Public Health Assessment for

NAVAL AIR STATION CECIL FIELD
(a/k/a USN AIR STATION CECIL FIELD)
JACKSONVILLE, DUVAL COUNTY, FLORIDA
EPA FACILITY ID: FL5170022474
SEPTEMBER 30, 2002

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
Agency for Toxic Substances and Disease Registry

PUBLIC HEALTH ASSESSMENT

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Prepared by:

Federal Facilities Assessment Branch
Division Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6)), and in accordance with our implementing regulations (42 C.F.R. Part 90). In preparing this document, ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate.

In addition, this document has previously been provided to EPA and the affected states in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. The revised document was released for a 30-day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The public health assessment has now been reissued. This concludes the public health assessment process for this site, unless additional information is obtained by ATSDR which, in the agency's opinion, indicates a need to revise or append the conclusions previously issued.

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FOREWORD

The Agency for Toxic Substances and Disease Registry, ATSDR, was established by Congress in 1980 under the Comprehensive Environmental Response, Compensation, and Liability Act, also known as the *Superfund* law. This law set up a fund to identify and clean up our country's hazardous waste sites. The Environmental Protection Agency, EPA, and the individual states regulate the investigation and clean up of the sites.

Since 1986, ATSDR has been required by law to conduct a public health assessment at each of the sites on the EPA National Priorities List. The aim of these evaluations is to find out if people are being exposed to hazardous substances and, if so, whether that exposure is harmful and should be stopped or reduced. If appropriate, ATSDR also conducts public health assessments when petitioned by concerned individuals. Public health assessments are carried out by environmental and health scientists from ATSDR and from the states with which ATSDR has cooperative agreements. The public health assessment program allows the scientists flexibility in the format or structure of their response to the public health issues at hazardous waste sites. For example, a public health assessment could be one document or it could be a compilation of several health consultations the structure may vary from site to site. Nevertheless, the public health assessment process is not considered complete until the public health issues at the site are addressed.

Exposure: As the first step in the evaluation, ATSDR scientists review environmental data to see how much contamination is at a site, where it is, and how people might come into contact with it. Generally, ATSDR does not collect its own environmental sampling data but reviews information provided by EPA, other government agencies, businesses, and the public. When there is not enough environmental information available, the report will indicate what further sampling data is needed.

Health Effects: If the review of the environmental data shows that people have or could come into contact with hazardous substances, ATSDR scientists evaluate whether or not these contacts may result in harmful effects. ATSDR recognizes that children, because of their play activities and their growing bodies, may be more vulnerable to these effects. As a policy, unless data are available to suggest otherwise, ATSDR considers children to be more sensitive and vulnerable to hazardous substances. Thus, the health impact to the children is considered first when evaluating the health threat to a community. The health impacts to other high risk groups within the community (such as the elderly, chronically ill, and people engaging in high risk practices) also receive special attention during the evaluation.

ATSDR uses existing scientific information, which can include the results of medical, toxicologic and epidemiologic studies and the data collected in disease registries, to determine the health effects that may result from exposures. The science of environmental health is still developing, and sometimes scientific information on the health effects of certain substances is not available. When this is so, the report will suggest what further public health actions are needed.

Conclusions: The report presents conclusions about the public health threat, if any, posed by a site. When health threats have been determined for high risk groups (such as children, elderly, chronically ill, and people engaging in high risk practices), they will be summarized in the conclusion section of the report. Ways to stop or reduce exposure will then be recommended in the public health action plan.

ATSDR is primarily an advisory agency, so usually these reports identify what actions are appropriate to be undertaken by EPA, other responsible parties, or the research or education divisions of ATSDR. However, if there is an urgent health threat, ATSDR can issue a public health advisory warning people of the danger. ATSDR can also authorize health education or pilot studies of health effects, fullscale epidemiology studies, disease registries, surveillance studies or research on specific hazardous substances.

Community: ATSDR also needs to learn what people in the area know about the site and what concerns they may have about its impact on their health. Consequently, throughout the evaluation process, ATSDR actively gathers information and comments from the people who live or work near a site, including residents of the area, civic leaders, health professionals and community groups. To ensure that the report responds to the community's health concerns, an early version is also distributed to the public for their comments. All the comments received from the public are responded to in the final version of the report.

Comments: If, after reading this report, you have questions or comments, we encourage you to send them to us.

Letters should he addressed as follows:

Attention: Chief, Program Evaluation, Records, and Information Services Branch, Agency for Toxic Substances and Disease Registry, 1600 Clifton Road (E60), Atlanta, GA 30333.

Summary

Naval Air Station (NAS) Cecil Field is approximately 14 miles southwest of Jacksonville in northeastern Florida. NAS Cecil Field was in operation (except for brief periods of inoperation) from 1941 to September 30, 1999 when operations ceased. The base property occupied more than 31,000 acres, primarily in Duval County with the southern portion of the base extending into Clay County. Approximately 17,200 acres will be transferred to the private sector (non-military) and the remainder will be transferred to NAS Jacksonville. The future ownership of these areas will be the city of Jacksonville (10,560 acres), the Jacksonville Port Authority (6,000 acres), and Clay County (641 acres). To date, more than 95% of the property designated for the private sector use has been transferred.

