alternative 3) or $150,000 (with Alternative 4) would be realized over Alternative 5, which would remove all soil above background levels.

Table 4-1

Cost for Alternative Two - Covering

Line Item	Unit	Unit Cost ($)	Quantity	Cost ($)
Capital Costs				
Cover Material (6 inches)	CY	6.95	525	3,649
Topsoil (6 inches)	MSF	440	28.27	12,439
Rough Grading	MSF	19.25	56.74	1,092
Hydroseeding	MSF	45	28.37	1,277
Surveying	DAY	885	1	885
Geofabric	SY	1.77	361	639
Riprap	SY	64	361	23,104
Subtotal				43,000
Engineering (15%)				6,500
Mobilization/Demobilization 10% (Inc. submittals, erosion control, sampling and monitoring)				4,300
Subtotal				53,800
Operation and Maintenance Costs				
Annual Cover Maintenance	LS	1000	1	1,000
O&M Subtotal				1,000
O&M present worth (30 yr, 6%)				13,765
Subtotal				67,565
Contingency (20%)				13,500
Total				**81,100**

Key: CY: Cubic Yards
LS: Lump Sum
MSF: Thousands of square feet

Table 4-2

Cost for Alternative Three - Excavation of Group 1 Soils

Line Item	Unit	Unit Cost ($)	Quantity	Cost ($)
Capital Costs				
Excavation - Common Earth	CY	9.11	895	8,153
Soil Transportation and Disposal	CY	90.7	475	43,083
Common Earth Backfill	CY	4.81	895	4,305
Backfill Material, including cover	CY	6.95	791	5,497
Topsoil (6")	MSF	440	29.54	12,998
Rough Grading	MSF	19.25	59.08	1,137
Hydroseeding	MSF	45	29.54	1,329
Surveying	DAY	885	3	2,655
Geofabric	SY	1.77	361	639
Riprap	SY	64	361	23,104
Subtotal				103,000
Engineering (15%)				15,500
Mobilization/Demobilization 10% (Inc. submittals, erosion control, sampling and monitoring)				10,300
Subtotal				128,800
Operation and Maintenance Costs				
Annual Cover Maintenance	LS	1000	1	1,000
O&M Subtotal				1,000
O&M present worth (30 yr, 6%)				13,765
Subtotal				142,565
Contingency (20%)				28,500
Total				**171,100**

Key: CY: Cubic Yards
LS: Lump Sum
MSF: Thousands of square feet

Table 4-3 Comparison of Maximum Remaining Metals Concentrations; Cauterskill Road Site; Catskill, New York

Metal of Concern	Maximum Concentrations Remaining in Soil with Alternative 3 (mg/kg)	Maximum Concentrations Remaining in Soil with Alternative 4 (mg/kg)
Cadmium	39.1	11.2
Chromium	86.5	81.7
Copper	1,130	71.5
Lead	<400	<400
Nickel	611	108
Zinc	1,540	386

Key:

mg/kg = Milligrams per kilogram.

Table 4-4

Cost for Alternative Four - Excavation of Group 2 Soils

Line Item	Unit	Unit Cost ($)	Quantity	Cost ($)
Capital Costs				
Excavation - Common Earth	CY	9.11	1779	16,207
Soil Disposal	CY	90.7	1039	94,237
Common Earth Backfill	CY	4.81	1779	8,557
Backfill Material (including cover)	CY	6.95	1137	7,902
Topsoil (6")	MSF	440	30.41	13,380
Rough Grading	MSF	19.25	60.82	1,171
Landscaping	MSF	45	30.41	1,368
Surveying	DAY	885	3.5	3,098
Subtotal				146,000
Engineering (15%)				21,900
Mobilization/Demobilization 10% (Inc. submittals, erosion control, sampling and monitoring)				14,600
Subtotal				182,500
Operation and Maintenance Costs				
Annual Cover Maintenance	LS	1000	1	1,000
O&M Subtotal				1,000
O&M present worth (30 yr, 6%)				13,765
Subtotal				196,265
Contingency (20%)				39,300
Total				**235,600**

