# FIRE TRAINING AREA (FT-002)/ INDUSTRIAL AREA GROUNDWATER OPERABLE UNIT

## PROPOSED PLAN

***Plattsburgh Air Force Base***

***Installation Restoration Program***


*prepared for:*

**United States Department of The Air Force**
**Plattsburgh Air Force Base**
Plattsburgh, New York

**Final**
**January 2002**

G3140B

# FIRE TRAINING AREA (FT-002)/INDUSTRIAL AREA (IA)
# GROUNDWATER OPERABLE UNIT (OU)

## FINAL
## PROPOSED PLAN

## PLATTSBURGH AIR FORCE BASE
## PLATTSBURGH, NEW YORK

## UNITED STATES DEPARTMENT OF THE AIR FORCE
## INSTALLATION RESTORATION PROGRAM

**Prepared by:**

**URS CONSULTANTS, INC.**

**JANUARY 2002**

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## ACRONYMS

| | |
|---|---|
| AFB | Air Force Base |
| AFBCA | Air Force Base Conversion Agency |
| ARARs | applicable and/or relevant and appropriate requirements |
| BCT | BRAC Cleanup Team |
| BRAC | Base Realignment and Closure |
| BTEX | benzene, toluene, ethylbenzene, xylenes |
| DCE | dichloroethene |
| EE/CA | engineering evaluation/cost analysis |
| FS | feasibility study |
| FT-002 | Fire Training Area |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| gpm | gallon per minute |
| IRP | Installation Restoration Program |
| L | liter |
| µg | microgram |
| MCL | Maximum Contaminant Level |
| NYCRR | New York Code of Rules and Regulations |
| NYSDEC | New York State Department of Environmental Conservation |
| O&M | operation and maintenance |
| OU | operable unit |
| PA | preliminary assessment |
| PARC | Plattsburgh Airbase Redevelopment Corporation |
| RAB | Restoration Advisory Board |
| RI | remedial investigation |
| ROD | Record of Decision |
| SI | site inspection |
| SUNY | State University of New York |
| SVE | soil vapor extraction |
| SVOC | semivolatile organic compounds |
| TCE | trichloroethene |
| TMV | toxicity, mobility, and volume |
| USAF | United States Air Force |
| USEPA | United States Environmental Protection Agency |
| VC | vinyl chloride |
| VOC | volatile organic compounds |
| WSA | Weapons Storage Area |

## 1.0 INTRODUCTION

This Proposed Plan presents the proposed remedial action for the Fire Training Area (FT-002)/Industrial Area Groundwater Operable Unit (hereafter abbreviated as the FT-002/IA Groundwater OU) at the Plattsburgh Air Force Base (AFB) in Plattsburgh, New York (Figure 1-1). The United States Air Force (USAF) is proposing this plan to address contaminated groundwater located at and downgradient from the FT-002 site that is present as a result of chemical releases at the FT-002 site and at several other Department of Defense Installation Restoration Program (IRP) sites at the base. The recommended alternative includes two collection drains, an aeration basin, two permeable treatment walls, institutional controls, progress monitoring and sampling, withdrawal of contaminated groundwater using wells, and five-year site reviews. Technical terms referenced in this document are defined in the Glossary, starting on page 47.

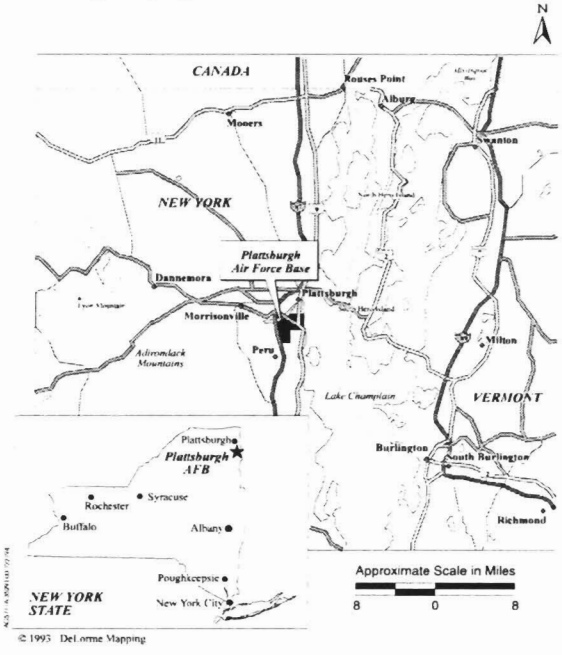



**Figure 1–1: Vicinity Location Map**

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) and feasibility study (FS) 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 USAF, in consultation with the United States Environmental Protection Agency (USEPA) and the New York State Department of Environmental Conservation (NYSDEC), will consider public input while selecting the final response action for FT-002. 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 at the **information repository**, which is located at the Feinberg Library on the campus of the State University of New York at Plattsburgh. The repository documents are on reserve (see the Special Collections Librarian). Photocopying equipment is available.

Administrative Record File Location

Feinberg Library
SUNY at Plattsburgh
Plattsburgh, NY 12901
Special Collections Department

Hours:

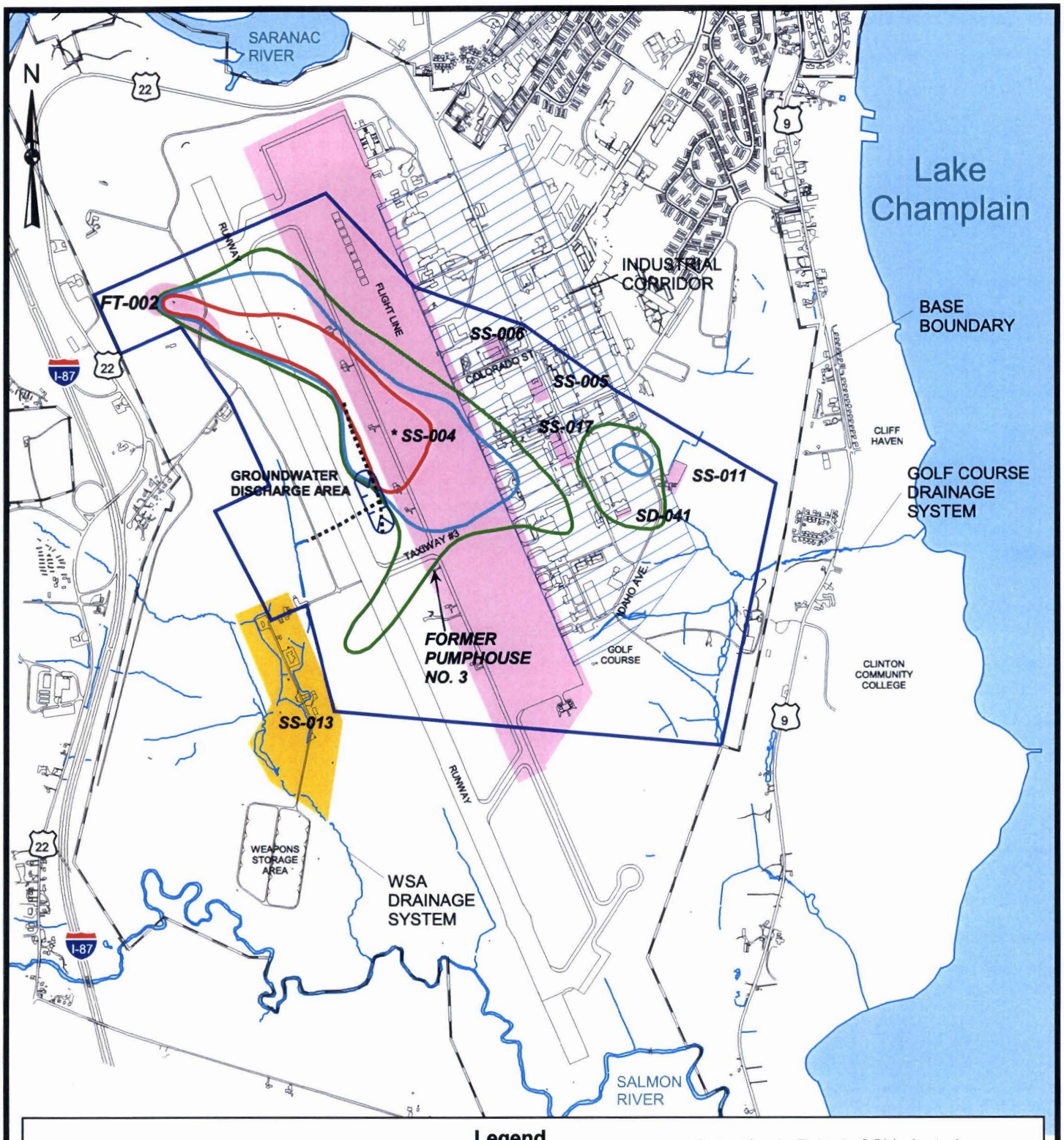
| | |
|---|---|
| Monday | Not Open |
| Tuesday | 4:00 p.m. to 7:00 p.m. |
| Wednesday | 9:00 a.m. to 12:30 p.m. and 1:00 p.m. to 4:00 p.m. |
| Thursday | 9:00 a.m. to 12:30 p.m. and 1:00 p.m. to 4:00 p.m. |
| Friday | 10:00 a.m. to 12:30 p.m. and 1:00 p.m. to 4:00 p.m. |
| Saturday | 1:00 p.m. to 5:00 p.m. |
| Sunday | Not Open |

The FT-002 site was formerly used by the base fire department for training exercises. Soil and groundwater were contaminated when combustible liquids were released to the environment during the training exercises. The FT-002 site has been divided into two operable units (OUs) to facilitate remedial activities. The first operable unit, the FT-002 Source OU, focuses on product (chemicals in pure form not dissolved in water) and contaminated soils at the FT-002 site. The FT-002 Source OU addresses contamination at the site from the ground surface vertically downward to the depth at which soil has been directly contaminated by free product to the lowest point of water table fluctuation. A Record of Decision (ROD) was signed for the FT-002 Source OU in March 2001. The second operable unit, the Fire Training Area (FT-002)/Industrial Area Groundwater Operable Unit (referred to as FT-002/IA Groundwater OU), is the subject of this Proposed Plan. The FT-002/IA Groundwater OU addresses cleanup and control of groundwater contamination resulting from the FT-002 source area and includes contaminated groundwater located at or near several other sites in the industrial area of the base that lie downgradient from the FT-002 site (see Figure 2-1). These sites include six IRP sites as follows: the flightline ramp (SS-004), the former non-destructive inspection facility (SS-005), the former aerospace ground equipment facility (SS-006), former defense reutilization and marketing office (SS-011), the former jet engine inspection and maintenance shop (SS-017), and Building 2612 (SD-041). Because groundwater contamination from site FT-002 impacts or will potentially impact groundwater beneath each of these sites, groundwater at these sites has been combined with the FT-002 site groundwater into the FT-002/IA Groundwater OU. The sources or soil contamination at each of these sites are being addressed separately (as is the FT-002 source) and are not included in the FT-002/IA Groundwater OU.

As shown on Figure 2-1, the current extent of groundwater contamination includes a plume that extends from the FT-002 site into the industrial corridor, and a smaller plume near the southeast corner of the industrial area.

Groundwater contamination that begins at the source areas and has migrated downgradient includes chlorinated hydrocarbons and fuel-related compounds. Contamination has spread within the unconfined sand aquifer over 1 mile downgradient from the FT-002 site; contaminants have not been found in the underlying till water-bearing zone and carbonate bedrock aquifer. Groundwater is retarded from migrating downward by a low-permeability clay unit which appears to be continuous beneath the sand aquifer. This clay rises to near the ground surface to the east of the base's industrial corridor (east of Idaho Avenue), which limits eastward migration of contamination in groundwater. Offbase groundwater users to the east along Route 9, who primarily utilize the bedrock aquifer for private supply, have not been impacted by the groundwater contamination detected on base. Groundwater contamination appears to be discharging into the Golf Course drainage system, which flows to Lake Champlain, and the Weapons Storage Area (WSA) drainage system, which flows to the Salmon River. There are no exceedances of regulatory standards (NYSDEC surface water quality standards) in these drainage systems except for one portion of the WSA drainage system.

The remedial objectives for the FT-002 Groundwater OU are: 1) to prevent ingestion of groundwater containing contaminant concentrations above applicable and/or relevant and appropriate requirements (ARARs); 2) to restore groundwater to ARARs; 3) to prevent




**Legend**

- Boundary of FT-002/IA Groundwater Operable Unit
- Sites Included in FT-002/IA Groundwater OU
- Other Referenced Sites
- ..... Major Storm Drain

Approximate Extent of Chlorinated Hydrocarbons in Groundwater

- 10 ug/L isopleth
- 100 ug/L isopleth
- 1000 ug/L isopleth

2000 0 2000 Feet

* - Boundary of site SS-004 is outside of the boundary of the FT-002/IA Groundwater OU. However the sources of contamination associated with SS-004 are within the boundary of the FT-002/IA Groundwater OU (See Figure 2-4)

| | | |
|---|---|---|
| **URS** Consultants, Inc. | PLATTSBURGH AIR FORCE BASE SITE FEATURES | FIGURE 2-1 |

J:\01000131\DBI\GIS\11999\wgoperunit.apr SITE FEATURES 11/29/2000

migration of groundwater with contaminant concentrations above ARARs beyond base boundaries; and 4) to restore surface water, that has been impacted by contaminated groundwater, to ARARs.

The USAF, 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 1993, 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 use of FT-002, its surrounding area, and the base's industrial corridor is commercial/industrial and aviation support. To the east of the industrial corridor downgradient from FT-002, the planned use is recreational—the area is currently in use as a golf course (the Barracks Golf Course). The base land use plans developed by PARC were incorporated into the Environmental Impact Statement (Tetra Tech 1995).

As part of the USAF'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 USAF, USEPA, and NYSDEC on July 10, 1991. Plattsburgh AFB was placed on the National Priorities List on November 21, 1989. Cleanup is being funded by the USAF.

The USAF has kept the community informed regarding progress at site FT-002 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 USAF, 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. In addition to the formal quarterly meetings, several "working group" meetings were held in 1999, on base or on site, specifically to discuss outstanding issues regarding the FT-002 site among RAB members.

The FT-002 site is located approximately 500 feet west of the runway and 500 feet from the base's western boundary (Figure 2-1). From the mid- to late-1950s through 1989, the site was used to meet the training requirements of the base fire department. During training exercises, fires were ignited in fire training pits on site. As a result of releases of combustible liquids (e.g. off-specific fuel and waste solvents) from the pits, the soil and groundwater have

become contaminated with a variety of organic chemicals. Groundwater contamination consists primarily of fuel-related compounds and chlorinated hydrocarbons. The fuel-related compounds are naturally biodegradable in groundwater and are attenuating below detection within 4,000 feet downgradient of the source. The chlorinated hydrocarbons, which are considerably less biodegradable, have been detected over 6,750 feet downgradient of the source. This contamination extends into Plattsburgh AFB's industrial corridor where other sites included in the FT-002/IA Groundwater OU are located as shown in Figure 2-1. The other sites are discussed further in Section 2.2.4. The nature and extent of contamination is described further in Section 2.3.2.