Historically the mission of the base had been to provide facilities, services, and material support for the operation and maintenance of naval weapons and aircraft. NAS Cecil Field was listed on the U.S. Environmental Protection Agency (EPA) National Priorities List (Superfund List) in 1989, based on indications that there was shallow groundwater, surface water, and soils contamination. Twelve "operable units" consisting of twenty-four separate areas of contamination have been identified as well as other potential sources of contamination. Environmental investigations at NAS Cecil Field are in varying stages of completion. Less than 800 acres of the 17,200 acres have been determined to be contaminated and require additional investigation or remediation. The majority of contaminated sites are located on the Main Base primarily to the west of the north-south runways.

ATSDR has focused our review of environmental exposures primarily on future uses of the property and has strived to provide information on safely managing the remaining environmental hazards for the current and future property users. Those situations we believe need more careful future management are the main focus of this document. From our review, ATSDR identified nine situations which have the most potential for human exposure. One of the situations poses a health hazard, four require more data or information about whether contamination has reached areas where people are living or working, three others could have exposure occurring, but exposure to the contaminants at the levels detected would not pose a health hazard, and one currently posing no public health hazard. The areas or activities people engage in that could result in exposure are as follows:

On-Base Groundwater

1) Future building occupants could be exposed to fuel components and other volatile compounds seeping into indoor air from on base groundwater contamination.*(Future - Indeterminate Public Health Hazard, Current - No Public Health Hazard)*

   EPA and the Navy should consider implementing an assessment of new or restructured buildings at risk for indoor air contamination as part of the Superfund Comprehensive Five Year Review.

2) In the future, building occupants could be exposed to contaminated drinking water on base. *(Future - Indeterminate Public Health Hazard, Current - No Public Health Hazard)*

EPA and the Navy should consider implementing an assessment of new and existing wells at risk for contamination as part of the Superfund Comprehensive Five Year Review.

Jet Fuel Pipeline (between NAS Cecil Field and NAS Jacksonville along 103rd Street)

3) Off-base private drinking water wells near the areas with past pipeline leaks and other pollution sources in the vicinity could be or become contaminated. *(Indeterminate Public Health Hazard)*

The Florida Department of Environmental Protection (FDEP) should provide educational material (such as radio or television broadcast or printed material in the newspaper) warning well owners of the possible regional contamination hazards prompting them to have their well sampled annually. Alternatively, a complete well survey can be conducted and people notified individually.

Because individual private, and especially shallow, wells can be affected by fuel leaks, improperly functioning septic tanks, small industrial waste disposal practices, and residential use and disposal of pesticides along 103rd Street, people should have their wells tested for volatile organic compounds, semi-volatile organic compounds, pesticides, and metals.

4) Current and future building occupants living near the 103rd Street Jet Fuel Pipeline could be exposed to fuel components and other pollutants seeping into indoor air. *(Indeterminate Public Health Hazard)*

Building occupants should report fuel odors in indoor air to the FDEP, Bureau of Emergency Response 1-800 320-0519 or (904) 807-3300 or the local fire department.

Site 15 (Blue Ordnance 10)

5) If unremediated or remediation is limited, current trespassers and future recreational users could be exposed to lead and other contaminants in soils, sediment, surface water and possibly other firing ranges on the Yellow Water Weapons Area. *(Future-Indeterminate Public Health Hazard, Current - No Apparent Public Health Hazard)*

The Navy, FDEP, and EPA are working to prevent people from having frequent contact with soils by implementing deed restrictions, monitoring during the Superfund Comprehensive Five Year Review, and possibly conducting limited soil removal. ATSDR recommends continuing evaluation of the land use controls during the Superfund Comprehensive Five Year Review to determine if changes in the economy or the regional vision for NAS Cecil Field redevelopment result in a proposed residential reuse or recreational activities where children could have frequent (i.e., several times a week) contact with the soils.

6) People could be eating contaminated fish or turtles from Yellow Water or Sal Taylor Creek draining Site 15; however, the levels are predicted to be too low to pose a public health hazard. *(Current - No Apparent Public Health Hazard)*

High dissolved lead levels have been found in surface water samples that run off Site 15 and during heavy rain events, possibly into Yellow Water Creek. We are recommending that the Superfund Comprehensive Five Year Review include an evaluation of whether increased use of this area is resulting in more frequent harvesting of fish and turtles, especially if Site 15 soils are left unremediated. Additionally, ATSDR's review of the Navy's shallow groundwater data shows that there are some contaminants (e.g., antimony and lead) in the groundwater at Site 15 that could exceed the drinking water standards. Therefore, we are also recommending that the groundwater use situation be part of the Superfund Comprehensive Five Year Review.

Lead and Asbestos in Base Housing

7) Current and future building occupants and visitors, particularly children, could be exposed to lead-based paint, lead in tap water, and asbestos insulation found in many buildings on base. Those hazards are indeterminate because the hazard management (preventing paint chipping, flushing water lines, covering insulation) efficacy is unknown.*(Indeterminate Public Health Hazard)*

The Navy or the redevelopment authority should provide information to new residents, developers, and tenants not only on the location of the lead paint and asbestos in buildings, but on how to manage those hazards. The Navy should determine if the lead solder is leaching into the drinking water at levels of health concern. If so, they should either remove the lead hazard or provide information to new occupants on tap water flushing techniques.

