United States Air Force
Installation Restoration Program

Munitions Maintenance Squadron (SS-013)

Proposed Plan

Plattsburgh Air Force Base
Clinton County, New York

Final
July 2006

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MUNITIONS MAINTENANCE SQUADRON (SS-013)

FINAL
PROPOSED PLAN

PLATTSBURGH AIR FORCE BASE
PLATTSBURGH, NEW YORK

UNITED STATES DEPARTMENT OF THE AIR FORCE
INSTALLATION RESTORATION PROGRAM

Prepared by:

URS, INC.

JULY 2006

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ACRONYMS

ABB	ABB Environmental Services, Inc.
AF	Department of the Air Force
AFB	Air Force Base
AFRPA	Air Force Real Property Agency
ARARs	applicable and/or relevant and appropriate requirements
AST	aboveground storage tank
BCT	BRAC Cleanup Team
BRAC	Base Realignment and Closure
FS	feasibility study
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	contaminant of concern
DCE	dichloroethene
DERP	Defense Environment Restoration Program
FFA	Federal Facilities Agreement
FWAA	Former Waste Accumulation Area
GW	groundwater
HRA	health risk assessment
IC	institutional control
IRP	Installation Restoration Program
L	liter
µg	microgram
MCL	Maximum Contaminant Level
MMS	Munitions Maintenance Squadron
NCP	National Contingency Plan
NPL	National Priorities List
NYCRR	New York Code of Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
O&M	operation and maintenance
ORC®	oxygen-releasing compound
OU	operable unit
PA	preliminary assessment
PAH	polycyclic aromatic hydrocarbon
PARC	Plattsburgh Airbase Redevelopment Corporation
PCB	polychlorinated biphenyl
RAB	Restoration Advisory Board
RI	remedial investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SI	site investigation/inspection
SS-013	Munitions Maintenance Squadron Site
SVOC	semivolatile organic compound
SW	surface water
TAGM	Technical and Administrative Guidance Memorandum
TBC	To Be Considered
TBD	To Be Determined
TCE	trichloroethene
TCL	Target Compound List
TMV	toxicity, mobility, and volume
TOGS	Technical and Operational Guidance Series
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VC	vinyl chloride
VOC	volatile organic compound
WSA	Weapons Storage Area

1.0 INTRODUCTION

This Proposed Plan presents the proposed remedial action for the Munitions Maintenance Squadron (MMS) site, also known as site SS-013 at the Plattsburgh Air Force Base (AFB), in Plattsburgh, New York (Figure 1). The Department of the Air Force (AF) is proposing this plan to address contaminated soil, groundwater, and sediment located at and downgradient from the SS-013 site that is present as a result of chemical releases at the SS-013 site. The recommended alternative includes air and ozone injection directly into the groundwater, and progress monitoring. Technical terms referenced in this document are defined in the Glossary, starting on page 31.

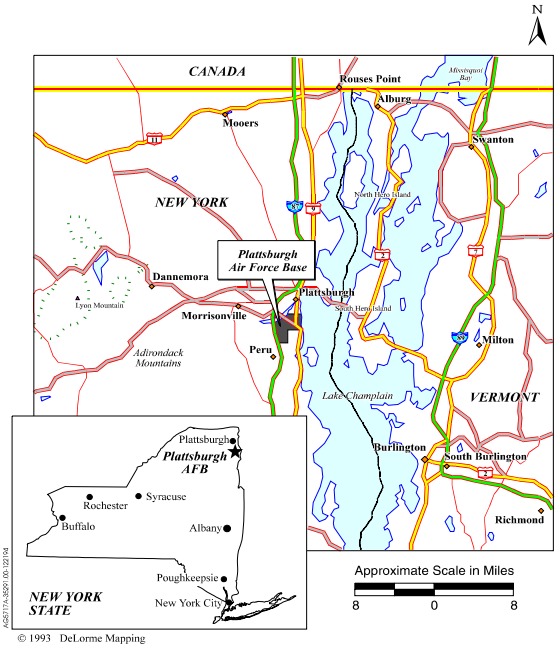


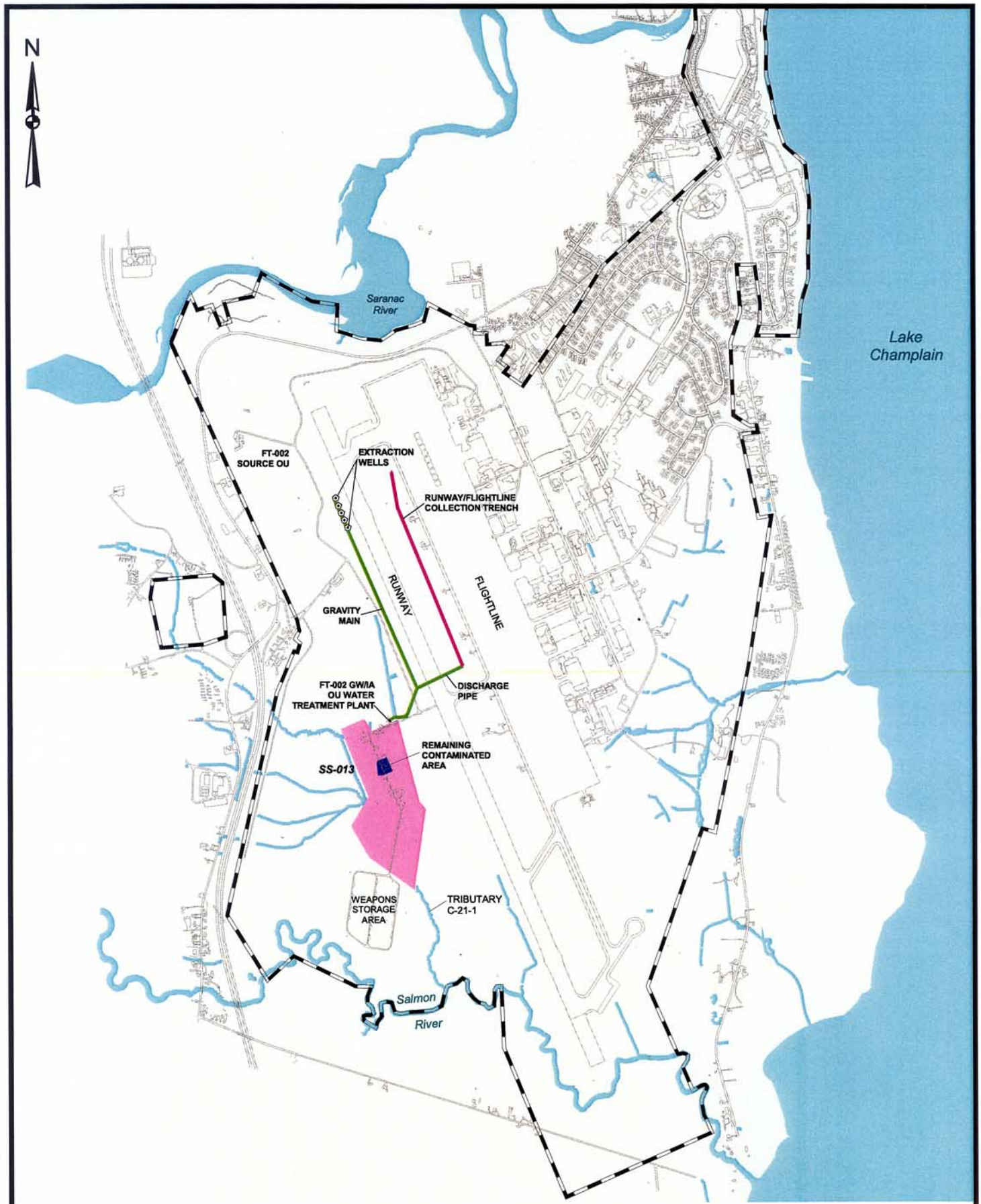
Figure 1: Vicinity Location Map

The Proposed Plan is being published in accordance with section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Its purpose is to summarize information that can be found in greater detail in the Remedial Investigation (RI), Supplemental RI, alternatives analysis reports and other related documents for this site and other IRP sites discussed in this Plan. Additionally, it provides information for public review and comment on the remedial alternative being considered. The AF, in conjunction with the United States Environmental Protection Agency (USEPA) and in consultation with the New York State Department of Environmental Conservation (NYSDEC), will consider public input while selecting the final response action for site SS-013. Therefore, the public is encouraged to review and comment on all the alternatives identified in this Proposed Plan. The **administrative record file** contains the information upon which the selection of the response action will be based. This information is available to the public online. To access the Administrative Record for Plattsburgh AFB go to the Air Force Real Property Agency (AFRPA) public web site at http://www.afrpa.hq.af.mil and follow the following steps:

- Go to "BRAC 1988-1995"
- Click on the link for "AFRPA Administrative Record"
- In "Select Base", choose "Plattsburgh"
- Enter search criteria

The SS-013 site complex occupies approximately 50 acres of land at the former base (Figure 2), and consists of several buildings that were used for the maintenance, storage, and handling of munitions-related items from 1954 to 1991. Soil, groundwater, and sediment were contaminated due to small spills of waste products at the former waste accumulation area and solvent storage pad, a leaking fuel oil underground storage tank (UST), and potential releases to the leach fields of the SS-013 septic system. These areas are illustrated on Figure 3. This Proposed Plan addresses cleanup and control of soil, groundwater, and sediment contamination resulting from past activities at site SS-013.

Several removal actions focused on addressing contamination in soil at the site. A human health risk assessment was



URS	SS-013 PROPOSED PLAN SITE LOCATION	FIGURE 2

N:\11168476.00000\GIS\Applications\ss-013.apr LOCATION MAP
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URS	SS-013 PROPOSED PLAN SITE FEATURES	FIGURE 3

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undertaken and completed subsequent to these actions. Cancer risk due to exposure to site soil in a residential reuse scenario fell at the upper end of the range of risk (10^{-4} to 10^{-6} excess cancer risk) that may be considered acceptable on a case-by-case basis by current USEPA guidelines. Noncancer risk for the soil pathway fell below the USEPA specified hazard index of 1. An ecological risk assessment was also performed; neither soil nor sediment were found to pose a significant risk to ecological receptors.

However, residual groundwater contamination that poses a potential threat to human health is present southwest of Building 3578. The cancer risk and noncancer hazard index due to exposure to site groundwater fell above USEPA's cancer and noncancer target thresholds (10^{-4} and 1, respectively). Building 3578 is currently unoccupied. The current extent of the groundwater contaminant plume is illustrated on Figure 3. Tributary C-21-1 of the Salmon River traverses the SS-013 site and acts as a hydraulic barrier that limits the downgradient extent of the plume.

A total of sixteen (16) organic compounds have been identified as contaminants of concern in site groundwater. Shallow groundwater in the vicinity of the SS-013 site flows radially inward from all directions into the drainage tributaries that meander through the site, coalesce into tributary C-21-1, and eventually discharges to the Salmon River. There are no exceedances of regulatory standards (NYSDEC surface water quality standards) in the SS-013 site drainage tributaries.

The remedial objectives for the SS-013 site are: 1) to reduce contaminant of concern concentrations in groundwater at the site to applicable and/or appropriate requirements (ARARs) and 2) to reduce groundwater contaminant concentrations to levels that do not pose a potential human health risk via inhalation of indoor air.

The AF, in consultation with the USEPA and NYSDEC, may modify the proposed remedial action presented in this Plan based on new information or public comments. Therefore, the public is encouraged to review and comment on all the alternatives identified herein.

2.0 SITE BACKGROUND

2.1 Site Description and Background

Plattsburgh AFB, located in Clinton County in northeastern New York State, is bordered on the north by the City of Plattsburgh, the south by the Salmon River, on the west by Interstate 87, and on the east by Lake Champlain. The base is approximately 26 miles south of the Canadian border and 167 miles north of Albany.