## 2.2 Summary of Previous and Ongoing Site Activities

### 2.2.1 FT-002 Preliminary Assessment/ Site Inspection

In 1984-85, a preliminary assessment (PA) consisting of primarily a records search was conducted for FT-002. Based upon the results of the PA, a site inspection (SI) was conducted in 1987 (E.C. Jordan 1989). It included the advancement of three borings completed as monitoring wells, soil sampling, an active soil gas survey, and geophysical surveys. The study confirmed the presence of fuel-related compounds and solvents in the subsurface soil. In addition, free product was detected floating on the water table surface.

Following the SI, further analysis of contamination related to site FT-002 was divided into two OUs: Source and Groundwater. From that point, implementation and documentation of investigations and remediation for the two OUs have proceeded along separate paths.

### 2.2.2 FT-002 Source OU Investigations and Actions

From 1988 to 1993, a multi-phased RI was undertaken to investigate soil and product contamination at the FT-002 site (ABB-ES & URS 1993a). The comprehensive study determined the vertical and horizontal extent of soil contamination by soil sampling. The study also included an evaluation of human and ecological health risks posed by the contaminants attributed to FT-002. Supplemental soil sampling was undertaken at the FT-002 site in 1997 (URS 1998c) and 1999 (Hunt 1999).

In 1990, an Engineering Evaluation/ Cost Analysis (EE/CA) was prepared to evaluate alternatives for the recovery of free floating product from the FT-002 site (E.C. Jordan 1990). As a result of the fire training exercises, product migrated vertically from the ground surface to the water table and formed a floating layer on the water table. Based on the EE/CA results, the USAF implemented a removal action in June 1992. A groundwater treatment plant and product recovery system were constructed and went on-line in 1993. The system was upgraded in 1996. Over 20,000 gallons of product have been collected to date.

In 1995, a feasibility study (FS) was completed which included a detailed evaluation and comparison of nine alternatives to remediate FT-002 soil based on nine USEPA criteria related to the effectiveness, implementability, and cost of the alternatives (URS 1995a).

In 1996, an Action Memorandum was prepared which included a recommendation and conceptual design for a removal action to address contaminated soil (Parsons & OHM 1996). The removal action, which was implemented later that year, consisted of soil vapor extraction (SVE) to address chlorinated hydrocarbon contaminants, bioventing to address fuel-related contamination, control of the water

table surface using groundwater extraction wells and a groundwater treatment plant constructed for the product removal action.

In 2000, a Proposed Plan for the FT-002 Source OU (URS 2000b) was completed. The document was presented to the public at a public meeting on December 14, 2000. The recommended alternative is a combination of SVE and bioventing of contaminated soil, free product collection, water table depression enabling remediation of residual product adhering to soil below the water table, hydraulic containment of the source, institutional controls, progress monitoring and sampling, and five-year reviews. A ROD for the FT-002 Source OU was prepared following public comment on the Proposed Plan and signed in March 2001.

### 2.2.3 FT-002 Groundwater OU Investigation

#### 2.2.3.1 FT-002 Groundwater Remedial Investigation

As a follow-up to the SI, a multi-phased FT-002 groundwater RI (ABB-ES & URS 1993b) was undertaken to address the nature and extent of contamination in groundwater attributable to FT-002. The RI identified the primary contaminants associated with the FT-002 groundwater plume as being trichloroethene (TCE), dichloroethene (DCE), and the fuel-related compounds benzene, toluene, ethylbenzene, and xylenes (collectively known as BTEX). TCE and DCE are chlorinated hydrocarbons. Other organic and inorganic compounds were limited in extent to the area close to the FT-002 source. The study concluded that the dissolved plume of chlorinated hydrocarbons extended from the FT-002 site eastward to beneath the flightline ramp. The surface water sampling also indicated that groundwater contaminants were being discharged to a storm drain between the runway and flightline which flows to surface water at the WSA.

As part of the study, the health risk posed to potential human receptors was assessed. The assessment concluded that using groundwater contaminated by the FT-002 site for potable use could pose a significant threat to human health. It is important to note that the portion of the aquifer contaminated by the FT-002 plume currently is not used as a potable supply source—a public water supply is available.

#### 2.2.3.2 Intrinsic Remediation EE/CA

In 1993 and 1994, an Intrinsic Remediation EE/CA was conducted (Parsons 1995). The purpose of the study was to determine whether naturally-occurring attenuation processes for fuel hydrocarbons were occurring in groundwater at the site and to evaluate the impact of these processes on contaminant migration. The effort was part of a greater study by the USAF to evaluate natural attenuation processes at bases across the country. This report provided valuable data concerning the size and strength of the contaminant source, the observed mechanics of biodegradation of fuel, the possible co-metabolism of chlorinated hydrocarbons, and the extent of contamination. Some of the data was used in the FT-002/IA Groundwater OU RI/FS (Section 2.2.3.4) – in particular to develop the groundwater transport model. An addendum to the study was issued in 1997 (Parsons 1997c).

#### 2.2.3.3 FT-002 Operable Unit Two Groundwater Feasibility Study

In 1994-1995, an FS was conducted which evaluated ten alternatives to cleanup contaminated groundwater associated with FT-002 and compared the alternatives to USEPA's nine criteria for effectiveness, implementability, and cost (URS 1995c). This study was based on the initial FT-002 groundwater RI report (ABB-ES & URS 1993b). The FS did not make a recommendation regarding a preferred alternative.

### 2.2.3.4 FT-002/Industrial Area Groundwater OU Remedial Investigation/Feasibility Study

Following the issuance of the FS, it was determined by the USAF, in conjunction with the NYSDEC and USEPA, that the groundwater operable unit for FT-002 should be expanded to include potentially impacted groundwater in the industrial corridor. As shown in Figure 2-1, the FT-002 groundwater contaminant plume has entered the western portion of the industrial corridor. In addition, a significant area of contaminated groundwater is located in the eastern portion of the industrial corridor as a result of spills occurring within the corridor; the FT-002 plume is migrating eastward and mingling with this contamination.

It was also apparent that additional data were necessary to reasonably predict potential future movement of groundwater contamination, and to adequately assess potential impact on offbase groundwater users and surface water bodies. Therefore, a comprehensive large-scale study was initiated.

The study (URS 2001e), which included both RI and FS components, provides the primary basis for remedy selection in this Proposed Plan. The RI described the geologic, hydrologic, and chemical conditions of groundwater; described potentially impacted human and ecological populations; numerically modeled the future disposition of contamination in groundwater; and evaluated potential risk to human health and the environment. The FS used the results of the RI to establish remedial goals, evaluate remedial alternatives, and recommended an appropriate remedial action.

The field investigation and data compilation phases of the RI were conducted to fill in data gaps remaining from previous investigations and to address USAF, USEPA, and NYSDEC concerns. Several phases of field investigation activities were conducted between December 1995 and August 1999. Activities consisted of:

- A potable well survey at over 50 residences and commercial properties along Route 9
- A rapid bioassessment (a screening level evaluation to determine whether biological impairment exists as a result of chemical releases from the area of study) of aquatic resources along the WSA and Golf Course surface water drainage systems
- Seismic and azimuthal resistivity geophysical surveys
- Installation of four borings and 44 monitoring wells and piezometers
- Geotechnical analyses
- Aquifer testing including slug tests, packer tests, and one pumping test
- Water level monitoring
- Collection and analysis of groundwater samples from about 100 wells and piezometers
- Soil gas surveys and soil sampling to attempt to identify a groundwater contamination source area upgradient of SS-011
- Stream flow measurements in the Golf Course and the Weapons Storage Area Drainage streams and the storm drainage culvert south of taxiway #1
- Geologic field reconnaissance and mapping
- Surveying and topographic mapping
- Advancement of three borings along the eastern base boundary to gather data on the depth and continuity of the clay confining layer
- A topographic survey of a large drainage basin between the runway and flightline ramp and the locations and elevations of storm sewer drainage features within this basin.

Data were analyzed using a comprehensive database of groundwater information that was collected over time, basewide. The hydrogeologic and chemical conditions of groundwater are presented in Section 2.3 of this Proposed Plan. A summary of human and ecological risk is given in Section 4.0. A summary and an evaluation of alternatives are presented in Sections 5.0 and 6.0, respectively.

#### 2.2.3.5 Supplemental Surface Water and Groundwater Sampling

The USAF has conducted periodic surface water and groundwater sampling at key locations on the base, and will continue to do so until a remedial action for the FT-002 Groundwater OU is formalized. The purpose of the sampling has been to provide a level of comfort to interested parties, including regulatory agencies and the community, and that surface water contaminants in the Golf Course and WSA drainage systems, and groundwater contaminants are not migrating off base. Since February 1998, 18 surface water sampling events (at four locations) and seven groundwater sampling events (at 14 locations) have been undertaken. The latest data were collected in December 2001 (URS 2001a). Surface water results indicated that only one area of the WSA stream contains contamination above regulatory limits. Contamination was not detected in the groundwater wells sampled, indicating that eastward migration of groundwater contamination off base is not occurring.

### 2.2.4 Other Relevant Investigations

Investigations related to the six sites other than FT-002 that are included in the FT-002/IA Groundwater OU are described below. One other site (Pump House No. 3) that is situated within the boundaries of the FT-002/IA Groundwater OU, but not considered part of the OU, is also discussed.

#### 2.2.4.1 Site SS-004

Groundwater at site SS-004 has been included in the FT-002/IA Groundwater OU (Figure 2-1). Two studies were conducted within the boundaries of site SS-004 that evaluated potential sources for groundwater contamination at the site. The first was the SS-004 Remedial Investigation (URS 1995b). In addition, extensive investigation of soil contamination was undertaken underneath the flightline ramp and near the pumphouses and underground storage tanks along the western edge of the flightline as part of the closure of the aircraft refueling system (OHM 2000). Several hundred soil and groundwater samples were collected during these studies. Based on these studies, the primary sources of chlorinated hydrocarbon contamination at SS-004 appear to be two former concrete-lined drainage trenches that spanned the entire north-to-south length of the flightline ramp. Aircraft degreasing activities, that may have introduced contamination into the trenches, occurred on the ramp between Colorado Street and Taxiway #3 (Figure 2-1). These trenches were abandoned by filling them in with concrete circa 1970. Evaluations which will result in a ROD for the SS-004 Soil OU are ongoing.

#### 2.2.4.2 Sites SS-005 and SS-006

The Non-Destructive Inspection Facility (NDI), site SS-005, was a facility used for nondestructive x-ray inspection of aircraft parts. A waste accumulation area was previously located on site. Materials used and stored at this facility included PD-680 cleaning solvent, engine oil, 1,1,1-trichloroethane, developer, dye penetrant fluid, remover, and photographic fixer solution.

The Aerospace Ground Equipment Facility (AGE), site SS-006, was a facility used for the maintenance and repair of ground power carts that provided electrical and pneumatic power to parked aircraft.

Building 2801, where aircraft maintenance tools were calibrated, is also included in site SS-006. The site is the location of one of the hazardous waste accumulation points on the base. The point accepted hazardous waste from satellite accumulation points at the AGE and at Building 2801. Underground diesel fuel tanks, an oil/water separator, and an underground holding tank were also formerly located on site.

The groundwater at sites SS-005 and SS-006 has been included in the FT-002/IA Groundwater OU. Site inspections were conducted at sites SS-005 and SS-006 in 1987 (E.C. Jordan 1989). Between October 1992 and February 1995, an RI was performed at the sites which included a health risk assessment for the two sites combined. Monitoring wells were installed, and soil and groundwater samples were collected. Based on the evaluation presented in the RI Report (Malcolm Pirnie 1996), RODs were executed for each of the SS-005 and SS-006 Soil OUs (URS 1998a and URS 1998b). The selected remedies for both sites were institutional restrictions to limit development to non-residential use and prohibition of the installation of wells for drinking water. Because groundwater contamination at and near the sites was potentially attributed to the FT-002 site, groundwater remedial actions were deferred to the FT-002/IA Groundwater OU.

#### 2.2.4.3 Site SS-011

Site SS-011, the Defense Reutilization and Marketing Office, is located on the eastern side of the base near Idaho Avenue. Several investigations and soil removal actions were conducted at SS-011 between 1984 and 1992 in response to PCB and pesticide spills at the site. During the RI (ABB-ES & URS 1992), chlorinated hydrocarbons were detected in groundwater. Since the concentrations of the chlorinated hydrocarbons clearly increased upgradient from the site, the contamination was attributed to an upgradient source. Post-removal action sampling and health risk analysis substantiated the adequacy of the soil removal actions. Therefore, a ROD for site SS-011 specifying no further action was executed (URS 1993). This ROD did not distinguish between soil and groundwater OUs. Contamination detected upgradient from and at SS-011 is addressed in the FT-002/IA Groundwater OU.

#### 2.2.4.4 Site SS-017

The former Jet Engine Inspection and Maintenance Shop (Building 2774) is located in the industrial corridor near the southernmost extent of the FT-002 chlorinated hydrocarbon groundwater plume. Solvent and petroleum product spills occurred in the parking lots in the vicinity of the building. An RI was conducted at the site between 1992 and 1995 (Malcolm Pirnie 1996). In 1992, 200 cubic yards of contaminated soil (contaminated mainly by BTEX and dichlorobenzenes) were removed from the site. In 1997, several treatment systems were installed (and are currently operating) as part of an additional removal action at the site to cleanup the remaining soil contamination (OHM 1997). The major contaminants of concern in soil at the beginning of the removal action included TCE, BTEX, and dichlorobenzenes. The treatment systems include soil vapor extraction, biosparging, and bioventing. Although relatively high levels of chlorinated hydrocarbons and other volatile organic compounds (VOCs) were detected in groundwater at the site during the RI, more recent groundwater sampling has indicated that the source removal actions have helped reduce groundwater contaminant levels to near or below ARARs (URS 2001c). A ROD for the SS-017 Soil OU is expected to be executed in 2002. Because the site lies directly and immediately downgradient from the FT-002 groundwater plume, the groundwater at the SS-017 site has been included in the FT-002/IA Groundwater OU.

### 2.2.4.5 Site SD-041

In 1998 and 1999, 15 monitoring wells were installed and sampled to investigate groundwater around Building 2612 (SD-041), a former base equipment and supply warehouse located near the intersection of Arizona and Idaho Avenues. The investigation was undertaken as part of a Supplemental Evaluation to the Plattsburgh AFB Environmental Baseline Survey (URS 2001d). The results indicated that the groundwater near the site is being impacted by an upgradient groundwater chlorinated hydrocarbon plume. However, the contaminant distribution also indicated that a source in the vicinity of Building 2612 is contributing to the observed contamination. Contaminant transport modeling (Section 2.3.3) indicated that groundwater beneath SD-041 will be impacted by the FT-002 chlorinated hydrocarbon plume well into the future. Therefore, groundwater contamination in this area is included in the FT-002/IA Groundwater OU. A Remedial Investigation to further evaluate the source of the groundwater contamination and the nature and extent of soil and sediment contamination is currently underway.

### 2.2.4.6 Pump House No. 3

Pump House No. 3 was formerly located along the western edge of the flightline ramp immediately south of taxiway 3 (Figure 2-1) and included six 50,000 gallon and one 2,000 gallon underground fuel storage tanks (USTs). In November 1968, the pump house was destroyed by fire during which jet fuel may have been released. In addition, a small fuel spill occurred in this area in 1994. In 1994, the seven USTs at the former Pumphouse No. 3 were removed. The tanks were originally used (beginning in 1956) for storage of jet fuel, but were later used (beginning in the early 1970s) for storage of heating fuel and waste fuels until 1994; these tanks were tightness tested annually, from 1991 through 1994, and found to be intact. Following the removal of the USTs, soil and groundwater samples were collected using Geoprobe sampling techniques. BTEX compounds were detected at significant levels in several of the samples. The magnitude and extent of groundwater contamination was not determined. The BTEX contamination appeared located immediately south of a portion of the FT-002 chlorinated hydrocarbon plume traveling toward the WSA drainage system (see Figure 2-1).