Eating Fish and Turtles from On-Base Lakes and Creeks

8) In the past, fish in Lake Fretwell were contaminated. New lakes or enlargement of existing lakes may inadvertently bring contamination to the water bodies from nearby remaining contaminant source areas and therefore, warrant periodic reassessment. (*Current - No Apparent Public Health Hazard)*

ATSDR recommends that a review of the potential for fish and turtles to become contaminated in the future be investigated as part of the Superfund Comprehensive Five Year Review.

Unexploded Ordnance (UXO)

9) UXO could be a future explosion hazard for people digging or excavating near many areas on the Main Base and on the Yellow Water Weapons Area. *(Public Health Hazard)*

UXO surveying and clearing has been done at a majority of the high risk areas on base. Although the likelihood is extremely low that people could be injured or killed by UXO, a

potential current and future hazard still exists and cannot be entirely eliminated. Additionally, the Navy also used at least four off- base areas during the WWII era for bombing ranges. Tbese areas have been identified by the Army as formerly used defense sites. The Navy should coordinate with the Army Corps of Engineers and new tenants to ensure the proper program provides public education on the locations and hazards associated with disturbing UXO. Institutional controls (i.e., no digging) may be needed in some areas. The Navy should verify emergency phone numbers and reporting information and provide clearing and reporting procedures to residents, bombing range owners, developers, utility contractors, and municipalities before people dig or excavate in UXO locations.

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Acronyms, Abbreviations, and Glossary

ATSDR	Agency for Toxic Substances and Disease Registry
adverse health effects	negative or unwanted effects on the health of an individual; for example, effects may include a specific illness or a general decrease in the overall health of a person
analyte(s)	The chemical or list of chemicals to be analyzed in the laboratory
AOI	Area of Investigation
aquifer	A geologic (rock) formation through which ground water moves and that is capable of producing water in sufficient quantities for a well
AVGAS	Aviation gas
bioaccumulation	Substances that increase in concentration in living organisms as they take in contaminated air, water, or food because the substances are very slowly metabolized or excreted. (See: biological magnification.)
bioconcentration	The accumulation of a chemical in tissues of a fish or other organism to levels greater than in the surrounding medium.
biomagnification	Biological Magnification: Refers to the process whereby certain substances such as pesticides or heavy metals move up the food chain, work their way into rivers or lakes, and are eaten by aquatic organisms such as fish, which in turn are eaten by large birds, animals or humans. The substances become concentrated in tissues or internal organs as they move up the chain. (See: bioaccumulants.)
BRAC	Base Realignment and Closure
BTEX	Major components of gasoline. BTEX stands for benzene, toluene, ethylbenzene, and xylene
CDC	Centers for Disease Control and Prevention
CAIS	Chemical Agent Identification Sets
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CREG	Cancer Risk Evaluation Guide (CREG) is a concentration in air, soil, or water at which a person's risk of cancer after exposure for 24 hours a day, 365 days a year, and for 70 years is 1×10^{-6}. Cancer risk assessments are typically only done on adults since animal studies are typically done on animals after they have reached puberty.

CSF	See Cancer Slope Factor.
Cancer Slope Factor	The slope of the oral dose-response curve for cancer. This value is derived by EPA and maintained on its IRIS database and used to estimate the risk from carcinogens.
Comparison Values or CVs	A concentration of a given contaminant in soil, water, or air below which no adverse human health effects are expected to occur. Comparison values are used by ATSDR health assessors to select environmental contaminants for further evaluation and can be based on either carcinogenic effects or noncarcinogenic effects.
COPC	Chemicals of potential concern
DCA	Dichloroethane
DCE	Dichloroethene or Dichloroethylene
DU	Depleted uranium
EMEG	Environmental Media Evaluation Guide (EMEG)-A concentration in air, soil, or water below which no adverse non-cancer health effects are expected to occur. EMEGs are derived from ATSDR's Minimal Risk Levels (MRL), and are expressed for acute (short), intermediate (medium), and chronic (long-term) exposures. They are used in selecting environmental contaminants for further evaluation.
EPA	United States Environmental Protection Agency
EBS	Environmental Baseline Survey is a report documenting the bases environmental status.
Feasibility Study	A study conducted to determine the best alternative for remediating environmental contamination based on a number of factors including health risk and costs
FID	Flame ionizing detector
Florida DEP, FDEP	Florida Department of Environmental Protection
GC	Gas chromatograph
groundwater	Water beneath the earth's surface in the spaces between soil particles and in rock