Key: CY: Cubic Yards
LS: Lump Sum
MSF: Thousands of square feet

Table 4-5

Cost for Alternative Five - Excavation of Group 3 Soils

Line Item	Unit	Unit Cost	Quantity	Cost ($)
<u>Capital Costs</u>				
Excavation - Common Earth	CY	9.11	3485	31,748
Soil Disposal	CY	90.7	1937	175,686
Backfill Material	CY	6.95	1927	13,393
Common Earth Backfill	CY	4.81	3485	16,763
Topsoil (6")	MSF	440	31.43	13,829
Rough Grading	MSF	19.25	62.86	1,210
Landscaping	MSF	45	31.43	1,414
Surveying	DAY	885	3.5	3,098
Subtotal				257,000
Engineering (15%)				38,600
Mobilization/Demobilization 10% (Inc. submittals, erosion control, sampling and monitoring)				25,700
Subtotal				321,300
<u>Operation and Maintenance Costs</u>				
None				
Contingency (20%)				64,300
Total				**385,600**

Key: CY: Cubic Yards
LS: Lump Sum
MSF: Thousands of square feet

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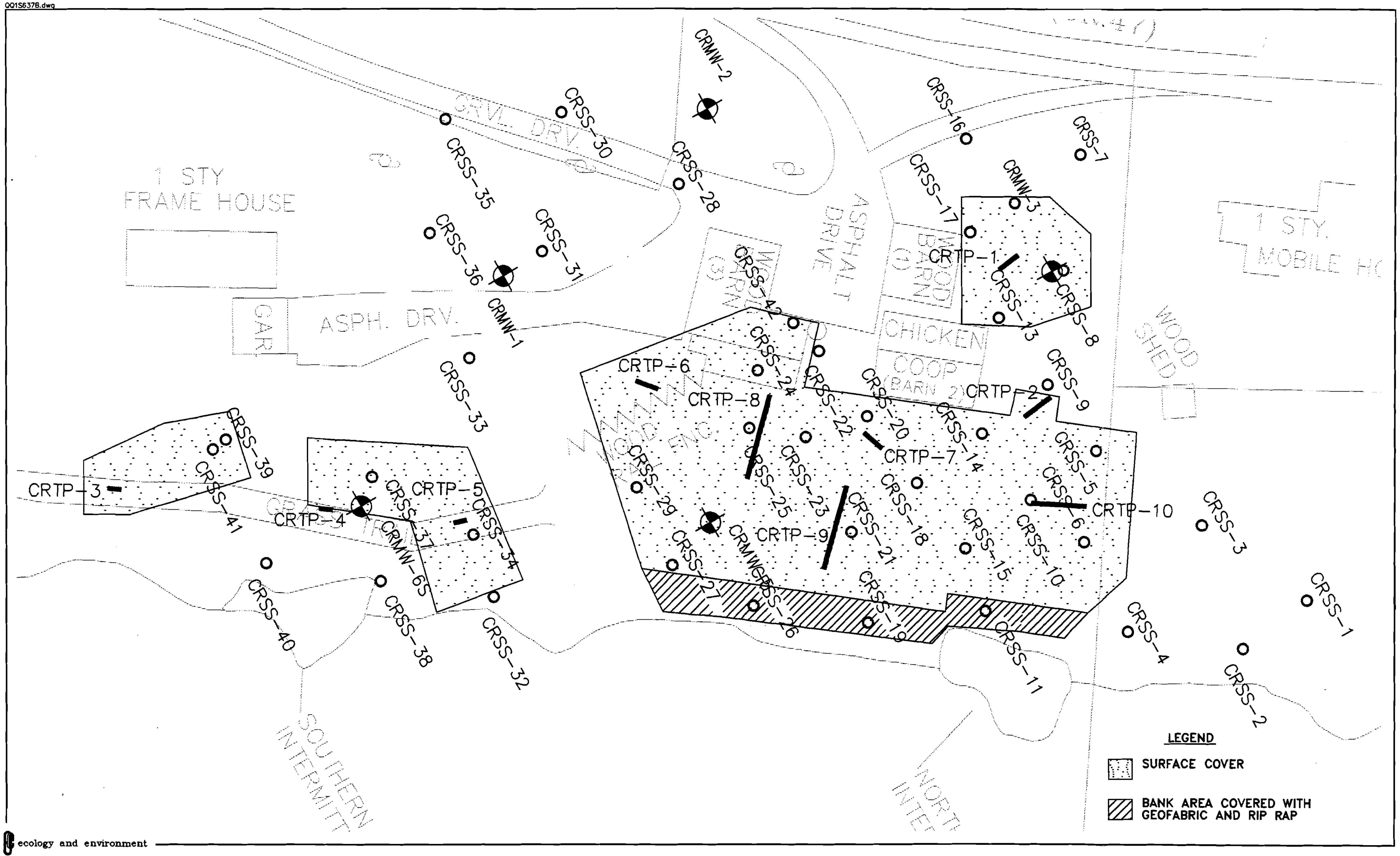

FIGURE 4-1 AREA TO BE COVERED FOR ALTERNATIVE 2

5

References

Ecology and Environment, Inc., September 1999a, *Remedial Investigation Report of the Cauterskill Road Site, Catskill, New York*, Lancaster, New York.