Plattsburgh AFB was closed on September 30, 1995 as part of the (third round of) base closures mandated under the Defense Base Closure and Realignment Act of 1990, as amended, and its reuse is being administered by the Plattsburgh Airbase Redevelopment Corporation (PARC). PARC is responsible for maintaining base property, marketing and controlling base reuse, leasing and managing property, and developing base facilities, as necessary, to promote advantageous reuse. According to land use plans (PARC 1995), the planned reuse of site SS-013 is aviation support. To the west and southwest, the planned reuses include recreational, commercial, and industrial. The base land use plans developed by PARC were incorporated into the Environmental Impact Statement (Tetra Tech 1995).

As part of the AF's IRP, Plattsburgh AFB has initiated activities to identify, evaluate, and restore identified hazardous material disposal areas. The IRP at Plattsburgh AFB is being implemented

according to a Federal Facilities Agreement (Docket No.: II-CERCLA-FFA-10201) signed between the AF, USEPA, and NYSDEC on July 10, 1991. Plattsburgh AFB was placed on the National Priorities List on November 21, 1989. The AF is funding cleanup.

The AF has kept the community informed regarding progress at MMS complex (site SS-013) and other base IRP sites during quarterly Restoration Advisory Board (RAB) meetings open to the public. This board consists of the BRAC Cleanup Team (BCT) members (key representatives from the AF, USEPA, and NYSDEC) and several representatives from municipalities, community organizations, and associations including community members with environmental/engineering expertise. The RAB, which was chartered in 1995, serves as a forum for the community to become familiar with the restoration activities ongoing at Plattsburgh AFB and to provide input to the BCT.

The SS-013 site is located immediately north of the Weapons Storage Area site, west of the runway, and approximately 500 feet from the base's western boundary (Figure 2). The MMS industrial complex consists of several buildings that were used from 1954 to 1991 for the maintenance, storage, and handling of munitions-related items. Building 3578 generated wastes in significant quantities. Activities carried out at MMS complex included warehousing, inspecting, cleaning, and painting of munitions and munitions support equipment. The MMS complex was not connected to the Plattsburgh AFB sanitary sewer system, but instead was served by septic systems with leach fields. Leach fields were located north of Building 3578 (leach field "N"), adjacent to the north side of Building 3569 (leach field "S"), and northeast of Building 3569 (leach field "A"), as shown on Figure 3. The MMS complex also had its own heating system that was supplied by fuel oil stored in above ground storage tanks (ASTs) and underground storage tanks (USTs).

Several remedial actions addressing soil contamination have been undertaken at site SS-013 in coordination with the NYSDEC and USEPA. In addition, equipment removals were executed following the closure of Plattsburgh AFB in 1995. These actions included the Fuel-oil tank UST-3578-A-2 removal (1996), leach Fields N and A Piping Removals (1996), Septic Tank SPT-3578 Removal (1996), Former Waste Accumulation Area Solvent Storage Pad Removal (1997), and Buildings 3578 and 3569 Soil Removal Actions (2000-2001).

SS-013 is situated downgradient of groundwater contaminant plumes emanating from site FT-002 and LF-023; however, in the vicinity of SS-013 this contamination is below levels that might cause a risk to human health or the environment. Groundwater contamination remaining beneath the SS-013 site is likely attributable to the former waste accumulation area north of Building 3578; and the fuel oil UST located next to Building 3578 (near the southwest corner). Groundwater contamination consists primarily of fuel-related compounds and chlorinated hydrocarbons. This contamination extends a maximum of approximately 200 feet southwest of the southern edge of Building 3578 as shown in Figure 3. Tributaries that traverse this area of the base act as hydraulic barriers for extended lateral contamination. The nature and extent of groundwater contamination is described further in section 2.3.4.

2.2 Summary of Previous Site Activities

2.2.1 SS-013 Phase I Records Search

In 1985, a Phase I record search was completed for SS-013 (Radian 1985). Based upon the results of the Phase I record search, recommendations were proposed to initiate a

preliminary investigation. These recommendations included sampling surface water and the installation and sampling of five monitoring wells.

2.2.2 SS-013 Site Investigation

In 1987, a series of site investigations (SIs) were performed at various Plattsburgh AFB sites, including SS-013 (E.C. Jordan 1989). The SI for SS-013 included 1) a limited soil gas survey around leachfield "A", 2) installation and sampling of five monitoring wells, and 3) collection of one surface water and one sediment sample in tributary C-21-1 located downstream of the SS-013 site.

Based on the results of the SI, which indicated organic and inorganic compounds were present in the sediment, surface, and groundwater, an additional investigation was recommended to further characterize the drainageways and groundwater at SS-013.

2.2.3 SS-013 Drainage Flow Study

A base-wide drainage flow study was completed in September 1991 (ABB 1991). The purpose of the study was to establish baseline water quality data and to characterize the surface water network at Plattsburgh AFB. As part of this study, seven locations were monitored for one year in the vicinity of SS-013.

2.2.4 SS-013 Remedial Investigation

As a follow-up to the SI, a multi-phased SS-013 groundwater RI (URS 1996a) was undertaken to address the nature and extent of contamination in groundwater attributable to SS-013. The RI concluded that site contamination is potentially attributed to five potential onsite source areas: (1) leach field N; (2) leach field S; (3) leach field A; (4) the former waste accumulation area; and (5) the UST that was located southwest of Building 3578. Contamination in the leach fields is likely a result of small spills that may have reached the leach fields through floor drains and the sewer network. The waste accumulation area was used for drum storage and staging. A solvent storage pad, located about 30 feet north of the waste accumulation area, was used to stage drums of solvents, primarily toluene. Spills appear to have occurred in these areas. The UST and associated piping appear to have leaked an unknown quantity of #2 fuel oil. Of these sources, the solvent storage pad near the waste accumulation area and the fuel oil UST were believed to be continuous sources for groundwater contamination.

In general, contamination likely migrated from the five potential source areas into groundwater. Contamination in groundwater may then discharge into surface drainage near the site. Surface drainageways are also impacted by upgradient sources. Results of the groundwater sampling showed that the fire training area (site FT-002) plume was migrating and beginning to encroach on the MMS area, since 1,2-dichloroethene (1,2-DCE) and trichloroethene (TCE) were detected at one of the SS-013 upgradient wells (MW-13-001). However, this contamination had not impacted wells in the MMS industrial complex area and has diminished over time (URS 2003a).

As part of the study, the health risk posed to potential human receptors was assessed. The assessment concluded that using groundwater contaminated by the SS-013 site for potable use could pose a significant threat to human health. The aquifer contaminated by the SS-013 plume currently is not used as a potable supply source – a public water supply is available.

2.2.5 Equipment Removals

In 1996, the underground fuel-oil storage tank located southwest of Building 3578 and the majority of the septic system equipment at SS-013 were removed (Figure

3). The piping, septic tank, sand filter, and leach field S north of Building 3569 were not removed.

2.2.6 Fuel Oil UST Removal

In March 1996, OHM Inc. removed the fuel oil UST located southwest of Building 3578 as part of the basewide storage tank removal project. Soil around the UST was excavated to a depth of approximately 10 feet below grade. Based on preliminary soil and water samples obtained from the excavation, further soil was removed in October 1996 and the remaining fuel supply piping was removed. Results of a second round of soil and water sampling resulted in the excavation of additional soil. Confirmatory samples were collected in December 1996 and the excavation was backfilled with clean fill. The petroleum-impacted soil was transported to an on-site treatment cell.

2.2.7 Septic System Removal

In September 1996, the septic system at Building 3578 was removed and soil at the septic tank location was excavated to a depth of 5 feet and temporarily stockpiled adjacent to the excavation on plastic sheeting. Groundwater was encountered at a depth of 4 feet during removal activities. No signs of contamination (staining or odors) were noted. Sample results of soil and water indicated no compounds were detected in the samples. The excavation was backfilled to grade with the originally excavated soil.

2.2.8 1997 Removal Action at Former Waste Accumulation Area

In November 1997, the 6-foot by 13.5-foot concrete pad located east of Building 3578 was removed (Parsons 1999). Excavated soil beneath the pad was loaded directly into dump trucks for transportation to the on-site treatment facility. Confirmatory soil samples collected from the bottom and sidewalls of the excavation indicated that VOCs and SVOCs were detected at low concentrations in the soil samples, but the detected concentrations were well below their respective NYSDEC soil cleanup objective guidance concentrations (NYSDEC 1994). NYSDEC and USEPA concurred with the recommendation that no further soil removal was warranted at the excavation location. The excavation was backfilled with clean fill in May 1998 and regraded and seeded.

2.2.9 Fire Training Area /Industrial Area Groundwater Operable Unit Remedial Investigation/Feasibility Study

From 1995 through 1999, a large volume of groundwater and surface water data was compiled as part of the Fire Training Area (FT-002)/Industrial Area Groundwater RI/FS (URS 2001). These data supported the conclusions of the SS-013 RI, indicating that the leading edge of the chlorinated hydrocarbon contaminated groundwater plume from site FT-002 was impacting the most upgradient SS-013 monitoring wells (MW-13-001 and MW-13-002) and was likely to impact the MMS industrial complex in the future (this upgradient contamination has since diminished over time; URS 2003a). Surface water sampling results also indicated that contaminated groundwater from the FT-002 plume discharges to surface water in the drainage basin between the runway and flightline north of SS-013. The storm drainage system carries this water to tributary C-21-1 that flows through site SS-013 and eventually to the Salmon River. In the fall of 2003, a collection and treatment system (shown on Figures 2 and 3) was installed to address groundwater contamination from FT-002. The system currently treats about 300 gallons per minute of groundwater collected from the drainage basin between the runway and flightline north of SS-013 and about 80 gallons per minute of groundwater collected from

recovery wells located downgradient from the FT-002 source. Consequently, the upstream water quality of tributary C-21-1 is expected to improve.

2.2.10 2000/2001 Removal Action at Buildings 3578 and 3569

An additional soil removal action was implemented by the Air Force to address soil contamination remaining in the vicinity of the former Building 3578 UST and to address a small area of polycyclic aromatic hydrocarbon (PAH) contaminated soils near Building 3569. The soil removals began in August 2000 and continued through May 2001. Confirmatory soil samples were collected at both removal locations and sample data was submitted to the NYSDEC and USEPA for review. Following regulatory agency approvals, the Air Force (November 2001) removed and disposed of the contaminated soil and backfilled the excavations with soil from the stockpiles that showed no exceedances of NYSDEC recommended soil cleanup objectives (NYSDEC 1994) and imported clean fill material from an offbase source. A Draft Closure Report was submitted for regulatory agency review and concurrence in March 2002 (Versar 2002).

2.2.11 Supplemental Remedial Investigation

The purpose of this Supplemental RI report (issued in May 2002) was to present, summarize, and provide interpretations and conclusions regarding data from environmental activities at site SS-013, particularly those occurring after the initial RI (URS 2002). In addition, three new groundwater monitoring wells were installed. Groundwater samples were also collected from all wells at the SS-013 site and the results were used to update the human health risk assessment to provide an evaluation of a potential future residential reuse exposure scenario.