HI/HQ hazard index/quotient	Hazard Quotient (HQ): A comparison of the daily human exposure to a substance to the Minimum Risk Level (MRL) or a Reference Dose (RfD). The value used as an assessment of non-cancer associated toxic effects of chemicals, e.g., kidney or liver dysfunction. It is independent of a cancer risk, which is calculated only for those chemicals identified as carcinogens. A hazard index or quotient of 1 or less is generally considered safe. A ratio greater than 1 suggests further evaluation if needed. Hazard Index (HI): A summation of the HQ for all chemicals being evaluated. A Hazard Index value of 1.0 or less means that no adverse human health effects (non-cancer) are expected to occur. A ratio greater than 1 suggests further evaluation is needed.
ingestion	Eating and drinking; for example, children eating lead paint chips or swallowing lead in dust due to chewing and sucking activity on hands and toys
IRP	Installation Restoration Program (Department of Defense)
J	This letter is used as a modifier to a chemical concentration indicating that the concentration value is an estimated quantity because the analytical methods used to quantify the chemical concentration were not sufficiently precise or accurate at the concentrations detected.
JP-5	Jet propulsion fuel (number 5), primarily kerosene with additives
L	Liter
MCL	Maximum Contaminant Level. A concentration of a chemical that cannot be legally exceeded in a public drinking water supply system. The MCL is devised and enforced by U.S. EPA. States may also enforce the MCL as well as develop more stringent values.
median	the middle value, same number of samples above and below the middle value
migration	Moving from one location to another
mg/kg	Milligram per kilogram
mg/m^3	Milligrams per cubic meter; a measure of the concentration of a chemical in a known amount (a cubic meter) of air, soil, or water
MRL	Minimal Risk Level: An estimate, developed by ATSDR, of the daily human exposure to a substance below which no adverse non-cancer health effects are expected to occur. MRLs are available for acute, intermediate, and chronic exposures.
Mogas	Automotive gasoline

munitions	Explosive military items; for example, grenades and bombs
NAS	Naval Air Station
ND	Not detected. The chemical was not detected at the analytical limits of the equipment and procedures.
NPL	National Priorities List (of Superfund sites)
NOAEL	No-Observed-Adverse-Effect Level -- The dose of chemical at which there were no statistically or biologically significant increases in frequency or severity of adverse effects seen between the exposed animal population and its appropriate control. Effects may be produced at this dose, but they are not considered to be adverse.
ng/m^3	Nanograms per cubic meter. A measure of the concentration of a chemical in a known amount (a cubic meter) of air, soil, or water
ordnance	Military materiel, such as weapons, ammunition, explosives, combat vehicles, and equipment
OLF	Outlying Landing Field
OU	Operable Unit
Pathway	To determine whether nearby residents are exposed to contaminants migrating from a site, ATSDR evaluates the environmental and human components that lead to human exposure. This pathways analysis consists of five elements: source of contamination, transport through an environmental medium, a point of exposure, a route of human exposure (for example, dermal contact or ingestion), and an exposed population. ATSDR identifies exposure pathways as completed, potential, or eliminated. For a completed pathway to exist, five elements must be present to provide evidence that exposure to a contaminant has occurred, is occurring, or will occur. A potential pathway, however, is defined as a situation in which at least one of the five elements is missing, but could exist. Potential pathways indicate that exposure to a contaminant could have occurred, could be occurring, or could occur in the future. Pathways are eliminated when at least one of the five elements is missing and will never be present.
Pb	Lead
PbB	Lead concentration in blood
PCE	Perchloroethene, also known as tetrachloroethene
PAH	Polyaromatic hydrocarbons

PCB	Polychlorinated Biphenyls
PHA	Public Health Assessment
PID	Photo Ionizing Detector
PSC	Possible Source of Contamination
ppb	Parts per billion
ppm	Parts per million
RfD	See Reference dose
RI/FS	Remedial Investigation/Feasibility Study
Reference dose	An estimate of the daily exposure to the general public that is likely to have no measurable risk of harmful health effects during a lifetime exposure or exposure during a limited time interval
Restoration Advisory Board	A committee of public and private citizens formed to act as a focal point for information exchange between NAS Cecil Field, private citizens, and other public agencies
RDX	An explosive with the chemical name cyclotrimethylenetrinitramine
Remedial Investigation	The CERCLA process of determining the type and extent of hazardous material contamination at a site
Risk	A qualitative and quantitative expression of the theoretical probability of potential adverse health effects occurring at specific levels of exposure to chemical or physical hazards. Risk is <u>not</u> predictive. Risk incorporates very conservative assumptions. Adverse health effects can be the result of noncancer and cancer. Risk from cancer is expressed as a probability such as 1 in 1,000,000 (also expressed 1×10^{-6} or 1E-6). This means that 1 person in a population of 1,000,000 are more likely to get cancer over the lifetime of these people. Other risk values considered are 1 in 10,000 and 1 in 100,000. This cancer risk is above the background cancer risk which is about 1 in 4 or 250,000 people in a population in 1,000,000. A noncancer health risk is expressed as a hazard quotient (HQ, this term is defined in this glossary).
SQL	Sample Specific Quantization Limit
solvent	A liquid capable of dissolving or dispersing another substance; for example, acetone or mineral spirits
subsistence	Needed to support life

TCA	Trichloroethane
TCE	Trichloroethene
µg/L	Micrograms per liter. A measure of the concentration of a chemical in a known amount (a liter) of air, soil, or water
µg/dL	Micrograms per deciliter. A measure of the concentration of a chemical in a known amount (deciliter) of liquid; for example, the concentration of lead in a blood sample
$\mu g/m^3$	Microgram per cubic meter. A measure of the concentration of a chemical in a known amount (a cubic meter) of air, soil, or water
UXO	Unexploded Ordnance
VOC	Volatile organic compound
YWWA	Yellow Water Weapons Area

