Final Phase I & II Feasibility Study

Remedial Investigation/Feasibility Study

Korkay Inc.

Village Of Broadalbin, New York

Site Number 5-18-014
Work Assignment #D002925-3

Prepared for:

New York State
Department Of Environmental Conservation
50 Wolf Road, Albany, New York 12233

Thomas C. Jorling
Commissioner

Division Of Hazardous Waste Remediation

Michael J. O'Toole, Jr., P.E.
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Camp Dresser & McKee
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Executive Summary

At the request of the New York State Department of Environmental Conservation (NYSDEC), and in accordance with the State Superfund Standby Contract (SSSC) that the NYSDEC and Camp Dresser & McKee Inc. (CDM) entered into on September 16, 1993, CDM has prepared this Phase I and II Feasibility Study (FS) under Work Assignment #D002925-3 for the Korkay Inc. (Korkay) site, which is located in the Village of Broadalbin, Fulton County, New York, to determine potentially applicable remedial action alternatives for the site. From 1887 to 1964, the site was owned by the Crosley Glove Company, which was a leather manufacturer. Following this period, Korkay operated a chemical supply company at the site that bought and stored bulk chemicals, and blended these chemicals into products such as car waxes, spray cleaners, and hand cleaners. Site activities included the washing and relining of previously-used barrels, the former contents of which were unknown. Operations at the site reportedly ceased in 1988. The site is currently vacant.

Shallow soil at the site is characterized by fine- to medium-grained sand above silty clay. The silty clay unit (aquitard) is present at depths ranging from about 9.5 to 42 ft below land surface (bls). Beneath this geologic unit is a thin sand and gravel unit that overlies dense silt till, which is present at depths ranging from about 34 to 54 ft bls. The till is underlain by bedrock.

Shallow groundwater was encountered at the site in the unconsolidated overburden at a depth of 7.5 to 8 ft bls. Deep groundwater was encountered beneath the site aquitard at depths ranging from 32 to 43 ft bls.

Based on one round of water level measurements obtained during the Phase I RI, it appears that groundwater flow in the shallow aquifer is in a southerly direction and in the deep aquifer, east-southeasterly. However, due to the presence of thin and possibly discontinuous sand layers in the deep aquifer within which water levels were obtained, as well as the existence of a significant vertical hydraulic gradient at the site, a second round of water level measurements will be taken during the Phase II RI to confirm the direction of groundwater flow in the deep aquifer (CDM 1994a; CDM 1994b). However, because the Korkay site is located north-northwest of the Hudson River, it is likely that groundwater would tend to flow from the site to the south-southeast, towards the river.

Based on the results of the site Phase I RI (CDM 1994a), remedial action is required at this site. The Phase I and II FS has been completed to determine potentially applicable remedial action alternatives for the Korkay site. Specifically, this FS has been conducted in accordance with NYSDEC Technical and Administrative Guidance Memorandum (TAGM) Hazardous Waste Remediation (HWR)-90-4030, dated May 15, 1990 (NYSDEC 1990).

The site-specific remedial action objectives (RAOs) established for the development and evaluation of remedial alternatives for the Korkay site are the following:

> To eliminate, to the greatest extent possible, on-site soils as a source of contamination to on-site groundwater and improve the quality of groundwater at and in the vicinity of the site. Also, to eliminate human exposure to on-site soils.

The site RAOs are designed to protect human health and the environment, and address the following:

- the constituents of concern (COCs) at the site.
- the potential exposure routes and receptors of each COC.
- acceptable target remediation levels or ranges of levels for each COC with respect to its exposure route and New York State Standards, Criteria, and Guidelines (SCGs).

Specifically, the COCs in surficial soils at the Korkay site are semi-volatile organic compounds (VOCs) (benzo[a]pyrene, benzo[a]anthracene, dibenzo[a,h]anthracene, and hexachlorobenzene), pesticides (alpha-chlordane, gamma-chlordane, aldrin, and heptachlor epoxide), and metals (beryllium, chromium, copper, lead, mercury, zinc, and arsenic). In subsurface soils at the site, the COCs are VOCs (trichloroethene [TCE] and xylene), semi-VOCs (di-n-butylphthalate, benzo[a]pyrene, 2,4-dichlorophenol, and benzo[a]anthracene), pesticides (heptachlor epoxide, gamma-chlordane, and alpha-chlordane), and metals (aluminum, beryllium, lead, mercury, chromium, copper, zinc, and arsenic). The COCs in shallow groundwater at the site are VOCs (TCE, 1,2-dichloroethene [DCE], ethylbenzene, and xylene) and pesticides (4-4'DDE, dieldrin, gamma-chlordane, and alpha-chlordane).

The development of general response actions, identification and screening of remediation technologies and process options, and assemblage and screening of alternatives for site remedial action resulted in the identification of the following potentially applicable remedial action alternatives for the Korkay site:

- Alternative 1: No Action.
- Alternative 2: Access Restrictions, Alternate Water Supply, Media Monitoring.
- Alternative 3: Access Restrictions, Alternative Water Supply, Media Monitoring, Soil Excavation, Off-Site Disposal of Excavated Soils, and Soil Vegetative Cover.

- Alternative 4: Access Restrictions, Alternative Water Supply, Media Monitoring, Soil Excavation, Off-Site Disposal of Excavated Soils, Soil Vegetative Cover, and Combined Air Sparging and Soil Vapor Extraction (CASVE).

A detailed analysis of these alternatives (NYSDEC 1990) will be performed during the Phase III FS, and a final remedial action alternative recommended for the site. The Phase III FS will be submitted to the NYSDEC under separate cover.

Section 1
Introduction

At the request of the New York State Department of Environmental Conservation (NYSDEC), and in accordance with the State Superfund Standby Contract (SSSC) that the NYSDEC and Camp Dresser & McKee Inc. (CDM) entered into on September 16, 1993, CDM is conducting a Remedial Investigation/Feasibility Study (RI/FS) under Work Assignment #D002925-3 for the Korkay Inc. (Korkay) site, which is located in the Village of Broadalbin, Fulton County, New York. The RI/FS for the Korkay site is being performed with funds allocated under the New York State (NYS) Superfund Program.

The first phase of the site Remedial Investigation (RI) was completed in October 1993 (CDM 1994a). Phase II of the RI is expected to begin in September 1994 (CDM 1994b). This Feasibility Study (FS) includes the development of site remedial action alternatives (Phase I FS) and the preliminary screening of these alternatives (Phase II FS) based on the results of the Phase I RI. As requested by the NYSDEC, the Korkay site Phase I and II FS is a focused FS, i.e., based on the results of the Phase I RI, only potentially applicable remedial actions have been considered in the site FS (NYSDEC 1994a-j).

The final FS (Phase III) will include a detailed analysis of the potentially applicable alternatives identified during the Phase I and II FS, and a recommended remedial alternative for the site. The Phase III FS will be submitted under separate cover, and will be based on the results of both phases (I and II) of the site RI.

Section 2
Site Background

The following sections provide a brief description of the Korkay site, including its location and history.

2.1 Site Location

The Korkay site is a one acre parcel of land located at 70 West Main Street, in the Village of Broadalbin, Fulton County, New York (see Figure 2-1). It is located about 40 miles northwest of Albany, New York.

The site is bounded on the north by a lumber yard/residences, on the south by West Main Street, on the east by a church, and on the west by a residence (see Figure 2-2). There is a mix of residential and commercial properties in the vicinity of the site (CDM 1994a).

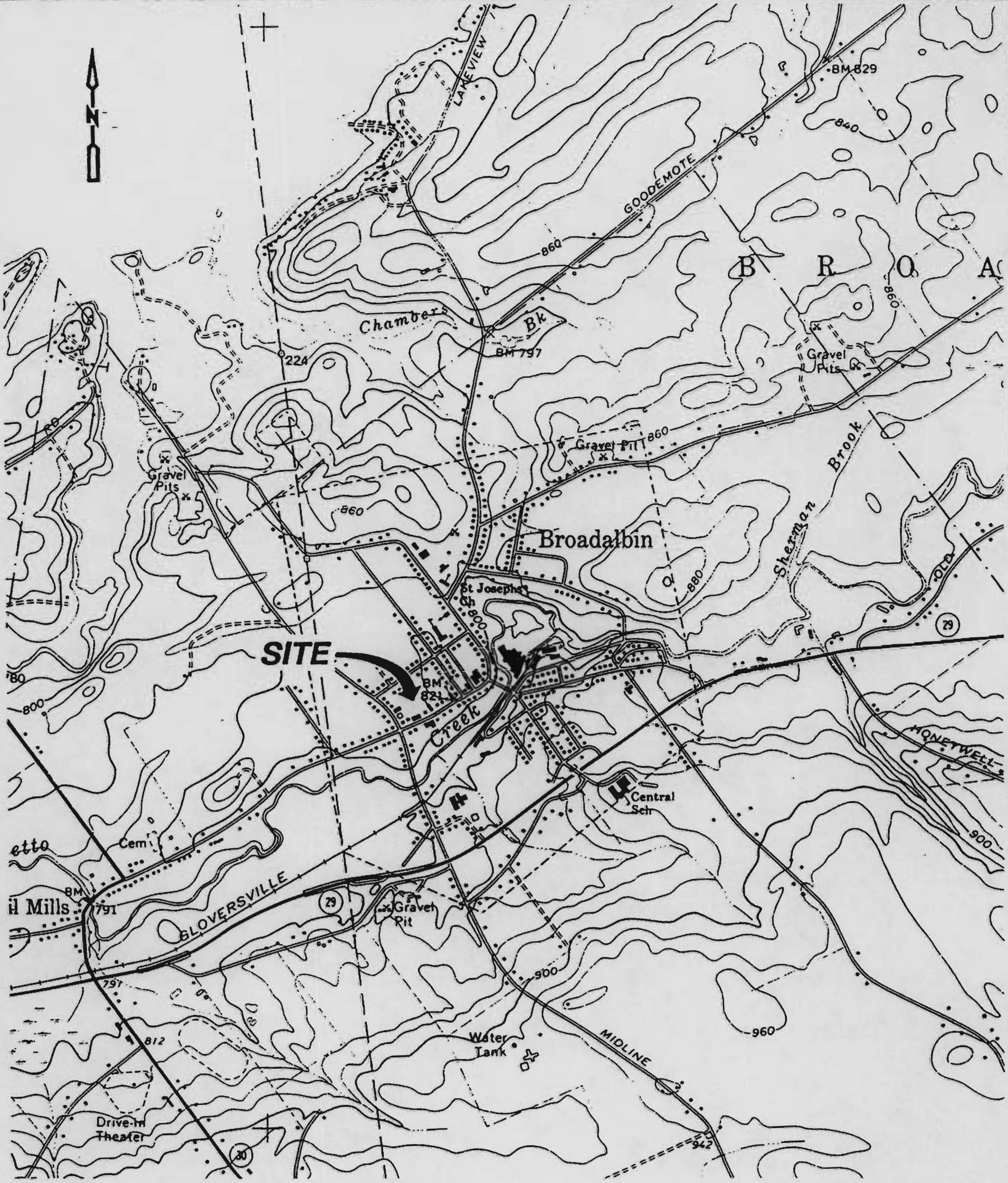
2.2 Site History

From 1887 to 1964, the site was owned by the Crosley Glove Company, a leather manufacturer. Following this period, Korkay operated a chemical supply company at the site that bought and stored bulk chemicals, and blended these chemicals into products such as car waxes, spray cleaners, and hand cleaners.

Between 1969 and 1980, Korkay obtained previously-used barrels, the former contents of which were unknown, and stored, washed, and relined the barrels on-site. Some of Korkay's final products were packaged in these barrels. Barrel washwaters, with washwaters from spill cleanups and vat cleaning, were discharged to on-site septic systems.

A site inspection was conducted by the New York State Department of Health (NYSDOH) and NYSDEC in August 1979. (This inspection was performed in response to a resident's complaint that vegetation on his property, as well as on a neighbor's (Hayes') property west of the site, was adversely affected by run-off from the Korkay barrel washing area [see Figure 2-2].) During this inspection, approximately 100 to 200 barrels were noted at the site, many of which were observed to be leaking onto the ground.

Beginning in 1980, barrels were shipped off-site to be washed and an aboveground, 4,000-gallon holding tank was installed (next to former mineral spirit underground storage tanks [see Figure 2-2]) to contain spill cleanup and vat cleaning washwaters, which were subsequently disposed off-site. As also shown on Figure 2-2, there are 5 underground tanks which were used for the storage of fuel oil and bulk chemicals at the site (CDM 1994a).



Source of map: Broadalbin, NY- Quadrangle, USGS

Village of Broadalbin ---------

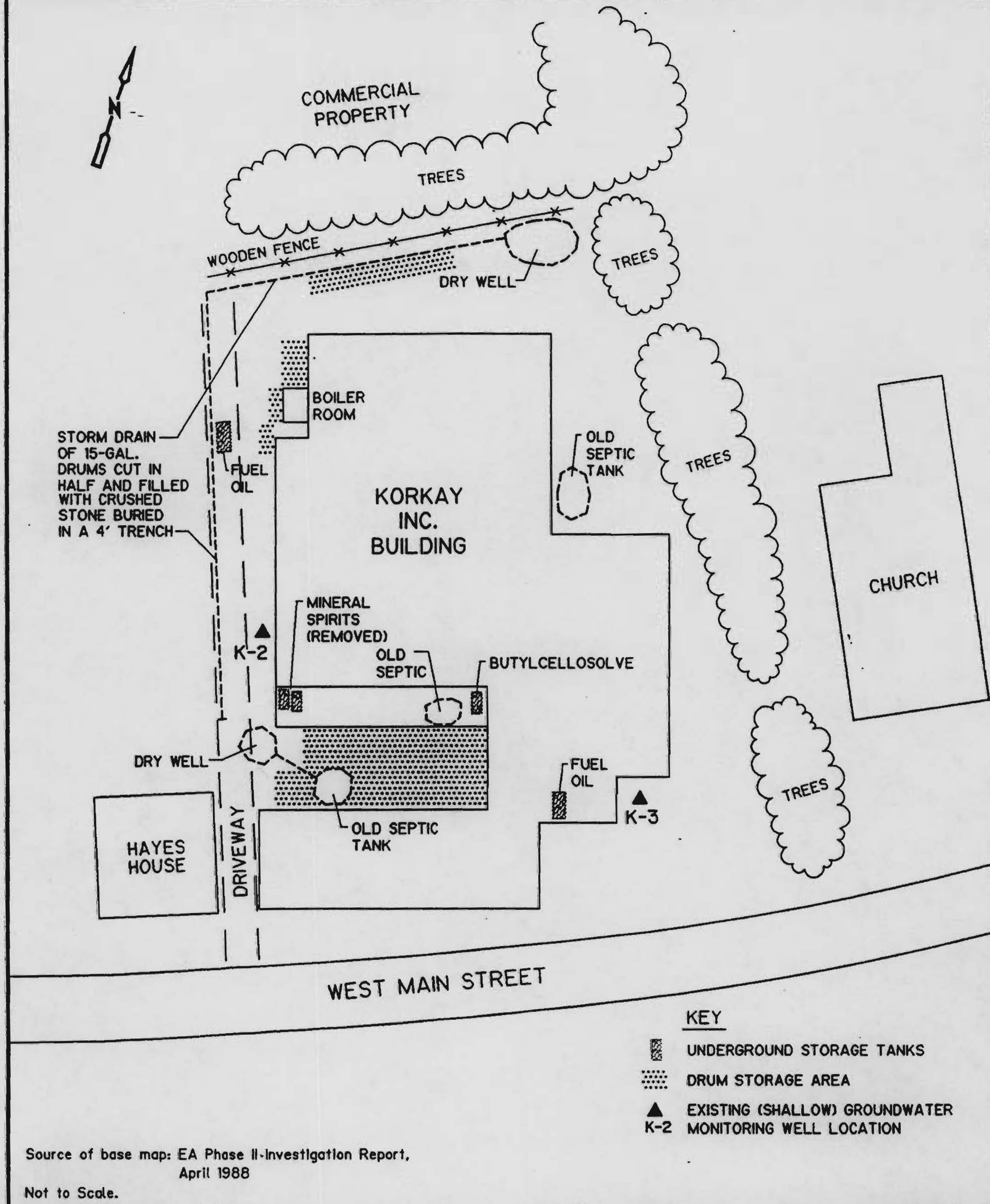
Figure 2-1

Location Map

Korkay Inc. Site - Broadalbin, New York
NYSDEC Site #5-18-014

CDM

environmental engineers, scientists, planners, & management consultants



Source of base map: EA Phase II-Investigation Report, April 1988

Not to Scale.