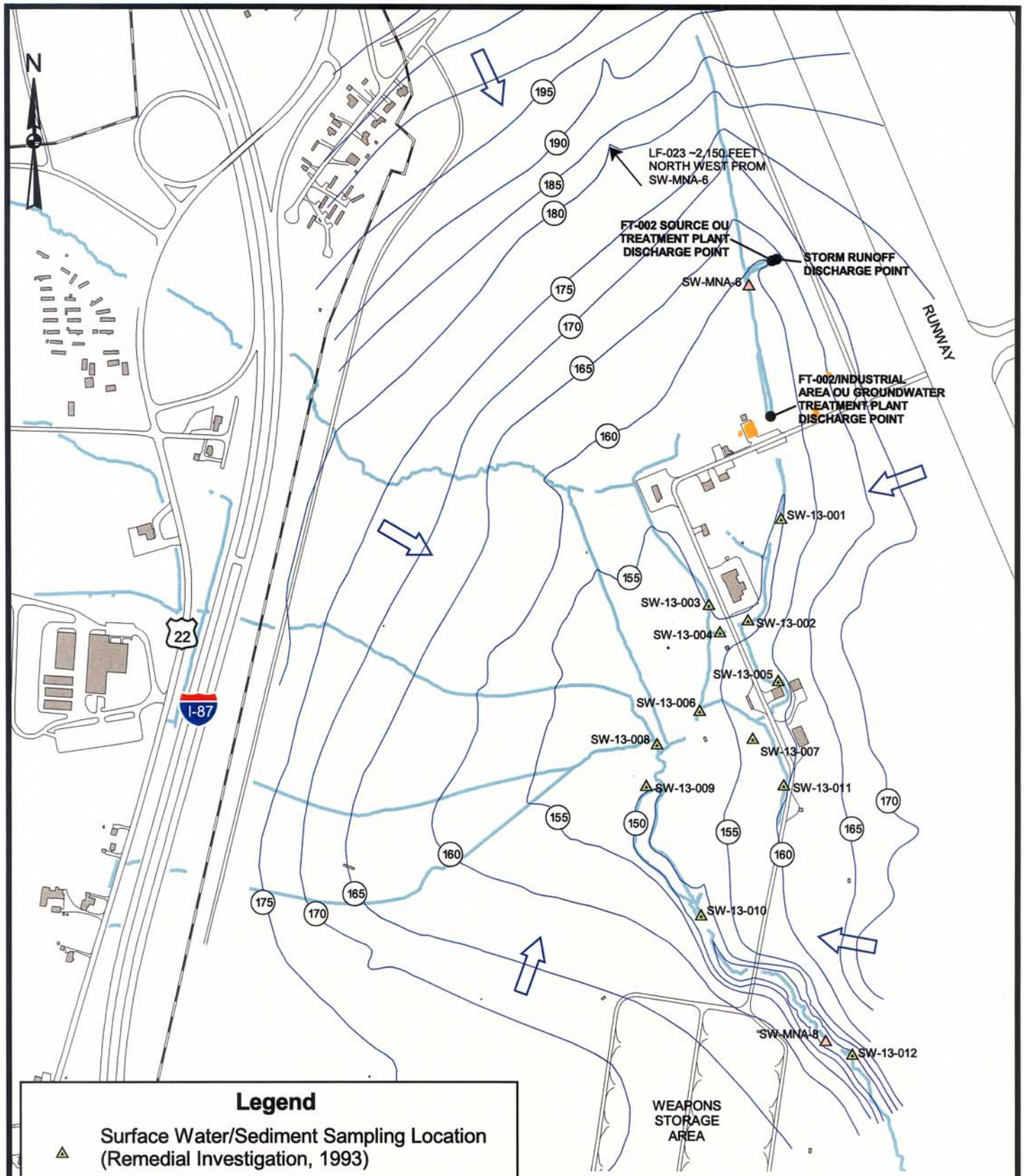
2.2.12 Supplemental Surface Water Sampling

Since February 1998, the USAF has conducted periodic surface water sampling at key locations on the base (including Tributary C-21-1), in support of the FT-002 Industrial Area Groundwater Operable Unit. Two locations in the C-21-1 drainage system have each been sampled 23 times and the samples analyzed for volatile organic compounds. The purpose of the sampling has been to assure that surface water and groundwater contaminants are not migrating off base. The latest data were collected in June (URS 2003b). Several compounds have been detected; however, only trichloroethene has been detected above ARARs (and only at the upstream location). The two sampling locations are shown on Figure 4. The volatiles detected in the stream are attributable to discharge from groundwater contaminated by the FT-002 contaminant plume.

2.2.13 Radiological Surveys

In June 1995, the AF completed a radiological decommissioning survey at the Weapons Storage Area and maintenance areas (AF 1995). The survey included alpha/beta/gamma and gamma scanning with detection equipment and swipe sampling. The survey concluded that the facility was releasable for public use.

In 2003-2004, a thorough preliminary assessment/site inspection (PA/SI) of the MMS and weapons storage area was undertaken by the AF in response to reports of potential disposal of low-level radiological waste at former Strategic Air Command bases across the United States. The investigation included historical research, interviews, and an extensive electromagnetic geophysical survey. In addition, a gamma radiological survey was performed. No radiological waste was discovered. The PA/SI Report (Cabrera 2004) recommended no further action for



N:\11168476.00000\GIS\Applications\ss-013.apr SURFACE WATER/SEDIMENT SAMPLING LOCATIONS 10/26/2005

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SS-013 PROPOSED PLAN
SURFACE WATER/SEDIMENT SAMPLING LOCATIONS

FIGURE 4

surface soils and building interiors, and no further subsurface investigation of burial sites. The site was deemed acceptable for unrestricted reuse (from a radiological perspective), confirming the recommendation of the 1995 radiological decommissioning survey. In April 2004, the NYSDEC Bureau of Hazardous Waste and Radiation Management agreed with the recommendations of the PA/SI (NYSDEC 2004), and the NYSDEC and USEPA accepted the document without comment. A no further action decision document (FPM Group 2004) was signed by the AF on September 22, 2004.

2.3 Site Characteristics

2.3.1 Surface Water Hydrology

Plattsburgh AFB lies within the Lake Champlain drainage basin. The dominant surface water features in the vicinity of Plattsburgh AFB are the Saranac River to the north, the Salmon River to the south, and Lake Champlain to the east. The Saranac and Salmon Rivers, which discharge into Lake Champlain, originate west of Plattsburgh AFB in the Adirondack Mountains. A network of drainage ways carries surface water runoff from the base into sewers and streams that lead to off base areas.

2.3.2 Site Drainage

SS-013 is located within the drainage basin of a tributary of the Salmon River (Figure 2). This drainage area carries water from the north/northwest to the south and discharges to the Salmon River. A significant part of the upper reaches of this drainage area lies off-base to the west of Route I-87. Drainage from the runway east of SS-013 also flows through this drainage area. The sources of drainage within this system are precipitation, discharge from the two FT-002 water treatment plants, and groundwater discharge.

SS-013 is situated in a broad topographic basin, where the unconfined aquifer thins. Groundwater discharges directly to the ground surface or into drainage channels. A collection trench carries groundwater from another topographic basin, situated between the runway and flightline ramp, to the recently installed FT-002/Industrial Area Groundwater Operable Unit treatment plant, which discharges into a tributary that flows through site SS-013. This stream also receives treated groundwater from the FT-002 Source OU water treatment plant. These discharge points are shown on Figure 4. The smaller drainage channels and seeps coalesce into a larger single stream. The major streams of this basin are classified by NYSDEC as tributary C-21-1 to the Salmon River.

The topographic basin between the runway and flightline ramp is probably the feature that historically had the greatest impact on water quality in the SS-013 drainage. This basin is a large depression in the sand unit with six storm sewer drop inlets at its base. The original intent of this basin was probably to collect surface water flow and direct it southward to tributary C-21-1. However, portions of the basin are up to 27 feet lower than the flanking runway and flightline ramp, which induces groundwater flow into the basin.

The installation of the runway/flightline groundwater collection trench has significantly lowered the water table beneath the runway/flightline topographic basin. The storm drainage system will still convey surface runoff to the tributary C-21-1.

2.3.3 Hydrogeologic Setting

Groundwater in the vicinity of Plattsburgh AFB occurs in both overburden deposits and bedrock. Hydrologically, the stratigraphic sequence can be divided into the following units from top to bottom: the

unsaturated zone, the unconfined sand aquifer, the clay confining layer, the confined till water-bearing zone, and the confined bedrock aquifer. Groundwater movement in these units is controlled by aquifer characteristics, infiltration, and run-off. Borings and monitoring wells were advanced within each of these units to thoroughly characterize them during the FT-002 RI/FS (URS 2001).

Within the boundaries of site SS-013, the naturally occurring surficial unit encountered is gray silty sand with occasional interstratified layers of fine sand, silts, and clays. This stratum probably represents the basal portions of the fine sand unit seen basewide. Within the SS-013 industrial complex, several feet of regraded material or sandy fill often cover the silty sand unit. The silty sand unit thickness was fairly consistent in site borings and ranged from 7 to 15 feet, overlying the clay-confining unit.

Groundwater around the SS-013 site flows radially from all directions (Figure 4) into the WSA drainage basin and converges along the main stream that meanders through the site (tributary C-21-1 of the Salmon River). The depth to groundwater ranges from up to 10 feet below the surface to the east toward the runway to near the surface in the immediate vicinity of the drainages of tributary C-21-1. Due to irregular surface topography and smaller drainage features (i.e., ditches and small streams), groundwater flow direction can vary on a local scale. Groundwater at SS-013 discharges to surface water within the basin and is eventually carried southward to the Salmon River by tributary C-21-1.

2.3.4 Nature and Extent of Groundwater Contamination

The primary contaminants of concern (COCs) identified in the Supplemental RI report are vinyl chloride and naphthalene. These compounds were identified as COCs based on concentrations detected at monitoring well MW-13-008 and on their potential to impact human health (refer to section 3.1). In the latest round of sampling at MW-13-008 in 2003, naphthalene was detected at a concentration of 2,842 µg/l and vinyl chloride was detected at a concentration of 12 µg/l. The most recent comprehensive round of groundwater sampling was accomplished in the fall of 2000 as part of the Supplemental RI. Sixteen (16) chemicals were present in groundwater at concentrations above ARARs among the wells sampled. Ten of the contraventions (vinyl chloride, methylene chloride, toluene, ethylbenzene, m&p xylenes, 2,4-dimethylphenol, naphthalene, acenaphthene, dibenzofuran, and carbazole) occurred at MW-13-008. Iron, manganese, and sodium were detected in groundwater at concentrations above ARARs in several of the onsite wells. However, all three of these metals were detected in groundwater at concentrations below base background concentrations (URS 1996b). Thallium was detected in groundwater at one location (MW-13-013); the detected concentration of 4 µg/L in the unfiltered (total) groundwater sample exceeded the 0.5 µg/L ARAR concentration. Thallium was not detected in the filtered (dissolved) groundwater sample at MW-13-013. The two remaining chemicals that were detected in groundwater above ARARs (trichloroethene and 1,2-dichoroethane) appear to be from upgradient sources. Trichloroethene (TCE) was detected in groundwater at MW-13-02 at a concentration of 9 µg/L. This contamination appears to have migrated from the flightline area (which lies to the northeast). However, subsequent sampling determined that this contamination has been reduced to below ARARs at this upgradient location (URS 2003a). 1,2-Dichloroethane (1,2-DCA) was detected in groundwater at MW-013-009 at a concentration of 1.2 µg/L, slightly above its ARAR concentration of 0.6 µg/L. This compound was not detected previously at this location. MW-013-009 is located

downgradient from landfill LF-023, which lies about 1,500 feet to the north. 1,2-DCA and related chemicals (chloroethane – a breakdown product of DCA) have been detected in groundwater at LF-023 in the past, albeit very sporadically.

Analytes detected in more recent (since 2000) SS-013 groundwater samples at concentrations above ARARs are listed in Table 1, below. Exceedances of ARARS have primarily occurred at MW-13-008. Groundwater at the nearest upgradient and downgradient wells (MW-13-007 and MW-13-012, respectively) is in compliance with ARARs for all organic compounds. The estimated extent of the contaminant plume is shown on Figure 3. Tributaries of the Weapons Storage Area stream (C-21-1) are believed to act as a hydraulic barrier and limit the downgradient extent of the plume. The upgradient limit is conservatively assumed to be located between MW-13-007 and MW-13-008.

