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PROPOSED PLAN FOR OPERABLE UNIT 4 (OU 4) NTC ORLANDO FL

11/1/2000

NAVFAC SOUTHERN

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Former Naval Training Center, Orlando, Florida

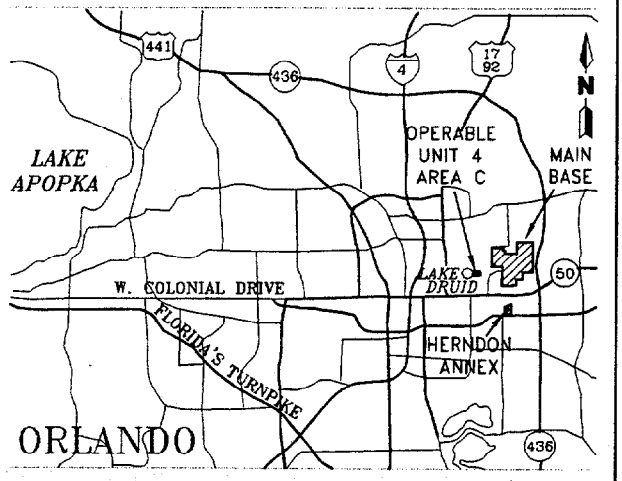
Proposed Plan

Operable Unit 4

Introduction

This Proposed Plan provides the public with an opportunity to comment on the selected cleanup remedy for Operable Unit (OU) 4 at the former Naval Training Center (NTC), Orlando (Figure 1) and presents the reasoning behind the remedy selection. Additional information can be found in the Remedial Investigation (RI) and Feasibility Study (FS) reports and other site documents, which are available for review at the Information Repository (see inset below). The RI and FS reports will be submitted as final documents in December 2000 or January 2001, incorporating lessons learned from small scale treatment technology studies conducted earlier this year.

Figure 1. Operable Unit 4, Site Location Plan



Past site activities at OU 4 have caused contamination in both soil and groundwater. Soil contamination in three small areas was likely caused by (1) routine application of pesticide containing arsenic, or (2) releases of either fuel or products of combustion in the form of PAHs (polynuclear aromatic hydrocarbons). PAHs at the levels found at OU 4 are common in an urban environment. The soil was cleaned up to Florida residential standards during an Interim Remedial Action (IRA) in May 1999, when contaminated soil was excavated, disposed of in a secure landfill, and replaced with clean fill.

Groundwater contamination consists of several chlorinated volatile organic compounds (VOCs). Studies have shown that the VOCs originated from improper handling of solvents used at the base laundry, which closed in 1994. In addition, there is a small antimony plume in a different portion of the OU at levels slightly exceeding State drinking water standards.

Eleven solutions are being considered for cleaning up groundwater. Seven of these solutions are intended to clean up the VOCs, whereas four are for the antimony. The solutions are summarized on pages 6 and 7. For a detailed description and analysis of all alternatives, please see the FS report, available at the NTC, Orlando Information Repository.

Site History

NTC, Orlando OU 4 is located at Area C of the NTC. OU 4 consists of three former study areas (SAs) which include the Defense Reutilization and Marketing Office [DRMO] Warehouses and Salvage Yard (SA 12), former base laundry and drycleaning facility (SA 13), and DRMO Storage Area (SA 14) (Figure 2).

These SAs were first identified as areas of potential concern during the NTC, Orlando Environmental Baseline Survey (EBS), completed in 1994. The EBS resulted in site screening investigations, which were conducted in January through April 1995. These investigations included geophysical and soil gas surveys, surface and subsurface soil sampling, and the installation of 16 monitoring wells to evaluate groundwater quality.