In 2001, an investigation of the groundwater contamination in the vicinity of Pump House No. 3 was conducted. The investigation included analyzing 131 groundwater-screening samples collected from 55 borings for BTEX and chlorinated hydrocarbons, installation of 6 monitoring wells, and analyzing groundwater from the 6 wells and 2 samples collected from the adjacent storm drainage system for volatile organic compounds (VOCs). A report of results (URS 2001b) was submitted to NYSDEC and USEPA.

Based on the groundwater screening and monitoring well sampling results, it was concluded that BTEX contamination originating from former Pump House No. 3 is limited in areal extent to within 450 feet from the pump house. The contamination is likely in an equilibrium state as evidenced by the likely age of the spill at the pump house (over 30 years) and high biological activity (indicated by oxygen depleted conditions). The plume of chlorinated hydrocarbons appears to trend separately from the BTEX contamination from the pump house (at a greater depth and to the north). Because the BTEX contaminants are not likely to migrate any farther downgradient and groundwater is not likely to be utilized at this location in the future, active remediation of the BTEX plume was not recommended. The NYSDEC Region 5, Office of Environmental Quality concurred with the conclusions of the report on

December 4, 2001. NYSDEC also recommended that monitoring of 9 wells and 2 two storm drain locations be conducted every 6 months for at least 2 years. Monitoring for this site will be accomplished in coordination with the NYSDEC Region V Office of Environmental Quality.

## 2.3 Site Characteristics

### 2.3.1 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 characterize them during the RI/FS (URS 2001e). The units are described in Table 2-1.

Groundwater flow from FT-002 is multi-directional, as indicated in Figure 2-2. Contamination has been detected only in the unconfined sand aquifer and flow into the underlying till water-bearing zone and bedrock aquifer is limited by the clay confining unit. The predominant flow direction from FT-002 is southeastward; much of the groundwater flow is directed toward a deep drainage basin that is situated between the runway and the flightline. The groundwater in this vicinity is diverted to the WSA drainage system by a large storm sewer. Some of the groundwater is not affected by the deep drainage basin and travels southward then southwestward around the deep drainage basin and discharges directly into the WSA drainage system (Figure 2-2). The streams of the WSA drainage system eventually converge and discharge into the Salmon River.

Some of the groundwater from the FT-002 site is not affected by the deep drainage basin and travels southeastward through the flightline into the industrial corridor. A geologic cross-section along this southeastward flow path is depicted in Figure 2-3. Near the southeastern boundary of the base, the unconfined sand aquifer thins, and clay and bedrock are found at or near the surface. Groundwater from the industrial corridor discharges into the Golf Course drainage system. The several streams in this drainage system converge near the Barracks Golf Course Clubhouse and discharge via a stream that runs just south of Cliffhaven into Lake Champlain.

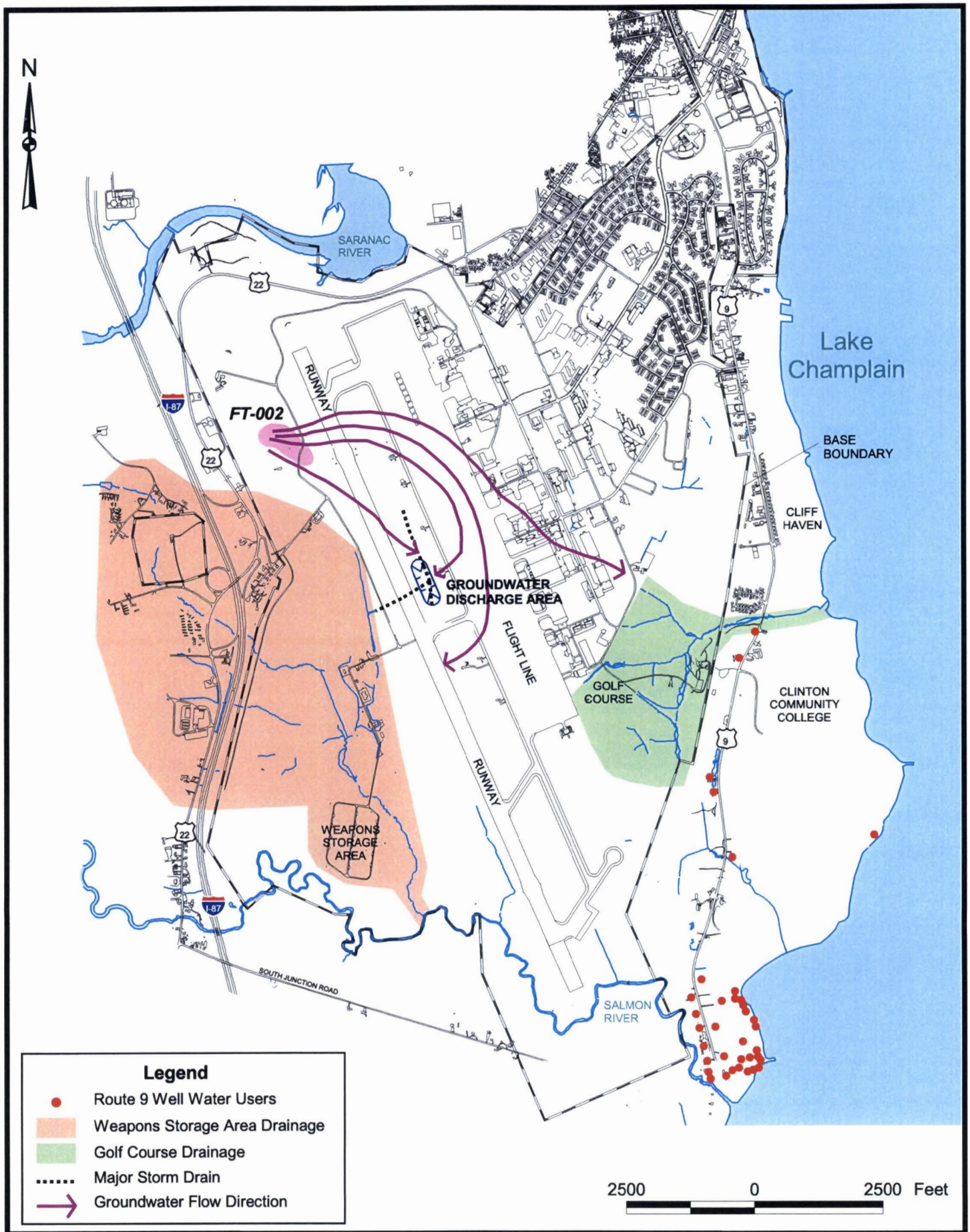
Some residences near Plattsburgh AFB rely on private groundwater wells for their potable water supply. To identify commercial and residential groundwater well users downgradient from the FT-002 site, a house-to-house water use survey was

## TABLE 2-1
## HYDROGEOLOGIC UNITS

| Hydrogeologic Unit | Description | Hydraulic Conductivity | No. of Wells or Borings |
|---|---|---|---|
| Unsaturated Zone | The unsaturated zone lies between the ground surface and the water table. It lies entirely within the sand unit, except in the southeastern portion of the base where the water table surface may intersect clay, till, or bedrock. This zone ranges in thickness from 1 to 50 feet. | --- | Over 400 borings |
| Unconfined Sand Aquifer | The unconfined aquifer, contained in the sand unit, has the water table as its upper bound and the clay confining layer as its lower bound. The saturated thickness of the aquifer is greatest in the northwest and north-central portions of the base (at over 50 feet), and decreases to the north, east, and south (being less than 5 feet in the vicinity of the golf course and the southern end of the flightline and runway). The unconfined aquifer is limited to the north and south by the Saranac and Salmon Rivers, respectively. Their river valleys cut through the sand into the underlying clay unit. Lake Champlain and bedrock outcrops east of the golf course limit the unconfined aquifer to the east and southeast. **The FT-002 contaminant plume is contained within this unit.** | $10^{-2}$ to $10^{-4}$ cm/sec | 321 monitoring wells |
| Clay Confining Unit | The clay unit forms a low permeability confining layer that separates the sandy unconfined aquifer from the till and bedrock below. The clay confining layer is believed to be continuous beneath the base; it is known to be absent only in the Saranac River valley and where bedrock outcrops. The clay was found in thicknesses up to 30 feet. | $10^{-8}$ cm/sec | 21 borings |
| Confined Till Water-Bearing Zone | The till water-bearing zone is confined by the overlying clay unit. It is isolated from the sand aquifer above, but is in immediate contact with the bedrock below. Vertical flow from the till toward the sand above appears upward except in a portion of the flightline industrial corridor. This unit is heterogenous in composition (silty gravel to gravelly silt) and ranges widely in thickness (3 to 182 feet) | $10^{-4}$ cm/sec | 6 wells; 20 borings |
| Confined Bedrock Aquifer | The bedrock aquifer is isolated from the unconfined sand aquifer by the overlying clay unit. Groundwater movement in the bedrock, which is variably fractured limestone and dolostone, is controlled by the secondary porosity features of the rock such as fractures, faults, bedding planes, joints, and solution cavities. Regional groundwater flow in the bedrock aquifer is generally to the east and southeast toward Lake Champlain. Artesian flow occurred from several wells installed at the golf course and along the southern end of the flightline and runway. | $10^{-2}$ to $10^{-6}$ cm/sec | 15 wells |

Notes:

Hydraulic conductivity is a measure of the ability of a unit to allow water to flow through it. The higher the number (i.e., $10^{-2}$), the quicker water will pass through the unit. The lower the number (i.e., $10^{-7}$), the slower water will pass through the unit.
cm/sec = centimeter per second




J:\0100013\DBGIS\1999\wgoperunit.apr POTENTIAL RECEPTORS 9/28/2000

| URS Consultants, Inc. | GROUNDWATER FLOW AND POTENTIAL RECEPTORS | FIGURE 2-2 |
|---|---|---|

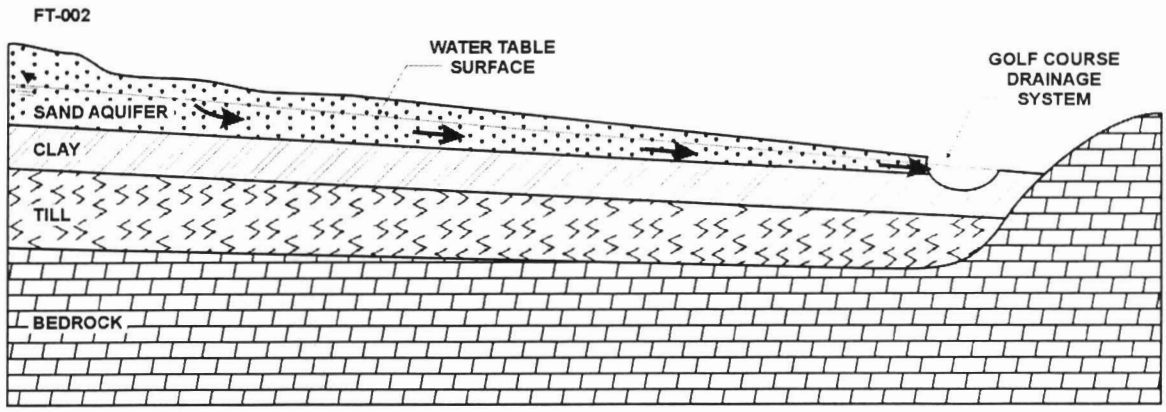



**Figure 2-3 Conceptual Cross Section**

conducted during the RI/FS (URS 2001e). These well users are shown in Figure 2-2. Elsewhere offbase and onbase downgradient from the FT-002 site, a public water line is available for residences and businesses. The geologic configuration, groundwater modeling, and groundwater sampling along the eastern base boundary indicate that the offbase residents along Route 9 are not and should not be affected by contamination from FT-002.

Ecological resources in the WSA and Golf Course drainage systems (shown in Figure 2-2) are receiving groundwater, and contaminant loading, from the FT-002 site. A bioassessment of aquatic resources in the streams of these drainage basins was conducted during the RI/FS (URS 2001e) to evaluate potential impairment to the stream ecological communities. The study included sampling of benthic macroinvertebrates. Further analysis was performed and is presented in Section 4.2 of this Plan.

### 2.3.2 Nature and Extent of Contamination in Groundwater

The chemical quality of groundwater in the vicinity of site FT-002, the flightline industrial corridor, and the former WSA was evaluated by compiling a database of existing groundwater analytical data (307 wells, 968 sample records) from studies/investigations conducted at Plattsburgh AFB during the period from 1987 to 1999. Contaminants detected in groundwater in the immediate vicinity of the FT-002 site included 17 VOCs, 14 semivolatile organic compounds (SVOCs), and 12 metals (Table 2-2). The metals generally were detected at or near background concentrations. VOCs included chlorinated hydrocarbons (e.g., trichloroethene), ketones (e.g., acetone), and fuel-related hydrocarbons (e.g., benzene). SVOCs included light fuel-related polycyclic aromatic hydrocarbons [PAHs] (e.g., naphthalene), heavier polycyclic aromatic hydrocarbons (e.g., phenanthrene), and phenolic compounds (e.g., 2-4 dimethyl phenol). Ketones, fuel-related polycyclic aromatic hydrocarbons, heavier polycyclic

## TABLE 2-2
## CHEMICALS DETECTED IN GROUNDWATER NEAR THE FT-002 SOURCE AREA

| Volatile Organic Compounds | Semivolatile Organic Compounds | Metals |
|---|---|---|
| Methylene Chloride (20) | **Phenol (110)** | **Aluminum (3,610)** |
| Acetone (19) | 2-Chlorophenol (130) | **Arsenic (20.6)** |
| Carbon Disulfide (280) | 1,2-Dichlorobenzene (1,200) | **Calcium (112,000)** |
| 1,1-Dichloroethene (DCE) (140) | 2-Methylphenol (17) | **Chromium (143)** |
| **1,2-DCE (total) (18,000)** | **4-Methylphenol (140)** | **Iron (23,400)** |
| 1,2-Dichloroethane (45) | **2,4-Dimethylphenol (98)** | Lead (126) |
| **2-Butanone (690)** | **Naphthalene (3,700)** | **Magnesium (45,900)** |
| **Trichloroethene (TCE) (3,900)** | 4-Chloro-3-Methylphenol (42) | **Manganese (12,100)** |
| 1,1,2-Trichloroethane (19) | **2-Methylnapthalene (9,600)** | Nickel (56.6) |
| **Benzene (720)** | Acenaphthene (780) | Potassium (7,470) |
| 4-Methyl-2-Pentanone (70) | 4-Nitrophenol (150) | **Sodium (43,500)** |
| 2-Hexanone (96) | Pentachlorophenol (140) | Zinc (9,910) |
| Tetrachloroethene (52) | Phenanthrene (1,700) | |
| **Toluene (4,200)** | **bis(2-Ethylhexyl)phthalate (1,100)** | |
| Chlorobenzene (7) | | |
| **Ethylbenzene (1,400)** | | |
| **Total Xylenes (13,000)** | | |

BTEX = benzene, toluene, ethylbenzene, and total xylenes

(52) = Maximum concentration of contaminant detected in the source area during the original RI (URS 1993) in ug/L. Note that concentrations at the well locations where the maximum detections occurred have generally diminished significantly since 1993 (URS 2000a).