Figure 2-2

Site Map

Korkay Inc. Site - Broadalbin, New York
NYSDEC Site #5-18-014

CDM

environmental engineers, scientists, planners, & management consultants

1980 : barrels shipped off site
: Above ground 4000 gal holding tank installed
5 underground tanks were used for storage of fuel oil and bulk chemicals.

Acetone
1,1,1-trichloroethane (TCA)
tetrachloroethene (PCE)
xylene
trichloroethene (TCE)
Chlordane
Iron
manganese

on site
in groundwate

Drums no longer stored outdoors
- now stacked 2 to 3 high as well as on their sides inside the site building.

In August 1983, the NYSDEC initiated a Preliminary Site Assessment at the Korkay site. As a result, investigations of site environmental conditions began in 1985. Sample analytical data collected during these investigations indicated the presence of acetone, 1,1,1-trichloroethane (TCA), tetrachloroethene (PCE), xylene, trichloroethene (TCE), chlordane, iron, and manganese in site groundwater (CDM 1994a; EA Science and Technology [EA] 1988a,b). Operations at the site reportedly ceased in 1988 (CDM 1994a).

The NYSDEC conducted Interim Remedial Measures (IRMs) at the site in late 1992/early 1993 based on a site inspection performed by the NYSDEC in December 1992. These IRMs included the relocation of 10 on-site drums to the site building, and the installation of a fence and gates around the rear of the site (along the north, east, and western boundaries). The site is currently vacant (CDM 1994a).

2.3 Site Description

The following sections present the environmental setting and land use, topography and surface drainage, hydrogeology, and meteorology at and in the immediate vicinity of the site.

2.3.1 Environmental Setting and Land Use

As mentioned in Section 2.2, the Korkay site is now vacant. The majority of the site is occupied by the site building, and a fence and gates were installed along the north, east, and western boundaries of the site (see Figure 2-2). Although drums are no longer stored outdoors, they are stacked 2 to 3 high, as well as on their sides, inside the site building.

As discussed in Section 2.1, land uses surrounding the site include a lumber yard/residences to the north, West Main Street to the south, a church to the east, and a residence to the west of the site. The site is zoned industrial. Properties immediately adjacent to the north side of the site and directly across the street from the site (south) are zoned commercial; properties immediately adjacent to the east and west sides of the site are zoned residential (CDM 1994a).

2.3.2 Topography and Surface Drainage

The site topography is relatively flat (not varying more than 2 ft in any one direction) with reportedly poor drainage. The site elevation is about 815 to 816 ft above mean sea level (msl).

In the past, site stormwater had reportedly drained to adjacent properties located north and west of the site. During wet weather, water would reportedly pond behind the site building. Also, to improve drainage conditions at the site, Korkay constructed its own storm sewer system consisting of several 15-gallon drums that were cut opened, placed end to end, and filled with crushed stone within a 4-ft deep, backfilled trench beginning midway along the western boundary, and ending at the northeastern corner, of the site (CDM 1994a).

2.3.3 Hydrogeology

Shallow soil at the site is characterized by fine to medium-grained sand above silty clay. The silty clay unit, interbedded with lenses of clayey silt, silt, and sand, is present at depths ranging from about 9.5 to 42 ft below land surface (bls). Beneath this geologic unit is a thin sand and gravel unit that overlies dense silt till, which is present at depths ranging from about 34 to 54 ft bls. The till is underlain by Dolomite bedrock of the Cambrian Age Little Falls Formation (CDM 1994a).

Kennyetto Creek and the Great Sacandaga Lake are the closest surface water bodies to the Korkay site. Kennyetto Creek is located on the south side of West Main Street, about 600 ft south of the site, and flows in a southwesterly direction past the site. At the next town west of the site (Town of Mayfield), the creek turns and flows north to northeast, and discharges into the Great Sacandaga Lake (CDM 1994a).

Shallow groundwater was encountered at the site in the unconsolidated overburden at a depth of 7.5 to 8 ft bls. Deep groundwater was encountered at the site beneath the silty clay unit (aquitard) at depths ranging from 32 to 43 ft bls.

Based on one round of water level measurements obtained during the Phase I RI, it appears that groundwater flow in the shallow aquifer is in a southerly direction. The direction of flow in the deep aquifer appears to be east-southeasterly. However, due to the presence of thin and possibly discontinuous sand layers in the deep aquifer within which water levels were obtained, as well as the existence of a significant vertical hydraulic gradient at the site, a second round of water level measurements will be taken during the Phase II RI to confirm the direction of groundwater flow in the deep aquifer (see Section 2.5.2.2)(CDM 1994a; CDM 1994b). However, because the Korkay site is located north-northwest of the Hudson River, it is likely that groundwater would tend to flow from the site to the south-southwest, towards the river.

2.3.4 Meteorology

Precipitation data for Broadalbin, New York (based on monthly and annual precipitation normals from 1961 to 1990) ranges from a minimum of 2.63 inches in February to a maximum of 4.10 inches in June. In 1992, the total annual precipitation recorded at Albany, New York (which is located about 40 miles southeast of the site [see Section 2.1]) was 31.9 inches. In the vicinity of the site, the warmest month of the year is July, with an average temperature of about 69 degrees Farenheit (F), and the coldest is January, with an average temperature of about 18 degrees F.

Wind velocities in the Albany area are moderate; in 1992, the average annual wind speed recorded in Albany was 8.9 miles per hour (mph). During periods of lighter winds, the Hudson River Valley, which runs north to south, has a marked effect on wind speed and direction. Hence, in the summer, it influences the average wind direction towards the south. (CDM 1994a).

2.4 Identification of Standards, Criteria, and Guidelines

As stipulated in the May 15, 1990, NYSDEC Technical and Administrative Guidance Memorandum (TAGM)(NYSDEC 1990), the development of potentially applicable remedial action alternatives for an inactive hazardous waste site (such as the Korkay site) requires the consideration of applicable or relevant and appropriate NYS Standards, Criteria, and Guidelines (SCGs). These standards should also include federal standards that are more stringent than SCGs. The following sections present the three categories of SCGs: chemical-, location-, and action-specific.

2.4.1 Chemical-Specific

Chemical-specific SCGs are health risk-based numbers that limit the concentration of a constituent that may be discharged into the ambient environment. These SCGs are independent of the location of the discharge, but may be related to the intended use of the environmental medium to which discharges are made. Potentially applicable chemical-specific SCGs for the Korkay site RI/FS are presented in Table 2-1.

2.4.2 Action-Specific

Action-specific SCGs are based on the implementation and limitation(s) of a particular remedial action. Potentially applicable action-specific SCGs for the Korkay site RI/FS are presented in Table 2-2.

2.4.3 Location-Specific

Depending on the location of the site, several SCGs may require consideration during the FS. These SCGs often include criteria for the protection of sensitive flood plains, as well as wetlands and natural reserves with endangered species. Potentially applicable location-specific SCGs for the Korkay site RI/FS are presented in Table 2-3.

2.5 Nature and Extent of Contamination

The Korkay site RI is being conducted to determine the nature and extent of contamination at the site. Phase I of the RI was completed in October 1993; the results of the Phase I RI are discussed, in detail, in the Korkay Final RI Report (CDM 1994a) and summarized in Section 2.5.1 below. Section 2.5.2,

Table 2–1
Potentially Applicable Chemical–Specific SCGs
Korkay Site, Broadalbin, New York

Standard, Requirement Criteria or Limitation	Citation or Reference	Description	Comments
Federal			
** Groundwater*			
National Primary Drinking Water Standards	40 CFR Part 141	Applicable to the use of public water systems; establishes maximum contaminant levels (MCLs), monitoring requirements and treatment techniques.	
National Secondary Drinking Water Standards	40 CFR Part 143	Applicable to the use of public water systems; controls contaminants in drinking water that primarily effect the aesthetic qualities relating to public acceptance of drinking water.	
Safe Drinking Water Act	Pub. L 95–523, as amended by Pub. L. 96502, 22 USC 300 et. seq.	Sets limits to the maximum contaminant levels (MCLs) and maximum contaminant level goals (MCLGs).	
SDWA MCL Goals	40 CFR 141.50 FR 46936	Established drinking water quality goals set at levels of anticipated adverse health effects with an adequate margin of safety.	
USEPA Office of Drinking Water Health Advisories		Standards issued by the USEPA Office of Drinking Water.	
**Surface Water*			
Clean Water Act (CWA)	33 USC 1251 et.seq.	Applicable for alternatives involving treatment with point source discharges to surface water.	Criteria available for water and fish ingestion, and fish consumption for human health. Point source discharge of treated waters not anticipated.

Table 2–1
Potentially Applicable Chemical–Specific SCGs
Korkay Site, Broadalbin, New York

Standard, Requirement Criteria or Limitation	Citation or Reference	Description	Comments
Toxic Pollutant Effluent Standards	40 CFR Part 129	Applicable to the discharge of toxic pollutants into navigable waters.	Effluent limitation for toxic pollutants are based on the Best Available Technology Economically Achievable for point source discharges. Discharge to navigable waters is not anticipated.
General Provisions for Effluent Guidelines and Standards	40 CFR 401	Establishes legal authority and general definitions that apply to all regulations issued concerning specific classes and categories of point sources.	Provides for point source identification. Aplicable to remedial action with effluent discharge.
* Air			
Clean Air Act	42 USC 7401 Section 112 (as amended 1993)	Establishes upper limits on parameter emissions to atmosphere.	Pollutants deemed hazardous or non–hazardous based on public health.
National Primary and Secondary Ambient Air Quality Standards	40 CFR 50	Establishes primary and secondary NAAQS under Section 109 of the Clean Air Act.	Primary NAAQS define levels of air quality necessary to protect public health. Secondary NAAQS define levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Applicable to remedial action alternatives that may emit pollutants to the atmosphere.
National Emissions Standards for Hazardous Air Pollutants	40 CFR 61	Establishes NESHAPs.	
***RCRA**			
Resource Conservation and Recovery Act– Identification and Listing of Hazardous Wastes	40 CFR 264.1	Defines those wastes which are subject to regulations as hazardous wastes under 40 CFR Parts 262–265 and Parts 124, 270,271.	

Table 2–1
Potentially Applicable Chemical–Specific SCGs
Korkay Site, Broadalbin, New York

Standard, Requirement Criteria or Limitation	Citation or Reference	Description	Comments
RCRA Maximum Concentration Limits	40 CFR 264	Ground Water protection standards for toxic metals and pesticides.	These provisions are applicable to RCRA regulated units that are subject to permitting.
**Other*			
USEPA Office of Research and Development Reference Doses		Reference dose issued by USEPA.	To Be Considered.
USEPA Environmental Criteria and Assessment Office– Carcinogenic Potency Factors		As develpoed by USEPA.	To Be Considered.
New York State			
** Soil*			
NYSDEC Soil Cleanup Objectives	NYSDEC TAGM, HWR–94–4046, January 24, 1994.	Applicable to the cleanup of contaminated soils. Cleanup goals recommended based on human health criteria, ground water protection, background levels, and laboratory quantification levels.	These objectives provide the maximum values for determining soil cleanup levels.
** Air*			
NYSDEC Division of Air Guidelines for the Control of Toxic Ambient Air Contaminants	Air Guide 1	Establishes air quality standards.	May be applicable if remedial alternatives include discharge to air.
New York Ambient Air Quality Standards	6 NYCRR 256–257	Establishes air quality standards.	May be applicable if remedial alternatives include discharge to air.

Table 2–1
Potentially Applicable Chemical–Specific SCGs
Korkay Site, Broadalbin, New York

Standard, Requirement Criteria or Limitation	Citation or Reference	Description	Comments
** Surface Water & Ground Water*			
NYSDEC Ground Water Quality Regulations	6 NYCRR Part 702	Applicable to existing surface water quality and the discharge of runoff and contaminated groundwater into surface waters.	Applicable to groundwater cleanup levels.
NYSDEC Ground Water Quality Regulations	6 NYCRR Part 703	Applicable to the groundwater quality of both the shallow and deep aquifers; sets forth criteria for the consumption of potable water.	
Ambient Water Quality Standards and Guidance Values	TOGS 1.1.1, October 22, 1993	Establishes groundwater quality standards.	
New York Water Classifications and Quality Standards	6 NYCRR Parts 609, 700–704	Describes classification system for surface water and groundwater. Establishes standards of Quality and Purity.	Establishes required clean–up criteria based on water classification.
NYSDEC Standards Raw Water Quality	10 NYCRR 170.4	Provides water quality standards.	May be applicable to groundwater clean–up levels.
** NYSDOH Sanitary Code*			
Drinking Water Supplies	10 NYCRR Support 5–1	Applicable for consumption of potable water from public water supplies.	
**Hazardous Waste*			
New York Identification and Listing of Hazardous Waste Regulations	6 NYCRR part 371	Identifies hazardous wastes.	May be applicable if hazardous wastes are generated, stored or transported during remediation.
NYSDEC Land Disposal Restrictions	6 NYCRR Part 376	Identifies hazardous wastes that are subject to land disposal restrictions.	May be applicable if site remediation involves land disposal of contaminated soils.

Table 2-2

Potentially Applicable Action-Specific SCGs

Korkay Site, Broadalbin, New York

Standard, Requirement Criteria or Limitation	Citation or Reference	Description	Comments
* ***Federal***			
Clean Air Act	42 U.S.C. 7401	Applicable if alternatives will impact ambient air quality.	Relevant if remedial action causes air pollution above primary or secondary ambient air quality standards.
National Ambient Air Quality Standards	40 CFR Part 50	Applicable to alternatives that may emit pollutants to the air; establishes standards to protect public health and welfare.	May be relevant and appropriate if treatment of groundwater or soils involves air emissions.
Resource Conservation and Recovery Act (RCRA)	42 USC 6901-6987 40 CFR part 264 RCRA Subtitle C	Applicable to the treatment, storage, transportation and disposal of hazardous wastes and wastes listed under 6 NYCRR Part 371.	May be required for contaminated soil disposal options. Testing of soils to determine hazardous characterisitics needs to be performed.
	40 CFR Part 264 RCRA Subtitle D	Applicable to management and disposal of non-hazardous wastes.	
	40 CFR Part 265	Interim standards for owners of hazardous waste facilities.	Includes design requirements for capping, treatment, and post closure care.
	40 CFR Part 262 and 263	Applicable to generators and transporters of hazardous waste.	Applicable to off-site disposal or treatment of hazardous material. Soils on-site may be deemed hazardous.
	40 CFR Part 268	Applicable to alternatives involving off-site disposal of hazardous waste; requires treatment to diminish waste toxicity.	May be required for soil disposal options.