2.3.5 Nature and Extent of Soil Contamination

Soil contamination identified in the RI (URS 1996a) was addressed by several removal actions at the site. Five areas of the site were identified in the RI as potential soil sources for groundwater contamination. Actions undertaken to address these sources included: removal of the UST and contaminated soil south of Building 3578 in 1996 and removal of additional soil contamination associated with the UST in 2000 (Versar 2002); removal of the solvent storage pad near the waste accumulation area; and removal of soil above the septic system that leads from Building 3569 to leach field S (Versar 2002). Confirmatory samples were collected from these excavations. Table 2 shows the maximum soil concentrations compared to soil TBCs for chemicals detected in groundwater above ARARs in the fall of 2000 comprehensive

TABLE 1
SUMMARY OF ANALYTES DETECTED IN SS-013 GROUNDWATER SAMPLES SINCE 2000 AT CONCENTRATIONS ABOVE ARARs

PARAMETER	ARAR VALUE	NO. OF SAMPLES	NO. OF DETECTIONS	NO. OF ARAR EXCEEDANCES	MAXIMUM DETECTED VALUE	LOCATION OF MAXIMUM VALUE
1,2,4-Trimethylbenzene	5	3	1	1	15.85	MW-13-008
1,2-Dichloroethane	0.6	26	1	1	1.23	MW-13-009
1,3,5-Trimethylbenzene	5	3	1	1	16.10	MW-13-008
Benzene	1	26	1	1	3.62	MW-13-008
Ethylbenzene	5	26	3	3	29.75	MW-13-008
Methylene Chloride	5	26	3	1	8.19	MW-13-008
Toluene	5	26	3	1	5.63	MW-13-008
Trichloroethene	5	26	4	2	9.39	MW-13-002
Vinyl Chloride	2	26	3	3	21.75	MW-13-008
Xylenes (total)	5	26	2	2	16.10	MW-13-008
1,1'-Biphenyl	5	6	1	1	20.10	MW-13-008
2,4-Dimethylphenol	1	18	2	2	209.7	MW-13-008
Acenaphthene	20	20	2	2	172.5	MW-13-008
Carbazole	50	18	2	2	75.78	MW-13-008
Dibenzofuran	50	20	2	1	63.73	MW-13-008
Naphthalene	10	23	3	3	4,529	MW-13-008
Antimony	3	10	3	3	11.20	MW-13-015
Iron	300	10	10	10	32,700	MW-13-013
Manganese	300	10	10	4	714.0	MW-13-014
Sodium	20000	10	10	3	31,100	MW-13-007
Thallium	0.5	10	4	4	11.50	MW-13-014
Note: Concentrations above are given in micrograms per liter.						

TABLE 2

MAXIMUM SOIL CONCENTRATIONS COMPARED TO SOIL TBCs FOR CHEMICALS DETECTED IN GROUNDWATER ABOVE ARARs

Chemical	TBC	Leach Field "N"	Leach Field "A"	Leach Field "S"	Waste AA/ Solvent Pad	3875 UST
Vinyl Chloride	200	Nd	Nd	Nd	2	Nd
Methylene Chloride	100	Nd	Nd	53	45	Nd
1,2-Dichloroethane	100	Nd	Nd	Nd	Nd	Nd
Trichloroethene	700	Nd	Nd	Nd	39	Nd
Toluene	1,500	4	Nd	110	48	Nd
Ethylbenzene	5,500	6	Nd	Nd	Nd	34.8
Xylenes	1,200	47	2	25	12	94.3
2,4-Dimethylphenol	Ns	Nd	Nd	Nd	Nd	Nd
Naphthalene	13,000	Nd	Nd	120	100	969
Acenaphthene	50,000	Nd	Nd	340	1,100	Nd
Dibenzofuran	6,200	Nd	Nd	200	540	Nd
Carbazole	Ns	Nd	Nd	500	1,100	Nd
Iron	36,700	18,700	7,420	5,760	10,900	Na
Manganese	474	441	84.6	92.4	**679**	Na
Sodium	520	155	36.4	33.5	82.1	Na
Thallium	Nd	Nd	Nd	Nd	Nd	Na

Note: Chemical concentrations of organic chemicals are given in µg/Kg; inorganic chemicals are given in mg/Kg
Ns = no standard; Nd = non detect; Na = not analyzed
679 = Concentration exceeds TBC (NYSDEC TAGM 4046)

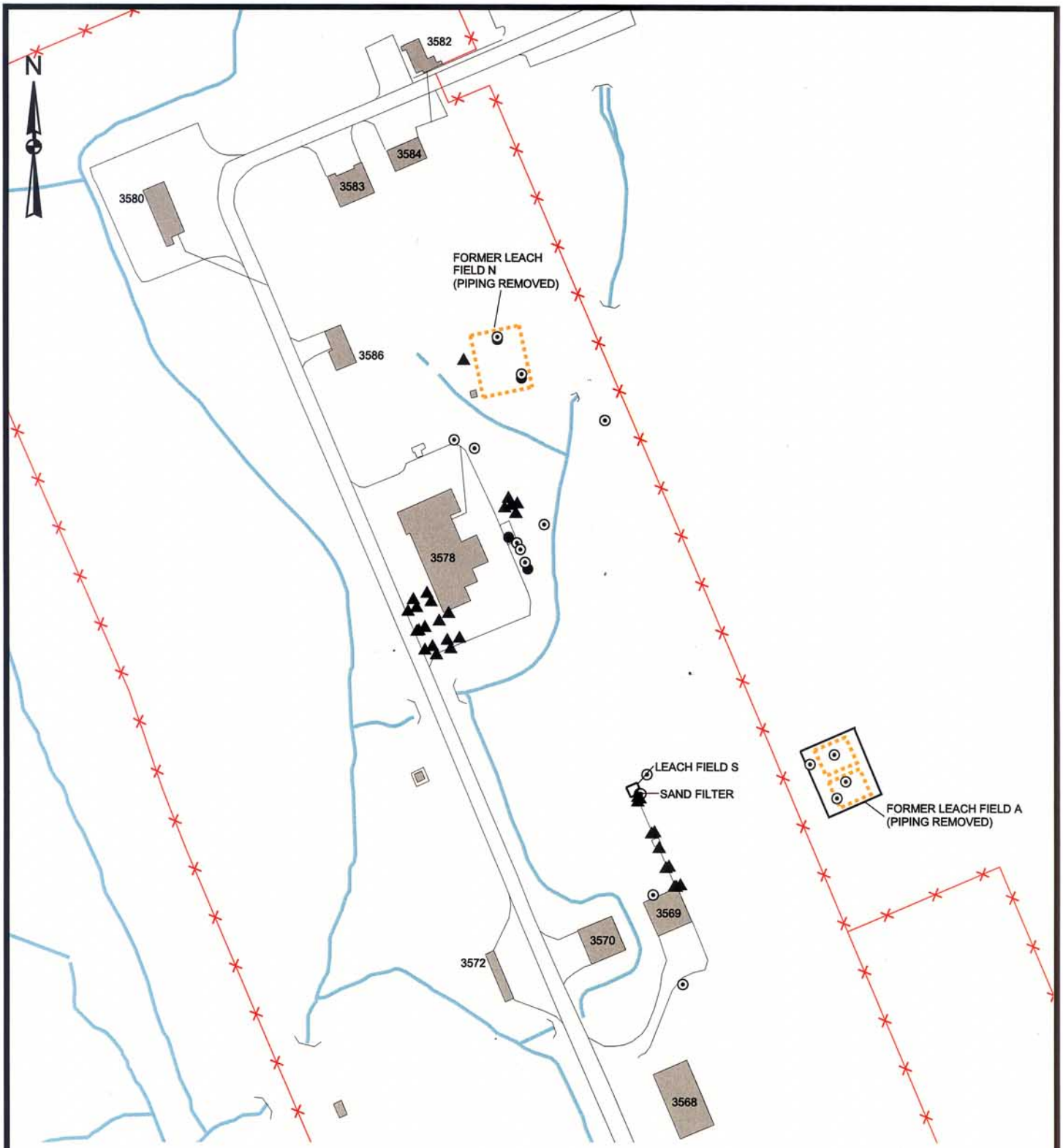
round of groundwater sampling. Maximum concentrations are shown for groups of soil samples based on the five potential source areas identified in the RI. Only manganese near the solvent storage pad was detected at a concentration above TBCs. Soil samples used in the analysis include locations that were not excavated and samples collected to confirm the extent of excavation (soil sample locations are shown on Figure 5). Therefore, no soil source for groundwater contamination remains at site SS-013.

2.3.6 Nature and Extent of Sediment Contamination

Twelve (12) sediment samples were collected at site SS-013 from the Tributary C-21-1 drainage system in October 1993 (URS 1996a). Sample locations are shown on Figure 4. Samples were analyzed for a wide ranging suite of chemicals. Four (4) volatile organic compounds, 17 semi-volatile organic compounds, 3 pesticides, 1 polychlorinated biphenyl (PCB), and 18 metals were detected among the samples. The concentrations of these chemicals were generally very low. Concentrations were compared to New York State screening criteria. Twelve (12) chemicals were detected above these criteria as shown in Table 3.

TABLE 3
CHEMICALS DETECTED ABOVE TBCs IN SEDIMENT

Chemical	Freq. Above State Screening Levels	Maximum Conc.
Benzo(a)anthracene	2 / 12	66 µg/Kg
Chrysene	3 / 12	75 µg/Kg
Benzo(b)fluoranthene	1 / 12	72 µg/Kg
Benzo(k)fluoranthene	1 / 12	50 µg/Kg
Benzo(a)pyrene	2 / 12	56 µg/Kg
4-4'DDE	2 / 4	2.3 µg/Kg
4-4'DDD	1 / 4	0.85 µg/Kg
Aroclor-1248	1 / 4	53 µg/Kg
Antimony	1 / 4	4.6 mg/Kg
Cadmium	1 / 4	0.75 mg/kg
Iron	1 / 4	41,100 mg/kg
Manganese	1 / 4	2,570 mg/kg



N:\11168476.00000\GIS\Applications\ss-013.apr SOIL SAMPLE LOCATIONS 10/26/2005

URS	SS-013 PROPOSED PLAN SOIL SAMPLE LOCATIONS	FIGURE 5

2.3.7 Nature and Extent of Surface Water Contamination

In 1993, twelve surface water samples were collected as part of the RI (URS 1996a) from locations corresponding to the sediment samples (Figure 4). Samples were analyzed for volatile and semivolatile organic compounds. No chemicals were detected above New York State Class C surface water ARARs.

Since February 1998, the AF has conducted periodic surface water sampling at key locations on the base (including Tributary C-21-1), in support of the FT-002 Industrial Area Groundwater Operable Unit. Two locations (Figure 4) in the C-21-1 drainage system have each been sampled 23 times and the samples analyzed for volatile organic compounds. Trichloroethene has been detected at a maximum concentration (106 µg/L) above its ARAR (40 µg/L) at the location (SW-MNA-6) upstream from site SS-013 (URS 2003b). The volatile organic compounds detected in the stream are attributable to discharge from groundwater contaminated by the FT-002 contaminant plume.

3.0 SUMMARY OF SITE RISKS

A human health risk assessment (HRA) was presented in the RI report that evaluated potential human exposure to soil and groundwater contamination under trespassing, construction, and industrial development scenarios (URS 1996a). The HRA was updated in the Supplemental RI in 2000 (URS 2000). The updated HRA evaluated the potential human health risks associated with exposure to contaminated soil and groundwater under a future residential use development scenario. Although the expected use of the site is industrial, risk was evaluated under a residential scenario to ascertain the need for institutional controls to restrict land development. The updated HRA asserted that the potential exposure pathway of greatest concern is the ingestion of contaminated groundwater. For this pathway, naphthalene and vinyl chloride are the primary COCs.

Ecological risks also were assessed as part of the RI report (URS 1996a).

3.1 Human Risk Assessment (HRA)

A four-step process is utilized for assessing site-related human health risks for a reasonable maximum exposure scenario: Step 1 – *Hazard Identification* – identifies the contaminants of concern at the site based on several factors such as toxicity, frequency of occurrence, and concentration. Step 2 – *Exposure Assessment* – estimates the magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathways (e.g., ingesting contaminated well water) by which humans are potentially exposed. Step 3 – *Toxicity Assessment* – determines the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of adverse effects (response). Step 4 – *Risk Characterization* – summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site-related risks.