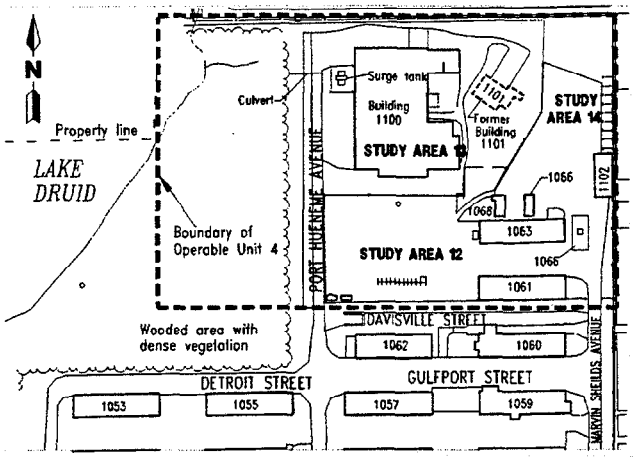
The site screening investigation identified groundwater contaminated with chlorinated VOCs, including tetrachloroethene (PCE), trichloroethene (TCE), and cis-1,2-dichloroethene (DCE) in the vicinity of the laundry building. PCE was the solvent used in the drycleaning operations. TCE and DCE are chemicals that form as PCE degrades through natural processes following a release. There were several documented

For More Information

For details on the investigation results and cleanup alternatives, see the following reports: Operable Unit (OU) 4 Remedial Investigation and Feasibility Studies, Potassium Permanganate Pilot Study Results, and Completion Report for Study Areas 17, 18, 23, 35, 37, and 42 and OUs 3 and 4. These reports and several others are available for review in the Information Repository located at the Orlando Public Library, Social Sciences Department, 2nd floor, 101 East Central Blvd., Orlando, Florida 32801.

small releases of PCE at the laundry. The groundwater flows from the laundry toward Lake Druid, about 300 feet to the west. Antimony was also detected in groundwater above Florida drinking water standards in a small area of SA 14.

Figure 2. Operable Unit 4 Site Features



After review of the site screening data, the NTC, Orlando Restoration Advisory Board (RAB) requested sampling of surface water and sediment along the Lake Druid shoreline. These samples were collected in November 1995. The results identified the above three VOCs plus vinyl chloride (VC) in surface water exceeding Florida criteria. In December 1995, additional surface water samples were collected in the lake. Groundwater samples were also collected between the laundry facility and Lake Druid. The groundwater data indicated that there were VOCs in groundwater to a depth of about 30 feet.

Using these data, a preliminary human health and ecological risk evaluation (PRE) was completed in April 1996. The PRE was reviewed and approved by FDEP and USEPA, and concluded that although potential human health risks existed, a serious risk to human health or animal and plant life was not present.

In May 1996, a focused field investigation (FFI) was conducted along the lakeshore. The FFI was performed to (1) define the extent of contamination in Lake Druid surface water and sediment, (2) evaluate the source of VOCs in Lake Druid, and (3) delineate the horizontal and vertical extent of VOC contaminants in groundwater along the lake shore. The purpose for the FFI was to determine how best to prevent VOCs from reaching Lake Druid. An interim remedial measure to reduce or eliminate VOCs from reaching the lake would serve as a temporary measure until a final solution could be put in place.

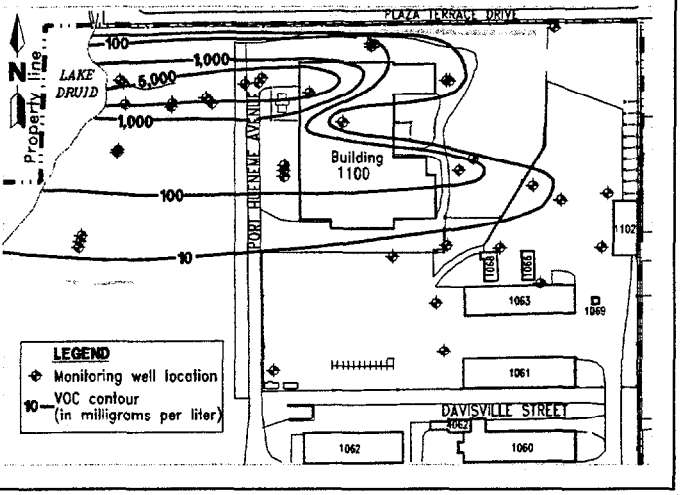
The FFI established that the likely source of VOCs to Lake Druid was the laundry facility. VOCs were detected in groundwater beneath the woods between the laundry and Lake Druid, and in the lake up to 75 feet away from the shoreline.