I. Introduction

This public health assessment (PHA) evaluates NAS Cecil Field and the properties previously part of NAS Cecil Field before Naval operations ceased. In response to the NPL listing, the Agency for Toxic Substances and Disease Registry (ATSDR) conducted this public health assessment by reviewing environmental data and reports and visiting NAS Cecil Field in January 29-30, 1991, February 17- 21, May 27 - 28, 1997, October 19-20, 1998, and October 24-25, 2000. NAS Cecil Field is a base closure site with some information available as to proposed reuse. We have focused our review primarily on future uses and strived to provide information on safely managing the remaining environmental hazards for the current and future property users. Those situations we believe need more careful future management are the main focus of this document. We include our review of all of the environmental contamination areas on base in Appendix A.

II. Background

Location and Surrounding Land Use

Naval Air Station Cecil Field (NAS Cecil Field) is located approximately 14 miles southwest of Jacksonville in northeastern Florida (U.S. Navy, 1997a). (Figure 1). When operational, the base property occupied over 31,000 acres, primarily in Duval County. The southern portion of the base extended into Clay County (U.S. Navy, 1997b).

Prior to development as a naval air station, the surrounding properties were undeveloped rural farm lands (U.S. Navy, 1997b; Arthur Andersen LLP, 1996). Today, the station is bordered on the southeast, northeast and northwest by low-density residential and agricultural properties. The land southwest of the base is mostly agricultural (tree-farming) with limited residential development. Some retail and commercial development exists along 103rd Street, east and west of the base (Arthur Andersen LLP, 1996). Additional information on the demographic makeup of the base and the surrounding community is provided in Figure 2.

NAS Cecil Field Mission and Environmental Contamination

Historically the mission of the base has been to provide facilities, services, and material support for the operation and maintenance of naval weapons and aircraft. The operations conducted in support of this mission included: operation of fuel and oil storage and disposal facilities; aircraft maintenance, aircraft engine repair and turbo-jet test cells; fire training; target ranges; and special weapons storage and support (U.S. Navy. 1997a, 1997b). Shallow groundwater, surface water, and soils have become contaminated from past waste disposal practices and accidental spills of chemicals, resulting in NAS Cecil Field being placed on the National Priorities List (NPL) for hazardous waste site investigation and clean-up.

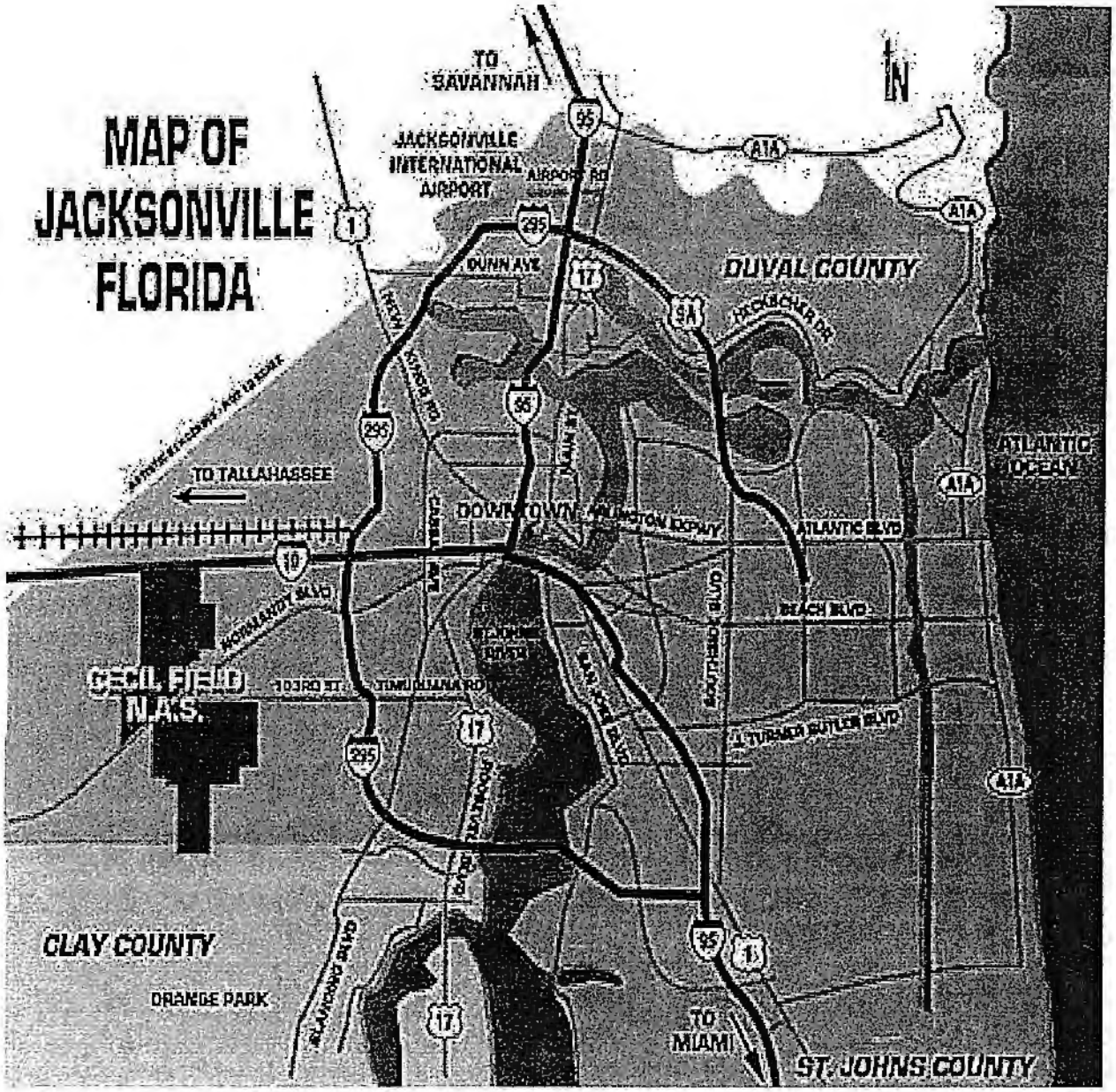
NAS Cecil Field is working with the U.S. Environmental Protection Agency (EPA) and the Florida Department of Environmental Protection (FDEP) to characterize the environmental contamination and clean-up those areas which pose a hazard to public health and the environment.