The HRA for the SS-013 site evaluated potential human exposure to contaminants in a residential reuse scenario. Exposure pathways assessed included ingestion of contaminated soil, dermal contact with and adsorption of contaminants from soil, inhalation of contaminants volatilizing from soil migrating to indoor air, ingestion of contaminated groundwater, dermal contact with and adsorption of contaminated groundwater, and inhalation of contaminants volatilizing from groundwater and indoor air. The latest round of groundwater samples, soil samples not excavated during removal actions, and confirmation soil samples from the removal

actions were used in the assessment. Risks were quantified and compared to USEPA evaluation criteria. Under USEPA guidelines, a calculated cancer risk of less than 1×10^{-6} is acceptable and risks in the range of 1×10^{-4} to 1×10^{-6} are evaluated on a case by case basis. A potential noncancer risk is indicated if the hazard index exceeds 1.

The overall excess cancer risk posed by chemicals detected in soil via the three soil exposure pathways is 1×10^{-4}. This risk falls at the upper end of the range of risk (10^{-4} to 10^{-6} excess cancer risk) that may be considered acceptable on a case-by-case basis by current USEPA guidelines. The overall noncancer hazard index for the soil pathways is below the USEPA specified hazard index of 1.

The overall cancer risk posed by chemicals detected in groundwater is 5×10^{-4} and the overall hazard index for the groundwater pathway is 50. These risks fall above USEPA's cancer and noncancer target risk thresholds. The ingestion and inhalation exposure pathways primarily contribute to the risk. The chemicals primarily responsible for the excess cancer risk posed by chemicals detected in groundwater include arsenic, vinyl chloride, and naphthalene. The potential indoor air risk is attributable to naphthalene. Detections of arsenic in groundwater were widespread; however, arsenic was not detected in groundwater at concentrations above its ARAR (10 µg/L) at any location. The assessment results for potential human cancer risk and noncancer hazard indices are given in Tables 4 and 5 below, respectively.

TABLE 4
SUMMARY OF CANCER RISKS

Exposure Pathway	Cancer Risk
Injestion of Soil	2 x 10-5
Dermal Contact With Soil	7 x 10-5
Inhalation of Soil Vapors in Indoor Air	1 x 10-5
TOTAL SOIL PATHWAYS	**1 x 10-4**
Ingestion of Groundwater	4 x 10-4
Dermal Contact With Groundwater	2 x 10-6
Inhalation of Groundwater in Indoor Air	8 x 10-5
TOTAL GROUNDWATER PATHWAYS	**5 x 10-4**

TABLE 5
SUMMARY OF NONCANCER RISKS

Exposure Pathway	Hazard Index
Injestion of Soil	0.16
Dermal Contact With Soil	0.15
Inhalation of Soil Vapors in Indoor Air	0.15
TOTAL SOIL PATHWAYS	**0.46**
Ingestion of Groundwater	38
Dermal Contact With Groundwater	3
Inhalation of Groundwater in Indoor Air	9
TOTAL GROUNDWATER PATHWAYS	**50**

It should be noted that all the above exposure pathways are hypothetical. Groundwater is not currently used as a potable supply source in the impacted area, and the impacted area (currently unoccupied) is not used for residential purposes and is not expected to be used for residential purposes in the future under the reuse and redevelopment plan for the base (Tetra Tech 1995).

3.2 Ecological Risk Assessments (ERAs)

A screening-level ERA was performed as part of the initial RI (URS 1996a). Risks to terrestrial wildlife were assessed by evaluating potential impacts of soil and sediment contaminants on four indicator species (meadow jumping mouse, raccoon, fox, and common crow). Results showed no potential threat to the terrestrial species from soil contamination. There was a potential for impacts on the meadow jumping mouse population from sediment exposure; however, the magnitude of the impact was expected to be small (risk is attributable to manganese). Ecological risk assessment results are given in Table 6 below.

TABLE 6
ECOLOGICAL HAZARD INDICES

Media	Meadow Jumping Mouse	Racoon	Red Fox	Common Crow
Soil	0.2	0.0005	0.000004	0.002
Sediment	2.5	0.002	0.00004	0.0003

Risks to aquatic life were evaluated by comparing representative contaminant concentrations in surface water to state and

federal water quality criteria and guidelines established for the protection of aquatic life. No significant risks were indicated by this evaluation.

The conclusions of the ERA for the SS-013 site were that site-related contaminants in soil, sediment, and surface water did not appear to represent a significant threat to ecological receptors.

4.0 SCOPE AND ROLE OF OPERABLE UNIT

Site SS-013 is one of a number of sites administered under the Plattsburgh AFB IRP. Records of Decision (RODs) have been signed for 17 OUs at the base and additional RODs are planned for other IRP sites. This Proposed Plan addresses groundwater, soil, and sediment contamination that has been detected at site SS-013.

Surface water is not considered a media of concern for the SS-013 OU because the contaminants detected in surface water are attributable to groundwater discharging from the FT-002 site groundwater plume and are being addressed as part of the FT-002 Industrial Area Groundwater OU.

The principal threats for this site include a potential threat to future groundwater users at the site should the unconfined aquifer be utilized as a source for potable water use in the future and a potential threat posed to occupants of existing or new buildings located within the area of groundwater contamination via contaminated indoor air volatilizing from contaminated groundwater (vapor intrusion). The proposed action addresses the principal threats by restoring the aquifer to drinking water quality over time. It is intended that the proposed action be the final action for site SS-013.

Based on the human and ecological risk assessment, no significant threat to human health and the environment is posed by contaminants remaining in soil and sediment at the site. Therefore, no further action is necessary to address these media.

5.0 REMEDIAL ACTION OBJECTIVES

The remedial action objectives for the SS-013 site are: 1) to reduce contaminant of concern concentrations in groundwater at the site to applicable and/or appropriate requirements (ARARs) and 2) to reduce groundwater contaminant concentrations to levels that do not pose a potential human health risk via inhalation of indoor air.

Remediation goals are chemical-specific targets for remediation that are developed consistent with the remedial action objectives. For the SS-013 site, remediation goals for groundwater are ARARs which include federal maximum contaminant levels (MCLs) or New York State groundwater quality standards, whichever are most stringent. Remediation goals were developed for the contaminants of concern (listed below).

TABLE 7
NEW YORK STATE GROUNDWATER ARARs

SUBSTANCE	MAXIMUM ALLOWABLE CONCENTRATION (µg/L)
1,2,4-Trimethylbenzene	5
1,2-Dichloroethane	0.6
1,3,5-Trimethylbenzene	5
Benzene	1
Ethylbenzene	5
Methylene Chloride	5
Toluene	5
Trichloroethene	5
Vinyl Chloride	2
Xylenes (total)	5
1,1'-Biphenyl	5
2,4-Dimethylphenol	1
Acenaphthene	20
Carbazole	50
Dibenzofuran	50
Naphthalene	10

Notes:µg/L = microgram per liter

Reference: NYSDEC. 1998. "Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations." *Technical and Operational Guidance Series (1.1.1.)*. June, Albany, NY.

Achievement of the second remedial action objective will be demonstrated when groundwater concentrations reach levels acceptable for human health via the inhalation of indoor air exposure pathway, as determined by the AF, NYSDEC, and USEPA. Although the ARARs for groundwater are designed to be protective of the injection pathway, they will also be protective of the vapor intrusion pathway for the chemicals present in groundwater at site SS-013. The area of groundwater contamination requiring cleanup is shown on Figure 6.

6.0 SUMMARY OF ALTERNATIVES

Four groundwater remedial alternatives were developed and evaluated in the Focused Alternatives Analysis (URS 2003c) to address remedial action objectives for the SS-013 site.

Alternatives developed are described in greater detail below. Monitoring will be required for each alternative to verify attainment of ARARs. One additional monitoring well, designated MW-13-016, would be installed to monitor groundwater quality downgradient of MW-13-008. A groundwater sampling and analysis program is also included for each alternative.

Alternative 1:

INTITUTIONAL CONTROLS

Capital Cost: $ 2,000
Present Worth O&M: $229,400
Total Present Worth: $231,400
Years to Groundwater ARARs: 20

Under this alternative, contamination in groundwater would decrease over time by intrinsic processes. Institutional controls (ICs) would be implemented and maintained until the ARARs are achieved. The following ICs are anticipated:

- Prohibit the installation of any wells for drinking water or any other purposes that could result in the use of the underlying groundwater.

- Require that any new building constructed over subsurface concentrations that are above levels of concern incorporate a subslab depressurization system to mitigate the potential for human impairment associated with the inhalation of indoor air containing chemicals volatilizing from the groundwater. Existing buildings over the groundwater plume, were they to become occupied, would also require such a system.

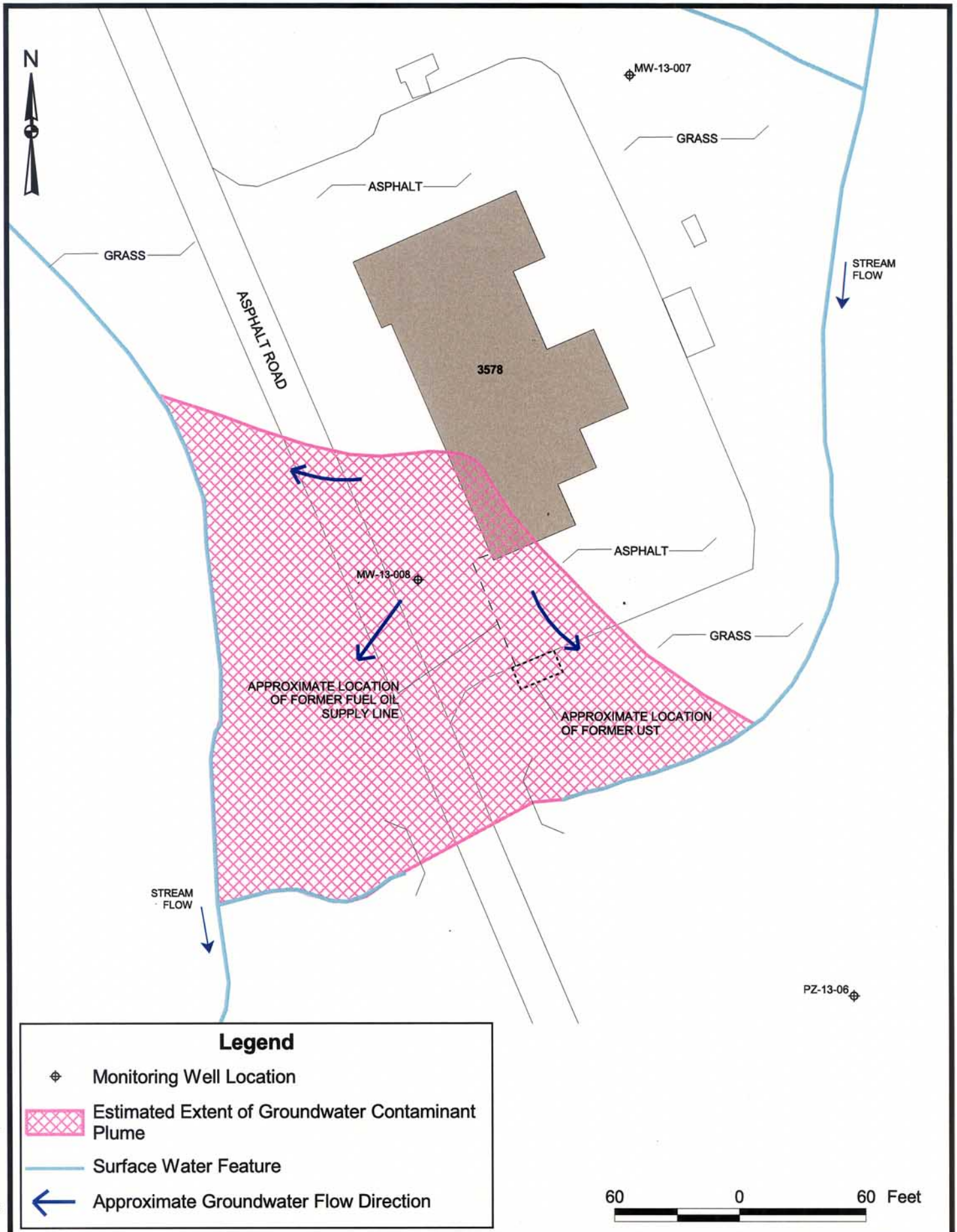
A routine groundwater sampling and analysis program would be required to document attainment of ARARs. The alternative also includes site reviews every 5 years in accordance with section 121(c) of CERCLA until all contaminant concentrations have been reduced to levels that allow for unlimited use and unrestricted exposure.