In August 1996, a pumping test was performed at OU 4 to study the aquifer properties. Data would be used to support the future IRA.

In the fall of 1996, several technologies were evaluated that might prevent the VOCs from reaching Lake Druid. The technology selected was a recirculation well system to remove the VOCs from groundwater between the laundry and the lake. The IRA selection process is described in the OU 4 Focused Feasibility Study, issued final in May 1997.

A focused source investigation was performed in March 1997. The purpose was to identify the location of the source of VOCs in groundwater. Learning more about the source would help to determine which cleanup technology might be suitable in this area. This investigation identified a source area approximately 250 feet long, 75 feet wide, and 30 feet thick (Figure 3). The majority of the source area was located under the laundry building. Another, smaller VOC plume was delineated about 150 to 200 feet south of the larger plume associated with the base laundry (Figure 3). The source for this plume is unknown, but may have been due to a small solvent spill in 1989, although the exact location for the spill was not recorded.

Figure 3. VOC Groundwater Contamination Plume



In addition, antimony was discovered in the east-central portion of the OU at concentrations slightly exceeding State drinking water standards (Figure 4). The source of the antimony is somewhat speculative, but may have been due to spillage of flame retardant materials, possibly used in the laundry.

In May 1997, the conceptual design for the recirculation well IRA was completed to address the VOC plume. A vendor was selected and the two recirculation wells were installed at OU 4 in December 1997.

The recirculation wells began operation in January 1998. By January 1999, the IRA had reduced VOC concentrations in the plume to levels below Florida surface water standards, including the water entering Lake Druid. A schematic drawing of one of the recirculation wells is shown on Figure 5. Please refer to page ? for a chronological summary of the Facility and Site History 1940 to Present.

Figure 4. Antimony Groundwater Contamination Plume

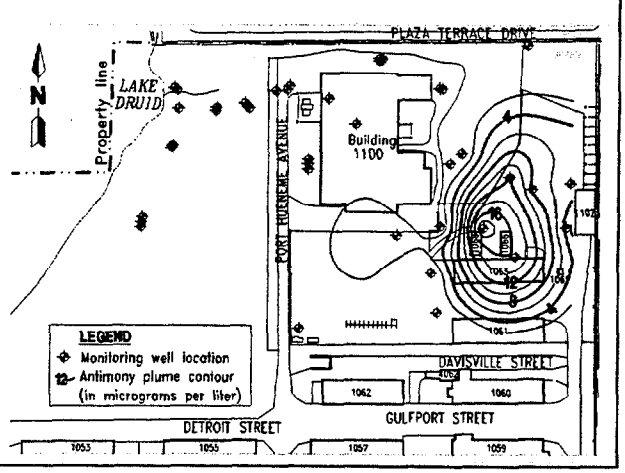
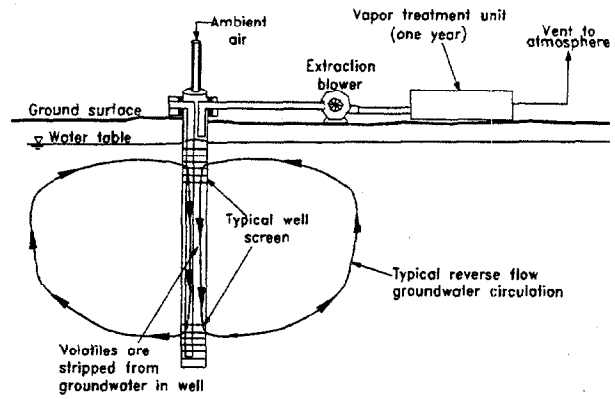