Table 2–2

Potentially Applicable Action–Specific SCGs

Korkay Site, Broadalbin, New York

Standard, Requirement Criteria or Limitation	Citation or Reference	Description	Comments
CERCLA/SARA/NCP	40 CFR Part 300	Applicable to remedial actions at CERCLA and NYS Superfund Sites.	The Korkay Site is a designated NYS Superfund Site.
	40 CFR 270,124	EPA administers hazardous waste permit program for CERCLA/Superfund Sites.	Covers basic permitting, application, monitoring, and reporting, requirements for off–site hazardous waste management faciltìes.
Clean Water Act	33 USC 1251	Restoration and maintenance of the chemical, physical and biological integrity of the nation's water.	May be applicable if groundwater and Kenyatto Creek are found to be negatively impacted by the site.
Safe Drinking Act Underground Injection	40 CFR Parts 144 and 146	Applicable to waste water treatment alternatives involving underground injections that may endanger drinking water sources.	
New York State			
NYSDEC TAGM	HWR–90–4030	Guidance for Selection of Remedial Actions at Inactive Hazardous Waste Sites.	Issued May 15, 1990.
NYS Uniform Procedures	6 NYCRR Part 621	Applicable to projects requiring permits.	Applicable to the construction/ operation of hazardous waste treatment facilities.
Hazardous Waste Management	6 NYCRR Part 373	Standards for owners of hazardous waste facilities.	Includes design requirements for soil capping and treatment options, and post–closure care.

Table 2–2

Potentially Applicable Action–Specific SCGs

Korkay Site, Broadalbin, New York

Standard, Requirement Criteria or Limitation	Citation or Reference	Description	Comments
Transportation of Hazardous Materials	6 NYCRR Part 364	Regulates transportation of hazardous materials.	May be relevant if action results in off–site transport of hazardous soils.
Occupational Safety and Health Act	29 CFR Part 1910 and 300.38	Applicable to workers and the work place during remediation of the site.	Applies to all response activities under the NCP.
Hazardous Materials Transportation Act	49 USC ss 1801–1813, 49 CFR Parts 107, 171	Applicable to transporters of hazardous materials.	May be relevant if action results in sludge, waste or soil being transported off–site.
**Air*			
New York State Air Regulations	(6 NYCRR Parts 200 through 207,210,211,212 and 219)		
	6 NYCRR Part 212	General process emission sources.	Sets allowable emissions for remedial options resulting in air emissions.
	6 NYCRR Part 201, 202	Permits for construction/operations of air pollution sources.	Describes permit requirements to construct and operate the above options.
	6NYCRR Part 219	Particulate emission limits.	Limits are based on the refuse charged (lb/hr) for the above options.
	6NYCRR Part 211	Regulates fugitive dust emissions.	Requires control of fugitive dust emissions from excavations and transport.
	6 NYCRR Part 257	Air quality standards.	Requires control for on–site treatment

Table 2–3
Potentially Applicable Location–Specific SCGs
Korkay Site, Broadalbin, New York

Standard, Requirement Criteria or Limitation	Citation or Reference	Description	Comments
• Federal			
Fish and Wildlife Coordination Act	16 USC	Requires consultation when Federal department or agency proposes or authorizes any modification of any stream or other water body and adequate provision for protection of fish and wildlife resources.	There are no major surface water bodies in the area surrounding the site. However, ground–water on site eventually flows into Kenyatto Creek.
Endangered Species Act	40 CFR 6.302 (g)	Requires Federal agencies to ensure that actions they authorize, fund or carry out are most likely to jeapordize the continued existence of endangered/threatened species or adversely modify the critical habitats of such species.	No endangered species are believed to be present in the study area.
Executive Order On Floodplain Management	Execuitive Order No. 11988 40 CFR 6.302(a) and Appendix A	Requires Federal agencies to evaluate potential effects of actions that may take place in a floodplain to avoid, to the maximum extent possible, the adverse impacts associated with direct and indirect development of a floodplain.	No floodplain is located in the immediate vicinity of the site.
Farmlands Protection	7 USC 4201 et. seq.	Protects significant or important agricultural lands from irreversible conversion to uses which result in loss of an environmental or essential food production resource.	

also below, summarizes the additional investigatory work to be performed during the Phase II RI, expected to begin in September 1994 (CDM 1994b).

2.5.1 Phase I Remedial Investigation (RI)

For purposes of the site RI, the study area was divided into six subareas (see Figure 2-3). As shown on Figure 2-3, Areas 1, 2, 3, and 4 encompass the southwestern, northwestern, northeastern, and southeastern portions of the site, respectively. Area 5 encompasses the Hayes property, which is located adjacent to, and west of, the site, and Area 6 is located adjacent to, and east of, the site (the church property). Area 6 is upgradient of the site and, therefore, samples collected in this area serve to define background constituent concentrations. In addition, environmental samples were also collected at the Tanner property which is located adjacent to, and north of, the site, also as shown on Figure 2-3. Soil and groundwater samples collected at the site were analyzed for USEPA Target Compound List/Target Analyte List (TCL/TAL) parameters (VOCs, semi-VOCs, pesticides/polychlorinated biphenyl compounds [PCBs], and metals). Chemical-specific SCGs used in the evaluation of Phase I RI soil and groundwater analytical results are presented in Tables 2-4 and 2-5, respectively (CDM 1994a).

2.5.1.1 Surficial Soils

Levels of volatile organic compounds (VOCs), semi-VOCs, pesticides, and metals were detected in surface (at 0 to 0.5 ft bls) soil samples collected at Area 6 (background samples). Specifically, 1,1,1-TCA, toluene, di-n-butylphthalate, fluoranthene, pyrene, bis(2-ethylhexyl)phthalate, lindane, heptachlor epoxide, dieldrin,, 4,4'-DDE, 4,4'-DDD, 4,4'-DDT, endrin aldehyde, alpha chlordane, aluminum, arsenic, barium, beryllium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, sodium, vanadium, and zinc were detected in background surficial soil samples. However, only beryllium (at 0.2 milligrams per kilogram [mg/kg]) was detected at levels above its NYS SCG (0.16 mg/kg). Detected background concentrations of aluminum (at 5,775 mg/kg), calcium (at 22,395 mg/kg), iron (at 8,345 mg/kg), lead (at 22.8 mg/kg), magnesium (at 10,431 mg/kg), manganese (at 107 mg/kg), and zinc (at 63.65 mg/kg) define the site SCGs, for surficial soils, for these metals.

In Areas 1 through 5, VOCs were detected in surficial soils at concentrations less than NYS SCGs. Detected concentrations of semi-VOCs exceed SCGs in Areas 1 (benzo[a]pyrene, dibenzo[a,h]anthracene), 2 (hexachlorobenzene), and 5 (benzo[a]anthracene, benzo[a]pyrene, dibenzo[a,h]anthracene). The semi-VOCs detected above SCGs in Areas 1, 2, and 5 were not detected in background samples. In Area 2, detected pesticide (gamma-chlordane, aldrin, heptachlor epoxide) concentrations also exceed SCGs. In addition, alpha-chlordane, for which there is no SCG, was detected in Areas 1 (at 0.0073 and 0.02 mg/kg), 2 (from 0.022 to 6.8 mg/kg), 3 (from 0.0012 to 0.023 mg/kg), 4 (at 0.0019 mg/kg), and 5 (from 0.00073 to 0.0063 mg/kg) at levels above its

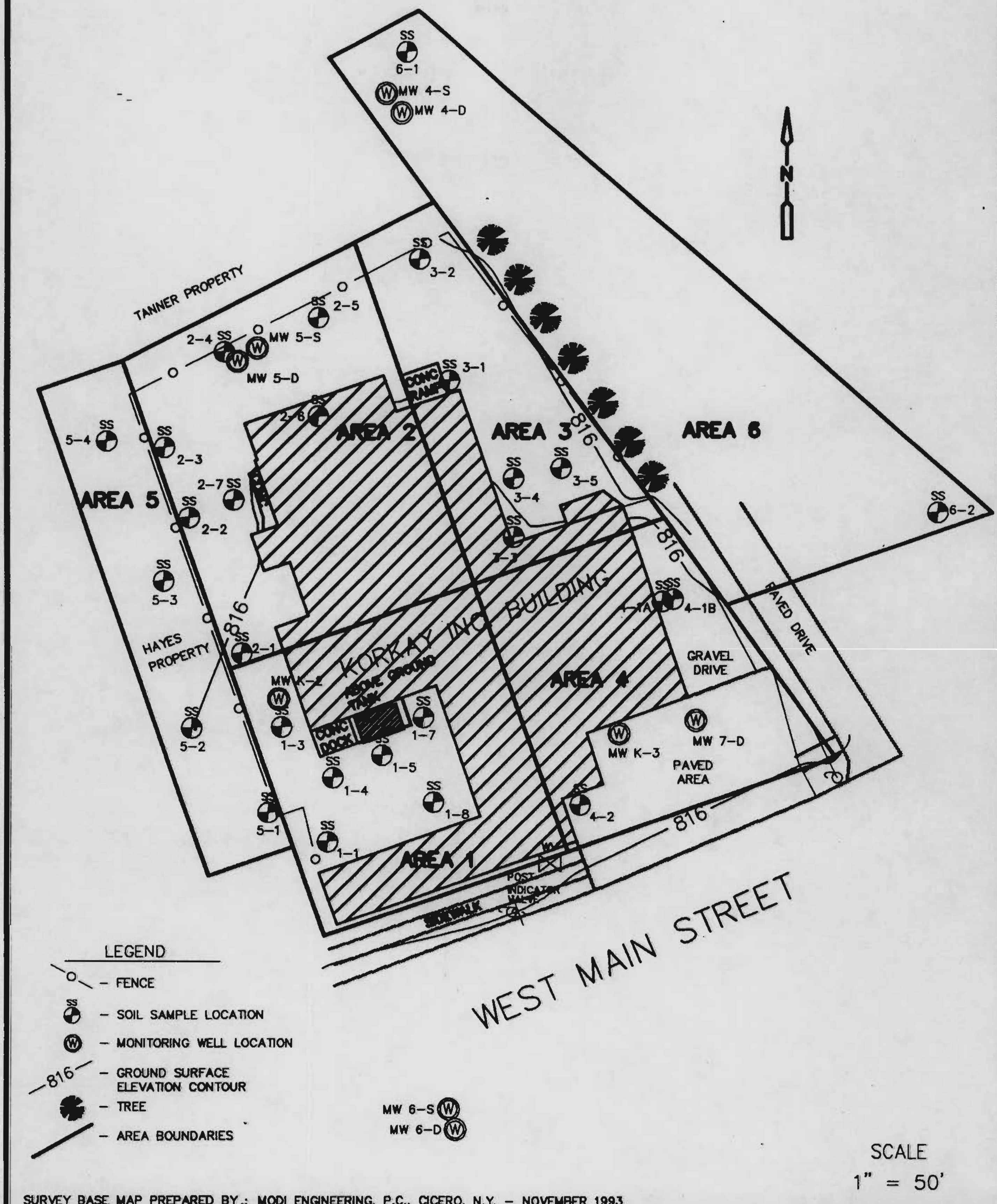


Figure 2-3

Investigation Areas and Sample Locations

Korkay Inc. Site – Broadalbin, New York
NYSDEC Site #5-18-014

CDM
environmental engineers, scientists, planners, & management consultants

Table 2–4
Soil Clean–Up Criteria
Korkay Site, Broadalbin, New York

Contaminant	NYSDEC Criteria (1)(2)(3)	Units
Volatile Organics:		
Chloromethane	---	ug/kg
Bromomethane	---	ug/kg
Vinyl Chloride	200	ug/kg
Chloroethane	1900	ug/kg
Methylene Chloride	100	ug/kg
Acetone	200	ug/kg
Carbon Disulfide	2700	ug/kg
1,1–Dichloroethene	400	ug/kg
1,1–Dichloroethane	200	ug/kg
1,2–Dichloroethene (Total)	---	ug/kg
Chloroform	300	ug/kg
1,2–Dichlorethane	100	ug/kg
2–Butanone	300	ug/kg
1,1,1–Trichloroethane	800	ug/kg
Carbon Tetrachloride	600	ug/kg
Bromodichloromethane	---	ug/kg
1,2–Dichloropropane	---	ug/kg
cis–1,3–Dichloropropylene	---	ug/kg
Trichloroethene	700	ug/kg
Dibromochloromethane	---	ug/kg
1,1,2–Trichloroethane	---	ug/kg
Benzene	60	ug/kg
Trans–1,3–Dichloropropylene	---	ug/kg
Bromoform	---	ug/kg
4–Methyl–2–Pentanone	1000	ug/kg
2–Hexanone	---	ug/kg
Tetrachloroethene	1400	ug/kg
1,1,2,2–Tetrachlorethane	600	ug/kg
Toluene	1500	ug/kg
Chlorobenzene	1700	ug/kg
Ethyl Benzene	5500	ug/kg
Styrene	---	ug/kg
Xylene (Total)	1200	ug/kg
BNAs:		
Phenol	30	ug/kg
Bis(2–Chloroethyl)ether	---	ug/kg
2–Chlorophenol	800	ug/kg
1,3–Dichlorobenzene	1600	ug/kg

Table 2-4

Soil Clean-Up Criteria

Korkay Site, Broadalbin, New York

Contaminant	NYSDEC Criteria (1)(2)(3)	Units
1,4-Dichlorobenzene	8500	ug/kg
1,2-Dichlorobenzene	7900	ug/kg
2-Methylphenol	100	ug/kg
Bis(2-Chloroisopropyl)ether	---	ug/kg
4-Methylphenol	900	ug/kg
N-Nitroso-Di-N-Propylamine	---	ug/kg
Hexachloroethane	---	ug/kg
Nitrobenzene	200	ug/kg
Isophorone	---	ug/kg
2-Nitrophenol	330	ug/kg
2,4-Dimethylphenol	---	ug/kg
Bis(2-Chloroethoxy)methane	---	ug/kg
2-Dichlorophenol	400	ug/kg
1,2,4-Trichlorbenzene	3400	ug/kg
Naphthalene	13000	ug/kg
4-Chloroaniline	220	ug/kg
Hexachlorobutadiene	---	ug/kg
4-Chlor-3-Methylphenole	240	ug/kg
2-Methylnaphthalene	36400	ug/kg
Hexachlorocyclopentadiene	---	ug/kg
2,4,6-Trichlorophenol	---	ug/kg
2,4,5-Trichlorophenol	100	ug/kg
2-Chloronaphthalene	---	ug/kg
2-Nitroaniline	430	ug/kg
Dimethyl Phthalate	2000	ug/kg
Acenaphthylene	41000	ug/kg
2,6-Dinotrotoluene	1000	ug/kg
3-Nitroaniline	500	ug/kg
Acenaphthene	50000	ug/kg
2,4-Dinitrophenol	200	ug/kg
4-Nitrophenol	100	ug/kg
Dibenzofuran	6200	ug/kg
2,4-Dinitrotoluene	---	ug/kg
Diethylphthalate	7100	ug/kg
4-Chlorophenol-Phenylether	---	ug/kg
Fluorene	50000	ug/kg
4-Nitroaniline	---	ug/kg
4,6-Dinitro-2-Methylphenol	---	ug/kg
N-Nitrosodiphenylamine	---	ug/kg
4-Bromophenyl-Phenyl ether	---	ug/kg
Hexachlorobenzene	410	ug/kg
Pentachlorophenol	1000	ug/kg