Alternative 2:

ENHANCED INTRINSIC BIOREMEDIATION USING AN OXYGEN-RELEASING COMPOUND

Capital Cost: $693,000
Present Worth O&M: $ 45,064
Total Present Worth: $738,064
Years to Groundwater ARARs: 2 ½

Enhanced intrinsic bioremediation using an oxygen-releasing compound (ORC®) is an in-situ technology that offers a passive, low maintenance approach to treat groundwater under aerobic conditions. The technology is suitable for treating vinyl chloride and naphthalene on saturated soils



N:\11168476.00000\GIS\Applications\ss-013.apr GROUNDWATER CONTAMINANT PLUME W/WELLS
10/26/2005

URS	SS-013 PROPOSED PLAN GROUNDWATER CONTAMINANT PLUME	FIGURE 6

and in the groundwater if indigenous organisms are present naturally in groundwater at the site.

This alternative involves injecting patented formulations of the ORC®, which is designed to evolve oxygen at a constant rate in groundwater, and maintain aerobic conditions in the subsurface. The length of time that oxygen is evolved from the ORC® is dependent on the biological activity, which in turn is dependent on the availability of compounds utilized by the bacteria as a source of energy. The product manufacturer recognizes that one application may be insufficient to produce the required results and periodic re-evaluation of site conditions is often warranted. Several applications of oxygen releasing compound may be required.

This alternative also includes groundwater monitoring and 5-year site-reviews as described in Alternative 1. In addition, institutional controls, as described in Alternative 1, would be implemented.

Alternative 3:

GROUNDWATER EXTRACTION, TREATMENT, AND REINJECTION OF TREATED WATER

Capital Cost: $ 67,000
Present Worth O&M: $221,300
Total Present Worth: $288,300
Years to Groundwater ARARs: 6

Alternative 3 involves extraction of contaminated groundwater, via pumping wells or collection trenches, and treatment in an above ground unit. A wide variety of recovery systems are available, but all have in common the ability to hydraulically control contaminant migration while treating the organic contaminants. The treated water would be reinjected into the aquifer upgradient from the contaminated area. This alternative also includes groundwater monitoring and 5-year site reviews as described in Alternative 1. In addition, institutional controls, as described in Alternative 1, would be implemented.

Alternative 4:

OZONE SPARGING

Capital Cost: $115,000
Present Worth O&M: $ 30,000
Total Present Worth: $145,000
Years to Groundwater ARARs: 1

This alternative would implement ozone sparging to destroy contaminants. Ozone is a highly reactive chemical that is effective in destroying various organic contaminants, including naphthalene and vinyl chloride. Ozone destroys these compounds through chemical oxidation.

Ozone sparging combines the unit operations of air stripping and oxidative decomposition in a single process. Air and ozone are injected directly into the groundwater through microporous sparge points that create microbubbles with a high surface area to volume ratio. Extraction of contaminants from groundwater occurs by aqueous to gas partitioning as the bubbles rise in the water table. The ozone contained within the bubbles reacts to decompose the contaminant molecules. The end products are carbon dioxide, dilute hydrochloric acid, and water. This technology can substantially reduce the mass of contaminants in a relatively short period of time and does not require vapor control since the contaminants are destroyed, rather than transferred from one phase to another.

This alternative also includes groundwater monitoring, institutional controls, and 5-year site-reviews as described in Alternative 1.

7.0 EVALUATION OF ALTERNATIVES

The alternatives for the SS-013 site were analyzed with respect to nine criteria specified in the National Contingency Plan (NCP), which directs remediation of inactive hazardous waste sites. A brief description of each criterion and the evaluation of alternatives based on these criteria are presented below. The USEPA has categorized the evaluation criteria into three principal groups:

Threshold Criteria - The recommended alternative must meet these requirements.

- Overall protection of human health and the environment.
- Compliance with ARARs

Primary Balancing Criteria - The most favorable and cost-effective alternative is determined using these criteria (a remedy is cost effective if its costs are proportional to its overall effectiveness).

- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume
- Short-term effectiveness
- Implementability
- Cost

Modifying Criteria - The recommended alternative may be modified by public input before it is finalized and presented in the ROD.

- State Acceptance
- Community Acceptance

Analysis of Alternatives

A discussion and comparative analysis is contained in the MMS (SS-013) Focused Alternative Analysis (URS 2003c). This analysis is summarized below.

- **Overall Protection of Human Health and the Environment** addresses whether a remedy provides adequate protection to potential human and ecological receptors.

All alternatives are protective of human health and the environment.

- **Compliance with ARARs** addresses whether a remedy will meet all of the ARARs of federal and state environmental statutes, and/or provide grounds for invoking a waiver.

The time to reach chemical-specific groundwater ARARs is estimated to range from one to 20+ years for the various alternatives. Alternative 4 - Ozone Sparging (1 year) would achieve groundwater ARARs in the shortest amount of time, whereas Alternative 1 - Institutional Controls (20+ years) would achieve ARARs in the longest period of time. The time needed to achieve ARARs for Alternative 2 (Enhanced Intrinsic Bioremediation Using an Oxygen-Releasing Compound) and Alternative 3 (Groundwater Extraction, Treatment, and Reinjection of Treated Water) is 2½ years and 6 years, respectively.

- **Long-Term Effectiveness and Permanence** refers to the magnitude of residual risk, and the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

Groundwater monitoring and deed restrictions (for Alternatives 1 through 4) will need to continue until ARARs are achieved. In this way, long-term effectiveness is related to the ability of the alternative to achieve ARARs (see discussion of ARAR compliance above). As ARARs are achieved more quickly, encumbrances on property and associated potential devaluation of property also would be eliminated sooner.

- **Reduction of Toxicity, Mobility, or Volume** addresses the anticipated performance of treatment technologies employed in the remedy.

The estimated mass of each of the primary contaminants of concern contained within the dissolved phase within the groundwater plume and adsorbed on soil at the water table surface is:

Vinyl chloride: 0.3 pounds
Naphthalene: 500 pounds

The bulk of this mass would be removed, either by natural or accelerated bioremediation (Alternatives 1 and 2), by removal from the aquifer by treatment (Alternative 3), or by in-situ destruction (Alternative 4).

- **Short-Term Effectiveness** refers to the speed with which the alternative achieves protection, as well as the alternative's potential to create adverse impacts on human health or the environment during its implementation.

Alternatives 1 through 3 achieve protection immediately with the implementation of groundwater deed restrictions. It is expected that Alternative 4 (Ozone Sparging) would eliminate the risk in approximately 1 year by reducing contaminant to ARARs. In all cases, potential short-term construction risk easily can be controlled or minimized by implementing standard environmental health and safety measures.

- **Implementability** addresses aspects of implementing the remedial alternatives, such as the ability to construct and operate technologies, reliability, ability to monitor effectiveness, availability of materials and services, permitting, and coordination with other agencies.

A comparison of alternatives in terms of implementability is presented below.

All alternatives include long term monitoring, which is relatively easy to implement.

Alternative 1 (Institutional Controls) includes little construction (installation of one monitoring well) and, comparatively, is easily implemented.

Alternative 2 involves drilling over 250 shallow injection borings with multiple applications of ORC®. Design and construction of this technology is conventional and standardized.

Alternative 3 (Groundwater Extraction with Re-injection) includes some construction (installation of two extraction wells and above ground treatment system). The construction activities are conventional and standardized and, comparatively, are easily implemented.

Alternative 4 (Ozone Sparging) requires drilling of 20 shallow sparge wells, limited shallow trenching, and construction of above ground treatment system and enclosure. Although the technology is relatively new, the construction activities are conventional and standardized.

- **Cost** includes the capital and O&M cost of each alternative, as well as its present worth.

The present worth cost of each alternative, from lowest to highest, is listed below.

Alternative 4	$145,000
Alternative 1	$231,000
Alternative 3	$288,000
Alternative 2	$738,000

- **State acceptance** addresses technical and administrative concerns of the State with regard to remediation.

The NYSDEC will provide input during the preparation of the Proposed Plan and their concurrence with the recommended alternative is expected.

- **Community acceptance** addresses public comments received on the Administrative Record and the Proposed Plan.

Community acceptance of the recommended alternative will be evaluated after the public comment period ends and will be described in the ROD for the site.

8.0 DESCRIPTION OF THE PREFERRED ALTERNATIVE

The AF has selected *Ozone Sparging (Alternative 4)* as the preferred alternative for the SS-013 Site. The development and selection of this alternative is based on a consensus of opinions between the AF, NYSDEC, and USEPA. This alternative provides the best balance between cost and effectiveness of all the alternatives examined. It provides a permanent solution to the extent practicable and is protective of human health and the environment. This alternative addresses the principal threats by in-situ destruction of the groundwater contaminants responsible for the threats.

8.1 Identification of Alternative

The preferred alternative for remediation of the SS-013 site includes the following components.

- Installation of one additional downgradient groundwater monitoring well.
- Installation of approximately 20 sparge wells to inject ozone into the subsurface to destroy the contamination.
- Groundwater monitoring
- Institutional Controls
- 5-year site reviews

The major conceptual components are depicted in Figure 7.

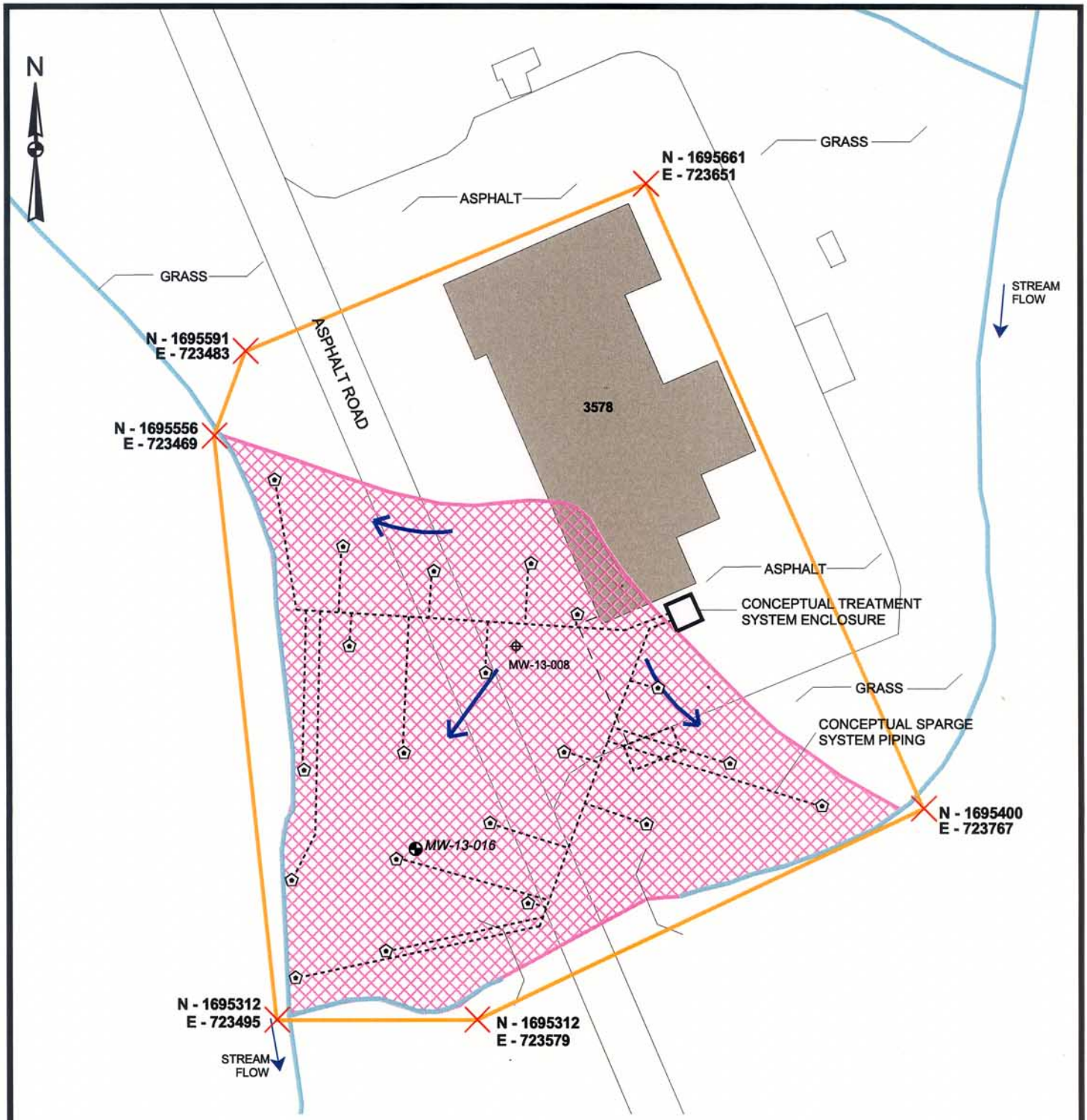
Institutional Controls

Institutional controls (ICs) are a component of the selected remedy for site SS-013. ICs are the non-technical non-engineering actions that support or complement the treatment elements of the remedy. ICs will be used to minimize the exposure of any future users of the property encompassed by site SS-013, including AF personnel, lessees/sublessees, transferees, and construction workers, and the environment to hazardous substances. The ICs will also be used to maintain the integrity of the physical remedial action components.