Figure 5. Schematic of OU 4 IRA Recirculation Wells



The primary purpose for the site screening, FFI, and source area investigations described above was to characterize groundwater in the immediate vicinity of the laundry building and at the shoreline of Lake Druid. Therefore, a comprehensive RI was performed at OU 4 from January to March 1997. The RI completed the characterization of site soil and groundwater. The RI was completed in accordance with USEPA's *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA.* CERCLA stands for the Comprehensive Environmental Response, Compensation, and Liability Act, and is more commonly referred to as the *Superfund* Act. Although NTC, Orlando is not a Superfund site, the RI for OU 4 was conducted in accordance with Superfund guidance to ensure a complete evaluation of site conditions.

The results of the RI were used to complete human health and ecological risk assessments for OU 4. In addition to the groundwater contaminants above drinking water standards (VOCs and antimony), the RI also identified soil contaminants at several locations (arsenic and PAHs). These concentrations were above State of Florida standards for future residential use.

In December 1997, a natural attenuation evaluation was performed at OU 4. The purpose was to determine the extent to which natural processes (e.g., biodegradation and dilution) could reduce VOCs in groundwater between the laundry building and the lake. This study estimated that if VOCs in the source area could be reduced to about 100 parts per billion (ppb), that natural processes will further reduce VOCs to Florida surface water criteria before the plume reaches the lake.

A limited groundwater treatability study was performed at OU 4 in May 1998. This consisted of air sparging within the source area. The study was intended to determine if air sparging was a feasible technology in the source area, and to determine the depths and spacing between sparge points needed for a full scale cleanup. The study concluded that the geology was unsuitable for this technology because of a hard sand layer located approximately 20 feet below the surface. The sand layer prevented the injected air from moving vertically through the groundwater.

A preliminary FS was completed in January 1999. This study evaluated several technologies to clean up VOCs and antimony in groundwater. The evaluation showed that chemical oxidation with potassium permanganate ($KMnO_4$) was a promising technology to treat the VOC source area. However, $KMnO_4$ had never been used in a full scale cleanup to attack PCE.

Therefore, a small scale study was conducted at the source area from February through July 2000. The study was very successful, and chemical oxidation with $KMnO_4$ is the recommended technology for full scale implementation to clean up the PCE source area.

In May 1999 soil contaminated with PAHs and arsenic was removed from three locations at OU 4. Soil sampling confirmed that the three locations had been cleaned up.

Sampling of Lake Druid sediment during the RI detected the presence of PAHs, polychlorinated biphenyls (PCBs), and pesticides. Scientists had suspected that these contaminants were present due to stormwater runoff into Lake Druid from the surrounding residential neighborhood and office park. A comparison between Lake Druid contaminants with sediment data collected throughout the state of Florida was completed in October 1999. The Orlando Partnering Team (OPT), including representatives from FDEP and USEPA, concluded that the contaminants detected in Lake Druid were likely not the result of Navy activities at Area C.

By the spring of 2000, the recirculation wells were performing intermittently due to mechanical problems within the aquifer, and the IRA was no longer effective in controlling the flow of VOCs toward Lake Druid. Therefore, in May 2000, the recirculation wells were disassembled and an attempt was made to refurbish them. The refurbishment was not successful, and the OPT concluded that the recirculation wells were no longer viable, and a replacement IRA was needed. A conventional groundwater extraction and treatment system was designed, making use of the existing recirculation wells. Groundwater is currently being pumped to a holding tank, VOCs are then removed with a tray stripper, and the treated water is pumped to the sanitary sewer. This new treatment system was operational in November 2000.

Implementation of a final remedy at OU 4 is expected to be in place before the end of 2001.

Why is Cleanup Needed?