**Benzene** = Chemicals shown in **bold** were detected in greater than 10% of the samples taken.

| Primary Contaminants of Concern |
|---|
| 1,2-Dichloroethene (DCE) |
| Trichloroethene (TCE) |
| Vinyl Chloride* (VC) |
| Benzene |
| Toluene |
| Ethylbenzene |
| Total Xylenes |

* Vinyl Chloride is a degradation product of DCE and is detected downgradient from the FT-002 Source Area.

hydrocarbons, and phenolic compounds were not detected at concentrations above ARARs outside the source area and are not considered primary contaminants of concern for the FT-002/IA Groundwater OU. Only two groups of compounds, including chlorinated hydrocarbons (TCE and DCE) and fuel-related volatiles (BTEX), were detected beyond the immediate source area at concentrations above ARARs (see table 2-3 below.) Chlorinated hydrocarbons and BTEX were detected at very high concentrations in the source area and these two groups of compounds are highly soluble and mobile in groundwater. Therefore, they are considered to be primary contaminants of concern. Contamination was found to be present only in the unconfined sand aquifer.

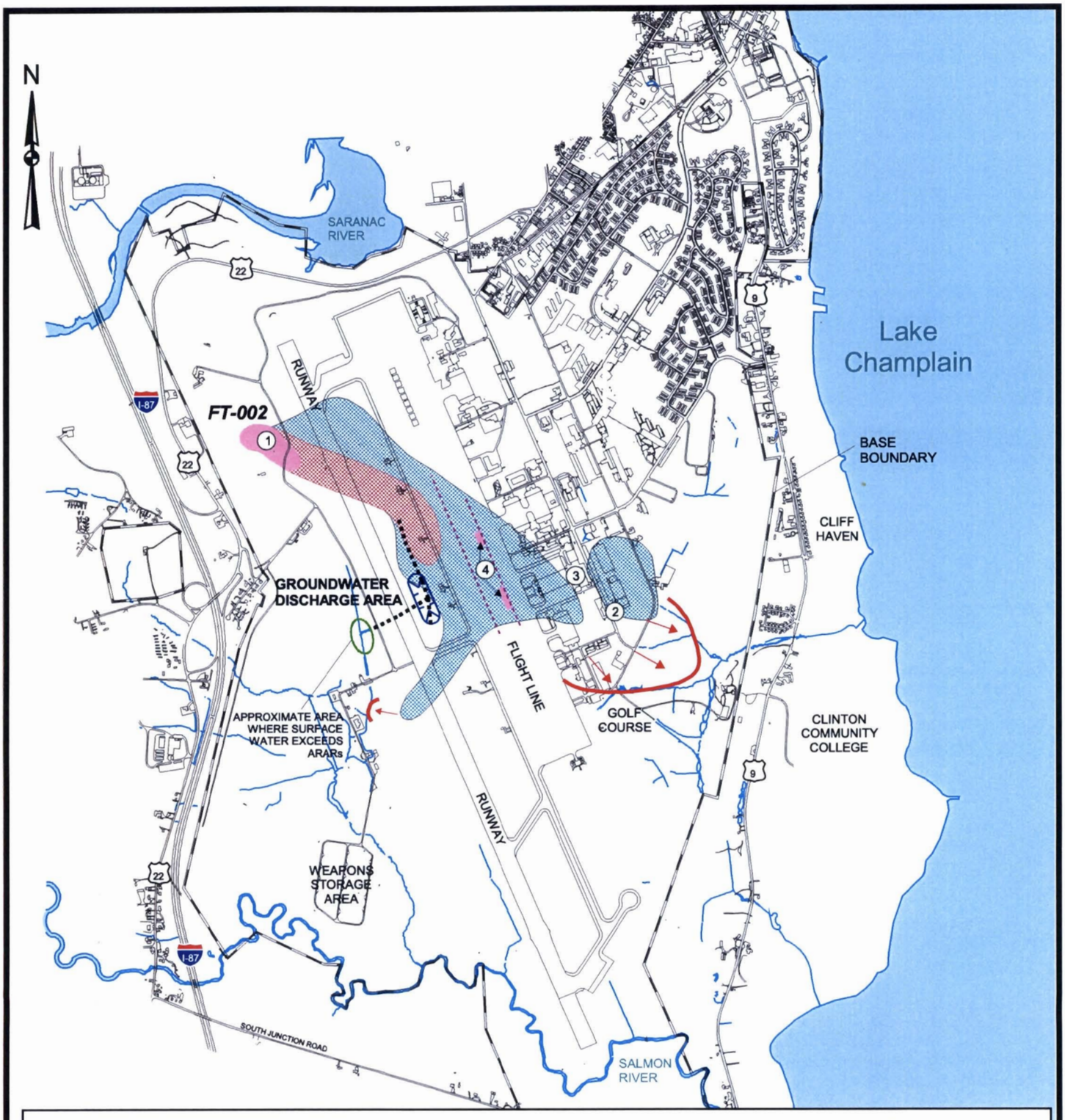
**TABLE 2-3**
**NEW YORK STATE GROUNDWATER ARARs**

| SUBSTANCE | MAXIMUM ALLOWABLE CONCENTRATION (µg/L) |
|---|---|
| Benzene | 1 |
| 1,2-DCE | 5 |
| Ethylbenzene | 5 |
| Toluene | 5 |
| Trichloroethene | 5 |
| Vinyl Chloride | 2 |
| Xylene | 5 |

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.

The extent of BTEX contamination is shown in Figure 2-4. The BTEX plume from FT-002 is about 4,000 feet long and 600 to 750 feet wide. This plume does not appear to be expanding, rather it appears to be at equilibrium (biological degradation is occurring as fast as the FT-002 source is feeding the plume). This accounts for the great difference in size between the BTEX plume and the larger chlorinated hydrocarbon plume (Figure 2-4). The biodegradation of the FT-002 BTEX plume was thoroughly investigated and documented by Parsons Engineering Science, Inc. and the USEPA National Risk Management Research Laboratory (formerly known as the Robert S. Kerr Laboratory) from 1993 through 1996 (Parsons 1995; 1997). Some of the BTEX compounds reach the deep drainage basin between the runway and flightline. These compounds travel via a large storm drain to the WSA drainage system. Benzene has been detected frequently in this drainage system, but at concentrations below surface water ARARs. In addition, a small area of BTEX groundwater contamination is located immediately south of Taxiway #3 at the former location of Pump House No. 3 (See Figure 2-1 and Section 2.2.4.6).

The extent of chlorinated hydrocarbon contamination at concentrations above groundwater ARARs is also shown in Figure 2-4. Although chlorinated hydrocarbons undergo biodegradation by a process known as reductive dechlorination, the biodegradation is slow and the plume of chlorinated hydrocarbons is still expanding. This biodegradation process changes TCE to DCE, DCE to vinyl chloride (VC), and VC to the non-toxic compound ethene over time. VC was detected at several locations away from the FT-002 source area. The plume of chlorinated hydrocarbons intersects the deep drainage basin between the runway and the flightline, and chlorinated hydrocarbons are discharging via the storm drain to the WSA drainage system. TCE is routinely detected at a concentration above its surface water ARAR (NYSDEC 1998) within a few hundred feet of the discharge location (Figure 2-4) before diluting to below its ARAR downstream. Some of the groundwater is not affected by the deep drainage basin and travels southward then southwestward around the deep drainage basin and is heading toward the WSA drainage system.




| URS Consultants, Inc. | PREDICTED FUTURE MIGRATION OF GROUNDWATER CONTAMINATION IF NO ACTION TAKEN | FIGURE 2-4 |
|---|---|---|

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Chlorinated hydrocarbons from the FT-002 site also are travelling underneath the flightline into the industrial corridor mingling with groundwater contamination upgradient from site SS-011, at site SD-041, at site SS-017, and from drains that formerly were located in the flightline. These other sources are shown in Figure 2-4. Sites SS-005 and SS-006 also were investigated as potential sources of groundwater contamination (URS 1998a and URS 1998b). These sites were determined not to be significant sources of groundwater contamination, although they lie on the northernmost limit of the FT-002 plume and chlorinated hydrocarbons have been intermittently detected in groundwater at the sites. Chlorinated hydrocarbons in groundwater in the industrial corridor eventually discharge to the Golf Course drainage system, although no chemicals attributable to this OU have been detected in this system above ARARs.

### 2.3.3 Future Migration of Contamination in Groundwater

A numerical contaminant transport model was developed as part of the RI/FS (URS 2000d) to evaluate the fate of chlorinated hydrocarbons in groundwater and to predict their future potential impact on receiving surface water bodies. The transport model was built upon a groundwater flow model developed to provide a mathematical representation of the groundwater flow regime at Plattsburgh AFB. The program MODFLOW was used. The flow model was calibrated to a basewide groundwater flow map developed from measurements of groundwater levels at over 300 wells and piezometers. The transport model was calibrated to the existing pattern of contamination determined using the extensive database of chemical data.

The modelling predicts that the extent of the chlorinated hydrocarbon plume will expand in the industrial corridor and toward the WSA drainage system as shown in Figure 2-4, if no remedial action is taken. About 90% of the mass of contamination is heading toward the WSA drainage system with the remainder heading toward the Golf Course drainage system. The chlorinated hydrocarbon plume is predicted to reach its maximum extent in about 30 years if no remedial action is taken. Loading to the WSA drainage system is expected to remain at its current level or decrease slightly in the future, whereas loading to the Golf Course drainage system is expected to increase in the future (but to levels one order of magnitude less than the loading to the WSA drainage system),if no action is taken.

## 3.0 SCOPE AND ROLE OF OPERABLE UNIT

Site FT-002 is one of a number of sites administered under the Plattsburgh AFB IRP. RODs have previously been signed for 13 OUs at the base and additional RODs are planned for other IRP sites. Because of the complex nature of the FT-002 site, site remediation was divided into two OUs:

- FT-002 Source OU
- FT-002 Groundwater OU

Further, because groundwater contamination from site FT-002 is currently impacting or will potentially impact groundwater beneath several IRP sites in the industrial corridor, the USAF, in conjunction with NYSDEC and USEPA, expanded the FT-002 Groundwater OU to include the groundwater portions of these affected sites. The expanded operable unit, called the FT-002/IA Groundwater OU, includes seven IRP sites (FT-002, SS-004, SS-005, SS-006, SS-011, SS-017, and SD-041). Only groundwater associated with these sites is included in the FT-002/IA Groundwater OU, which is the subject of this Proposed Plan. This OU addresses cleanup and control of contamination

dissolved within groundwater (mainly chlorinated hydrocarbons and fuel-related contaminants) resulting from the FT-002 source area and other source areas that lie downgradient from the FT-002 site. The principle threats of contamination in groundwater are its potential to be ingested by humans and its potential to migrate to surface water bodies.

The current extent of groundwater contamination above ARARs (shown on Figure 2-1) includes a plume that extends from the FT-002 site into the industrial corridor and a smaller plume near the southeast corner of the industrial corridor. The boundary of the FT-002/IA Groundwater OU (Figure 2-1) extends beyond the current limits of groundwater contamination to account for uncertainties associated with groundwater transport modelling and future contaminant migration, and to insure that remedial measures (including deed restrictions pertaining to groundwater use) are protective of public health and the environment.

The proposed action for the FT-002/IA Groundwater OU addresses the principal threats by restoring the aquifer to drinking water quality over time, and by controlling and treating groundwater discharge to surface water bodies. It is intended that the proposed action be the final action for the FT-002/IA Groundwater OU.

The soil media at each of the sites included in the FT-002/IA Groundwater OU are being addressed separately from the FT-002/IA Groundwater OU. The FT-002 Source OU addresses cleanup and control of product and contaminated soils at the FT-002 source area (vertically downward to a depth at which soil has been directly contaminated by free product to the lowest point of water table fluctuation). RODs already have been executed for the SS-005 Soil OU, the SS-006 Soil OU, SS-011, and the FT-002 Source OU. Analysis leading to RODs is underway for Soil OUs for sites SS-004, SS-017, and SD-041. The selection of a remedy for the FT-002/IA Groundwater OU considers the actions that have been or will be undertaken at these other sites.

Previously, the SS-013 Groundwater OU was included in the FT-002/IA Groundwater OU. The groundwater contamination from the FT-002 and SS-013 sites currently are not co-located, although FT-002 contaminants are expected to migrate to SS-013 in the absence of remedial action. However, the proposed action for the FT-002/IA Groundwater OU, if implemented, should prevent further migration of the FT-002 contaminant plume toward SS-013. Therefore, the SS-013 ground-water will be addressed separately from the FT-002/IA Groundwater OU. A Supplemental RI leading to a ROD for SS-013, including both soil and groundwater investigations, is ongoing.

## 4.0 SUMMARY OF SITE RISKS

Baseline risk assessments pertaining to groundwater or surface water were conducted as part of RIs undertaken at sites FT-002, SS-005, SS-006, and SS-017. These assessments estimated the risks associated with current and potential future planned industrial and hypothetical residential land use conditions. A baseline risk assessment estimates the human health and ecological risk which could result from the contamination at the site if no remedial action was taken.

### 4.1 Human Risk Assessments (HRAs)

A four-step process is utilized for assessing site-related human health risks for a reasonable maximum exposure scenario: *Hazard Identification* – identifies the contaminants of concern at the site based on several factors such as toxicity, frequency of occurrence, and concentration. *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. *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). *Risk Characterization* – summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site-related risks.

The HRAs for the several sites evaluated potential human exposure to contaminants by ingestion of contaminated groundwater, skin contact with contaminated groundwater, and inhalation of vapors produced by contaminated groundwater and surface water. Risks were quantified and compared to USEPA evaluation criteria. Under USEPA guidelines, a calculated cancer risk of less than $1 \times 10^{-6}$ is acceptable and risks in the range of $1 \times 10^{-4}$ to $1 \times 10^{-6}$ are evaluated on a case by case basis. A potential noncancer risk is indicated if the hazard index exceeds 1. Criteria ($10^{-4}$ for cancer and 1 for noncancer) were exceeded for the following:

- Ingestion of contaminated groundwater extracted from the FT-002 plume or the SS-017 site
- Inhalation of vapors while showering using groundwater extracted from the FT-002 plume
- Skin contact with contaminated groundwater by a child resident at site SS-017

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 areas, and the impacted areas currently are not used for residential purposes and are not expected to be used for residential purposes in the future under the reuse and redevelopment plan for the base (Tetra Tech 1995).

The HRAs indicate that there will be no significant human health risk if groundwater is not used as a potable supply source or if contaminants in groundwater are reduced to levels acceptable for use as drinking water.

## 4.2 Ecological Risk Assessments (ERAs)

A four-step process is utilized for assessing site-related ecological risks for a reasonable maximum exposure scenario: *Problem Formulation* – a qualitative evaluation of contaminant release, migration, and fate; identification of contaminants of concern, receptors, exposure pathways, and known ecological effects of the contaminants; and selection of endpoints for further study. *Exposure Assessment* - a quantitative evaluation of contaminant release, migration, and fate; characterization of exposure pathways and receptors; and measurement or estimation of exposure point concentrations. *Ecological Effects Assessment* – literature reviews, field studies, and toxicity tests linking contaminant concentrations to effects on ecological receptors. *Risk Characterization* - measurement or estimation of current adverse effects.