Table 2-4

Soil Clean-Up Criteria

Korkay Site, Broadalbin, New York

Contaminant	NYSDEC Criteria (1)(2)(3)	Units
Phenanthrene	50000	ug/kg
Anthracene	50000	ug/kg
Carbazole	---	ug/kg
Di-N-Butylphthalate	8100	ug/kg
Fluoranthene	50000	ug/kg
Pyrene	50000	ug/kg
Butylbenzylphthalate	50000	ug/kg
3,3-Dichlorobenzidine	---	ug/kg
Benzo(a)anthracene	220	ug/kg
Chrysene	400	ug/kg
Bis(2-Ethylhexyl)Phthalate	50000	ug/kg
Di-N-Octyl Phthalate	50000	ug/kg
Benzo(b)Fluoroanthene	1100	ug/kg
Benzo(k)Fluoroanthene	1100	ug/kg
Benzo(a)Pyrene	61	ug/kg
Indeno(1,2,3-CD)Pyrene	3200	ug/kg
Dibenzo(a,h)Anthracene	14	ug/kg
Benzo(g,h,i)Perylene	50000	ug/kg
Pesticides:		
Alpha-BHC	110	ug/kg
Beta-BHC	200	ug/kg
Delta-BHC	300	ug/kg
Gamma-BHC (lindane)	60	ug/kg
Heptachlor	100	ug/kg
Aldrin	41	ug/kg
Heptachlor Epoxide	20	ug/kg
Endosulfan I	900	ug/kg
Dieldrin	44	ug/kg
4,4-DDE	2100	ug/kg
Endrin, Total	100	ug/kg
Endosulfan II	900	ug/kg
4,4-DDD	2900	ug/kg
Endosulfan Sulfate	1000	ug/kg
4,4-DDT	2100	ug/kg
Methoxychlor	10000	ug/kg
Endrin Ketone	---	ug/kg
Endrin Aldehyde	---	ug/kg
Alpha-Chlordane	---	ug/kg
Gamma-Chlordane	540	ug/kg
Toxaphene	---	ug/kg

Table 2–4

Soil Clean–Up Criteria

Korkay Site, Broadalbin, New York

Contaminant	NYSDEC Criteria (1)(2)(3)	Units
PCBs (Total)		
Surficial Soil	1000	ug/kg
Subsurface Soil	10000	ug/kg
Inorganics:		
Aluminum	SB	mg/kg
Antimony	30.00	mg/kg
Arsenic	7.50	mg/kg
Barium	300.00	mg/kg
Beryllium	0.16	mg/kg
Cadmium	1.00	mg/kg
Calcium	SB	mg/kg
Chromium	10.00	mg/kg
Cobalt	30.00	mg/kg
Copper	25.00	mg/kg
Iron	SB	mg/kg
Lead	SB	mg/kg
Magnesium	SB	mg/kg
Manganese	SB	mg/kg
Mercury	0.10	mg/kg
Nickel	13.00	mg/kg
Potassium	4000.00	mg/kg
Selenium	2.00	mg/kg
Silver	200.00	mg/kg
Sodium	3000.00	mg/kg
Thallium	20.00	mg/kg
Vanadium	150.00	mg/kg
Zinc	SB	mg/kg

Notes: 1) NYSDEC TAGM, HWR–94–4046, January 24,1994.

2) SB = Site Background

3) NYSDEC criteria specified in this table is based on soil organic carbon content of 1%.

Table 2-5
Groundwater Clean-Up Criteria
Korkay Site, Broadalbin, New York

Contaminant	NYSDEC Criteria ug/l (1)	NYSDOH Criteria ug/l (2)
Volatile Organics:		
Chloromethane	5.0	5.0
Bromomethane	5.0	5.0
Vinyl Chloride	2.0	2.0
Chloroethane	5.0	5.0
Methylene Chloride	5.0	5.0
Acetone	50.0	50.0
Carbon Disulfide	50.0	50.0
1,1-Dichloroethene	5.0	5.0
1,1-Dichloroethane	5.0	5.0
1,2-Dichloroethene (Total)	5.0	5.0
Chloroform	7.0	50.0
1,2-Dichlorethane	5.0	5.0
2-Butanone	50.0	50.0
1,1,1-Trichloroethane	5.0	5.0
Carbon Tetrachloride	5.0	5.0
Bromodichloromethane	50.0	50.0
1,2-Dichloropropane	5.0	5.0
cis-1,3-Dichloropropylene	5.0	5.0
Trichloroethene	5.0	5.0
Dibromochloromethane	50.0	50.0
1,1,2-Trichloroethane	5.0	5.0
Benzene	0.7	5.0
Trans-1,3-Dichloropropylene	5.0	5.0
Bromoform	50.0	50.0
4-Methyl-2-Pentanone	50.0	50.0
2-Hexanone	50.0	50.0
Tetrachloroethene	5.0	5.0
1,1,2,2-Tetrachlorethane	5.0	5.0
Toluene	5.0	5.0
Chlorobenzene	5.0	5.0
Ethyl Benzene	5.0	5.0
Styrene	5.0	5.0
Xylene (Total)	5.0	5.0
BNAs:		
Phenol	1.000	---
Bis(2-Chloroethyl)ether	1.000	50.000
2-Chlorophenol	50.000	50.000
1,3-Dichlorobenzene	5.000	5.000

Table 2-5
Groundwater Clean-Up Criteria
Korkay Site, Broadalbin, New York

Contaminant	NYSDEC Criteria ug/l (1)	NYSDOH Criteria ug/l (2)
1,4-Dichlorobenzene	4.700	5.000
1,2-Dichlorobenzene	4.700	5.000
2-Methylphenol	5.000	50.000
Bis(2-Chloroisopropyl)ether	5.000	50.000
4-Methylphenol	50.000	50.000
N-Nitroso-Di-N-Propylamine	---	50.000
Hexachloroethane	5.000	50.000
Nitrobenzene	5.000	50.000
Isophorone	50.000	50.000
2-Nitrophenol	5.000	50.000
2,4-Dimethylphenol	---	50.000
Bis(2-Chloroethoxy)methane	5.000	50.000
2-Dichlorophenol	1.000	---
1,2,4-Trichlorbenzene	5.000	5.000
Naphthalene	10.000	50.000
4-Chloroaniline	5.000	50.000
Hexachlorobutadiene	5.000	5.000
4-Chlor-3-Methylphenole	5.000	---
2-Methylnaphthalene	50.000	---
Hexachlorocyclopentadiene	5.000	50.000
2,4,6-Trichlorophenol	---	---
2,4,5-Trichlorophenol	1.000	---
2-Chloronaphthalene	10.000	50.000
2-Nitroaniline	5.000	50.000
Dimethyl Phthalate	50.000	50.000
Acenaphthylene	20.000	50.000
2,6-Dinotrotoluene	5.000	50.000
3-Nitroaniline	5.000	50.000
Acenaphthene	20.000	50.000
2,4-Dinitrophenol	5.000	---
4-Nitrophenol	5.000	---
Dibenzofuran	5.000	---
2,4-Dinitrotoluene	5.000	50.000
Diethylphthalate	50.000	50.000
4-Chlorophenol-Phenylether	---	50.000
Fluorene	50.000	---
4-Nitroaniline	5.000	---
4,6-Dinitro-2-Methylphenol	---	---
N-Nitrosodiphenylamine	50.000	50.000
4-Bromophenyl-Phenyl ether	---	---
Hexachlorobenzene	0.350	50.000
Pentachlorophenol	1.000	---

Table 2-5

Groundwater Clean-Up Criteria

Korkay Site, Broadalbin, New York

Contaminant	NYSDEC Criteria ug/l (1)	NYSDOH Criteria ug/l (2)
Phenanthrene	50.000	50.000
Anthracene	50.000	50.000
Carbazole	---	---
Di-N-Butylphthalate	50.000	50.000
Fluoranthene	50.000	50.000
Pyrene	50.000	50.000
Butylbenzylphthalate	50.000	50.000
3,3-Dichlorobenzidine	5.000	50.000
Benzo(a)anthracene	0.002	---
Chrysene	0.002	---
Bis(2-Ethylhexyl)Phthalate	50.000	---
Di-N-Octyl Phthalate	50.000	---
Benzo(b)Fluoroanthene	0.002	---
Benzo(k)Fluoroanthene	0.002	---
Benzo(a)Pyrene	0.002	---
Indeno(1,2,3-CD)Pyrene	0.002	---
Dibenzo(a,h)Anthracene	50.000	---
Benzo(g,h,i)Perylene	5.000	---
Pesticides:		
Alpha-BHC	0.50	---
Beta-BHC	0.50	---
Delta-BHC	0.50	---
Gamma-BHC (lindane)	0.50	0.20
Heptachlor	0.01	0.40
Aldrin	0.01	---
Heptachlor Epoxide	0.01	0.20
Endosulfan I	0.10	---
Dieldrin	0.01	---
4,4-DDE	0.01	---
Endrin, Total	0.01	0.20
Endosulfan II	0.10	---
4,4-DDD	0.01	---
Endosulfan Sulfate	0.10	---
4,4-DDT	0.01	---
Methoxychlor	35.00	40.00
Endrin Ketone	5.00	---
Endrin Aldehyde	5.00	---
Alpha-Chlordane	---	---
Gamma-Chlordane	0.10	---
Toxaphene	ND	3.00

Table 2–5

Groundwater Clean–Up Criteria

Korkay Site, Broadalbin, New York

Contaminant	NYSDEC Criteria ug/l (1)	NYSDOH Criteria ug/l (2)
PCBs (Total)	0.10	0.50
Inorganics:		
Aluminum	---	---
Antimony	3.00	---
Arsenic	25.00	50
Barium	1000.00	2000
Beryllium	3.00	---
Cadmium	10.00	5
Calcium	---	---
Chromium	50.00	100
Cobalt	---	---
Copper	200.00	---
Iron	300.00	300
Lead	25.00	---
Magnesium	35000.00	---
Manganese	300.00	300
Mercury	2.00	2
Nickel	---	---
Potassium	---	---
Selenium	10.00	10
Silver	50.00	50
Sodium	20000.00	---
Thallium	4.00	---
Vanadium	---	---
Zinc	300.00	5000

Notes: (1) NYSDEC Division of Water, Technical and Operational Guidance Series (TOGS 1.1.1) / Ambient Water Quality Standards and Guidance Values, October 22, 1993.

(2) NYSDOH Drinking Water Supply MCLs, January 5,1993.

background concentration (0.00036 mg/kg). A summary of constituents that exceed SCGs in surficial soils at the site is provided in Table 2-6.

Also shown in Table 2-6, metals were detected above SCGs in surficial soil samples collected in all areas of the site. Specifically, detected concentrations of beryllium, iron, lead, manganese, mercury, and zinc exceed background concentrations and SCGs in Areas 1 through 5; of chromium, in Areas 1, 2, 3, and 5; of aluminum, in Areas 2, 3, and 5; of copper in Areas 1, 2, and 5; of cadmium, in Areas 2 and 5; of calcium, in Areas 2 and 3, and of arsenic, barium, magnesium, and nickel, in Area 2, only.

In addition, arsenic was detected at levels greater than its background concentration (3.65 mg/kg) but below its SCG (7.5 mg/kg) in one sample (SS-1-3; 4 mg/kg) collected from Area 1, one sample (SS-4-1A; 3.8 mg/kg) collected from Area 4, and three samples (SS-5-1, 4 mg/kg; SS-5-3, 4.3 mg/kg; and SS-5-4, 4.8 mg/kg) collected from Area 5. Similarly, barium, cadmium, chromium, cobalt, copper, nickel, potassium, selenium, silver, sodium, and vanadium were also detected at many areas of the site at levels above background concentrations but significantly below SCGs (see Table 2-6) (CDM 1994a).

2.5.1.2 Subsurface Soils

Subsurface soil samples were collected at and in the vicinity of the site in Areas 1 through 6, as shown on Figure 2-3, at the following depths:

Area 1: 1.5 to 2.0, 3.5 to 4.0, and 4.5 to 5.0 ft bls.

Area 2: 1.5 to 2.0, 3.5 to 4.0, 6 to 8, and 20 to 22 ft bls.

Area 3: 1.0 to 1.5, 1.5 to 2.0, 3.5 to 4.0, and 4.5 to 5.0 ft bls.

Area 4: 1.5 to 2.0 and 6 to 8 ft bls.

Area 5: 1.5 to 2.0 ft bls.

Area 6: 1.5 to 2.0, 6 to 8, and 28 to 30 ft bls.

In addition, two split spoon soil samples were collected (at depths of 8 to 10, and 22 to 24, ft bls, respectively) during the drilling of the borehole for monitoring well MW-6D (located across the street from the Korkay site, as shown on Figure 2-3). As discussed in Section 2.3.3, the water table was encountered at the site at a depth of about 7.5 to 8 ft bls.

In Area 6, at background soil sample locations SS-6-1 and SS-6-2 (see Figure 2-3), toluene was detected at 0.002 and 0.007 mg/kg, respectively, and di-n-butylphthalate was detected at 0.11 and 0.17 mg/kg/respectively, at a depth of 1.5 to 2.0 ft bls. Also, bis(2-ethylhexyl)phthalate (0.17 mg/kg) and

Table 2-6
Constituents Exceeding SCGs in Surficial Soils (0 - 5' bls)
Korkay Site, Broadalbin, New York

Constituent	Units	Area Detected	Detected Concentration (1)	SCG (2,3,4)	Background (5)
Semi-VOCs:					
benzo(a)pyrene	ug/kg	1	36 - 320	61	U
	ug/kg	5	38 - 200	61	U
dibenzo(a,h)anthracene	ug/kg	1	38 - 47	14	U
	ug/kg	5	39 - 73	14	U
hexachlorobenzene	ug/kg	2	1700	410	U
benzo(a)anthracene	ug/kg	5	37-260	220	U
Pesticides:					
alpha-chlordane	ug/kg	1	7.3 - 20	----	0.36
	ug/kg	2	22 - 6800	----	0.36
	ug/kg	3	1.2 - 23	----	0.36
	ug/kg	4	1.9	----	0.36
	ug/kg	5	0.73 - 6.3	----	0.36
aldrin	ug/kg	2	81	41	U
gamma-chlordane	ug/kg	2	25 - 8900	540	U
heptachlor epoxide	ug/kg	2	1.9 - 170	20	0.41
Metals:					
aluminum	mg/kg	2	3710 - 6100	SB	5775
	mg/kg	3	2200 - 6100	SB	5775
	mg/kg	5	4970 - 8630	SB	5775
arsenic	mg/kg	1	2 - 4	7.5	3.65
	mg/kg	2	4.2 - 9.2	7.5	3.65
	mg/kg	4	3.8	7.5	3.65
	mg/kg	5	3.4 - 4.8	7.5	3.65
barium	mg/kg	2	61.5 - 437	300	28.75
beryllium	mg/kg	1	0.14 - 0.28	0.16	0.2
	mg/kg	2	0.25 - 0.67	0.16	0.2
	mg/kg	3	0.14 - 0.30	0.16	0.2
	mg/kg	4	0.26	0.16	0.2
	mg/kg	5	0.15 - 0.26	0.16	0.2
	mg/kg	6	0.2	0.16	0.2
cadmium	mg/kg	2	1.0 - 1.2	1	U
	mg/kg	5	0.86 - 1.5	1	U
calcium	mg/kg	2	6750 - 104000	SB	22395

Table 2–6
Constituents Exceeding SCGs in Surficial Soils (0 – 5' bls)
Korkay Site, Broadalbin, New York

Constituent	Units	Area Detected	Detected Concentration (1)	SCG (2,3,4)	Background (5)
calcium (cont'd)	mg/kg	3	935 – 25000	SB	22395
chromium	mg/kg	1	6 – 39.2	10	4.7
	mg/kg	2	22.8 – 496	10	4.7
	mg/kg	3	8.3 – 19.3	10	4.7
	mg/kg	5	13.70 – 44.9	10	4.7
copper	mg/kg	1	5.10 – 29	25	6.15
	mg/kg	2	5.4 – 47	25	6.15
	mg/kg	5	6.0 – 87.8	25	6.15
iron	mg/kg	1	7840 – 10700	SB	8345
	mg/kg	2	8420 – 14100	SB	8345
	mg/kg	3	9360 – 13000	SB	8345
	mg/kg	4	10200	SB	8345
	mg/kg	5	7820 – 14300	SB	8345
lead	mg/kg	1	8.3 – 116	SB	22.8
	mg/kg	2	6.4 – 2340	SB	22.8
	mg/kg	3	31.5 – 167	SB	22.8
	mg/kg	4	218	SB	22.8
	mg/kg	5	4.10 – 1440	SB	22.8
magnesium	mg/kg	2	2610 – 10800	SB	10431
manganese	mg/kg	1	59.6 – 127	SB	107
	mg/kg	2	103 – 175	SB	107
	mg/kg	3	68 – 184	SB	107
	mg/kg	4	173	SB	107
	mg/kg	5	121 –298	SB	107
mercury	mg/kg	1	0.13–0.46	0.1	U
	mg/kg	2	0.25	0.1	U
	mg/kg	3	0.12 – 0.18	0.1	U
	mg/kg	4	0.41	0.1	U
	mg/kg	5	0.23 – 0.39	0.1	U
nickel	mg/kg	2	5.8 – 10.2	13	3.65
zinc	mg/kg	1	16 – 79	SB	63.65
	mg/kg	2	24.9 – 412	SB	63.65
	mg/kg	3	48.9 – 174	SB	63.65
	mg/kg	4	119	SB	63.65
	mg/kg	5	233 – 480	SB	63.65

Notes: (1) In a given area, there may have been several samples collected. For a given compound in the sampling area, it may have been undetected in some samples and detected in others. Only the detected range is shown on this table.
(2) NYSDEC TAGM, HWR–94–4046, January 24, 1994.
(3) SB= Site Background
(4) ––––– = no SCG exists for this compound
(5) U= not detected above method detection linits in background samples.

toluene (0.002 mg/kg) were detected in samples collected at depths of 6 to 8, and 28 to 30, ft bls, respectively, during the drilling of the borehole for monitoring well MW-4-D in Area 6 (see Figure 2-3). All detected background concentrations are below SCGs.