The Navy's studies of OU 4 resulted in the following conclusions:

- Several VOCs were found in the shallow aquifer at concentrations potentially harmful to humans if they drank the groundwater. The chemicals of concern are PCE, TCE, and cis-1,2-DCE.
- One metal was also found in groundwater in a small portion of the OU at concentrations slightly exceeding Florida drinking water standards. The metal is antimony, and may have been introduced into the aquifer by spillage of flame retardant materials used by the laundry.
- Based on the results of the RI/FS, a number of cleanup alternatives for groundwater were developed and evaluated in the FS according to USEPA guidelines. These cleanup alternatives are combinations of actions taken to contain, remove, treat, or restrict access to contamination in order to protect the public and the environment. Seven alternatives for VOCs and four alternatives for antimony in groundwater were considered, ranging from no action to extraction and treatment and/or filtration.

The Cleanup Proposal

Seven groundwater alternatives were considered to remediate VOCs. For all of the groundwater cleanup alternatives, the IRA would continue to operate until the levels of organic contaminants in the groundwater are low enough so that natural processes would "polish" them to Florida surface water standards. Several of these alternatives are unattractive because, for example, they may not clean up the aquifer rapidly enough or they are too expensive and judged not to be as effective as others. However, they were considered because of requirements under CERCLA.

- ***Alternative V-1 No Action:*** Essentially status quo, no remedial response or long-term monitoring occurs under this alternative. Site reviews are conducted every 5 years to determine if this alternative is still appropriate.
- ***Alternative V-2 Limited Action:*** This alternative is similar to the No Action alternative. However, this alternative also includes deed restrictions to limit the use of groundwater at the site and a long-term groundwater monitoring program.

The remaining alternatives address the source area of organic contaminants and the northern groundwater plume. The southern groundwater plume is addressed by enhanced biodegradation. This technology accelerates natural processes by injecting a food source into the subsurface to feed organisms that are known to degrade the organic contaminants.

- ***Alternative V-3 Chemical Oxidation and Enhanced Biodegradation:*** Chemical oxidation, involves the injection of potassium permanganate into the groundwater to chemically destroy the organic contaminants. Field studies conducted at the site have confirmed the potential success of this technology.
- ***Alternative V-4 Air Sparging and Enhanced Biodegradation:*** This alternative involves the injection of air into the groundwater through wells. The airflow causes the organic contaminants to volatilize from the groundwater. A vacuum is applied through additional wells to remove the vapors, which are then treated.
- ***Alternative V-5 Recirculation Wells and Enhanced Biodegradation:*** Recirculation wells strip organic contaminants from groundwater within the well. Recirculation wells can be more efficient than conventional groundwater extraction and treatment systems, like those described in Alternatives V-6 and V-7.

The last two groundwater treatment alternatives involve removal of the groundwater from the subsurface using pumping wells. The contaminated groundwater is then treated using various methods.

- ***Alternative V-6 Groundwater Extraction, Air Stripping and Discharge into Lake Druid:*** For this alternative, the source area is treated by extracting groundwater, which is then treated in a diffused aeration tank and discharged into Lake Druid. This alternative is a variation of a well-established and widely used technology. However, the time required to meet contaminant level objectives is quite long using this alternative (over 100 years!).
- ***Alternative V-7 Groundwater Extraction, UV/Oxidation and Discharge to Lake Druid:*** This alternative treats extracted groundwater using ultraviolet light and hydrogen peroxide. This is the most expensive alternative among those evaluated here. As with Alternative V-6, the time required to meet the contaminant level objectives is very long.

To address the antimony contamination, four treatment alternatives were evaluated.

- ***Alternative A-1 No Action:*** Only administrative actions are taken under this alternative and include review of the site conditions and exposure scenarios every 5 years. No remedial response or long-term monitoring occurs.
- ***Alternative A-2 Limited Action:*** This alternative implements a long-term groundwater monitoring program and institutional controls to restrict groundwater use. Site reviews are conducted every 5 years to assess water quality without active treatment.
- ***Alternative A-3 Extraction and Discharge to the Orlando STP:*** For this alternative, groundwater contaminated with antimony is extracted through pumping wells and discharged to the City of Orlando sewage treatment plant. Maximum antimony levels in the groundwater are well below discharge standards for the sewage treatment plant.