__________, April 1999b, *Draft Remedial Investigation Report of the Cauterskill Road Site, Catskill, New York*, Lancaster, New York.

A

Cost Estimate Calculations

F0350793

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General Computation Sheet

Name of Project CAUTERSKILL System

Subject COVERING - Alt 2

Calculation Set No.

Preliminary ☐

Final ☐

Void ☐

Sheet 1 of 2 Project No.

Rev.	Completed By	Checked By
	Initials: MB 01/12/00	Initials: JBB 1 12/00
	Initials: / /	Initials: / /

Area to be covered: 30,670 ft^2 (GROUP 3 (Table 2-4)) − 2,300 ft^2 = 28,370 ft^2

(2,300 ft^2: area along the steep bank adjacent to creek)

0.5' cover → cover volume: 28,370 × 0.5 = 14,185 ft^3 = 525 yd^2

→ Backfill Material $6.95/$yd^3$ (022-216-4010)

525 yd^3 × 6.95 $/$yd^3$ = $ 3,649

→ Topsoil (includes grading) $ 440/1000 ft^2 (029-204-3850)

(440 $/1,000 ft^2) × (28.370 × 1,000 ft^2) = $ 12,483

→ Grading: 19.25 $/1,000 ft^2. (029-204-2610)

(28.370 × 1,000 ft^2 × 2) × (19.25 $/1,000 ft^2) = $ 1,092

→ Hydroseeding: $45/1,000 ft^2 (029-308-1000)

(28.370 × 1,000 ft^2) × ($45/1,000 ft^2) = $1,277

→ Annual O&M on soil/grass cover:

2 person days to review conditions/need for maintenance and arrange for contractor to maintain, if necessary:

2 × $35/hour × 8 hour = $ 560

Mowing: twice a year: assume $50/mowing = $100

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General Computation Sheet

Calculation Set No.
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Final ☐
Void ☐
Sheet 2 of 2 Project No.

Rev.	Completed By	Checked By
☒	Initials: MB 01/12/00	Initials: JM 1/12
	Initials: / /	Initials: / /

Name of Project CAUTERSKILL System

Subject COVERING

Actual Maintenance: (e.g. repair of eroded areas, etc)

Assume: 1 yard soil $40/yard

? $300/day

Laborer: 4 hr × $20/hr = $80.

Total O&M $1,080 → say $1,000 for O&M.

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General Computation Sheet

Name of Project CAUTERSKILL. System

Subject ALTERNATIVE 2 -

Calculation Set No.		
Preliminary	☐	
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Void	☐	
Sheet 1 of 1		Project No.

Rev.	Completed By	Checked By
☒	Initials: MB 02/01/00	Initials: / /
	Initials: / /	Initials: / /

GEOFABRIC WITH RIPRAP ALONG THE KAATERSKILL CREEK BANKS:

→ Geofabric (geotextiles) - adverse conditions drainage:

(027-054-0110) $\$1.77/yd^2$

Bank area: $3{,}250\ ft^2 = 361\ yd^2$

$361\ yd^2 \times \$1.77/yd^2 = \$639$

→ Riprap (022-712-0200) 18" thickness, not grouted:

$\$64/yd^2$.

$361\ yd^2 \times \$64/yd^2 = \$23{,}104$

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General Computation Sheet

Name of Project CAUTERSKILL System

Subject EXCAVATION OF GROUP 1 SOILS -AII-3

Calculation Set No.

Preliminary ☐

Final ☐

Void ☐

Sheet 1 of 2 Project No.

Rev.	Completed By	Checked By
☒	Initials: MB 01/12/00	Initials: JAS / 1
	Initials: / /	Initials: / /

→ **Excavation:** Group 1 soils (Table 2-4): 12,823 ft^3 = 475 yd^3

Slopes (3:1) 54 ft^3/1 ft × 210 ft = 11,340 ft^3 = 420

(18 ft^2/1 ft)

475 + 420 = 895 yd^3

(A12.1-414-2400) Common Earth $9.11/$yd^3$.