Pesticides were also detected in Area 6. Specifically, at locations SS-6-1 and SS-6-2, at a depth of 1.5 to 2.0 ft bls, 4-4'-DDE was detected at 0.00052 and 0.00087 mg/kg, respectively, 4-4'-DDT at 0.00085 and 0.00074 mg/kg, respectively, methoxychlor at 0.0039 and 0.0023 mg/kg, respectively, and endrin aldehyde at 0.00075 and 0.00059 mg/kg, respectively. Also, gamma-chlordane was detected at 0.00027 mg/kg in a sample collected, from the monitoring well MW-4-D borehole, at a depth of 28 to 30 ft bls. Again, all detected background concentrations are below SCGs.

Aluminum, arsenic, barium, beryllium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, sodium, thallium, vanadium, and zinc were detected in background subsurface soil samples. Of these metals, beryllium (at 0.19 mg/kg), calcium (at 28,000 mg/kg), chromium (at 10.3 mg/kg), iron (at 18,100 mg/kg), magnesium (at 12,300 mg/kg), manganese (at 350 mg/kg), and mercury (at 0.15 mg/kg), at a depth of 28 to 30 ft bls, were detected at levels above SCGs (0.14; 1,895; 10.3; 10,150; 990; 115; and 0.1 mg/kg, respectively). Magnesium was also detected above its SCG at a depth of 6 to 8 ft bls. Detected background concentrations of aluminum (at 8,970 mg/kg), calcium (at 1,895 mg/kg), iron (at 10,150 mg/kg), lead (at 35.25 mg/kg), magnesium (at 990 mg/kg), manganese (at 115 mg/kg), and zinc (at 85 mg/kg) define the site SCGs, for subsurface soils, for these metals.

A summary of constituents that exceed SCGs in subsurface soils at the site is provided in Table 2-7. As shown in Table 2-7, VOCs were detected at concentrations above SCGs in subsurface soil samples collected in Area 1, only. Specifically, TCE was detected (at 2.6 mg/kg) above its SCG (0.07 mg/kg) at one sample location (SS-1-4), only, at a depth of 1.5 to 2.0 ft bls. Xylene was also detected above its SCG (1.2 mg/kg) (at 12 [SS-1-4] and ll [SS-1-5] mg/kg at depths of 1.5 to 2.0, and 4.5 to 5.0, ft bls, respectively).

Semi-VOCs were detected above SCGs in Areas 1, 2, and 5. Specifically, in Area 1, di-n-butylphthalate (SCG: 8.1 mg/kg) and benzo(a)pyrene (SCG: 0.061 mg/kg) were detected at a depth of 1.5 to 2.0 ft bls at sample locations SS-1-4 (27 mg/kg) and SS-1-5 (0.07 mg/kg), respectively; di-n-butylphthalate was also detected (at 8.4 mg/kg) at location SS-1-5, at a depth of 4.5 to 5.0 ft bls. 2,4-Dichlorophenol (SCG: 0.40 mg/kg) was detected (at 0.88 mg/kg in sample SS-2-3) in Area 2 at a depth of 1.5 to 2.0 ft bls. At Area 5, at a depth of 1.5 to 2.0 ft bls, benzo(a)anthracene (SCG: 0.22 mg/kg) and benzo(a)pyrene (SCG: 0.061 mg/kg) were detected at 0.25 and 0.20 mg/kg, respectively, at location SS-5-2 (See Table 2-7).

Table 2–7

Consituents Exceeding SCGs in Subsurface Soils

Korkay Site, Broadalbin, New York

Constituent	Units	Area Detected (2)	Depth (bls)	Detected Concentration (3)	SCG (4,5,6)	Background (7)
VOCs:						
trichloroethene	ug/kg	1	1.5' – 2'	4 – 2600	700	11.5
xylene	ug/kg	1	1.5' – 2'	86 – 12000	1200	11.5
	ug/kg	1	4.5' – 5'	11000	1200	11.5
Semi–VOCs:						
benzo(a)anthracene	ug/kg	5	1.5' – 2'	250	220	U
benzo(a)pyrene	ug/kg	1	1.5' – 2'	54 – 70	61	U
	ug/kg	5	1.5' – 2'	200	61	U
di–n–butylphthalate	ug/kg	1	1.5' – 2'	27000	8100	140
	ug/kg	1	4.5 – 5'	8400	8100	140
2,4–dichlorophenol	ug/kg	2	1.5' – 2'	880	400	U
Pesticides:						
alpha–chlordane (1)	ug/kg	1	1.5' – 2'	1.7 – 27	---	U
	ug/kg	1	4.5' – 5'	3.3	---	U
	ug/kg	2	1.5' – 2'	57 – 5000	---	U
	ug/kg	2	3.5' – 4'	47 – 2300	---	U
	ug/kg	2	6'–8'	190	---	U
	ug/kg	3	1.5'–2'	36	---	U
	ug/kg	3	3.5'–4'	490 – 1100	---	U
gamma– chlordane	ug/kg	2	1.5'–2'	59 – 7800	540	U
	ug/kg	2	3.5' – 4'	52 – 2400	540	U
	ug/kg	3	3.5'–4'	0.34 – 1000	540	U
heptachlor epoxide	ug/kg	2	1.5'–2'	37 – 110	20	U
	ug/kg	2	3.5' – 4'	47	20	U
	ug/kg	3	3.5'–4'	32	20	U
Metals:						
aluminum	mg/kg	2	20–22'	22000	SB	8970
	mg/kg	MW–6D	22'–24'	11900	SB	8970
beryllium	mg/kg	1	1.5'–2'	0.15 – 0.23	0.14	0.24
	mg/kg	1	4.5' – 5'	0.26	0.14	0.24
	mg/kg	2	1.5'–2'	0.19 – 0.24	0.14	0.24
	mg/kg	2	3.5' – 4'	0.10 – 0.17	0.14	0.24
	mg/kg	2	20'–22'	0.84	0.14	0.24
	mg/kg	3	1.5'–2'	0.12 – 0.23	0.14	0.24
	mg/kg	4	1.5'–2'	0.17 – 0.20	0.14	0.24
	mg/kg	5	1.5–2'	0.17 – 0.23	0.14	0.24
	mg/kg	MW–6D	22'–24'	0.40	0.14	0.24

Table 2-7
Consituents Exceeding SCGs in Subsurface Soils
Korkay Site, Broadalbin, New York

Constituent	Units	Area Detected (2)	Depth (bls)	Detected Concentration (3)	SCG (4,5,6)	Background (7)
mercury	mg/kg	1	1.5'-2'	0.12 - 0.45	0.1	U
	mg/kg	1	3.5' - 4'	0.39	0.1	U
	mg/kg	1	4.5' - 5'	0.16	0.1	U
	mg/kg	2	1.5'-2'	0.10 - 0.12	0.1	U
	mg/kg	2	3.5 - 4'	0.12	0.1	U
	mg/kg	2	6'-8'	0.15	0.1	U
	mg/kg	4	1.5'-2'	0.56	0.1	U
	mg/kg	4	6'-8'	0.13	0.1	U
	mg/kg	5	1.5'-2'	1.2	0.1	U
	mg/kg	MW-6D	8'-10'	1.1	0.1	U
	mg/kg	MW-6D	22'-24'	0.68	0.1	U
nickel	mg/kg	MW-6D	22'-24'	14.8	13	3.5
potassium	mg/kg	2	20'-22'	4020	4000	225
zinc	mg/kg	1	1.5'-2'	16.70 - 94.90	SB	85
	mg/kg	2	1.5'-2'	16.10 - 88.60	SB	85
	mg/kg	2	20'-22'	92	SB	85
	mg/kg	5	1.5'-2'	29.50 - 512	SB	85

Notes:

(1) Average site concentration of alpha chlordane = 1.95 ug/kg.

(2) Borehole/monitoring well MW-6D is located off-site, across West Main Street from site Area 1 (see Figure 2-3).

(3) In a given area, there may have been several samples collected. For a given compound in the sampling area, it may have been undetected in some samples and detected in others. Only the detected range is shown on this table.

(4) NYSDEC TAGM, HWR-94-4046, January 24, 1994.

(5) SB= site background

(6) --- = No SCG exists

(7) U= not detected above method detection limit in background samples.

Pesticides were detected at concentrations above SCGs in Areas 2 and 3. Heptachlor epoxide (SCG: 0.02 mg/kg) was detected at 0.047, 0.11, and 0.032 at locations SS-2-1 (3.5 to 4.0 ft bls), SS-2-3 (1.5 to 2.0 ft bls), and SS-3-2 (3.5 to 4.0 ft bls), respectively. Gamma-chlordane (SCG: 0.54 mg/kg) was detected above its SCG at four locations: SS-2-1 (2.4 mg/kg, 3.5 to 4.0 ft bls), SS-2-3 (7.8 and 4.6 mg/kg, 1.5 to 2.0 ft bls), SS-2-7 (1.6 mg/kg, 1.5 to 2.0 ft bls), and SS-3-2 (1.0 mg/kg, 3.5 to 4.0 ft bls). Also, alpha-chlordane, for which there is no SCG but is a probable human carcinogen, was detected above its average site concentration (0.00195 mg/kg) in Areas 1, 2, and 3, as shown in Table 2-7.

Beryllium, lead, and magnesium were detected above SCGs in all areas of the site (Areas 1 through 5) at a depth of 1.5 to 2.0 ft bls. Beryllium was also detected at concentrations above its SCG in samples collected at depths of 4.5 to 5.0, and 3.5 to 4.0, in Areas 1 and 2, respectively.

Calcium, manganese, and mercury were detected above SCGs in Areas 1, 2, 4, and 5 at a depth of 1.5 to 2.0 ft bls. In addition, mercury was detected above its SCG at depths of 3.5 to 4 and 4.5 to 5.0 ft bls in Area 1, and both mercury and manganese were detected above their SCGs at a depth of 3.5 to 4.0 ft bls in Area 2.

Chromium was detected in Areas 1, 2, 3, and 5 at concentrations above its SCG at a depth of 1.5 to 2.0 ft bls, and also at a depth of 4.5 to 5.0 ft bls in Area 1. Iron was detected above its SCG in Areas 3, 4, and 5, at a depth of 1.5 to 2.0 ft bls. Cadmium and zinc were also detected above their SCGs at a depth of 1.5 to 2.0 ft bls in Areas 1 and 5, and 1, 2, and 5, respectively. Copper was detected above its SCG in Area 5, only, at a depth of 1.5 to 2.0 ft bls.

Analytical results for samples collected from the boreholes for monitoring wells MW-5D (Area 2), MW-6D (across the street from the site), and MW-7D (Area 4) indicate the presence of metals, at concentrations above background and SCGs, at depths greater than 5 ft bls. Specifically, calcium, magnesium, and mercury were detected, above background concentrations and SCGs, at a depth of 6 to 8 ft bls in Areas 2 and 4; mercury was also detected off-site (at monitoring well location MW-6) at levels above background concentrations and SCGs, at depths of 8 to 10, and 22 to 24, ft bls. Aluminum, beryllium, calcium, chromium, iron, magnesium, and manganese were detected above background concentrations and SCGs at a depth of 20 to 24 ft bls at both Area 2 and monitoring well location MW-6. Also, at 20 to 24 ft bls, potassium and zinc were found in Area 2, and nickel was found at monitoring well location MW-6, at concentrations greater than background and SCGs (see Table 2-7)(CDM 1994a).

2.5.1.3 Groundwater

Groundwater samples were collected from two newly installed upgradient wells (monitoring wells MW-4-S and MW-4-D in Area 6), one well located on property adjacent to, and directly north of, the site (Tanner's Well), three newly installed site wells (monitoring wells MW-5S and MW-5D in Area 2, and monitoring well MW-7D in Area 4), two pre-existing site wells (monitoring well K-2 in Area 1 and monitoring well K-3 in Area 4), and two newly installed downgradient wells (monitoring wells MW-6-S and MW-6-D)(see Figure 2-3). The total depths of monitoring wells MW-4-S and MW-4-D are 10 and 46 ft bls, respectively; of Tanner's Well is unknown; of monitoring wells MW-5S, -5D, and -7D are 10, 40, and 55 ft bls, respectively; of K-2 and K-3 are 14.5 and 14 ft bls, respectively; and of monitoring wells MW-6-S and MW-6-D are 11 and 55 ft bls, respectively. As discussed in Section 2.3.3, depth-to-water at the site is about 7.5 to 8.0 ft bls; deep groundwater was encountered at the site beneath an aquitard at depths ranging from 32 to 43 ft bls. At the direction of the NYSDEC, collected groundwater samples were not filtered (CDM 1994a).

Shallow Groundwater

As shown in Table 2-8, VOCs, semi-VOCs, pesticides, and metals were detected at levels above SCGS (NYSDEC and NYSDOH) in shallow groundwater samples collected at the site. Specifically, TCE (NYSDEC and NYSDOH SCG: 5 micrograms per liter [ug/l]) was detected in samples collected from monitoring wells MW-5-S and K-2 at 12 and 21 ug/l, respectively. Ethylbenzene (SCG: 5 ug/l) was detected in a sample from monitoring well K-2 at a concentration of 19 ug/l, and 1,2-DCE (SCG: 5 ug/l) was detected in a sample from monitoring well MW-5-S at 16 ug/l. Xylene was detected above its SCG (5 ug/l) in monitoring wells MW-5-S (at 7 ug/l) and K-2 (at 110 ug/l). VOCs were not detected in any samples collected from upgradient wells (the Tanner well and monitoring well MW-4-S); xylene, 1,2-DCE, and toluene were detected downgradient of the site in well MW-6-S at 61, 4, and 6 ug/l, respectively.