The ERAs for the several sites (FT-002, SS-004, SS-005, SS-006, and SS-017) evaluated potential exposure of terrestrial and aquatic species to contaminated surface water and sediments. Significant findings of the ERAs are summarized below.

- A potential risk to fish species such as rainbow trout in a portion of the WSA drainage system was identified (note the portion of the WSA stream above

ARARs in Figure 2-4). The contaminant of concern is TCE.

- At sites SS-005, SS-006, and SS-017, concentrations in groundwater exceeded guidelines for surface water for some chemicals of concern. However, the actual risk is expected to be much smaller than indicated, since groundwater concentrations would be reduced greatly in surface water by mixing and volatilization.

In summary, the ERAs indicate that there is no significant risk to aquatic or terrestrial species from sites in the FT-002 Groundwater OU except for a potential risk to fish species such as trout in a portion of the WSA stream.

## 5.0 REMEDIAL ACTION OBJECTIVES

The remedial objectives for the FT-002/IA Groundwater OU are: 1) to prevent ingestion of groundwater containing contaminant concentrations above applicable and/or appropriate requirements (ARARs); 2) to restore impacted groundwater to ARARs; 3) to prevent migration of groundwater with contaminant concentrations above ARARs beyond base boundaries; and 4) to restore surface water, that has been impacted by contaminated groundwater, to ARARs.

Remediation goals are chemical-specific targets for remediation that are developed consistent with the remedial objectives. For the FT-002/IA Groundwater OU, 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 for the contaminants of concern (TCE, DCE, VC, and BTEX) are presented in Table 5-1. Remediation goals for surface water are NYSDEC surface water quality standards for the Golf Course and WSA drainage systems, which are classified as Class D under the New York Code of Rules and Regulations (6 NYCRR Parts 700 to 705). Remediation goals for contaminants of concern in surface water also are presented in Table 5-1.

## 6.0 SUMMARY OF ALTERNATIVES

Sixteen alternatives were developed and evaluated in the RI/FS to address remedial objectives for the FT-00/IA Groundwater OU. Fifteen alternatives were developed during the Draft-Final version of the RI/FS (URS 2000a). Following discussions between USAF, NYSDEC, and USEPA, a sixteenth alternative (Alternative 13) was added for comparative analysis in the Final RI/FS (URS 2001e).

For clarification, it should be noted that remedial objective 4 will not be achieved by actively or directly treating surface water. Rather this objective will be addressed by collecting and treating groundwater that is currently impacting the WSA stream. Groundwater collection and treatment technologies that achieve remedial objective 4 are discussed in this section.

Alternatives developed are described in greater detail below. The alternatives have been evaluated considering the actions implemented under the soil or source OUs of sites within the area impacted by contaminated groundwater. Since hydraulic containment of the source has been specified as one element of the remedy for the FT-002 Source OU, it is assumed that the major source for further groundwater contamination will be controlled in the future.

It should also be noted that the estimates of cleanup timeframes and the mass of contaminants treated for the alternatives presented below are based on the groundwater transport model and are imprecise. That is, the estimates are based

## TABLE 5-1
## GROUNDWATER AND SURFACE WATER REMEDIATION GOALS

| Compound | Groundwater (µg/L) | Surface Water (µg/L) |
|---|---|---|
| VC | 2 | NV |
| DCE | 5 | NV |
| TCE | 5 | 40 |
| Benzene | 1 | 10 |
| Toluene | 5 | 6,000 |
| Ethylbenzene | 5 | NV |
| Xylene (total) | 5 | NV |

NV = No value; there are no Class D surface water standards for these compounds.

on the projections of the model several decades into the future so results cannot be regarded with absolute certainty. The accuracy of the estimates, however, meets the goals of the USEPA RI/FS guidance with respect to evaluating long-term and short-term effectiveness, reduction of the toxicity, mobility, and volume of the principle threat waste, and cost for all alternatives.

Alternative 1:

NO ACTION

Capital Cost: $0
Present Worth O&M: $0
Total Present Worth: $0
Years to Groundwater ARARs: 190
Years to Surface Water ARARs: 45

The Superfund program requires that the "No Action" alternative be evaluated at every site to establish a baseline for comparison. Under this alternative, Plattsburgh AFB would take no further action to prevent exposure to the contaminated groundwater.

Alternative 2:

MONITORED NATURAL ATTENUATION

Capital Cost: $2.5 million
Present Worth O&M: $0.9 million
Total Present Worth: $3.4 million
Years to Groundwater ARARs: 190
Years to Surface Water ARARs: 45

Alternative 2 relies on natural processes to mitigate contamination. Under this alternative, the plume should expand somewhat, but will not migrate off base at concentrations above ARARs. Modeling predicts that any or all contamination will be discharged to drainage streams where it will attenuate (primarily by volatilization) well before reaching the base boundaries. This alternative includes deed restrictions prohibiting the installation of wells that will effectively prevent human ingestion of contaminated groundwater. Wells installed along the eastern base boundary also will be used to provide warning if contaminated groundwater migrates toward residential groundwater wells located east of the base. Surface water sampling will be performed to assess contaminant levels in drainage streams and determine if offbase water bodies are being adversely effected.

Alternative 2 also includes provisions for implementing contingency measures in the event that monitoring results show potential impact on downgradient receptors. Extension of the existing water line along Route 9 would be the most likely action if groundwater contamination could impact residences along Route 9. Surface water collection and treatment would be the most likely action if surface water sampling shows that contaminants could impact offbase water bodies.

The alternative also includes site reviews every five years in accordance with Section 121(c) of CERCLA to ensure that human health and the environment are protected.

Alternative 3:

COLLECTION/TREATMENT BETWEEN RUNWAY AND FLIGHTLINE

Capital Cost: $2.3 million
Present Worth O&M: $2.3 million
Total Present Worth: $4.6 million
Years to Groundwater ARARs: 120
Years to Surface Water ARARs: 0

Alternative 3 includes the installation of a collection trench, sloped to allow groundwater flow by gravity, beneath the deep drainage basin between the runway and flightline. Groundwater captured by the trench would be treated in a treatment system, currently envisioned to be a constructed aeration basin, before being

discharged to the WSA drainage system. This system would treat contaminant discharge to the WSA drainage to levels less than appropriate NYSDEC criteria, thereby achieving surface water ARARs in the drainage upon startup of the treatment. The locations of these features are shown in blue in Figure 6-1. Approximately 7,600 pounds of contamination would be treated by this system in the first 10 years of operation. This constitutes a great majority of the estimated contamination that is attributable to the FT-002 site. Treatment of water discharged to the WSA drainage system and air emitted from the treatment basin would be in accordance with appropriate criteria established by NYSDEC regulations. Alternative 3 also includes groundwater deed restrictions, groundwater and surface water monitoring, and five-year site reviews described under Alternative 2.

Alternative 4a:

COLLECTION/TREATMENT BETWEEN RUNWAY AND FLIGHTLINE AND EAST FLIGHTLINE COLLECTION TRENCH
Capital Cost: $3.7 million
Present Worth O&M: $2.6 million
Total Present Worth: $6.3 million
Years to Groundwater ARARs: 100
Years to Surface Water ARARs: 0

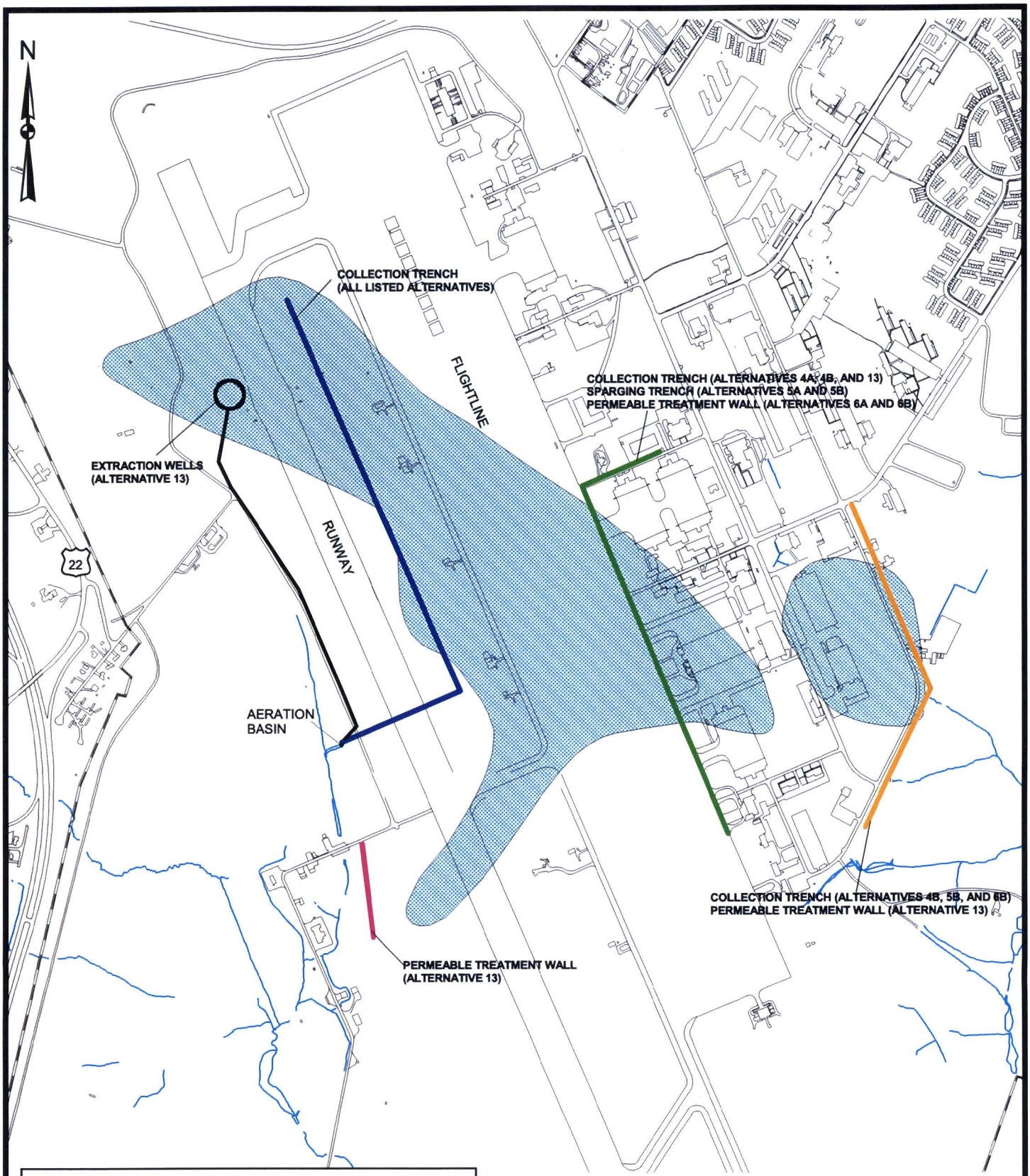
Alternative 4a includes the collection trench and treatment between the runway and flightline described under Alternative 3, and the groundwater deed restrictions, groundwater and surface water monitoring, and five-year site reviews described under Alternative 2. In addition, a second collection trench would be constructed along the eastern edge of the flightline, as shown in green in Figure 6-1. The additional trench would collect contaminated groundwater that has passed beyond the influence of the runway/flightline trench and is traveling toward the industrial corridor. The industrial corridor of the base is considered a valuable asset by the community because of its potential for redevelopment. More rapid cleanup of contamination in this area is advantageous because it would diminish concerns regarding groundwater handling during construction. The water collected by the east flightline collection trench would be discharged to the Golf Course drainage system in a manner consistent with NYSDEC regulations. Approximately 7,600 pounds of contamination would be treated by the systems specified under this alternative in the first 10 years of operation.

Alternative 4b:

COLLECTION/TREATMENT BETWEEN RUNWAY AND FLIGHTLINE, EAST FLIGHTLINE COLLECTION TRENCH, AND IDAHO AVENUE COLLECTION TRENCH

Capital Cost: $4.7 million
Present Worth O&M: $2.9 million
Total Present Worth: $7.6 million
Years to Groundwater ARARs: 80
Years to Surface Water ARARs: 0

Alternative 4b includes the collection trench and treatment between the runway and flightline described in Alternative 3, the collection trench along the eastern edge of the flightline described under Alternative 4a, and the groundwater deed restrictions, groundwater and surface water monitoring, and five-year site reviews described under Alternative 2. In addition, a third collection trench would be constructed along Idaho Avenue, as shown in orange in Figure 6-1. This third trench would collect contaminated groundwater already within the industrial corridor as a result of the FT-002 site and other sources within the corridor, thereby limiting the extent of contamination to the area west of Idaho Avenue. The water collected by the Idaho Avenue collection trench would be discharged to the Golf Course drainage system in a manner consistent with NYSDEC regulations. Approximately 7,600

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| URS Consultants, Inc. | LOCATION OF TREATMENT COMPONENTS FOR ALTERNATIVES 3, 4, 5, 6, AND 13 | FIGURE 6-1 |
|---|---|---|

pounds of contamination would be treated by the systems specified under this alternative in the first 10 years of operation. Figure 6-1

Alternative 5a

COLLECTION/TREATMENT BETWEEN RUNWAY AND FLIGHTLINE AND EAST FLIGHTLINE SPARGING

Capital Cost: $4.7 million
Present Worth O&M: $21.3 million
Total Present Worth: $26.0 million
Years to Groundwater ARARs: 100
Years to Surface Water ARARs: 0

Alternative 5a includes the collection trench and treatment between the runway and flightline described under Alternative 3 and the groundwater deed restrictions, groundwater and surface water monitoring, and five-year site reviews described under Alternative 2. In addition, an air sparging trench would be constructed along the eastern edge of the flightline, at the location shown in green on Figure 6-1. Air sparging is the injection of air into the saturated zone below or within the zone of contamination. In this instance, the air would be injected into the aquifer using a horizontal pipe at the bottom of the trench. Contaminants are entrained in the air and discharged to the atmosphere at the surface. Approximately 7,600 pounds of contamination would be treated by the systems specified under this alternative in the first 10 years of operation.

Alternative 5b

COLLECTION/TREATMENT BETWEEN RUNWAY AND FLIGHTLINE, EAST FLIGHTLINE SPARGING, AND IDAHO AVENUE COLLECTION TRENCH

Capital Cost: $5.8 million
Present Worth O&M: $21.4 million
Total Present Worth: $27.2 million
Years to Groundwater ARARs: 80
Years to Surface Water ARARs: 0

Alternative 5b includes the collection trench and treatment between the runway and flightline described under Alternative 3, the groundwater deed restrictions, groundwater and surface water monitoring, and five-year site reviews described under Alternative 2, and the air sparging trench along the eastern edge of the flightline described under Alternative 5a. In addition, a collection trench would be constructed along Idaho Avenue (described under Alternative 4b). Approximately 7,600 pounds of contamination would be treated by the systems specified under this alternative in the first 10 years of operation.