The AF is responsible for implementing, maintaining, and monitoring the remedial actions identified herein including institutional controls for the duration of the remedial alternative recommended by this Proposed Plan. It will exercise this responsibility in accordance with CERCLA and the NCP.

It is anticipated that successful implementation, operation, maintenance, and enforcement of these ICs in accordance with the terms of this Proposed Plan will achieve protection of human health and the environment and compliance with all legal requirements.

The following are the goals and objectives of the ICs:



Legend

- Conceptual Ozone Sparge Point
- Conceptual New Monitoring Well Location
- Monitoring Well Location
- Estimated Extent of Groundwater Contaminant Plume
- Area Subject to Institutional Controls
- Surface Water Feature
- Approximate Groundwater Flow Direction

60 0 60 Feet

URS	SS-013 PROPOSED PLAN LOCATION OF PREFFERED ALTERNATIVE COMPONENTS	FIGURE 7

N:\11168476.00000\GISVApplications\ss-013.apr LOCATION OF PREFFERED ALTERNATIVE COMPONENTS
10/26/2005

- Prevent the use of the contaminated groundwater for drinking water or any other purposes that could result in the ingestion of the contaminated groundwater.

- Mitigate the potential for human health impairment associated with the inhalation of indoor air containing chemicals volatizing from groundwater.

To achieve these goals and objectives, the AF is requiring that use restrictions and controls be placed on the property where the residual contamination is located. The following are the corresponding use restrictions and controls on the property:

- Prohibit the installation of any wells for drinking water or any other purposes that could result in the use of the underlying groundwater within the area shown on Figure 7.

- Require that any existing building or new construction within the contaminated area incorporate controls to mitigate the potential for human health impairment associated with the inhalation of indoor air containing chemicals volatizing from groundwater.

The above restrictions shall be maintained until the concentrations of hazardous substances in the groundwater have been reduced to levels that allow for unlimited exposure and unrestricted use and treatment systems and other related components of the remedy are no longer operational. Approval by the AF, the NYSDEC, and USEPA is required for any modification or termination of ICs. Sampling of groundwater and/or air, conducted in coordination between AF, the NYSDEC, and USEPA will be used to evaluate levels that allow for unlimited exposure and unrestricted use.

The AF will take the following actions to ensure that the aforementioned use restrictions and the controls are effective in eliminating the exposure scenario and protecting human health and the environment:

Deed Restrictions: Each transfer of fee title from the United States will include a CERCLA 120(h)(3) covenant which will have a description of the residual contamination on the property and the environmental use restrictions, described above, expressly prohibiting activities inconsistent with the performance measures goals and objectives.

The environmental restrictions will be included in a section of the CERCLA 120(h)(3) covenant that the United States is required to include in the deed for any property that has had hazardous substances stored for one year or more, known to have been released or disposed of on the property. The AF will consult with USEPA and NYSDEC on the deed restriction language. The deed will contain appropriate provisions to ensure that the restrictions continue to run with the land. Each deed will also contain a reservation of access to the property for the AF, USEPA, and the State of New York, and their respective officials, agents, employees, contractors, and subcontractors for purposes consistent with the AF IRP and the FFA.

Lease Restrictions: During the time between adoption of this Proposed Plan and deeding of the property, equivalent restrictions are implemented by lease terms. The parcels of property encompassing the SS-013 site are currently leased in furtherance of conveyance to the PARC under AF Lease No. BCA-PLA-12-00-1001. The lease restrictions will remain in place

until the property is transferred by deed. At the moment of deed transfer, the lease restrictions will be superseded by the restrictions to be included in the federal deed.

Environmental Easement: An environmental easement, containing a complete description of the restrictions described in this Proposed Plan, will be established for the area shown on Figure 7 in accordance with Article 71, Title 36 of the New York State Environmental Conservation Law.

Notice: Concurrent with the transfer of fee title, information regarding the environmental use restrictions and controls will be communicated in writing to the property owners and to appropriate state and local agencies to ensure such agencies can factor such conditions into their oversight and decision-making activities regarding the property. The AF will also provide a copy of the deeds to the regulatory agencies as soon as practicable after the transfer of fee title.

Monitoring and Enforcement:

Monitoring: Monitoring of the environmental use restrictions and controls will be conducted on an annual basis by the AF. The monitoring results will be included in a separate report or as a section of another environmental report, if appropriate, and provided to the USEPA and NYSDEC. The IC monitoring reports will be used in the preparation of the 5-Year Reviews to evaluate the continuation, modification, or elimination of the monitoring reports and IC monitoring frequencies. The 5-Year Review reports will be submitted to the regulatory agencies in accordance with the FFA.

The annual monitoring report submitted to the regulatory agencies by the AF, will evaluate the status of the ICs and how any IC deficiencies or inconsistent uses have been addressed. The annual evaluation will address whether the use restrictions and controls were communicated in the deed(s), whether the owners and state and local agencies were notified of the use restrictions and controls affecting the property, and whether use of the property has conformed with such restrictions and controls.

Response to Violations: The AF will notify the USEPA and the NYSDEC via e-mail or telephone as soon as practicable, but no later than ten days after discovery of any activity that is inconsistent with the IC objective or use restrictions, or any action that may interfere with the effectiveness of the ICs. Any violations that breach federal, state or local criminal or civil law will be reported to the appropriate civilian authorities, as required by law.

Enforcement: Any activity that is inconsistent with the IC objective or use restriction, or any action that may interfere with the effectiveness of the ICs will be addressed by the AF as soon as practicable (but in no case more than 10 days) after the AF becomes aware of the violation. The AF will notify USEPA and NYSDEC regarding how the breach has been or will be addressed within 10 days of sending USEPA and NYSDEC notification of the breach. The AF will exercise such rights under the deed and applicable laws to direct that activities in violation of the controls be immediately halted. To the extent necessary, the

AF will engage the services of the Department of Justice to enforce such rights.

Notification of Land Use Modification: The recipient of the property will obtain approval from the AF, USEPA, and NYSDEC for any proposals for a land use change at a site inconsistent with the use restrictions and assumptions described in this Proposed Plan.

State Land Use Notification Requirements: With the recent amendment to the New York environmental conservation law, the requirements of section 27-1318, Institutional and Engineering Controls, of the law will be implemented by the AF. In accordance with section 27-1318, the AF will meet the annual certification requirement through the annual monitoring reporting described above. Prior to property transfer, the grantee will be notified of any state land use control/ institutional control notification or reporting requirements. At the time of transfer by the AF, the deed will include language saying that the new property owner will provide an annual certification, prepared and submitted by a professional engineer or environmental professional acceptable to the Department, which would certify that the institutional controls and engineering controls put in place are unchanged from the previous certification, and nothing has occurred that would impair the ability of the control to protect human health and the environment or constitute a violation or failure to comply with any operation and maintenance or site management plan.

The AF may arrange for third parties or other entities to perform any and all of the above actions. Any such arrangement shall be undertaken and executed in accordance with all applicable legal requirements, to include the USAF's functions, obligations, and responsibilities under CERCLA.

5-Year Site Reviews

At least once within 5 years of the implementation of the remedy, a review of the selected remedy will be undertaken by the AF and USEPA in coordination with the NYSDEC in accordance with section 121(c) of CERCLA. Remedial progress and the need to continue institutional controls to protect human health and the environment will be evaluated as part of the review.

Groundwater Monitoring

As currently envisioned, a conceptual groundwater monitoring plan would include the installation and sampling of one additional new monitoring well in conjunction with the sampling of two existing monitoring wells as summarized in Table 8 below. Samples would be collected quarterly until ARARs are achieved. A surface water sample would also be collected during each monitoring event to calculate potential impact on the stream during remediation.

TABLE 8
CONCEPTUAL GROUNDWATER AND SURFACE WATER MONITORING PLAN

Location	Matrix	Parameter
MW-13-016 (new)	GW	TCL Volatiles and Semivolatiles
MW-13-008 (exist)	GW	TCL Volatiles and Semivolatiles
MW-13-012 (exist)	GW	TCL Volatiles and Semivolatiles
TBD (in tributary)	SW	TCL Volatiles and Semivolatiles

GW = Groundwater
SW = Surface water
TCL = Target Compound List
Surface water sampling location to be determined

The actual frequency, locations, and parameters sampled for would be developed in coordination among the AF, NYSDEC,

and USEPA during the design process and detailed in a final monitoring plan.

8.2 Comparison of the Preferred Alternative to Nine USEPA Criteria

The USEPA has developed nine evaluation criteria, which are specified in the National Contingency Plan, that are used to assess remedial alternatives. These criteria are listed in Table 9 and compared to AF's preferred alternative.

9.0 COMMUNITY PARTICIPATION

The following paragraphs explain how the public can become involved in the selection process after reviewing the Proposed Plan. Note that the preferred alternative can change in response to public comment or as a result of new information.

Public Comment Period

Plattsburgh AFB will hold a 30-day public comment period from July 17, 2006 to August 15, 2006 to solicit public input. During this period, the public is invited to review the SS-013 Proposed Plan, and other project documents, and to comment on the proposed action. These documents are included in the Administrative Record of the SS-013 site. The Administrative Record can be accessed at http://www.afrpa.hq.af.mil. Procedures for accessing records for Plattsburgh AFB are described in section 1.0 of this Proposed Plan.

Public Informational Meeting

Plattsburgh AFB will hold a public meeting on July 24, 2006 at the Clinton County Government Center, First Floor Conference Room, 137 Margaret Street. The actual date and time of the meeting will be published in the Plattsburgh *Press Republican*. The meeting will be divided into two segments. In the first segment, data gathered at the site, the preferred alternative, and the decision-making process will be discussed. The public is encouraged to attend this presentation and to ask questions. Immediately after the informational presentation, the AF will accept comments about the remedial action being considered for the SS-013 site. The meeting will provide the opportunity for people to comment officially on the plan. Public comments will be recorded and transcribed, and a copy of the transcript will be added to the Administrative Record.

Written Comments

If you would like to submit written comments about Plattsburgh AFB's preferred alternative or other issues relevant to the site remediation, please deliver your comments to Plattsburgh AFB's IRP Coordinator at the Public Hearing or mail your written comments (to be received no later than August 15, 2006) to:

Mr. Michael D. Sorel
BRAC Environmental Coordinator/ Site Manager
Air Force Real Property Agency
304 New York Road
Plattsburgh, NY 12903
(518) 563-2871

Air Force Review of Public Comments

Public comments are part of the process of reaching a final decision on an appropriate remedial alternative for the SS-013 site. Plattsburgh AFB's final choice of a remedial alternative will be issued in a ROD for the site and will be submitted to the USEPA for review, approval, and signature and to the NYSDEC for review and concurrence. A Responsiveness Summary of public comments and Plattsburgh AFB's responses to them will accompany the ROD. Once the ROD is signed, it becomes part of the Administrative Record.