The primary environmental contaminants at the base include heavy metals, jet fuels and oils, and volatile organic compounds (solvents) (U.S. Navy, 1997a). Less than 800 acres of the 17,200 acres of the base have been determined to be contaminated and require additional investigation or remediation (U.S. Navy, 1997b). Therefore, they are not yet suitable for transfer (U.S. Navy, 2001a). The majority of contaminated sites are located on the Main Base primarily to the west of the north-south runways (Figure 3). A summary of ATSDR's public health evaluation of these sites is provided in Appendix A. For detailed information on the Navy's continued environmental investigation and remediation plans at NAS Cecil Field, refer to NAS Cecil Field's documents at the public repositories:

Cecil Field NAS Repository
Jacksonville Public Library
122 N. Ocean Street
Jacksonville, FL 32202
(904)630-2665

Westbrook Branch Library
2809 Commonwealth Ave.
Jacksonville, FL 32254
(904)384-7424

Figure 1. Location of NAS Cecil Field (City of Jacksonville, 2000).



Base Realignment and Closure

NAS Cecil Field had been in operation from 1941 until 1999. In July 1993, the Base Realignment and Closure (BRAC) Commission recommended the closure of NAS Cecil Field. The station's aircraft, equipment, and personnel were relocated to other Navy facilities. Naval operations at NAS Cecil Field ceased September 30, 1999.

As part of the closure activities, the majority of the Main Station and the Yellow Water Weapons Area properties have been returned to the Jacksonville community for redevelopment (U.S. Navy 2001a). The Cecil Field Development Commission has been established by the mayor of Jacksonville to oversee the base conversion process and develop a reuse plan for the base. Outlying Landing Field (OLF) Whitehouse, the Land Target Complex, the 252 acre Yellow Water Family Housing west of the Yellow Water Weapons Area, and the additional outlying parcels have been retained by the Navy (Arthur Andersen LLP, 1996) (U.S. Navy 2001a).

NAS Cecil Field land holdings to be turned over for redevelopment include the following: (i) Main Station (8,500 acres); (ii) Yellow Water Weapons Area (7,900 acres); and (iii) Jacksonville Heights (800 acres). Other areas that were once part of NAS Cecil Field include the (iv)(OLF Whitehouse (2,565 acres), located 7 miles north of the Main Station; (v) Pinecastle Land Target Complex (11,142 acres leased from US. Forest Service), located 90 miles south of Jacksonville; and (vi) additional outlying parcels comprising 52 acres of over-water training areas and transmitting towers (U.S. Navy, 1997b).

Approximately 17,200 acres will be transferred to the private sector (non-military) heavy industrial - 1,030 acres, light industrial - 3,400 acres, residential/light office - 220 acres, commercial - 300 acres, parks - 2,260 acres, conservation - 3,990 acres, aviation-related facilities - 6,000 acres. The future ownership will be city of Jacksonville - 10,560 acres; Jacksonville Port Authority - 6,000 acres, Clay County - 641 acres (City of Jacksonville, 2000). Figure 4 shows the Proposed Base Reuse Map (City of Jacksonville, 2000).

Twelve Operable Units (OUs) consisting of twenty-four separate sites have been identified as well as numerous potential sources of contamination. Investigations at NAS Cecil Field are in varying stages of completion. Clean-up actions include long term monitoring of creek sediments and surface water, natural attenuation, soil excavation with off-site disposal and air sparging of groundwater. The various remedial activities at NAS Cecil Field have and will address groundwater plumes of chlorinated solvents and petroleum waste products, as well as surface soils, sediments and sources contaminated with metals and organics (EPA, 2000).