895 × 9.11 = $8,153

→ **Disposal of Contaminated Soil:** $90.70/$yd^3$.

475 × 90.70 = $43,083 (33-19-7301)

→ **Common Earth Backfill:** $4.81/$yd^2$ (A12.1-724-1850)

895 yd^3 × $4.81/$yd^3$ = $4,305

→ **Backfill Material:** (022-206-4010) $6.95/$yd^3$.

- excavated: 475 yd^3 × $6.95/$yd^3$ = $3,301
- covering the rest of the contaminated area, up to the creek, pond (Table 2-4):

can't cover along bank adjacent to creek.

30,670 (GROUP 3) - 2,300 (CREEK) - 11,240 (Group 1 soils) = 17,080

17,080 ft^2 × 0.5 ft (cover depth) = 8,540 ft^3 = 316 yd^3.

316 yd^3 × $6.95/$yd^3$ = $2,198

(30,670 - 2,300 = 28,370 ft^2)

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General Computation Sheet

Calculation Set No.
Preliminary ☐
Final ☐
Void ☐
Sheet 2 of 2 Project No.

Name of Project CAUTERSKILL System
Subject EXCAVATION OF GROUP 1 SOILS

Rev.	Completed By	Checked By
	Initials: MB 01/13/00	Initials: JAS 1/13/00
	Initials: / /	Initials: / /

→ 6" Topsoil (includes spreading) (029-204-3850) $\$440/1,000\ ft^2$.

$28,370\,mft^2 \times \$440/1,000\ ft^2 = \$12,483.$

extra for TP-05: $(1.170 \times 1000\ ft^2) \times \$440/1,000\ ft^2 = \$515$ } $\$12,998$

→ Rough Grading (029-204-2610): $\$19.25/1,000\ ft^2$

$(28.370 \times 1000\ ft^2) \times 2 \times \$19.25/1,000\ ft^2 = \$1,092$

extra for TP-05: $1.170 \times 2 \times \$19.25 = \$45$ } $\$1,137$

→ Hydroseeding: (029-308-1000): $\$45/1,000\ ft^2$

$(28.370 \times 1000\ ft^2) \times \$45/1,000\ ft^2 = \$1,277$

extra for TP-05: $1.170 \times \$45 = \$53$ } $\$1,330.$

→ O&M costs: ~ $1,000

(as in Alternative 2: Covering)

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General Computation Sheet

Name of Project CAUTERSKILL System

Subject ALTERNATIVE 3 -

Calculation Set No.
Preliminary ☐
Final ☐
Void ☐
Sheet 1 of 1 Project No.

Rev.	Completed By	Checked By
	Initials: MB 02/04/00	Initials: /
	Initials: / /	Initials: / /

GEOFABRIC WITH RIPRAP ALONG THE KAATERSKILL CREEK BANKS:

→ Geofabric (geotextiles) - adverse conditions drainage:

(027-054-0110) $\$1.77/yd^2$

Bank area: $3,250\ ft^2 = 361\ yd^2$

$361\ yd^2 \times \$1.77/yd^2 = \underline{\underline{\$639}}$

→ Riprap (022-712-0200) 18" thickness, not grouted:

$\$64/yd^2$

$361\ yd^2 \times \$64/yd^2 = \underline{\underline{\$23,104}}$

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General Computation Sheet

Calculation Set No.
Preliminary ☐
Final ☐
Void ☐
Sheet 1 of 2 Project No.

Rev.	Completed By	Checked By
☒	Initials: MB 01/13/00	Initials: SB3 1/13/00
	Initials: / /	Initials: / /

Name of Project CAUTERSKILL System

Subject EXCAVATION OF GROUP 2 SOILS #4

→ Excavation: Group 2 soils (Table 2-4): 28,061 ft^3 = 1,039 yd^2

Slopes (3:1): 54 ft^3/1 ft × 370 ft = 19,980 ft^3 = 740 yd^3

1,039 + 740 = 1,779 yd^3

(A12.1-414-2400) Common Earth $9.11/$yd^3$

1,779 × 9.11 = $16,207

→ Disposal of contaminated soil: $90.70 yd^3

1,039 × 90.70 = $ 94,237

→ Common Earth Backfill: $4.81/$yd^3$ (A12.1-724-1850)

1,779 × 4.81 = $ 8,557

→ Backfill Material: (022-216-4010) $6.95/$yd^3$.