Additional Public Information

Because the Proposed Plan only summarizes the field investigation and remedial alternative for the SS-013 site, the public is encouraged to consult the Administrative Record which contains the complete RI/FS, and other supporting reports.

TABLE 9
COMPARISON OF PREFERRED ALTERNATIVE TO USEPA EVALUATION CRITERIA

CRITERION	DESCRIPTION OF CRITERION	COMPARISON OF ALTERNATIVE TO CRITERION
Overall Protection of Human Health and the Environment	Addresses whether a remedy provides adequate protection to human and ecological receptors.	The preferred alternative is protective of human health and the environment. It includes measures to restore groundwater to ARARs.
Compliance with ARARs	Addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of all state and federal environmental statutes.	Chemical-specific ARARs for groundwater should be achieved in an estimated time period of 1 year or less.
Long-Term Effectiveness and Permanence	Refers to the magnitude of residual risk and the ability of the remedy to maintain reliable protection of human health and the environment once cleanup goals have been met.	The risk for groundwater ingestion and indoor air inhalation will be reduced to an acceptable level after remediation. Groundwater concentrations will be at or below ARAR levels. During the remediation period, monitoring and use restrictions will adequately and reliably protect human health and the environment.
Reduction of Toxicity, Mobility, or Volume	Addresses the anticipated performance of treatment technologies employed in the remedy.	Based on the estimated mass of contaminants (vinyl chloride and naphthalene), the preferred alternative is estimated to take one year or less to reduce the concentrations to levels below the groundwater ARARs. The contamination will be destroyed in-situ.

TABLE 9 (Continued)

CRITERION	DESCRIPTION OF CRITERION	COMPARISON OF ALTERNATIVE TO CRITERION
Short-Term Effectiveness	Refers to the speed with which the remedy achieves protection, as well as the remedy's potential to create adverse impacts during its implementation.	Intrusive activities required for construction of the ozone sparging system and small buildings would produce a small potential risk to workers. However, potential risk could be minimized easily by implementing standard environmental health and safety measures. Groundwater would be restored to ARARs in an estimated time period of 1year or less.
Implementability	Addresses aspects of implementing the remedy such as the ability to construct and operate technologies, reliability, ability to monitor effectiveness, availability of materials, permitting, and coordination with other agencies.	The preferred alternative is feasible. Design and construction of all this technology is conventional and standardized. Groundwater and surface water monitoring would reliably test the effectiveness of remediation.
Cost	Refers to the capital and O&M cost of a remedy and its present worth.	The cost to construct the elements of the preferred alternative (capital cost) is $115,000. It is expected that $30,000 will be needed annually to operate the remedial system and to perform monitoring. The overall present worth is $145,000.
State Acceptance	Addresses the technical and administrative concerns of the State with regard to remediation.	The NYSDEC has provided input during the preparation of the Proposed Plan and its concurrence with the preferred alternative is expected.
Community Acceptance	Addresses public comments received on the Administrative Record and the Proposed Plan.	Community acceptance of the recommended alternative will be evaluated after the public comment period ends and will be described in the Record of Decision for the SS-013 site. A description of how the community can become involved in the selection process is presented in section 9.0.

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GLOSSARY

Administrative Record: A file established and maintained in compliance with section 113(K) of the Comprehensive Environmental Response, Compensation, and Liability Act consisting of information upon which the lead agency bases its final decisions on the selection of remedial method(s) for a Superfund site. The Administrative Record is available to the public.

Adsorption: The assimilation of a gas, solid or dissolved matter through a surface (such as skin).

Aerobic: Conditions that exist in the presence of free oxygen.

Applicable or Relevant and Appropriate Requirements (ARARs): ARARs include any state or federal statute or regulation that pertains to protection of public health and the environment in addressing certain site conditions or using a particular remedial technology at a Superfund site. A state law to preserve wetland areas is an example of an ARAR. The United States Environmental Protection Agency must consider whether a remedial alternative meets ARARs as part of the process for selecting a remedial alternative for a Superfund site.

Aquifer: A water-bearing formation or group of formations.

Bedrock: Rock that underlies soil or other unconsolidated material.

Chlorinated Hydrocarbons: Organic compounds that contain chloride such as trichloroethene (TCE) and dichloroethene (DCE). Also referred to as chlorinated solvents.

Collection/Treatment: Collecting and treating groundwater to remove contaminants. Collection can be accomplished by wells or trenches. For volatile organic compounds, treatment is usually by air stripping or carbon polishing; cleaned water is returned to the ground or discharged to nearby surface water.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): A federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act (SARA). The act requires federal agencies to investigate and remediate abandoned or uncontrolled hazardous waste sites.

Confining Layer: A body of impermeable or distinctly less permeable material adjacent to an aquifer or water-bearing zone.

Contaminant Plume: A volume of contaminated groundwater with measurable horizontal and vertical dimensions. Plume contaminants are dissolved in and move with groundwater.

Drainage Basin: A region or area that gathers water originating as precipitation and contributes it to a particular stream channel, system of channels, lake, reservoir, or other body of water.

Electromagnetic Geophysical Survey: An exploration method based on the measurement of alternating magnetic fields associated with currents artificially or naturally maintained in the subsurface.

Environmental Impact Statement: A study conducted to provide information on potential environmental impacts that could result from a proposed action.

Feasibility Study (FS): An evaluation to identify and evaluate appropriate remedial goals and remedial alternatives for a site based upon United States Environmental Protection Agency criteria.

Groundwater: Water found beneath the earth's surface that fills pores within materials such as sand, soil, gravel, and cracks in bedrocks, and often serves as a source of drinking water if found in an adequate quantity.

Hazard Index: A quantitative measure of non-carcinogenic risk associated with exposure to chemicals. The hazard index is determined for all chemicals of concern affecting a particular organ or acting by a common mechanism. If the sum of all hazard indices is less than 1 for a particular exposure scenario, the risk of adverse health effects is considered acceptable.

Hydrogeologic: Pertaining to subsurface waters and the related geologic aspects of subsurface waters.

Infiltration: The flow of a fluid into a solid substance, such as soil or porous rock, through pores or small openings.

Inorganic Compounds: A class of naturally occurring compounds that includes metals, cyanide, nitrates, sulfates, chlorides, carbonate, bicarbonate, and other oxide complexes.

Installation Restoration Program (IRP): The United States Air Force subcomponent of the Defense Environment Restoration Program (DERP) that specifically deals with investigating and remediating sites associated with suspected releases of toxic and hazardous materials from past activities. The DERP was established to cleanup hazardous waste disposal and spill sites at Department of Defense facilities nationwide.

Interstratified: Layers of geologic material lying between or alternating with others of different character.

Intrinsic Bioremediation: The use of naturally present microorganisms to consume contaminants and transfer them to non-toxic compounds. Intrinsic bioremediation processes typically occur below ground surface.

Low-Level Radiological Waste: Waste material containing radioactive nuclides emitting primarily beta or gamma radiation, or both, in concentrations or quantities that exceed applicable federal or State standards for unrestricted release. Low-level radioactive waste materials are acceptable for disposal in a land disposal facility.

Monitoring: Ongoing collection of information about the environment that helps gauge the effectiveness of a cleanup action. Information gathering may include groundwater well sampling, surface water sampling, soil sampling, air sampling, and physical inspections.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP): The NCP provides the organization, structure and procedures for preparing for and responding to discharges of oil and releases of hazardous substances, pollutants, and contaminants. The NCP is required under CERCLA and the Clean Water Act, and USEPA has been delegated the responsibility for preparing and implementing the NCP. The NCP is applicable to response actions taken pursuant to the authorities under CERCLA and the Clean Water Act.

National Priorities List: USEPA's list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial action under the Superfund program.

Operation and Maintenance (O&M): A step in the remedial program. While a site is being remediated, it is overseen to make sure that the remedy is working as planned and that the construction remains operational.

Operable Unit (OU): A separate and distinct remedial project that is part of a large, complex hazardous waste site. Each OU has its own Record of Decision, remedial investigation, feasibility study, design and construction.

Organic Compounds: Any chemical compounds built on the carbon atom, i.e., methane, propane, phenol, etc.

Overburden: The loose soil, silt, sand and gravel, or other unconsolidated material overlying bedrock.

Pesticide: Chemical compounds used to control insects, rodents, plants, etc. Two classes of organic pesticides include chlorine (chlorinated) or organic phosphorous (organophosphorous).

Polychlorinated Biphenyl (PCB): An organic pollutant that was formerly used in electrical transformers and capacitors, their manufacture was banned in 1979. There are 210 different PCB compounds that typically have 40% to 60% chlorine by weight.

Polycyclic Aromatic Hydrocarbons (PAHs): Compounds often associated with combustion process and distillation tars.

Proposed Plan: A public document that solicits public input on a recommended remedial alternative to be used at a National Priorities List (NPL) site. The Proposed Plan is based on information and technical analysis generated during the RI/FS. The recommended remedial action could be modified or changed based on public comments and community concerns.

Radiological: Pertaining to the use of ionizing radiation for the scientific examination of material structures.

Record of Decision (ROD): A public document that explains the remedial alternative to be used at a National Priorities List (NPL) site. The ROD is based on information and technical analysis generated during the remedial investigation, and on consideration of the public comments and community concerns received on the Proposed Plan. The ROD includes a Responsiveness Summary of public comments.

Remedial Action: An action that stops or substantially reduces a release or threat of a release of hazardous substances that is serious but not an immediate threat to human health or the environment.

Remedial Alternatives: Options evaluated to address the source and/or migration of contaminants to meet health-based or ecology-based remediation goals.

Remedial Investigation (RI): An investigation that determines the nature and extent and composition of contamination at a hazardous waste site. It is used to assess the types of remedial options that are developed in the feasibility study.

Risk Assessment: A systematic scientific process of determining risk estimates based on the presence of contaminants in the environment and who might be exposed to the contaminants.

Semivolatile Organic Compounds (SVOCs): Organic constituents which are generally insoluble in water and are not readily transported in groundwater.

Solvents: Organic liquids used to dissolve grease and other oil-based materials. Many solvents are toxic at high concentrations.

Source: Area at a hazardous waste site from which contamination originates.

Sparging: A remedial action that involves injecting air into the soil's saturated zone below or within the zone of contamination. Contaminants are entrained in the air and may be discharged to the atmosphere at the surface.

Stratigraphic: Pertaining to the arrangement of consolidated or unconsolidated geologic materials as to geographic position and chronologic order of sequence.

Superfund: The trust fund, created by CERCLA out of special taxes, used to investigate and clean up abandoned or uncontrolled hazardous waste sites. Out of this fund USEPA either: (1) pays for site remediation when parties responsible for the contamination cannot be located or are unwilling or unable to perform the work or (2) takes legal action to force parties responsible for site contamination to cleanup the site or pay back the federal government for the cost of the remediation. Federal facilities are not eligible for Superfund monies.

To Be Considered (TBC): Federal and state policies, advisories, and other non-promulgated health and environment criteria, including numerical guidance values, that are not legally binding. TBCs are used for the protection of public health and the environment if no specific ARARs for a chemical or other site conditions exist, or if ARARs are not deemed sufficiently protective.

Topographic Basin: A depressed area with no surface outlet.

Toxicity: The quality or condition of a destructive, deadly, or poisonous substance.

Vadose Zone: The volume located between the ground surface and the water table. Also known as the unsaturated zone.

Volatile Organic Compounds (VOCs): Organic constituents which tend to volatilize or to change from a liquid to a gas form when exposed to the atmosphere. Many VOCs are readily transported in groundwater.

Water Table: The surface of a body of unconfined groundwater at which the water pressure is equal to that of the atmosphere.