Semi-VOCs were detected above SCGs in samples collected from monitoring wells K-2 and MW-6-S, only (see Table 2-8). 2,4-Dichlorophenol (NYSDEC SCG: 1 ug/l) was detected in well K-2 at 4 ug/l; it was not detected downgradient of the site. Naphthalene was detected in well K-2 (at 23 ug/l) as well as downgradient, in well MW-6-S (at 29 ug/l), at levels that exceed its NYSDEC SCG (10 ug/l) but not its NYSDOH SCG (50 ug/l). 1,2-Dichlorobenzene and 2-methylphenol were detected above SCGs downgradient of the site (at 16 and 26 ug/l, respectively), only.

In monitoring wells MW-5-S and K-2, 4-4'-DDE, dieldrin, and gamma-chlordane were detected (at 0.1, 0.08, and 0.77 ug/l, and 0.21, 0.02, and 0.82, respectively) above SCGs (0.01, 0.01, and 0.1 ug/l, respectively). Heptachlor epoxide was detected in monitoring well K-2 at 0.11 ug/l, above its NYSDEC SCG of 0.01 ug/l but below its NYSDOH SCG of 0.20 ug/l. However, with the exception of heptachlor epoxide at 0.01 ug/l in monitoring well MW-4-S, these pesticides were not detected upgradient or downgradient of the site.

Table 2-8

Constituents Exceeding SCGs in Groundwater

Korkay Site, Broadalbin, New York

Constituent	Units	Area Detected (1)	Well Depth	Concentration	SCG (2) NYSDEC Criteria (3)	NYSDOH Criteria (4)
VOCs:						
1,2-Dichloroethene	ug/l	2	10'	16	5	5
	ug/l	downgradient	11'	4	5	5
Ethylbenzene	ug/l	1	14.5	19	5	5
Trichloroethene	ug/l	2	10'	12	5	5
	ug/l	1	14.5'	21	5	5
Toluene	ug/l	downgradient	11'	6	5	5
Xylene	ug/l	1	14.5'	110	5	5
	ug/l	2	10'	7	5	5
	ug/l	downgradient	11'	61	5	5
Semi-VOCs:						
1,2-Dichlorobenzene	ug/l	downgradient	11'	16	4.7	5
2,4-Dichlorophenol	ug/l	1	14.5'	4	1	---
2-Methylphenol	ug/l	downgradient	11'	26	5	50
Naphthalene	ug/l	1	14.5'	23	10	50
	ug/l	downgradient	11'	29	10	50
Pesticides:						
alpha-Chlordane	ug/l	1	14.5'	0.9	---	---
	ug/l	2	10'	0.27	---	---
4,4-DDE	ug/l	1	14.5'	0.21	0.01	---
	ug/l	2	10'	0.1	0.01	---
Dieldrin	ug/l	1	14.5'	0.02	0.01	---
	ug/l	2	10'	0.08	0.01	---
gamma-Chlordane	ug/l	1	14.5'	0.82	0.1	---
	ug/l	2	10'	0.77	0.1	---
Heptachlor epoxide	ug/l	1	14.5'	0.11	0.01	0.2
	ug/l	upgradient	10'	0.01	0.01	0.2
Metals:						
Arsenic	ug/l	1	14.5'	2.5	25	50
	ug/l	2	10'	2.8	25	50
	ug/l	4	55'	8.1	25	50
	ug/l	upgradient	46'	4.3	25	50
	ug/l	upgradient	unknown	78.2	25	50
	ug/l	downgradient	11'	4.3	25	50
Chromium	ug/l	upgradient	46'	77.4	50	100

Table 2-8
Constituents Exceeding SCGs in Groundwater
Korkay Site, Broadalbin, New York

Constituent	Units	Area Detected (1)	Well Depth	Concentration	SCG (2) NYSDEC Criteria (3)	SCG (2) NYSDOH Criteria (4)
Iron	ug/l	1	14.5'	12200	300	300
	ug/l	2	10'	60200	300	300
	ug/l	2	40'	26900	300	300
	ug/l	4	14'	10600	300	300
	ug/l	4	55'	25800	300	300
	ug/l	upgradient	10'	4810	300	300
	ug/l	upgradient	46'	48100	300	300
	ug/l	upgradient	unknown	1530	300	300
	ug/l	downgradient	11'	35700	300	300
	ug/l	downgradient	55'	3610	300	300
Manganese	ug/l	1	14.5'	1150	300	300
	ug/l	2	10'	1620	300	300
	ug/l	2	40'	448	300	300
	ug/l	4	55'	401	300	300
	ug/l	upgradient	10'	157	300	300
	ug/l	upgradient	46'	749	300	300
	ug/l	upgradient	unknown	38.9	300	300
	ug/l	downgradient	11'	1740	300	300
	ug/l	downgradient	55'	70.5	300	300
Sodium	ug/l	4	55'	48000	20000	---
	ug/l	upgradient	10'	78400		
	ug/l	upgradient	46'	32200	20000	---
	ug/l	upgradient	unknown	12700	20000	---
	ug/l	downgradient	11'	100000	20000	---
	ug/l	downgradient	55'	11800	20000	---

Notes:

(1) MW-4 and the Tanner well are upgradient of the site; K-2 is in Area 1; MW-5 is in Area 2; MW-7 is in Area 4; K-3 is in Area 4; and MW-6 is downgradient of the site.
(2) --- = No SCG exists.
(3) NYSDEC, Division of Water, Technical and Operational Guidance Series (TOGS 1.1.1) / Ambient Water Quality Standards and Guidance Values, October 22, 1993.
(4) NYSDOH Drinking Water Supply MCLs, January 5, 1993.

Also, alpha-chlordane, for which there is no SCG but is a probable human carcinogen, was detected in on-site monitoring wells MW-5-S and K-2 at 0.27 and 0.90 ug/l, respectively, but was not detected upgradient or downgradient of the site (see Table 2-8).

As shown in Table 2-8, metals were detected above SCGs in shallow groundwater on-site, as well as upgradient and downgradient of the site. Specifically, iron and manganese were detected above their SCGs (300 ug/l) in on-site monitoring wells MW-5-S (at 60,200 and 1,620 ug/l, respectively) and K-2 (at 12,200 and 1,150 ug/l, respectively). Iron was also detected above its SCG in on-site monitoring well K-3 (at 10,600 ug/l). Upgradient of the site, iron and manganese were detected in MW-4-S at 4,810 and 157 ug/l, respectively, and in the Tanner well at 1,530 and 38.9 ug/l, respectively. Iron and manganese were also detected downgradient of the site at 35,700 and 1,740 ug/l, respectively.

Sodium (SCG: 20,000 ug/l) was detected upgradient (in monitoring well MW-4-S at 78,400 and in the Tanner well at 12,700 ug/l) as well as downgradient (in monitoring well MW-6-S at 100,000 ug/l) of the site, but was not detected on-site. Also, arsenic was detected above its SCG (NYSDEC: 25 ug/l, NYSDOH: 50 ug/l) in a sample collected from the Tanner well (78.2 ug/l), but was not detected in upgradient well MW-4-S. Arsenic was detected, below its SCG, in on-site wells MW-5-S (at 2.8 ug/l) and K-2 (at 2.5 ug/l), and in downgradient monitoring well MW-6-S (at 4.3 ug/l) (CDM 1994a).

Deep Groundwater

Only metals were detected above SCGs in deep groundwater samples collected at and in the vicinity of the site (see Table 2-8). Iron and manganese were detected above their SCG (300 ug/l) in upgradient monitoring well MW-4-D at 48,100 and 749 ug/l, respectively, and in on-site monitoring wells MW-5-D and MW-7-D at 26,900 and 448 ug/l, and 25,800 and 401 ug/l, respectively. Iron was also detected above its SCG in the Tanner well (at 1,530 ug/l) and downgradient of the site (at 3,610), and manganese was detected above its SCG downgradient of the site at 70.5 ug/l.

Sodium was detected above its SCG (20,000 ug/l) in upgradient monitoring well MW-4-D (at 32,200 ug/l), and was also detected in the Tanner well (at 12,700 ug/l) and monitoring well MW-7-D (at 48,000 ug/l). Sodium was also detected above its SCG in downgradient monitoring well MW-6-D (at 11,800 ug/l). Arsenic was detected upgradient of the site in well MW-4-D at 4.3 ug/l and, above its NYSDEC and NYSDOH SCGs (25 and 50 ug/l, respectively), in the Tanner well at 78.2 ug/l. Arsenic was also detected in on-site well MW-7-D (at 8.1 ug/l), but was not detected downgradient of the site. In addition, chromium was detected above its NYSDEC SCG (50 ug/l) but below its NYSDOH SCG (100 ug/l) in upgradient monitoring well MW-4-D (77.4 ug/l). (CDM 1994a).

2.5.2 Phase II Remedial Investigation (RI)

Based on the results of the Phase I RI, it was determined that additional investigatory work at the Korkay site was warranted. The following sections present a brief description of the site Phase II RI.

2.5.2.1 Soils

Additional subsurface soil samples (at depths greater than 2 ft bls, above and below the water table) will be collected and analyzed (for TCL/TAL parameters) to further delineate the vertical extent of contamination in Areas 1 through 5 at the site. Two soil samples will also be analyzed for grain size, soil moisture content, porosity, bulk density, cation exchange capacity, clay content, pH, total organic carbon (TOC), redox potential, indigenous soil microbiota, nutrient availability, oxygen content, and toxicity characteristics (using the USEPA toxicity characteristic leaching procedure [TCLP]).

Also, because constituents were detected at concentrations above SCGs in background samples collected in Area 6, four additional background soil samples will be collected in another area. These samples will be collected at two different depths (e.g., two surface samples at 0 to 0.5 ft bls and two subsurface samples at 1.5 to 2.0 ft bls).

An assessment of risk to human health due to the consumption of vegetables grown on the Hayes' property will also be conducted. The assessment will utilize existing site-specific chemical data to calculate the most conservative potential human health risks associated with the consumption of these vegetables (tubers and/or aboveground crops) (CDM 1994b).

2.5.2.2 Groundwater

A second round of groundwater samples will be collected from monitoring wells MW-4S, -4D, -5S, -5D, -6S, -6D, and -7D, and wells K-2 and -3, and analyzed for TCL/TAL parameters. Unlike the Phase I RI during which only unfiltered groundwater samples were analyzed, both filtered and unfiltered groundwater samples will be analyzed during the Phase II RI to quantify dissolved metal concentrations in groundwater at and in the vicinity of the site. In addition, to determine the rate at which constituents may be migrating off-site, a slug test will be performed at monitoring well MW-6S and K-2 (CDM 1994b).

Additional study of deep groundwater flow is necessary during the Phase II RI. As discussed in Section 2.3.3, the direction of flow in the deep aquifer appears to be east-southeasterly. However, due to the presence of thin and possibly discontinuous sand layers in the deep aquifer within which water levels were obtained, as well as the existence of a significant vertical hydraulic gradient at the site, a second round of water level measurements will be taken during the Phase II RI to confirm the direction of groundwater flow in the deep aquifer (CDM 1994a; CDM 1994b).

Two groundwater samples will also be collected at the site and analyzed for water chemistry properties (i.e., chemical oxygen demand (COD), total organic content (TOC), total suspended solids (TSS), total dissolved solids (TDS), pH, alkalinity, hardness, turbidity, color, and dissolved oxygen). Also, a maximum of 6 "hydropunch" groundwater samples will be collected and analyzed for TCL/TAL parameters to further delineate the horizontal extent of off-site, downgradient groundwater contamination, if any, towards Kennyetto Creek (CDM 1994b).

Also, a five-day combined air sparging and vapor extraction (CASVE) system treatability study will be conducted in Area 1 of the site. The effect of CASVE on the removal of VOCs (particularly xylene) from shallow groundwater and, subsequently, from overlying soils will be monitored. The pilot system will consist of four vapor extraction wells and one air sparging well. Two soil gas observation wells will also be installed, one in Area 5 and one in Area 6, to estimate the CASVE radius of influence at and in the vicinity of the site (CDM 1994c).

2.5.2.3 Surface Water

Surface water and sediment sampling in Kennyetto Creek, which is located downgradient of the Korkay site, will be conducted. Specifically, three surface water and sediment samples will be collected upgradient and downgradient of, as well as at, the approximate location (based on the results of the Phase I RI) of shallow groundwater discharge to the creek, and analyzed for TCL/TAL parameters to assess the impact of past site activities, if any, on the creek (CDM 1994b).

2.5.2.4 Other Field Activities

During the Phase I RI, two private homes, north of the site, were identified as having private water well supplies (CDM 1994a). During the Phase II RI, CDM and the NYSDEC will visit these homes to collect additional information concerning the use of their wells. If deemed necessary, the NYSDOH will collect samples from the wells for TCL/TAL analysis.

Also, if deemed necessary, a visual walkover inside the site building will be conducted to determine if hazardous materials are stored within the building. Field instruments to be used during this visual inspection will include a photoionization detector (PID)(CDM 1994b).

2.6 Potential Migration and Exposure Pathways of Constituents of Concern

Constituents of concern (COCs) are those constituents that exceed established SCGs and contribute to human health risks. Based on the Phase I RI sample analytical results (CDM 1994a), applicable SCGs, and the site risk assessment (RA) (Dynamac 1994), the constituents of concern at the Korkay site are as shown in Table 2-9.

In summary, as shown in Table 2-9, VOCs were not detected in upgradient monitoring wells, but were detected above SCGs in on-site and downgradient wells. TCE 1,2-DCE, ethylbenzene, and xylene were detected above their SCG in shallow groundwater samples collected in Areas 1 and/or 2. However, only xylene was detected downgradient of the site. In addition, toluene was detected above its SCG downgradient of the site, but not on-, or upgradient of the, site. VOCs were not detected in deep groundwater.

VOCs (TCE and xylene) are present at levels above SCGs in subsurface soils above the water table in Area 1, only. TCE and xylene were not detected in background surficial or subsurface soil samples; TCE was detected below its SCG in surficial soil samples collected from site Areas 1, 2, and 5 (CDM 1994a). With respect to VOCs, these data indicate that subsurface soils above the water table are impacting (possibly through the infiltration of precipitation) shallow groundwater at and in the immediate vicinity of the site. Also, based on the absence of VOCs in deep groundwater, the relatively impermeable nature of the site aquitard will minimize/prevent downward movement of constituents from the shallow to the deep aquifer.

Semi-VOCs (2,4-dichlorophenol, 1,2-dichlorobenzene, and 2-methylphenol) were detected above SCGs in shallow groundwater: 2,4-dichlorophenol was detected on-site, but not downgradient of the site; 1,2-dichlorobenzene and 2-methylphenol were detected downgradient of the site, only. However, these compounds were not detected in surficial soils (background or otherwise) and only 2,4-dichlorophenol was detected above its SCG in subsurface soils (in Area 2, at a depth of 1.5 to 2.0 ft bls). Also, these compounds were not detected in deep groundwater (see Table 2-9)(CDM 1994a). With respect to semi-VOCs, these data indicate minimal impact of subsurface soils on shallow groundwater, and no migration of shallow groundwater constituents to the deep aquifer.