Alternative 6a

COLLECTION/TREATMENT BETWEEN RUNWAY AND FLIGHTLINE AND EAST FLIGHTLINE PERMEABLE TREATMENT WALL

Capital Cost: $10.5 million
Present Worth O&M: $5.7 million
Total Present Worth: $16.2 million
Years to Groundwater ARARs: 100
Years to Surface Water ARARs: 0

Alternative 6a includes the collection trench and treatment between the runway and flightline described under Alternative 3 and the groundwater deed restrictions, groundwater and surface water monitoring, and five-year site reviews described under Alternative 2. In addition, a permeable treatment wall would be constructed along the eastern edge of the flightline, at the location shown in green on Figure 6-1. Using this technology, contaminated groundwater upgradient from (to the west of) the wall would be cleaned up by a chemical reaction with reactive media emplaced within the wall, as it passes through to the east. Approximately 7,600 pounds of contamination would be treated by the system specified under this alternative in the first 10 years of operation.

Alternative 6b

COLLECTION/TREATMENT BETWEEN RUNWAY AND FLIGHTLINE, EAST FLIGHTLINE PERMEABLE TREATMENT WALL AND IDAHO AVENUE COLLECTION TRENCH

Capital Cost: $11.6 million
Present Worth O&M: $5.9 million
Total Present Worth: $17.5 million
Years to Groundwater ARARs: 80
Years to Surface Water ARARs: 0

Alternative 6b includes the collection trench and treatment between the runway and flightline as described in Alternative 3, the groundwater deed restrictions, groundwater and surface water monitoring, and five-year site reviews as described under Alternative 2, and the permeable treatment wall along the eastern edge of the flightline described under Alternative 6a. In addition, a collection trench would be constructed along Idaho Avenue (as described in Alternative 4b). Approximately 7,600 pounds of contamination would be treated by the systems specified under this alternative in the first 10 years of operation.

Alternative 7

CONTAINMENT OF PLUME CORE

Capital Cost: $5.6 million
Present Worth O&M: $10.3 million
Total Present Worth: $15.9 million
Years to Groundwater ARARs: 170
Years to Surface Water ARARs: 25

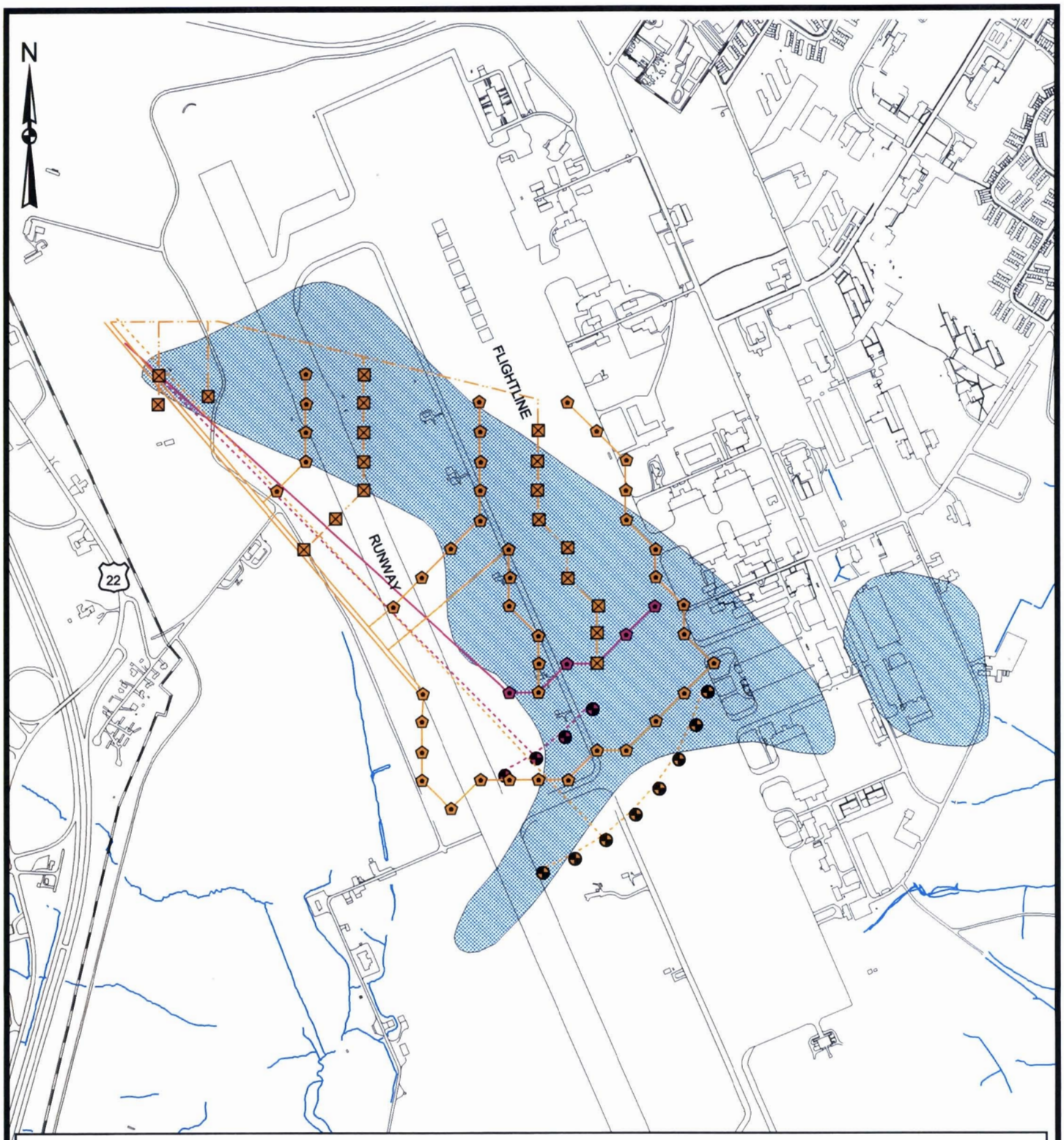
Alternative 7 includes installing groundwater extraction wells at the downgradient edge of the most highly contaminated groundwater (i.e. the plume core which is defined as the area where the total concentration of dissolved chlorinated hydrocarbons exceeds 1,000 µg/l) to prevent its further migration. Extracted groundwater would be treated by a newly constructed water treatment plant and discharged to an infiltration gallery downgradient from the extraction zone. Major components of this system are shown in purple in Figure 6-2. The system would be operated until groundwater ARARs were achieved in the plume core. This alternative also includes the groundwater deed restrictions, groundwater and surface water monitoring, and five-year site reviews described under Alternative 2. Approximately 900 pounds of contamination would be treated by the systems specified under this alternative in the first 10 years of operation.

Alternative 8

CONTAINMENT OF PLUME CORE – ALTERNATE CLEANUP LEVELS

Capital Cost: $5.6 million
Present Worth O&M: $10.0 million
Total Present Worth: $15.6 million
Years to Groundwater ARARs: 170
Years to Surface Water ARARs: 25

Like Alternative 7, Alternative 8 includes extraction of groundwater from the downgradient edge of the plume core, with reinjection downgradient following treatment, and the groundwater deed restrictions, groundwater and surface water monitoring, and five-year site reviews described under Alternative 2. However, Alternatives 7 and 8 differ in the period of operation of the extraction, treatment, and reinjection system. Rather than cleaning up the plume core to ARARs as in Alternative 7, the treatment operations for Alternative 8 would be discontinued when chlorinated hydrocarbon concentration reached 250 µg/L or less. This is a concentration approximating a potential cancer risk at the upper limit ($10^{-4}$) of the target risk range ($10^{-4}$ to $10^{-6}$) considered acceptable to USEPA on a case-by-case basis. Approximately 900 pounds of contamination would be treated by the systems specified under this alternative in the first 10 years of operation.




**Legend**

- Extraction Well
- Infiltration Gallery
- Reinjection Well
- Force Main
- Force Main for Infiltration Gallery
- Force Main for Reinjection Well
- Alternative 7 and 8 Components
- Alternative 9 Components
- Approximate Extent of Chlorinated Hydrocarbons in Groundwater (10 ug/L isopleth)

1200 0 1200 Feet

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| | | |
|---|---|---|
| **URS** Consultants, Inc. | LOCATION OF TREATMENT COMPONENTS FOR ALTERNATIVES 7, 8, AND 9 | FIGURE 6-2 |

Alternative 9

ACCELERATED RESTORATION OF ENTIRE PLUME

Capital Cost: $15.6 million
Present Worth O&M: $38.4 million
Total Present Worth: $54.0 million
Years to Groundwater ARARs: 60
Years to Surface Water ARARs: 0

Alternative 9 includes the installation of extraction wells at the downgradient edge of the plume and within the plume, and the installation of reinjection wells within the plume. Extracted water would be treated at a newly-constructed water treatment plant and the treated water reinjected. This recirculation (extraction /cleaning/reinjecting) process would occur at a high rate to reduce the restoration time frame. Approximately 1,200 gallons per minute (gpm) of contaminated groundwater would be extracted with 900 gpm reinjected within the plume and 300 gpm discharged to an infiltration gallery downgradient of the extraction zone. System components are depicted in orange in Figure 6-2. This alternative also includes the groundwater deed restrictions, groundwater and surface water monitoring, and five-year site reviews described under Alternative 2. Approximately 8,800 pounds of contamination would be treated by the systems specified under this alternative in the first 10 years of operation.

Alternative 10

ACCELERATED RESTORATION OF PLUME CORE

Capital Cost: $8.1 million
Present Worth O&M: $18.1 million
Total Present Worth: $26.2 million
Years to Groundwater ARARs: 140
Years to Surface Water ARARs: 0

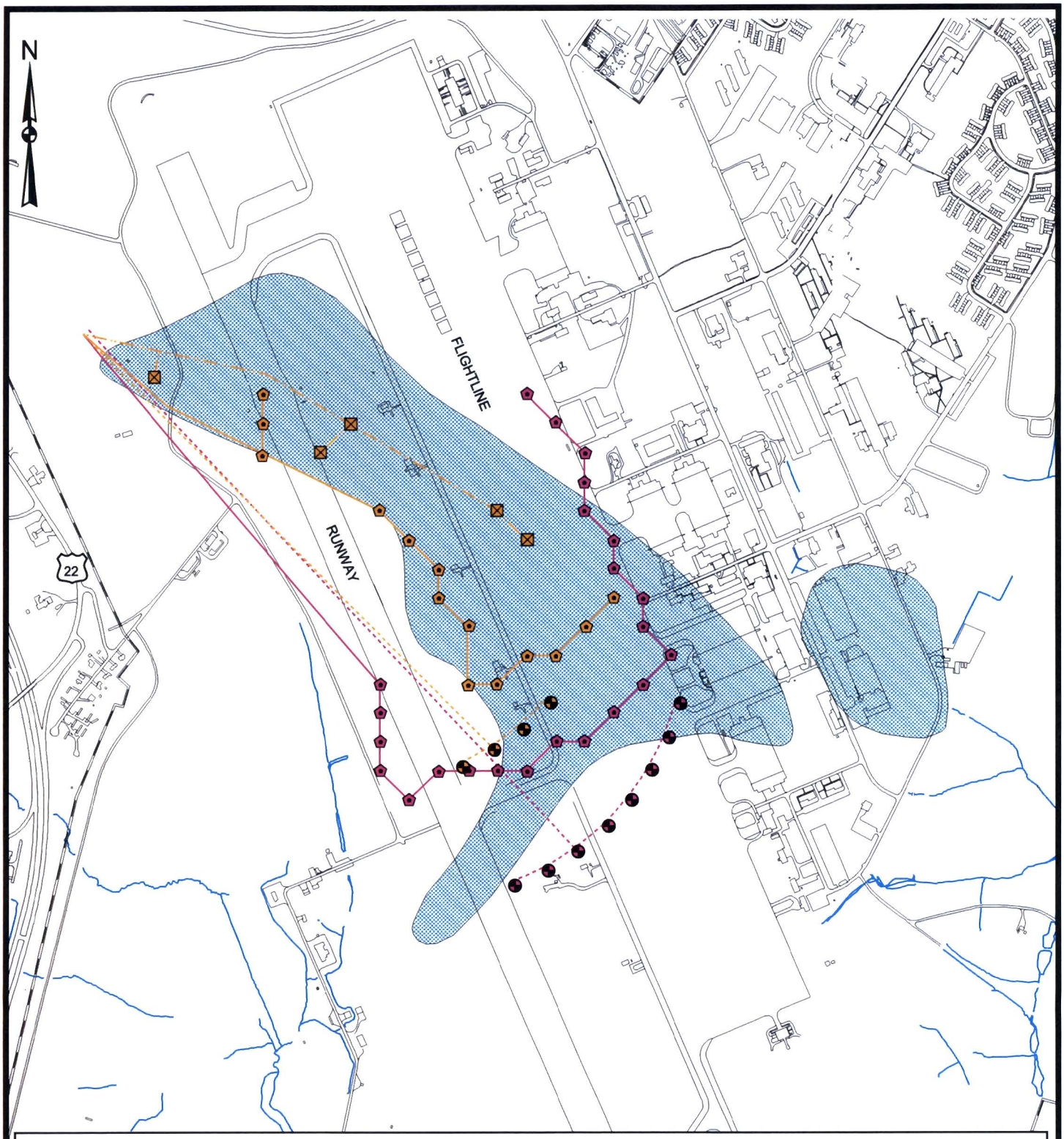
Alternative 10 is similar to Alternative 9 in the application of a groundwater recirculation process (extraction/cleaning/reinjecting) to reduce the restoration time frame. These alternatives differ in the location where the pumping and reinjection are applied. Unlike Alternative 9 which applies groundwater recirculation of the entire plume, Alternative 10 focuses the recirculation only on the plume core. The system would be operated until groundwater ARARs are achieved within the plume core. Groundwater would be extracted at a rate of about 450 gpm from within the plume core of which about half would be reinjected within the plume core and half discharged to an infiltration gallery downgradient of the extraction zone. System components are depicted in orange in Figure 6-3. This alternative also includes the groundwater deed restrictions, groundwater and surface water monitoring and five-year site review described under Alternative 2. Approximately 7,500 pounds of contamination would be treated by the systems specified under this alternative in the first 10 years of operation.

Alternative 11

ACCELERATED RESTORATION OF PLUME CORE ALTERNATE CLEANUP LEVELS

Capital Cost: $8.0 million
Present Worth O&M: $16.5 million
Total Present Worth: $24.5 million
Years to Groundwater ARARs: 140
Years to Surface Water ARARs: 0

Like Alternative 10, Alternative 11 includes groundwater recirculation (extraction/cleaning/reinjecting) focused on the plume core and the groundwater deed restrictions, groundwater and surface water monitoring, and five-year site reviews described under Alternative 2. However, Alternatives 10 and 11 differ in the period of operation of the recirculation system. Rather than cleaning up the plume core to ARARs as in Alternative 10, the recirculation operations for Alternative 11




**Legend**

- Extraction Well
- Infiltration Gallery
- Reinjection Well
- Force Main
- Force Main for Infiltration Gallery
- Force Main for Reinjection Well
- Alternative 12 Components
- Alternative 10 and 11 Components
- Approximate Extent of Chlorinated Hydrocarbons in Groundwater (10 ug/L isopleth)

1200 0 1200 Feet

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| | | |
|---|---|---|
| **URS** Consultants, Inc. | LOCATION OF TREATMENT COMPONENTS FOR ALTERNATIVES 10, 11, AND 12 | FIGURE 6-3 |

would be discontinued when chlorinated hydrocarbon concentrations reached 250 µg/L or less. This is a concentration approximating a potential cancer risk at the upper limit ($10^{-4}$) of the target risk range ($10^{-4}$ to $10^{-6}$) considered acceptable to USEPA on a case-by-case basis. Approximately 7,500 pounds of contamination would be treated by the systems specified under this alternative in the first 10 years of operation.