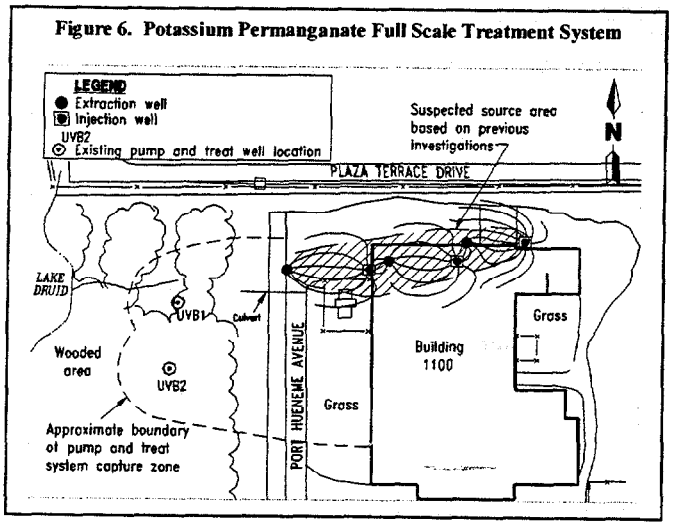
- ***Alternative A-4 Extraction, Treatment via the NP™ Ultrafiltration System and Discharge into Lake Druid:*** Groundwater containing antimony is extracted through a pumping well, and then treated using a commercially available filtration unit. The treated groundwater is then discharged to Lake Druid. This alternative is the most expensive of the antimony treatment alternatives considered here.

Proposed Plan

After careful consideration of the conditions at OU 4, comparison of cleanup alternatives, and consideration of the proposed reuse of the area, the OPT proposes the following plans to address the potential risk from groundwater contamination in the shallow aquifer. For VOCs, ***Alternative V-3, Chemical Oxidation and Enhanced Biodegradation*** has been chosen (Figure 6).

Chemical oxidation (potassium permanganate) will be used to remediate the source area adjacent to and under the laundry building, the so-called "northern" plume. The smaller "southern" plume will be treated with enhanced biodegradation. No remedial action will be implemented for the antimony plume until VOCs are remediated in the source area. Engineers fear that the performance of the VOC treatment system may be adversely affected by the antimony treatment. During this period, the antimony plume will be closely monitored, although the plume currently appears to be stable, and is not expected to be of major concern in the future. When treatment of the southern plume VOCs is complete, and groundwater monitoring indicates that antimony levels still exceed Florida maximum contaminant levels, an appropriate active remedial option will be selected, such as ***Alternative A-3 Extraction and Discharge to the Orlando STP.***

Figure 6. Potassium Permanganate Full Scale Treatment System



The OPT will select a final cleanup action for the site after consideration of public comments. The public comment period will extend for a 30-day period to be announced in the Orlando Sentinel. The final cleanup action will be detailed in the OU 4 ROD document for the site. The ROD will be available in the Information Repository when completed.

Facility and Site History 1940 to Present

1940s
Orlando Municipal Airport property taken over by U.S. Army Air Corps in 1940 and commissioned as Orlando Air Base. In 1947, the U.S. Air Force assumed command of Orlando Air Force Base.

1968
Navy assumed control of the entire base and recommissioned all parcels as the Naval Training Center, Orlando.

1985
The first Installation Restoration activity involving NTC occurred. An Initial Assessment Study (IAS) concluded that no further study of Area C was necessary, as efforts to clean up asbestos associated with the old laundry boiler building (Building 1101) were planned. No recommendations were made to investigate the base laundry (Building 1100).

1986
A Verification Study was completed at the NTC based on recommendations from the IAS. No work was recommended or performed at Area C.