ATSDR Involvement at NAS Cecil Field

ATSDR visited Naval Air Station Cecil Field on January 29-30, 1991, February 17- 21, May 27 - 28, 1997, October 19-20, 1998, and October 24-25, 2000. The purpose of the visits was to collect the information needed to identify any public health issues related to exposure to environmental contamination in the soil, water, air, and buildings at the base and to identify community health concerns.

During our tour of the site to observe the environmental conditions at the base, we met with Navy personnel and representatives from the federal and state agencies. Our discussions addressed the nature and extent of chemical contamination at NAS Cecil Field, the proximity of chemically contaminated areas to on- and off-base populations, and the types of human activities that could lead to exposures to the contamination. In addition, ATSDR attended the February, 1997, joint meeting of the NAS Cecil Field, NAS Jacksonville, and Naval Station Mayport Restoration Advisory Boards and the October 1998 and 2000 RAB meetings. The information collected during our site visits and discussions has been integrated with our review of environmental sampling data to draw the conclusions about public health issues at NAS Cecil Field that are presented in this public health assessment document.

Quality Assurance and Quality Control

In preparing this public health assessment, ATSDR relied on information provided in the referenced documents and contacts. The agency assumes quality assurance and control measures were followed with regard to chain of custody, laboratory procedures, and data reporting. The validity of analyses and conclusions drawn in this document is determined by the reliability of the information referenced in this report.

For all sites on the Main Base and Yellow Water Weapons Area, numerous chemicals in many contaminated media (groundwater, soil unspecified depth, sediment, surface water, biota (fish and worms) provided in electronic format to ATSDR have unspecified locations. Additionally, applicable sample data were identified for the electronic format and certain data sets collected early in the program were not entered. Therefore, a number of locations named in the electronic report cannot be cross referenced to hard-copy reports provided to ATSDR. The Navy did not intend the electronic system to be a "stand alone" system, but it may be confusing to people, especially new property owners or developers, who may think they are looking at the total set of data with the electronic system when they are not.

ATSDR has also identified data gaps, data format and data presentation limitations in hard copy results that will limit the information that can be provided to future users of the data.

III. Evaluation of Environmental Contamination, Exposure Pathways, and Public Health Implications

ATSDR reviewed the environmental data generated from investigations at NAS Cecil Field to determine if there are any associated past, current and future public health hazards. See Appendix B for information on how ATSDR assesses exposure. From this review, ATSDR identified nine situations which have the potential for human exposure. One of the situations poses a health hazard, four require more data or information about whether contamination has reached areas where people are living or working, three others could have exposure occurring, but exposure to the contaminants at the levels detected would not pose a health hazard, and one currently posing no public health hazard. These nine exposure situations are discussed in the following sections. They are organized by areas or by activities people engage in that could result in exposure and are as follows:

OUTLINE OF THE NINE POSSIBLE EXPOSURE SITUATIONS

A. On-Base Groundwater

1) Future building occupants could be exposed to fuel components and other volatile compounds seeping into indoor air from on base groundwater contamination. *(Future - Indeterminate Public Health Hazard, Current - No Public Health Hazard)*
2) In the future, building occupants could be exposed to contaminated drinking water on base. *(Future - Indeterminate Public Health Hazard, Current - No Public Health Hazard)*

B. Jet Fuel Pipeline (between NAS Cecil Field and NAS Jacksonville)

3) Drinking water wells near the areas with past pipeline leaks and other pollution sources in the vicinity could be or become contaminated. *(Indeterminate Public Health Hazard)*
4) Current and future building occupants living near the 103rd Street Jet Fuel Pipeline could be exposed to fuel components and other pollutants seeping into indoor air. *(Indeterminate Public Health Hazard)*

C. Site 15 (Blue Ordnance 10)

5) If unremediated or remediation is limited, current trespassers and future recreational users could be exposed to harmful levels of lead and other contaminants in soils, sediment, surface water and possibly other firing ranges on the Yellow Water Weapons Area (YWWA).*(Future-Indeterminate Public Health Hazard, Current - No Apparent Public Health Hazard)*
6) People could be eating contaminated fish or turtles from Yellow Water or Sal Taylor Creek draining Site 15, however, the levels are predicted to be low enough to pose a public health hazard. *(Current - No Apparent Public Health Hazard)* *see UXO section for unexploded ordnance near Site 15.

D. Lead and Asbestos in Base Housing

7) Current and future building occupants and visitors, particularly children, could be exposed to lead-based paint, lead in tap water, and asbestos insulation found in many buildings on base. These hazards are indeterminate as the hazard management (preventing paint chipping, flushing water lines, covering insulation) efficacy is unknown.*(Indeterminate Public Health Hazard)*

E. Eating Fish and Turtles from On-Base Lakes and Creeks

8) In the past, fish in Lake Fretwell were contaminated. New lakes or enlargement of existing lakes may inadvertently bring contamination to the water bodies from nearby remaining source areas and therefore, warrant periodic reassessment. (*Current - No Apparent Public Health Hazard)*

F. Unexploded Ordnance

9) Unexploded ordnance (UXO) could be a future explosion hazard for people digging or excavating near many areas on the Main Base and on the Yellow Water Weapons Area. *(Public Health Hazard)*