Alternative 12

CONTAINMENT OF ENTIRE PLUME

Capital Cost: $8.0 million
Present Worth O&M: $15.8 million
Total Present Worth: $23.8 million
Years to Groundwater ARARs: 120
Years to Surface Water ARARs: 25

Alternative 12 is similar to Alternative 7 in the application of pumping on the downgradient edge of the plume and reinjection via an infiltration gallery downgradient from the extraction zone. These alternatives differ in the location where the pumping is applied. Unlike Alternative 7 which focuses groundwater pumping on the downgradient edge of the plume core, Alternative 12 applies groundwater pumping on the downgradient edge of the entire plume. System components are shown in purple on Figure 6-3. This alternative also includes the groundwater deed restrictions, groundwater and surface water monitoring, and five-year site reviews described under Alternative 2. Approximately 600 pounds of contamination would be treated by the systems specified under this alternative in the first 10 years of operation.

Alternative 13

COLLECTION/TREATMENT BETWEEN RUNWAY AND FLIGHTLINE, EAST FLIGHTLINE COLLECTION TRENCH, IDAHO AVENUE PERMEABLE TREATMENT WALL, WSA TREATMENT WALL, AND PUMPING OF CORE

Capital Cost: $9.5 million
Present Worth O&M: $6.2 million
Total Present Worth: $15.7 million
Years to Groundwater ARARs: 80
Years to Surface Water ARARs: 0

Alternative 13 includes the collection trench and treatment between the runway and flightline described in Alternative 3, the collection trench along the eastern edge of the flightline described under Alternative 4a, and the groundwater deed restrictions, groundwater and surface water monitoring, and five-year site reviews described under Alternative 2. In this alternative, the aeration basin would be covered to enable treatment of contaminants in the air stripped from the water in the basin.

In addition, a permeable treatment wall would be constructed along Idaho Avenue, at the location shown in orange on Figure 6-1. A permeable treatment wall also would be constructed immediately upgradient from the WSA drainage system, at the location shown in purple in Figure 6-1. Further, groundwater from the plume core (i.e. the area where the total concentration of chlorinated hydrocarbons exceeds 1,000 µg/l) would be pumped from withdrawal wells located between the FT-002 site and the runway (as shown in Figure 6-1).

The WSA permeable treatment wall would be constructed to intercept groundwater contamination that flows around the collection trench to be located between the runway and flightline. If the permeable treatment wall was not constructed, contaminated (untreated) groundwater would be discharged to the WSA drainage system. Groundwater recovered from the pumping wells, targeted to recover as much contaminant mass as possible to the bottom of the aquifer, would

be discharged via a force main to a treatment system, currently envisioned to be a covered aeration basin, where it would be treated with the water recovered from the flightline/ runway trench. Approximately 8,000 pounds of contamination would be treated by the systems specified under this alternative in the first 10 years of operation.

## 7.0 EVALUATION OF ALTERNATIVES

The alternatives for the FT-002 Groundwater OU were analyzed with respect to nine criteria specified in the National Contingency Plan, 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

A detailed discussion and comparative analysis is contained in the FS. 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, except Alternative 1 (No Action), 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 60 to 190 years for the various alternatives. Alternative 9 (60 years) and Alternatives 4b, 5b, 6b, and 13 (80 years) would achieve groundwater ARARs in the shortest amount of time, whereas Alternatives 7 and 8 (170 years) and 1 and 2 (190 years) would achieve ARARs in longer periods of time.

The time to reach surface water ARARs is estimated to range from 0 (i.e. shortly after remediation is in place) to 45 years for the various alternatives. Alternatives other than 7, 8, and 12 (25 years) and 1 and 2 (45 years) would achieve surface water ARARs upon implementation (0 years).

- **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, surface water sampling, and deed restrictions 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 reduction of toxicity, mobility, or volume (TMV) between the alternatives can be compared by examining the mass of contamination treated for each alternative as summarized below:

| | Mass Treated (pounds) | |
|---|---|---|
| **Alt.** | **10 Years** | **Overall** |
| 1, 2 | 0 | 0 |
| 3 – 6 | 7,600 | 8,000 |
| 7 – 8 | 900 | 4,700 |
| 9 | 8,800 | 8,800 |
| 10 – 11 | 7,500 | 8,700 |
| 12 | 600 | 5,000 |
| 13 | 8,000 | 8,200 |

As shown, the alternatives with the best overall reduction of TMV are 9, 10, and 11, whereas the alternatives with the best reduction of TMV in the first 10 years of operation are 9 and 13. Alternatives 1 and 2 do not provide for reduction of TMV and Alternatives 7, 8, and 12 provide a level of reduction of TMV that is significantly less than the other alternatives. As discussed in Section 6.0, the estimates presented in the table above are imprecise, although they meet the goals of USEPA guidances with respect to evaluating TMV.

- **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.

All alternatives, except Alternative 1 (No Action), achieve protection immediately with the implementation of groundwater deed restrictions. All alternatives (except Alternative 1) include intrusive activities that could produce air emissions potentially impacting workers or the community. The greatest intrusive activities are associated with trench technologies (3, 4, 5, 6, and 13). The least intrusive activities are associated with Alternative 2. In all cases, potential short-term 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.

Alternative 1 (No Action) requires no action and is easily implemented.

All alternatives, other than Alternative 1, include institutional controls and long term monitoring, which are relatively easy to implement.

Alternative 2 (Monitored Natural Attenuation) includes little construction and, comparatively, is easily implemented.

Alternatives 3, 4a, 4b, 5a, 5b, 6a, 6b, and 13 include construction of collection trenches. Design and construction of this technology is conventional and standardized.

Alternatives 5a and 5b include air sparging. This technology is less conventional and standardized than a collection trench. Some testing will be required.

Alternatives 6a, 6b, and 13 include a permeable treatment wall. This technology is relatively new (five years of proven performance). Some testing will be required. Long-term operation and maintenance (O&M) requirements and costs are unknown because of the short performance period.

Alternatives 7, 8, 12, and 13 include "pump and treat" technology. This technology is conventional. Alternatives 9, 10, and 11 include accelerated restoration (recirculation), which is relatively unproven, particularly on the large-scale required for the FT-002 remediation. For Alternatives 7 through 12, installation of components on the airfield will complicate implementation (both construction and O&M). Alternative 9 will be the most difficult to implement. It includes the construction of 61 wells on the airfield. These wells would be very difficult to access for O&M when the airfield is active. Alternative 9 also includes constructing a 1,500-gpm (2.2 million gallon per day) treatment plant. This is an extremely large facility for groundwater treatment. It is similar in capacity to a wastewater treatment plant for a small community. O&M for this system would be difficult. Significant downtime for O&M would be expected.

- **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 (in millions of dollars).

| | |
|---|---|
| Alternative 1 | $0 |
| Alternative 2 | $3.4 |
| Alternative 3 | $4.6 |
| Alternative 4a | $6.3 |
| Alternative 4b | $7.6 |
| Alternative 8 | $15.6 |
| Alternative 13 | $15.7 |
| Alternative 7 | $15.9 |
| Alternative 6a | $16.2 |
| Alternative 6b | $17.5 |
| Alternative 12 | $23.8 |
| Alternative 11 | $24.5 |
| Alternative 5a | $26.0 |
| Alternative 10 | $26.2 |
| Alternative 5b | $27.2 |
| Alternative 9 | $54.0 |

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

The NYSDEC has provided 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 USAF has selected *Collection/Treatment Between the Runway and Flightline, East Flightline Collection Trench, Idaho Avenue Permeable Treatment Wall, WSA Permeable Treatment Wall, and Pumping of the Core (Alternative 13)* as the preferred alternative for the FT-002/IA Groundwater OU. The development and selection of this alternative is based on a consensus of opinions between the USAF, 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 groundwater contamination through control or treatment along all pathways of expected migration, and will capture and treat an estimated 91 percent of the remaining groundwater contamination in the first 10 years of operation.

## 8.1 Identification of Alternative

The preferred alternative for remediation of the FT-002 Groundwater/IA OU includes the following components.

- A collection trench between the runway and flightline
- A groundwater treatment system, currently envisioned to be a covered aeration basin, to treat contaminated groundwater to levels below effluent criteria.
- Extraction wells located in the plume core (defined as the area where total chlorinated hydrocarbon concentrations are greater than 1,000 µg/l), west of the runway
- A collection trench located just east of the flightline
- A permeable treatment wall along Idaho Avenue
- A permeable treatment wall located upgradient of the WSA drainage system
- Institutional controls to prohibit withdrawal of groundwater for potable use, to control discharge of groundwater withdrawn during construction activities, and to prohibit land use that interferes with remedial operations
- Groundwater and surface water monitoring
- Five-year site reviews

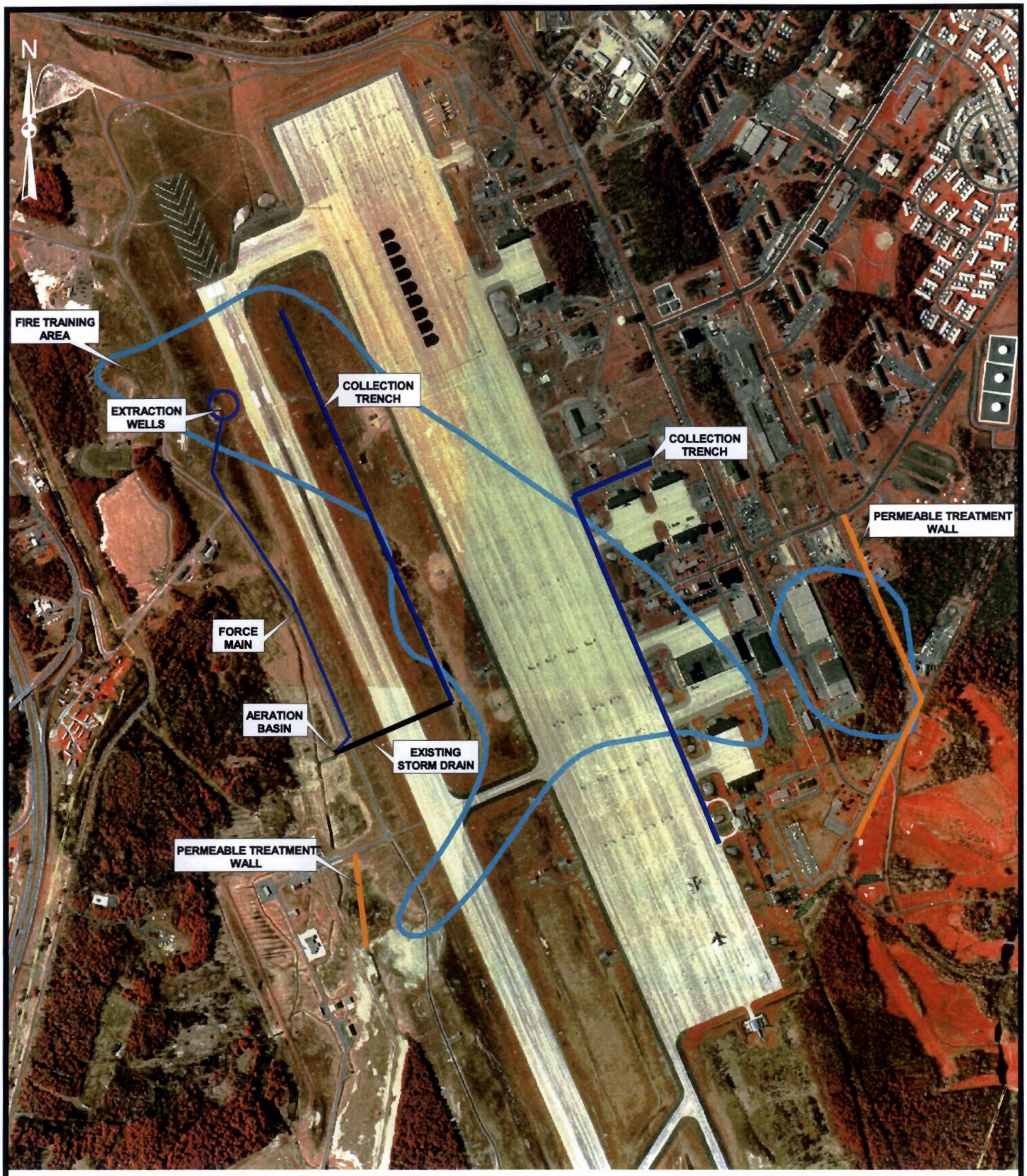
The major constructed components are depicted in Figure 8-1. Note that the conceptual design of these components is based on the expected migration of the existing groundwater contamination and on contingency factors. These components are discussed individually below.

Collection Trench Between the Runway and Flightline

A collection trench would be installed to collect contaminated groundwater from the FT-002 site and part of the flightline area. As currently envisioned, an approximately 5,300-foot-long trench would consist of a perforated drain pipe set in a trench excavated to the deepest possible elevation and to allow gravity flow to the aeration basin (see below). This drain would be tied into the existing storm drain at the point where the existing storm drain crosses underneath the runway to the WSA drainage system.

Aeration Basin

A treatment system would be necessary to treat groundwater from the runway/flightline collection trench and the extraction wells in the plume core. As currently envisioned, a 1,000-square-foot aeration basin would be constructed to treat groundwater from the runway/flightline collection trench and the extraction wells in the plume core (see below). The basin would be covered to control air emissions. Treatment of the air emissions would be provided in a manner consistent with NYSDEC regulations. Treated water would be discharged to the WSA drainage system in a manner consistent with NYSDEC effluent discharge regulations. It is anticipated that groundwater treatment could be discontinued after approximately 15 years following system startup.




**Legend**

Approximate Extent of Chlorinated Hydrocarbons in Groundwater (10 ug/L isopleth)

1200 0 1200 Feet

| URS Consultants, Inc. | LOCATION OF PREFERRED ALTERNATIVE COMPONENTS | FIGURE 8-1 |
|---|---|---|

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Plume Core Extraction Wells

Several deep (to just above the clay unit) vertical groundwater extraction wells would be constructed between the FT-002 site and the runway (as shown in Figure 8-1) to extract contaminated groundwater from the plume core. Five extraction wells were assumed in costing the preferred alternative; the actual number of wells will be determined during design. The extracted groundwater would be transported via a constructed force main and discharged to the aeration basin.

Collection Trench Along the Eastern Edge of Flightline

As currently envisioned, an approximately 4,400-foot-long trench would be constructed in a manner similar to the runway/flightline trench. The collection pipe would be placed at the deepest possible elevation to allow gravity flow to the Golf Course drainage system.

Based on evaluations using groundwater modeling and the results of sampling at the Golf Course, Golf Course streams should not be impacted negatively by discharge from this collection trench. However, because of uncertainties associated with the model, groundwater treatment at the Golf Course is included as a contingency measure. If results of system effluent sampling (conducted after construction of the preferred alternative) show effluent criteria exceedances, then this contingency measure will be implemented. In either case, discharge would be accomplished in a manner consistent with NYSDEC effluent discharge regulations.