In addition, benzo(a)pyrene was detected above its SCG in Area 1 of the site, as well as off-site at the Hayes' property (Area 5), in surficial and shallow subsurface soils; similarly, benzo(a)anthracene was detected above its SCG in surficial soils at Areas 1 and 5, as well as in shallow subsurface soils at Area 5 (see Table 2-9) (CDM 1994a). These data indicate that surficial soils (as well as shallow subsurface soils) at the site, possibly through the infiltration of runoff,

Table 2-9
CONSTITUENTS OF CONCERN
Korkay Site, Broadalbin, New York

MEDIA	CONSTITUENT OF CONCERN	AREA*	DEPTH (ft bls)
Surficial Soils:	**Semi-VOCs:**		
	benzo (a) pyrene	1,5	0 – 5
	benzo (a) anthracene	5	0 – 5
	dibenzo (a,h) anthracene	1,5	0 – 5
	hexachlorobenzene	2	0 – 5
	Pesticides:		
	alpha-chlordane	1,2,3,4,5	0 – 5
	gamma-chlordane	2	0 – 5
	aldrin	2	0 – 5
	heptachlor epoxide	2	0 – 5
	Metals:		
	beryllium	1,2,3,4,5	0 – 5
	cadmium	2,5	0 – 5
	chromium	1,2,3,5	0 – 5
	lead	1,2,3,4,5	0 – 5
	mercury	1,2,3,4,5	0 – 5
	arsenic	1,2,4,5	0 – 5
Subsurface Soils:	**VOCs:**		
	trichloroethene (TCE)	1	1.5 – 2
	xylene	1	1.5 – 2
		1	4.5 – 5
	Semi-VOCs:		
	di-n-butylphthalate	1	1.5 – 2
			4.5 – 5
	benzo (a) pyrene	1	1.5– 2
		5	1.5 – 2
	2,4-dichlorophenol	2	1.5 – 2
	benzo (a) anthracene	5	1.5 – 2
	Pesticides:		
	heptachlor epoxide	2	1.5 – 2
		2	3.5 – 4
		3	3.5 – 4
	gamma-chlordane	2	1.5 – 2
		2	3.5 – 4
		3	3.5 – 4
	alpha-chlordane	1	1.5 – 2
			4.5 – 5
		2	1.5 – 2
			3.5 – 4
			6 – 8
		3	1.5 – 2
			3.5 – 4

Table 2-9

CONSTITUENTS OF CONCERN

Korkay Site, Broadalbin, New York

MEDIA	CONSTITUENT OF CONCERN	AREA*	DEPTH (ft bls)
Subsurface Soils (contd.)			
	Metals:		
	beryllium	1	1.5 – 2
		1	4.5 – 5
		2	1.5 – 2
		2	3.5 – 4
		2, MW-6	20 – 24
		3,4,5	1.5 – 2
	cadmium	1,5	1.5 – 2
	chromium	1,2,3,5	1.5 – 2
		1	4.5 – 5
		2, MW-6	20 – 24
	lead	1,2,3,4,5	1.5 – 2
	mercury	1	1.5– 2
		1	3.5 – 4
		1	4.5 – 5
		2,4	1.5 – 2
		2	3.5 – 4
		2,4	6 – 8
		5	1.5 – 2
		MW-6	8 – 10
		MW-6	22 – 24
Groundwater:	**VOCs:**		
	1,2-dichloroethene (DCE)	2	shallow
	ethylbenzene	1	shallow
	toluene	downgradient	shallow
	trichloroethene (TCE)	1,2	shallow
	xylene	1, downgradient	shallow
	Semi-VOCs:		
	2,4-dichlorophenol	1	shallow
	1,2-dichlorobenzene	downgradient	shallow
	2-methylphenol	downgradient	shallow
	Pesticides:		
	alpha-chlordane	1,2	shallow
	dieldrin	1,2	shallow
	4,4-DDE	1,2	shallow
	gamma-chlordane	1,2	shallow

* Note: For purposes of the site RI, the study area was divided into six subareas. Specifically, areas 1,2,3 and 4 encompass the southwestern, northwestern, northeastern and southeastern portions of the site, respectively. Area 5 encompasses the Hayes property, which is located Monitoring well MW-6 is located off-site across West Main Street from site Area 1 (see Figure 2-3).

may be a source of surficial and shallow subsurface soil contamination at the Hayes' property (Area 5).

Pesticides (4-4'DDE, dieldrin, and gamma-chlordane) were detected above SCGs in shallow groundwater. 4-4'DDE and dieldrin were also detected in surficial and shallow subsurface soils, but at levels significantly less than their SCG; gamma-chlordane was detected above its SCG in surficial soils in Area 2 and in shallow subsurface soils in Areas 2 and 3. These pesticides were not detected upgradient of the site (CDM 1994a). Therefore, possibly through the infiltration of precipitation, site soils above the water table may be impacting on-site shallow groundwater. Pesticides were not detected in deep groundwater, reflecting the impermeable nature of the site aquitard.

The Phase I RI results indicate that iron, manganese, and sodium are fairly ubiquitous in on- and off-site soils and groundwater. Beryllium, lead, mercury, chromium, copper, and zinc were detected above background levels and SCGs in on- and off-site (Hayes' property) surficial soils, and above SCGs in on- and off-site (including background samples) shallow subsurface soils, but detected in site groundwater at levels significantly below SCGs. Only zinc was detected in groundwater upgradient of the site, and lead and zinc were detected in groundwater downgradient of the site (all at levels significantly below SCGs) (CDM 1994a). Arsenic was detected above its SCG in surficial soils in Areas 1, 2, 4, and 5. It was also detected in on- and off-site groundwater, but at levels significantly below its NYSDEC and NYSDOH SCG. In addition, arsenic was detected upgradient of the site, in the Tanner well, at levels above its SCGs (CDM 1994a). With respect to metals, these data indicate that runoff from the site may be impacting soils at the Hayes' property; on-site soils do not appear to be adversely impacting site groundwater.

The potential exposure pathways of the site COCs, assuming no remedial action is undertaken at the site, are presented in Table 2-10. As shown in Table 2-10, humans may be exposed to COCs in soils at and in the vicinity of the site through the ingestion of, or dermal contact with, these soils (Dynamac 1994). With respect to groundwater, there are two public water supply wells in the village of Broadalbin, neither of which are affected by site groundwater. With the exception of a few residences, all village residences are connected to the public water supply system. However, in the towns of Broadalbin and Mayfield, just outside the village of Broadalbin, residences are not connected to the public supply system (CDM 1994a). Those residents whose homes are not connected to the public supply system may be exposed to COCs in groundwater at and in the vicinity of the site through the ingestion of groundwater. In addition, humans may be exposed to site COCs in shallow groundwater through inhalation of, or dermal contact with, this groundwater (e.g., exposure to surface waters receiving shallow groundwater discharge) (Dynamac 1994).

Table 2-10

Potential Exposure Pathways Under No Action Alternative

Korkay Site, Broadalbin, New York

Media	Exposure Pathway via	Chemicals Contributing to Human Health Risk	Chemicals Exceeding NYS SCGs	Area of Concern (1)
Surficial Soils	Ingestion or Dermal Contact			
		Semi-VOCs:		
		benzo(a)pyrene	benzo(a)pyrene	1,5
		dibenzo(a,h)anthracene	dibenzo(a,h)anthracene	1,5
		benzo(a)anthracene	benzo(a)anthracene	5
		hexachlorobenzene	hexachlorobenzene	2
		Pesticides:		
		gamma-chlordane	gamma-chlordane	2
		aldrin	aldrin	2
		heptachlor expoxide	heptachlor expoxide	2
		alpha-chlordane	alpha-chlordane	1,2,3,4,5
		Metals:		
			aluminum	2,3,5
		arsenic	arsenic	1,2,3,4,5
			barium	2
		beryllium	beryllium	1,2,3,4,5
			calcium	2,3
		cadmium	cadmium	2,5
		chromium	chromium	1,2,3,5
			copper	1,2,5
			iron	1,2,3,4,5
		lead	lead	1,2,3,4,5
			magnesium	2
			manganese	1,2,3,4,5
		mercury	mercury	1,2,3,4,5
			nickel	2
			zinc	1,2,3,4,5
Subsurface Soils	Ingestion or Dermal Contact			
		VOCs:		
		trichloroethene	trichloroethene	1
		xylene	xylene	1
		Semi-VOCs:		
		di-n-butylphthalate	di-n-butylphthalate	1
		benzo(a)pyrene	benzo(a)pyrene	1,5
		benzo(a)anthracene	benzo(a)anthracene	5
		2,4-dichlorophenol	2,4-dichlorophenol	2
		Pesticides:		
		gamma-chlordane	gamma-chlordane	2,3
		heptachlor epoxide	heptachlor epoxide	2,3
		alpha-chlordane	alpha-chlordane	1,2,3

Table 2–10
Potential Exposure Pathways Under No Action Alternative
Korkay Site, Broadalbin, New York

Media	Exposure Pathway via	Chemicals Contributing to Human Health Risk	Chemicals Exceeding NYS SCGs	Area of Concern (1)
Subsurface Soils (cont'd)	Ingestion or Dermal Contact	**Metals:**		
			aluminum	2,MW–6
		beryillium	beryllium	1,2,3,4,5,MW–6
		cadmium	cadmium	1,5
			calcium	1,2,4,5,MW–6
		chromium	chromium	1,2,3,5,MW–6
			copper	5
			iron	2,3,4,5,MW–6
		lead	lead	1,2,3,4,5
			magnesium	1,2,3,4,5,MW–6
			manganese	1,2,4,5,MW–6
		mercury	mercury	1,2,4,5,MW–6
			nickel	MW–6
			potassium	2
			zinc	1,2,5
Shallow Groundwater	Inhalation, Ingestion, or Dermal Contact	**VOCs:**		
		1,2–dichloroethene	1,2–dichloroethene	2
		trichloroethene	trichloroethene	1,2
		toluene	toluene	DG
		ethylbenzene	ethylbenzene	1
		xylene	xylene	1,2,DG
		Semi–VOCs:		
		2,4–dichlorophenol	2,4–dichlorophenol	1
			naphthalene	1
		1,2–dichlorobenzene	1,2–dichlorobenzene	DG
		2–methylphenol	2–methylphenol	DG
		Pesticides:		
			heptachlor expoxide	1, UG
		dieldrin	dieldrin	1,2
		4,4–DDE	4,4–DDE	1,2
		alpha–chlordane	alpha–chlordane	1,2
		gamma–chlordane	gamma–chlordane	1,2
		Metals:		
			iron	1,2,4,UG
			manganese	1,2,UG,DG
			sodium	UG,DG

Table 2–10

Potential Exposure Pathways Under No Action Alternative

Korkay Site, Broadalbin, New York

Media	Exposure Pathway via	Chemicals Contributing to Human Health Risk	Chemicals Exceeding NYS SCGs	Area of Concern (1)
Deep Groundwater		**Metals:**		
			arsenic	UG
			iron	2,4,UG,DG
			manganese	2,4,UG,DG
			sodium	4,UG DG
			chromium	UG

Notes: (1) UG= upgradient and DG= downgradient.

Section 3
Remedial Action Objectives

Site-specific remedial action objectives (RAOs) have been established for the development and evaluation of remedial action alternatives for the Korkay site. These objectives are based on public health and environmental concerns, the National Contingency Plan (NCP), NYSDEC and USEPA guidance, NYS statutes, and the requirements of other applicable federal and local statutes. Specifically, the RAOs for the Korkay site are:

To eliminate, to the greatest extent possible, on-site soils as a source of contamination to on-site groundwater and improve the quality of groundwater at and in the vicinity of the site. Also, to eliminate human exposure to on-site soils.

The site RAOs are designed to protect human health and the environment, and address the following:

- the constituents of concern (COCs) at the site, as discussed in Section 2.6 and shown in Table 2-9.
- the potential exposure routes and receptors of each COC, as discussed in Section 2.6 and shown in Table 2-10.
- acceptable target remediation levels or ranges of levels for each COC with respect to its exposure route and New York State Standards, Criteria, and Guidelines (SCGs) (see Tables 2-4 and 2-5).

Section 4
Development of Remedial Alternatives (First Phase Feasibility Study)

Alternatives for remediation are developed by assembling combinations of technologies, and the media to which they would be applied, into alternatives that address contamination on a site-wide basis. This process consists of the following:

- develop site RAOs to address the constituents and media of concern, and potential exposure pathways (see Section 3).
- develop general response actions for each medium of concern that may be taken to satisfy the site RAOs.
- identify volumes or areas of media to which general response actions might be applied, taking into account the requirements for protectiveness as identified in the RAOs and the chemical and physical characterization of the site.
- identify and screen the technologies applicable to each general response action to eliminate those that cannot be implemented technically at the site.
- identify and evaluate technology process options to select a representative process for each technology type retained for consideration.
- assemble the selected representative technologies into alternatives representing a range of treatment and containment combinations, as appropriate.

As requested by the NYSDEC, the Phase I and II FS for the Korkay site is a focused FS, i.e., based on the results of the Phase I RI, only the following potentially applicable remedial actions have been considered in this FS: access restrictions, media monitoring, an alternate water supply, soil excavation and off-site disposal of excavated soils, residual soil containment (soil cover), and combined air sparging and soil vapor extraction (CASVE)(NYSDEC 1994a-j).

4.1 General Response Actions

General response actions have been developed for the Korkay site that may be taken, singly or in combination, to satisfy the site remedial action objectives. Like remedial action objectives, general response actions are medium-specific.

The general response actions for the Korkay site are as follows:

No Action - No action is a general response action that is required by the USEPA and National Contingency Plan (NCP) to be carried forward to the detailed analysis phase of the FS. It is defined as no proactive steps taken to remediate affected media (i.e., natural attenuation). It provides a baseline for comparison of all other potentially applicable remedial action alternatives.

Institutional Controls - Institutional actions may be implemented at the site to provide limited remedial action. Institutional controls as general response actions for the remediation of site soils and groundwater include access restrictions and media monitoring. Institutional controls for groundwater remediation also include the provision of an alternate water supply.

Access restrictions involve physical (such as fences or barriers) or legal (such as deed restrictions, zoning changes, or security restrictions) actions prohibiting access to, and use of, site soils and/or groundwater. However, access restrictions do not apply to soils or groundwater at adjacent properties controlled by other parties and, therefore, are limited to a source control strategy. Media monitoring involves scheduled, periodic sampling and analysis of site soils and/or groundwater. Media monitoring is implemented to provide a database and evaluate changes in site conditions over time. Continued monitoring of site soils and/or groundwater over time enables the determination of restoration rates occurring through natural attenuation and biodegradation.

The institutional action of providing an alternate water supply to populations affected by site groundwater involves the extension of the existing municipal water system to serve such populations.

Removal - The removal of affected soils at and in the vicinity of the site for disposal is a general response action that would eliminate these soils as a source of contamination to shallow groundwater. The most common soil removal technology is excavation; it is a well-established removal technology that involves standard engineering practices.

Containment - Containment may be implemented at the site to reduce and/or prevent direct human exposure to affected residual soils (following soil excavation) as well as to reduce and/or prevent the migration of residual soil constituents, if any, to shallow groundwater. Capping is an effective means by which to achieve soil containment. A soil cap (or cover) will reduce and/or prevent the infiltration of precipitation and surface water run-off, thereby reducing/mitigating the migration of soil constituents to shallow groundwater.

In-Situ Treatment - In-situ treatment of site subsurface soils and groundwater is another method by which to accomplish the RAOs for the site. In-situ treatment refers to those technologies that are applied to affected soil and groundwater in place. The result of in-situ treatment is a reduction in constituent mobility, volume, and/or toxicity.

Disposal - The final general response action for the Korkay site is disposal with respect to excavated soils. As requested by the NYSDEC, excavated soils will be disposed off-site.

4.2 Identification and Initial Screening of Remedial Technologies and Process Options

The general response actions presented in Section 4.1 provide the basis for identifying potentially applicable remedial technologies and process options, which are subsequently screened for technical feasibility.

4.2.1 No Action

No action is defined as no proactive steps taken to remedy site conditions. It is included in this FS to provide a baseline for comparison with other potential remedial action alternatives.

4.2.2 Institutional Actions

Institutional actions provide limited remedial action and include access restrictions, an alternate water supply, and media monitoring.

4.2.2.1 Access Restrictions

Access restrictions may include deed restrictions, such that the site property deed would include restrictions on site activities and use, and/or fencing. Deed restrictions could also be implemented to prohibit the consumption of groundwater at the site. However, it is noted that the implementability of this option is limited because the NYSDEC has limited authority to restrict uses of a site after the site is remediated and delisted from the registry.