July 1993
The Base Realignment and Closure Commission recommended closure of NTC, Orlando.

June 1994
As part of base closure, an EBS was completed for the entire NTC, Orlando. SAs 12, 13 and 14 were recommended for investigation due to potential environmental releases associated with the DRMO (SA 12), the base laundry (SA 13), and the DRMO storage area (SA 14).

January-April 1995
Site Screening Investigation. Soil and groundwater testing confirmed that certain VOCs and other contaminants had been released to the environment at all three SAs. Because of their proximity, these SAs were combined as Operable Unit 4 for administrative purposes.

November-December 1995
Initial Lake Druid sampling took place to determine if contaminants had reached the lake at concentrations of concern. Several VOCs were present at concentrations exceeding State of Florida surface water standards.

April 1996
A PRE was completed to determine if contaminants in Lake Druid posed a health risk to human and ecological receptors. The study concluded that there was potential long-term risk, but that the risk could be managed in the short term by institutional controls, including increasing public awareness and posting warning signs (the property currently has restricted access).

May 1996
A FFI was conducted to delineate the VOC contamination in groundwater along the lake shore, and in surface water and sediment.

August 1996
A Pumping Test was conducted to determine hydrologic characteristics of the contaminated shallow aquifer.

March 1997
A Focused Source Investigation was completed to confirm whether or not the area around a surge tank at the northwest corner of the former laundry building was a primary source of groundwater contamination.

May 1997
A Focused Feasibility Study (FFS) was completed to confirm the suspected location of the VOC source area and estimated its size.

May 1997
The IRA Conceptual Design was completed, based on the FFS.

December 1997
The chosen IRA (Recirculation Wells) was installed and began operation.

January-March 1997
RI field studies took place.

December 1997
A Natural Attenuation Evaluation was conducted to determine the rate at which natural processes are reducing the concentrations of the chlorinated solvents.

May 1998
An Air Sparging Pilot Study was completed to determine the effectiveness of this technology in eliminating chlorinated solvents from the source area.

January 1999
The Draft FS was submitted. The FS is a report presenting the evaluation of several remedial technologies and an estimate of their costs.

April 1999
NTC, Orlando was formally decommissioned.

May 1999
Surface soil removals took place in three small areas contaminated with arsenic and fuel-derived compounds, or PAHs

October 1999
An evaluation of potential sources of Pesticides and PAHs in Lake Druid was completed; the study concluded that the source of minor levels of contaminants is common in similar surface water bodies throughout Florida, and that the likely source is urban runoff unrelated to Navy activities at Area C.

February-July 2000
A Potassium Permanganate ($KMnO_4$) Pilot Study was completed to determine the effectiveness of this chemical additive in reducing chlorinated contaminant concentrations in groundwater to levels below drinking water standards. The results of the study are very promising, and it is recommended that this technology be implemented as the final solution.

November 2000
The two IRA recirculation wells were modified into simple pumping wells in order to pump and treat groundwater downgradient from the source and protect Lake Druid. A full-scale $KMnO_4$ treatment system is planned for a portion of the final solution.

Glossary

DCE	dichloroethene
EBS	Environmental Baseline Survey
FDEP	Florida Department of Environmental Protection
FFI	focused field investigation
FFS	Focused Feasibility Study
FS	Feasibility Study
IAS	Initial Assessment Study
IRA	Interim Remedial Action
$KmnO_4$	potassium permanganate
NTC	Naval Training Center
OPT	Orlando Partnering Team
OU	Operable Unit
PAH	polynuclear aromatic hydrocarbon
PCBs	polychlorinated biphenyls
PCE	tetrachloroethene
ppb	parts per billion
PRE	preliminary human health and ecological risk evaluation
RAB	Restoration Advisory Board
RI	Remedial Investigation
SA	Study area
TCE	trichloroethene
USEPA	U.S. Environmental Protection Agency
VC	vinyl chloride
VOC	volatile organic compounds