- excavated: 1,039 × 6.95 = $ 7,221
- covering the rest of the contaminated area, up to the creek: 30,670 (GROUP 3) − 2,300 (CREEK) − 23,065 (group 2) = 5,305

5,305 ft^2 × 0.5 ft (cover depth) = 2,653 ft^3 = 98 yd^3.

98 yd^3 × $6.95/$yd^3$ = $683

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General Computation Sheet

Name of Project CAUTERSKILL System

Subject EXCAVATION OF GROUP 2 SOILS

Calculation Set No.

Preliminary ☐

Final ☐

Void ☐

Sheet 2 of 2 Project No.

Rev.	Completed By	Checked By
☒	Initials: MB 01/13/00	Initials: / /
	Initials: / /	Initials: / /

→ 6" Topsoil (includes spreading: 029-204-3850) $440/1,000 ft

(28.370 × 1,000 ft^2) × ($440/1,000 ft^2) = $12,483

extra for TP-5 and TP-10 slopes

(1.170 + 0.870) × 1000 ft^2 × $440/1000 ft^2 = $898

= 2.04

} $13,381

→ Rough grading (029-204-2610): $19.25/1,000 ft^2.

(28.370 × 1,000 ft^2) × 2 × $19.25/1,000 ft^2 = $1,092

extra for TP-5 and TP-10:

2.04 × 2 × $19.25 = $79

} $1,171

→ Hydroseeding (029-308-1000): $45/1,000 ft^2

28.370 × 45 = $1,277

extra for TP-05 and TP-10: 2.04 × 45 = $92

} $1,369

→ O&M costs: ~ $1,000

(as in Alternative 2: Covering)

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General Computation Sheet

Calculation Set No.
Preliminary ☐
Final ☐
Void ☐
Sheet 1 of 2 Project No.

Rev.	Completed By	Checked By
	Initials: MB 01/13/00	Initials: JVS 1/13/00
	Initials: / /	Initials: / /

Name of Project CAUTERSKILL System

Subject EXCAVATION OF GROUP 3 SOILS - Alt 5

→ Excavation: Group 3 soils (Table 2-4): 52,296 ft^3 = 1,937 yd^3

Slopes (3:1): 774 ft × 54 ft^3/ft = 41,796 ft^3 = 1,548 yd^3

1,937+1,548 = 3,485 yd^3

(A12.1-414-2400) Common Earth \$9.11/yd^3

3,485 × 9.11 = \$31,748

→ Disposal of contaminated soil: \$9070 yd^3

1,937 × 90.70 = \$175,686

→ Backfill Material: (022-206-4010) \$6.95/yd^3

- contaminated & excavated: 1,937 yd^3.

- ~~Truck area: 2,300 ft^2 × 0.5 = 1,150 ft^3 = 43 yd^3~~

~~1,937 − 43 = 1,894 yd^3~~

1,937 × 6.95 = \$13,393

→ Common Earth Backfill: \$4.81/yd^2 (A12.1-724-1850)

(1,937 + 1,548) yd^3 × \$4.81/yd^3 = \$16,763

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General Computation Sheet

Name of Project CAUTERSKILL System

Subject EXCAVATION OF GROUP 3 SOILS

Calculation Set No.
Preliminary ☐
Final ☐
Void ☐
Sheet 2 of 2 Project No.

Rev.	Completed By	Checked By
☒	Initials: MB 01/13/00	Initials: JAS 1/13/
	Initials: / /	Initials: / /

→ 6" Topsoil (includes spreading: 029-204-3850): \$440/msf

28.370 × 440 = \$12,483.

extra for TP: 3,4,5,6,2+10; area 170 ft × 18 ft²/ft = 3,060 ft²

3.06 × 440 = \$1,346.
\$12,483 } \$13,829

→ Rough grading: (029-204-2610): \$19.25/1,000 ft²

28.370 × 19.25 × 2 = \$1,092
extra for the marginal TP's:
3.06 × 2 × 19.25 = \$118 } \$1,210.

→ Landscaping: (029-308-1000): \$45/1,000 ft²

28.370 × 45 = \$1,277
extra for the marginal TP's: 3.06 × 45 = \$138 } \$1,415

→ O&M costs: ~ \$1,000.

(as in Alternative 2: Covering)