Permeable Treatment Wall Along Idaho Avenue

To limit eastward migration of groundwater contamination, a permeable treatment wall, currently envisioned to be approximately 2,900 feet long, would be installed along Idaho Avenue as shown in Figure 8-1. Reactive media would be placed in a trench at this location from above the water table to the top of the clay unit. The reactive media would form an uninterrupted curtain in the unconfined sand aquifer along the entire length of the wall.

As a contingency measure, a collection trench could be installed to serve the same function as the permeable treatment wall at this location. This trench would be constructed, and discharge handled, as discussed for the collection trench along the eastern edge of the flightline, including a contingency for treatment of the collected groundwater.

A decision regarding whether a permeable treatment wall or a collection trench will be applied along Idaho Avenue will be made jointly by the USAF, USEPA, and NYSDEC during the design process. The permeable treatment wall's advantage is that contamination is destroyed in situ, while the collection trench's advantage is that it would be more easily constructed and is less costly. Both options would be equally as effective in preventing further migration of groundwater contamination.

Permeable Treatment Wall Upgradient From WSA

To limit westward migration of a small arm of groundwater contamination travelling toward the WSA drainage system, an approximately 800-foot-long permeable treatment wall would be installed, as shown in Figure 8-1. The final location and orientation of this wall would be based on the results of a predesign boring program; this program would provide data to evaluate the depth to clay and the water table surface, factors which impact cost and constructibility. Like the Idaho Avenue wall, reactive media would be emplaced in a trench at this location from above the water table to the top of the clay unit. Groundwater would be monitored, and data

would be evaluated to determine if the wall is meeting its goal.

Institutional Controls

The institutional controls included in the preferred alternative are:

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

- Prohibition of discharge of groundwater withdrawn during construction dewatering to the ground or surface water, without prior approval of the New York State Department of Environmental Conservation.

- Prohibition of development or land use which interferes with remedial operations.

The USAF will incorporate language implementing the institutional controls, outlined in this Proposed Plan and as specified by the ROD, in deeds/leases/property transfer documents with any grantees, successors, or transferees upon property transfer of any or all of the areas subject to restriction. Because the USAF is the owner of the subject parcels, it is legally able to implement the controls via deeds/leases/property transfer documents. Further, language will be included in the deeds/leases/transfer documents binding the grantee, successor, or transferee to include the language implementing the institutional controls in all future deeds/leases/transfer documents. Review of the effectiveness of the institutional controls will be undertaken, at a minimum, every five years by the USEPA and USAF in accordance with Section 121(c) of CERCLA. Deeds/leases/property transfer documents will be recorded with the Clinton County Clerk's Office, currently located at 137 Margaret Street, in Plattsburgh, New York.

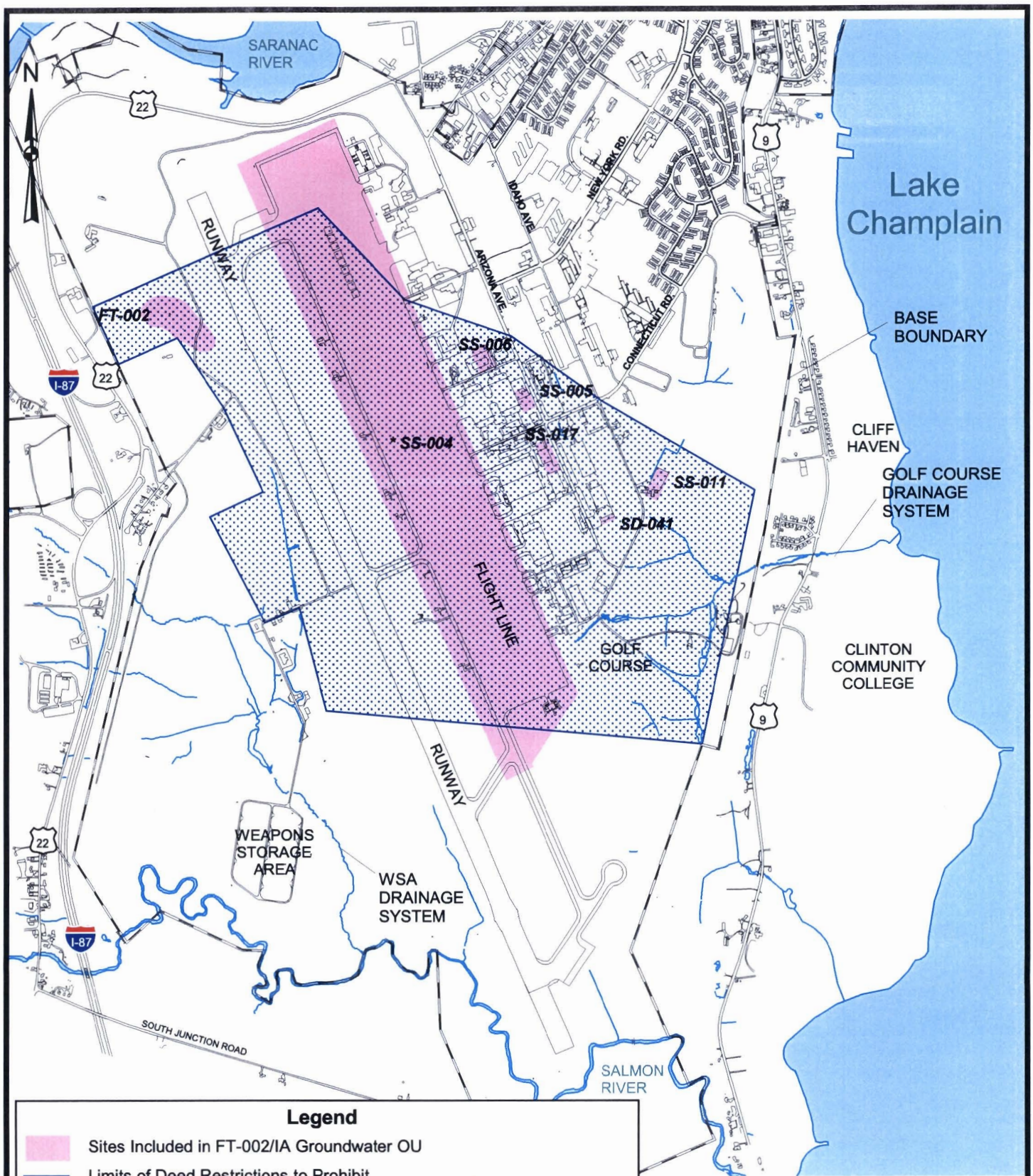
After the ROD is signed, the USAF will incorporate the areal limits (including map coordinates) of the institutional controls onto a basewide map that denotes the extent of all controls that have been agreed upon to date for other IRP sites. This map has been submitted to the NYSDEC, USEPA, and local agencies, and will continue to be updated and distributed as new controls are agreed upon. The areal extent of the controls specific to the FT-002/IA Groundwater OU are shown in Figure 8-2.

Groundwater and Surface Water Monitoring

As currently envisioned, a conceptual groundwater monitoring plan would include the installation of about 10 new monitoring wells and sampling of approximately 46 monitoring wells for VOCs (25 on a semiannual basis and 21 every five years). Conceptually, these wells will have at least 3 purposes: 1) to serve as sentry wells; 2) to evaluate the effectiveness of remediation components; and 3) to determine when groundwater ARARs have been achieved throughout the FT-002/IA Groundwater OU. Surface water samples for VOCs would be collected from nine locations at the Golf Course and WSA drainage systems (five quarterly and four annually). Details regarding proposed locations for these monitoring points are given in the FS (URS 2001e). The actual frequency, locations, and parameters sampled for would be developed in coordination among the USAF, NYSDEC, and USEPA during the design process and detailed in a monitoring plan.

Five-Year Site Review

Every five years (at minimum), a review of the selected remedy will be undertaken by the USAF and USEPA in accordance with Section 121(c) of the 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.




| URS Consultants, Inc. | FT-002/IA GROUNDWATER OPERABLE UNIT ANTICIPATED AREA OF GROUNDWATER USE RESTRICTIONS | FIGURE 8-2 |
|---|---|---|

J:\0100013\DB\GIS\1999\wgoperunit.apr GROUNDWATER RESTRICTIONS 12/26/2001

## 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 8-1 and compared to USAF'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 January 22, 2002 to February 20, 2002 to solicit public input. During this period, the public is invited to review the Proposed Plan, the FT-002/Industrial Area Groundwater OU Remedial Investigation/ Feasibility Study, and other project documents, and to comment on the proposed action. These documents are included in the Administrative Record of the FT-002 site. The full-length reports are available at the Information Repository located at the Feinberg Library at the SUNY Plattsburgh Campus (see page one of this Proposed Plan for the address and available hours).

### Public Informational Meeting

Plattsburgh AFB will hose a public meeting on February 4, 2002 at the old Court House, Second Floor Meeting Room, 133 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 USAF will accept comments about the remedial action being considered for the FT-002 Groundwater OU. 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 and Information Repository.

### 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 February 20, 2002) to:

Mr. Michael D. Sorel
BRAC Environmental Coordinator/
Site Manager
Air Force Base Conversion Agency
22 U. S. Oval, Suite 2200
Plattsburgh, NY 12903
(518) 563-2871

### Plattsburgh AFB's Review of Public Comment

Public comments are part of the process of reaching a final decision on an appropriate remedial alternative for the FT-002 Groundwater OU. 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.

**TABLE 8-1**
**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 reduce the time required to restore groundwater and surface water to ARARs. The extent of the plume and, therefore, the site risk decreases over time for this alternative. This alternative also includes measures that limit the extent of plume migration that further protects human health and the environment. Institutional controls to prevent groundwater use also provide protection during remediation. |
| 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 80 years and chemical-specific ARARs for surface water will be achieved almost immediately after successful operation of the trench between the runway and flightline and treatment system is achieved. |
| 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 will be reduced to an acceptable level after remediation. Groundwater and surface water concentrations will be at or below ARAR levels. During the remediation period, monitoring and deed restrictions will adequately and reliably protect human health and the environment. Institutional controls and monitoring would be discontinued when groundwater restoration is complete. |

**TABLE 8-1 (Continued)**

| CRITERION | DESCRIPTION OF CRITERION | COMPARISON OF ALTERNATIVE TO CRITERION |
|---|---|---|
| Reduction of Toxicity, Mobility, or Volume | Addresses the anticipated performance of treatment technologies employed in the remedy. | The aeration basin included in the preferred alternative will remove an estimated 8,000 pounds of chlorinated compounds from groundwater during the first 10 years of operation. This is approximately 91% of the estimated quantity of chlorinated compounds presently in groundwater. The two permeable treatment walls also will remove and treat contamination from groundwater. |
| 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 two collection trenches and two permeable treatment walls would produce a small potential risk to workers and the community, mainly from air emissions. 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 80 years and surface water (a portion of the WSA drainage stream) would be restored to ARARs almost immediately after successful operation of the trench between the runway and flightline and treatment system is achieved. |
| 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 the technologies except the permeable treatment walls are conventional and standardized. Bench-scale testing (and possibly pilot testing) would be required to prove the effectiveness of the permeable treatment walls. As an alternative to the permeable treatment wall along Idaho Avenue, a collection trench could be installed to serve the same function in the preferred alternative. Groundwater and surface water |

**TABLE 8-1 (Continued)**

| CRITERION | DESCRIPTION OF CRITERION | COMPARISON OF ALTERNATIVE TO CRITERION |
|---|---|---|
| | | 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 is $9.5 million (capital cost). It is expected that $370,000 will be needed annually to operate the remedial systems and to perform monitoring. The overall present worth is $15.7 million. |
| 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 FT-002/IA Groundwater Operable Unit. A description of how the community can become involved in the selection process is presented in Section 9.0. |

Note: The estimates of cleanup timeframes and mass of contaminants treated are based on the groundwater transport model and are imprecise. That is, the estimates are based on projections of the model several decades into the future so results cannot be regarded with absolute certainty. The accuracy of the estimates, however, meets the goals of USEPA RI/FS guidance with respect to evaluating and comparing alternatives.

## Additional Public Information

Because the Proposed Plan only summarizes the field investigation and remedial alternative for the FT-002 Groundwater OU, the public is encouraged to consult the Information Repository which contains the complete RI/FS, and other supporting reports.

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## GLOSSARY

*Accelerated Restoration*: A pump-and-treat restoration process by which groundwater is pumped out of an aquifer faster than the rate of normal groundwater recharge. The pumped water is reinjected into the aquifer after treatment so that water is recirculated through the aquifer at a rapid rate. Also called soil washing.

*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.

*Aeration:* A remediation method whereby air is pushed through a contaminated media (e.g., soil or groundwater), facilitating compounds susceptible to volatilization to do so.

*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.

*BTEX:* Volatile organic compounds (benzene, toluene, ethylbenzene, xylene) typically associated with gasoline and other fuel product contamination.

*Carcinogenic:* Chemicals which, when exposure occurs at a particular level, may produce cancer.

*Chlorinated Compounds:* An organic compound that contains chlorine such as trichloroethene (TCE) and dichloroethene (DCE). Also referred to as chlorinated hydrocarbons or chlorinated solvents.

*Collection/Treatment:* Collecting and treating groundwater to remove contamination. 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.

*Containment:* A remedial measure whereby contaminants in groundwater are to prevented from migrating by a barrier. The barrier can be physical (e.g., slurry wall) or hydrologic (line of pumping wells that reverse the direction of groundwater flow).

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

*Ecological Receptors:* Fauna or flora (plant and animals) in a given area that could be affected by contaminants in surface soils, surface water, and/or sediment.

*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.

*Floating Product*: A chemical or mixture of chemicals in pure form (non-aqueous or not dissolved in water) that is of lighter density than water and therefore floats on the top of the water table.

*Free Product:* A chemical or mixture of chemicals in pure form (non-aqueous or not dissolved in water). The substance is free if it can be recovered by pumping.

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

*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.

*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.

*Natural Attenuation:* Processes by which contaminant levels are reduced in nature. Contaminants in soil or groundwater are reduced by aerobic (oxygen-using) bacteria, other biological activity, volatilization, and dilution/dispersion.

*New York State Registry of Inactive Hazardous Waste Sites:* The state's compilation of all known hazardous waste sites, comprising nine volumes with site descriptions and locations. (Copies available for review in NYSDEC offices).

*Noncarcinogenic:* Chemicals that may produce adverse health effects that are not related to cancer.

*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.

*Permeable Treatment Wall:* A remedial measure whereby contaminated groundwater passes through a reactive media (usually an iron filings-type material) and a chemical reaction occurs destroying the contamination.

*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.

*Product:* A chemical or mixture of chemicals in pure form (nonaqueous or not dissolved in water).

*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.

*SARA:* The Superfund Amendments and Reauthorization Act of 1986 amended the 1980 CERCLA environmental statues. The amendments re-authorized the federal Superfund which had expired in 1985 and established the preference for remedies that permanently reduces toxicity, volume or mobility of hazardous constituents.

*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.

*Source Control:* A remedy that addresses contamination problems at their source, rather than at some other more distant point along the chain of exposure.

*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.

*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.

*Terrestrial Wildlife:* Animals living on land (e.g., reptiles, small mammals, small birds, predatory mammals, predatory birds).

*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.

*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.