As discussed in Section 2.3.1 and shown on Figure 2-3, there is a fence (with gates) along the north, east, and western boundaries of the site that serves to reduce unrestricted access to the site. Site fencing is a feasible technology and highly reliable if periodic inspections and maintenance of the fence are performed. This technology is easily implemented, restricts site access, and prevents public exposure to potential on-site soil-contact hazards (see Table 2-10). Site access may also be restricted by increasing public awareness of site conditions and remedies. Through meetings, written notices, and news releases concerning the site, unintended exposures may be prevented.

Access restrictions may also include water-use controls. Water-use controls include well permits to regulate the drilling of new wells at and in the vicinity of the site, the inspection and/or sealing of existing wells, and point of use treatment, providing individual water treatment systems to all potentially affected well water systems.

Access restrictions are technically feasible and will be considered further in the Korkay site FS.

4.2.2.2 Media Monitoring

Media monitoring involves scheduled, periodic sampling and analysis of site soils and groundwater. Implementation of media monitoring at the Korkay site would be implemented to augment the existing site database and evaluate changes in site conditions over time. Continued monitoring of site media will enable the determination of restoration rates occurring through natural attenuation and biodegradation.

The monitoring of soils at and in the immediate vicinity of the site is technically feasible. Groundwater monitoring is also technically feasible at the site; monitoring wells are already in-place and, if necessary, more wells could be installed. If affected media should remain on-site, a groundwater monitoring program could be implemented at the site to tract off-site constituent migration, if any.

Media monitoring at the Korkay site will be considered further in the site FS.

4.2.2.3 Alternate Water Supply

As discussed in Section 2.6, there are two public water supply wells in the village of Broadalbin, neither of which are affected by groundwater beneath the Korkay site. With the exception of a few residences, all village residences are connected to the public water supply system. However, in the towns of Broadalbin and Mayfield, just outside the village of Broadalbin, residences are not connected to the public supply system (CDM 1994a). Also, during the Phase II RI, any additional residences in the vicinity of the site that are not connected to the public water supply system will be identified (CDM 1994b). Because those residents in the vicinity of the site whose homes are not connected to the public supply system may be exposed to site COCs through the ingestion of groundwater (Dynamac 1994), the connection of such homes to the available public water supply system will be considered further in this FS.

4.2.3 Removal of Affected Soils

Removal refers to the action of physically relocating affected soils. Once affected soils are excavated, the exposed areas are backfilled with clean fill, compacted and graded (and covered to reduce the infiltration of precipitation, as discussed in Section 4.2.4). Excavation of affected soils is a commonly used source removal technique that utilizes standard construction equipment such as backhoes and loaders.

Underground utilities, if any, must be sufficiently marked to prevent damage by the heavy equipment required in excavating soils. Also, disposal options for affected soils must be evaluated to ascertain whether treatment will be required prior to land disposal (see Section 4.2.6).

During the excavation of affected soils, the health and safety of workers, and others nearby, are of concern because a potential exists for exposure to constituents found in the soils through inhalation, ingestion, and dermal contact. A site-specific health and safety plan (HASP) must be developed and implemented for the proper conduct of this activity to control potential exposures. Excavation must be done in accordance with Occupational Safety and Health Administration (OSHA) standards, especially standards governing worker safety during hazardous waste operations (20 CFR 1910). To limit exposure of workers and nearby residences to site constituents of concern (COCs), it may be necessary to implement in-situ treatment options, such as soil vapor extraction (see Section 4.2.5), prior to excavation.

Based on the results of the Phase I RI, as summarized in Table 2-9, soils should be excavated to depths as follow to meet the site RAOs:

Area 1	4.5 to 5.0 ft bls.
Area 2	3.5 to 4.0 ft bls.
Area 3	3.5 to 4.0 ft bls.
Area 4	1.5 to 2.0 ft bls.
Area 5	1.5 to 2.0 ft bls.

These depths will be verified/fine-tuned based on analytical results obtained for additional soil samples collected during the Phase II RI (see Section 2.5.2.1). For Areas 1, 2, 3, and 4, the horizontal extent of excavation should be to the site boundary. For Area 5, soil should be excavated to the Hayes' property boundary. Therefore, based on the results of the Phase I RI, a total of about 20,300 cf (cubic ft) of soils should be removed from Area 1; 21,250 cf from Area 2; 25,000 cf from Area 3; 3,125 cf from Area 4; and 14,100 cf from Area 5. (see Figure 2-3). It is noted that, following excavation, residual soil contamination will be minimal.

The excavation of affected soils will be considered further in this FS.

4.2.4 Containment of Residual Soils

The excavation of site soils, as described in Section 4.2.3, will effectively remove the source of constituents in shallow groundwater at and in the vicinity of the site (see Table 2-9). Based on the results of the Phase I RI, following excavation, residual soil contamination will be minimal, consisting primarily of metals. However, metals of concern were not detected in groundwater at or downgradient of the site (see Tables 2-9 and 2-10) and, in fact, metals will tend to adsorb to, rather than desorb from, soils. But to ensure that residual soil constituents do not migrate to/within shallow groundwater, a soil cover may be installed at the site.

A soil cover will effectively reduce the infiltration of precipitation and surface run-off, thereby reducing the transport of any soil constituents to/within groundwater. Capping can also reduce risks associated with direct human contact with affected residual soils, if any (the placement of clean fill in excavated areas will serve to prevent direct contact with residual site soils). Because the source of groundwater contamination will be removed through excavation (i.e., residual soil contamination will be minimal following excavation), a vegetative soil cover will suffice at the site, and at the Hayes' property, to control any residual contamination. Waters at land surface will mostly be absorbed by the vegetative soil cover, thereby reducing the infiltration of these waters to deep subsurface soils. An area of about 4,000; 5,300; 6,250; 1,500; and 7,000 square ft (sq. ft) will be covered at Areas 1, 2, 3, 4, and 5 (Hayes' property), respectively. The soil cover will consist of 12 inches of low-permeability soil that is adequately seeded and maintained.

The containment of residual soils will be considered further in the Korkay site FS.

4.2.5 In-Situ Treatment

In-situ treatment refers to those technologies that are applied to affected media in-place. Air sparging, also referred to as in-situ air stripping, is a treatment technology for removing VOCs from the saturated zone. Contaminant-free air is injected into groundwater to remove volatile constituents from the saturated zone and effectively capture them with a soil vapor extraction (SVE) system. Sparged air displaces water in the soil pore spaces and causes the soil constituents to desorb, volatilize, and enter the saturated zone vapor phase (SZVP). The mechanical action of the air passing through the saturated zone increases turbulence and mixing in the groundwater. Dissolved groundwater constituents volatilize into the SZVP and migrate up through the aquifer to the unsaturated zone. The SVE system creates a negative pressure gradient in the unsaturated zone, which pulls the constituent vapors toward the SVE wells, effectively capturing subsurface constituents. Air sparging also enhances aerobic biodegradation of constituents in the subsurface. Because vacuum extraction and air sparging increase air flow through contaminated areas, oxygen availability is enhanced and natural biodegradation stimulated, further increasing the rate of remediation (Noonan et. al. 1993).

Combined air sparging/soil vapor extraction (CASVE) will address any residual (following excavation) subsurface contamination both above and below the water table. Specifically, CASVE will effectively address VOCs of concern detected in shallow groundwater as well as remove any residual source of this contamination (i.e. soil gas) present in subsurface soils at the site (it should be noted that the excavation of site soils will effectively remove COCs above the water table) (see Section 2.6 and Table 2-9). Also, it is noted that it may be necessary to implement soil vapor extraction (SVE) prior to the excavation of affected site soils to limit the exposure of workers and nearby residences to site constituents of concern (COCs) during excavation. As discussed in Section 2.5.2.2, a CASVE treatability study will be conducted during the Phase II RI to determine the applicability of this technology at the site.

CASVE will be considered further in the Korkay site FS.

4.2.6 Disposal

As requested by the NYSDEC, excavated soil will be disposed off-site. During the Phase II RI, soil samples collected at the site will be analyzed by the toxicity characteristic leaching procedure (TCLP). If sample analytical results exceed USEPA TCLP limits, excavated soil will be hauled and disposed off-site as Resource Conservation and Recovery Act- (RCRA-) hazardous waste. Excavated soil may require treatment at an approved off-site facility prior to disposal due to USEPA Land Ban restrictions.

Excavated soil accepted for landfilling will be hauled to the disposal site in containers or in bulk form in accordance with federal and State Department of Transportation (DOT) regulations for off-site transport of hazardous materials. The landfill used for disposal of affected soils must be properly permitted.

Off-site disposal of excavated soils will be considered further in the Korkay site FS.

4.3 Assemblage of Remedial Action Alternatives

Based on the results of the Phase I RI (CDM 1994a), the following remedial action alternatives have been developed for the Korkay site:

- Alternative 1: No Action.
- Alternative 2: Access Restrictions, Alternate Water Supply, Media Monitoring.
- Alternative 3: Access Restrictions, Alternative Water Supply, Media Monitoring, Soil Excavation, Off-Site Disposal of Excavated Soils, and Soil Vegetative Cover.
- Alternative 4: Access Restrictions, Alternative Water Supply, Media Monitoring, Soil Excavation, Off-Site Disposal of Excavated Soils, Soil Vegetative Cover, and Combined Air Sparging and Soil Vapor Extraction (CASVE).

These alternatives will be screened, based on their effectiveness and implementability, in the next phase of the site FS (Phase II FS)(see Section 5.0).

Section 5
Preliminary Screening of Remedial Alternatives (Second Phase Feasibility Study)

During the Korkay site Phase II FS, the remedial alternatives assembled for the site (see Section 4.0) have been evaluated against the short- and long-term aspect of two broad criteria: effectiveness and implementability. The effectiveness of each assembled alternative has been evaluated in terms of its ability to protect human health and the environment. Each alternative has been assessed based on the degree of both short- and long-term effectiveness provided and the reductions in constituent toxicity, mobility, or volume achieved. Implementability serves to measure both the technical and administrative feasibility of construction, operation, and maintenance of the remedial action alternative.

Specifically, the effectiveness of each assembled alternative has been evaluated with respect to the following:

- Attainment of RAOs (based on public health and environmental considerations)
- Long-term effectiveness: magnitude of residual risk and adequacy, and reliability of controls.
- Short-term effectiveness: protection of community and workers, environmental impacts and time required to achieve RAOs.

Similarly, the implementability of each assembled alternative has been evaluated with respect to the following:

- Ability to construct and operate the technology, including scheduling.
- Reliability of the technology.
- Ability to monitor the effectiveness of the remedy.
- Ease of undertaking additional remedial actions, if necessary.
- Availability of technology, equipment, and specialists.
- Compliance with regulatory requirements.

Remedial action alternatives determined to be effective and implementable will be considered further, in a detailed analysis, in the Phase III FS (to be submitted under separate cover).

5.1 Alternative 1 - No Action

No action is defined as no proactive steps taken to remedy affected media at the Korkay site. The flushing of site soil by precipitation events may eventually wash the constituents from soils to the shallow groundwater at the site. However, natural attenuation and biodegradation of constituents will occur (soil samples collected at the site during the Phase II RI will be analyzed for indigenous microbiota type, count, and specificity). The toxicity and mobility of site constituents will not be reduced by the no action alternative, but the volume of contamination may decrease over time. This alternative will not be effective in meeting site RAOs in the short-term. The implementability criteria does not apply to this alternative because there is no action to implement. The no action alternative will be included in the detailed FS analysis (Phase III FS) to provide a baseline for comparison with other potential remedial action alternatives.

5.2 Alternative 2 - Access Restrictions, Media Monitoring, Alternate Water Supply

Remedial Action Alternative 2 includes access restrictions, media monitoring, and an alternate water supply, as described in Section 4. All are easily implemented at the site in a relatively short period of time.

As discussed in Section 4, access restrictions may include deed and/or well restrictions, and fencing. These restrictions may be imposed to reduce human and environmental exposure to affected media at the site, but they will not satisfy SCGs or site RAOs in the short-term. The flushing of site soil by precipitation events may eventually wash constituents from soils to shallow groundwater at the site. However, natural attenuation and biodegradation of constituents will occur. Access restrictions do not reduce constituent mobility or toxicity, but the volume of contamination may be reduced over time through natural attenuation and biodegradation. Deed restrictions do not apply to media at adjacent properties controlled by other parties (e.g., the Hayes property) and are therefore limited to a source control strategy. Fencing requires long-term maintenance; site fencing could be used to control site access during construction and operation of remedial technologies. Also, soil sampling should occur periodically, within the fenced area, to determine natural biodegradation and attenuation rates.

Media monitoring would indicate the natural attenuation of COCs as well as the migration of COCs off-site, if any; media monitoring will indicate the attainment of RAOs. Monitoring activities may be conducted for many years and would require long-term management efforts.

Remedial Action Alternative 2 will be retained for further consideration in the Korkay site Phase III FS.

5.3 Alternative 3 - Access Restrictions, Media Monitoring, Alternative Water Supply, Soil Excavation, Off-Site Disposal of Excavated Soils, and Soil Vegetative Cover

Remedial Action Alternative 3 includes all actions included in Alternative 2 (see Section 5.2) plus the excavation of affected site soil, off-site disposal of excavated soil, and the installation of a soil vegetative cover at the site. Alternative 3 is easily implemented and will serve to remove the source of groundwater contamination at the site, and will therefore meet the site RAOs. Excavation involves the physical removal of affected soils for off-site disposal, as requested by the NYSDEC. Once affected soils are excavated, the exposed area may be backfilled with clean soil to prevent exposure to residual media. Media monitoring may then be implemented to monitor the natural attenuation and biodegradation of residual contamination, if any. Underground utilities, if any, must be sufficiently marked to prevent damage by the heavy equipment required in excavating soils. Substantial areas are required for the excavation of soils, as well as staging pads and heavy equipment, as previously noted.

Following excavation, residual soil contamination will be minimal and, hence, a vegetative soil cover will suffice to eliminate site soils as a source of contamination to site groundwater. A vegetative soil cover (capping) will reduce the mobility of constituents through subsurface soil because waters at land surface will mostly absorb to the vegetation and not infiltrate to deeper subsurface soil. It will effectively reduce the infiltration of precipitation and surface run-off, thereby reducing the transport of site constituents to/within groundwater. Capping also reduces risks associated with direct human contact with affected soils. Limited degradation of the cover over time may require some maintenance or repair.

TCLP analyses will be performed on site soil samples collected during the Phase II RI to determine the characteristics of soils to be excavated. Excavated soil will be disposed off-site as deemed appropriate by the results of the TCLP analyses.

Remedial Action Alternative 3 will be retained for further consideration in the Korkay site Phase III FS.

5.4 Alternative 4 - Access Restrictions, Media Monitoring, Alternative Water Supply, Soil Excavation, Off-Site Disposal of Excavated Soils, Soil Vegetative Cover, and Combined Air Sparging and Soil Vapor Extraction (CASVE)

Remedial Action Alternative 4 includes all actions included in Alternatives 2 and 3 (see Sections 5.2 and 5.3) plus the implementation of CASVE at the site. Because Alternative 4 includes the excavation of affected site soil, the source of groundwater contamination will be removed under this alternative. The addition of CASVE will provide for the remedy of residual contamination, if any. It is also noted that it may be necessary to implement SVE prior to the excavation of affected site soils to limit the exposure of workers and nearby residences to site constituents of concern (COCs) during excavation.

A CASVE treatability study will be conducted during the Phase II RI to determine the applicability of this technology at the site.

Remedial Action Alternative 4 will be retained for further consideration in the Korkay site Phase III FS.

Section 6
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