A. ON-BASE GROUNDWATER - On-base groundwater contamination presents two possible exposure situations: (1) future building occupants could be exposed to fuel components and other volatile compounds seeping into indoor air from on-base groundwater contamination.*(Future - Indeterminate Public Health Hazard, Current - No Public Health Hazard)* and (2) in the future, people who are supplied with drinking water from on-base wells, could be exposed to contaminants in drinking water. *(Future-Indeterminate Public Health Hazard, Current- No Public Health Hazard)*

Past use, disposal, and accidental spills of hazardous substances on base have contaminated the groundwater in at least 23 on-base areas. In several areas, highly concentrated groundwater contamination is close to the ground surface beneath buildings on base. ATSDR is concerned that water, sewer, and other utility lines coming into the buildings would provide a channel increasing the possibility of contaminant migration from groundwater into indoor air. Because many of the contaminants are highly volatile, they could readily seep into the buildings, possibly making the air indoors unsafe to breathe. Based on ATSDR recommendations, the Navy determined the current buildings most susceptible to groundwater contaminants migrating into indoor air. Those buildings were determined not to be at risk because they were buildings with constant air exchange such as open airplane hangers. However, future new or restructured buildings could still be at risk, but simple precautions could greatly reduce that risk.

Drinking water for the base is supplied by deep wells. Several deep wells are near areas where contamination has been detected in the shallow aquifer. Old well casings could provide an easy mechanism for contaminants to travel from shallow to deeper aquifers. Although not currently contaminated, deep wells with old casings could become contaminated in the future if the shallow contaminated groundwater is not prevented from seeping into the deeper aquifer. ATSDR recommends that the new well owners improve the wellhead protection program and maximize the use of monitoring data to reduce the risk.

INFORMATION FOR
BUILDING OCCUPANTS AND WELL USERS

INDOOR AIR POLLUTION AND WELL USE ON BASE

It is important to report indoor air odors and have drinking water wells tested regularly!

If groundwater is contaminated under your building:

- Report fuel odors in indoor air or water to the to the Florida Department of Environmental Protection, Bureau of Emergency Response (904) 807-3300 or the local fire department.

If you are using a well:

- Have well water tested at least every three years for volatile organic compounds, semi-volatile organic compounds, pesticides, and metals.
- Report any pasitive tests to the Duval County Health Department so other nearby well users can be notified.

Background and Land Use

Some of the operations conducted in support of this mission that may have contributed to groundwater contamination included operation of fuel and oil storage and disposal facilities, aircraft maintenance, aircraft engine repair and turbo-jet test cells, fire training; target ranges, special weapons storage and support. Contaminants that possibly spilled or leaked into the groundwater include: volatile organic compounds, chlorinated hydrocarbons, aromatic hydrocarbons (benzene, toluene, ethylbenzene, and xylene (BTEX)), paraffin hydrocarbons, mercury, and fuel additives.

Exposure Evaluation

Cecil Field Known Areas of Groundwater Contamination

Plumes have been identified and monitoring is ongoing. Restrictions on future use of shallow contaminated groundwater are planned or a deed restriction is required by the Record of Decision. There are approximately 23 areas identified to date with groundwater contamination including the following:

Installation Restoration (IR) Sites with Groundwater Contamination:

1. Site 3
2. Site 5
3. Site 7
4. Site 8
5. Site 16
6. Site 17
7. Site 36/37
8. Site 21
9. Site 25
10. Site 45

Underground Storage Tank (UST) Sites with Groundwater Contamination:

11. North Fuel Farm/Truck Stand (NFF/TS)
12. South Fuel Farm (SFF)
13. Day Tank 1 (DT1)
14. Day Tank 2 (DT2)
15. Jet Engine Test Cell (JETC)
16. Bldg 9
17. Bldg 46
18. Bldg 199
19. Bldg 312
20. Bldg 367
21. Bldg 428
22. Bldg 502
23. Bldg 860

ATSDR evaluated the likelihood of people to be affected by contaminated groundwater caused by the base's past use, disposal, and accidental spills of hazardous substances in at least 23 different areas on base (Figure 5).

We identified two possible situations in which people could be exposed to groundwater contaminants: (1) people using on-base buildings over groundwater contamination, and (2) people using the base wells or installing new wells in the future.

1. People Using On-base Buildings Over Groundwater Contamination - Potential Migration to Indoor Air

During its operation, NAS Cecil Field had a large number and quantity of fuel and other contaminant releases due to past waste disposal practices and accidental spills. Appendix C shows the large quantity of fuels (only) spilled over the years of operation.

To remedy the groundwater contamination, the Navy has installed treatment systems in areas with the highest concentrations. Those systems have been effective in reducing the contaminant concentrations in groundwater. For example, the groundwater monitoring wells near the Building 313 source area showed concentrations of trichloroethylene (TCE) as high as 410,000 parts per billion (ppb) in 1998 rising to over 700,000 ppb in 1999 (Tetra Tech, 2000). After startup of the Air Sparging/Soil Vapor Extraction (AS/SVE) system in June 1999, the highest groundwater concentrations quickly dropped below 1,000 ppb and the system has been operating in pulse mode since May 2000 to maintain the source area contamination below the 1,000 ppb source area cleanup goal concentration (U.S. Navy, 2001a).

Although the groundwater contaminant concentrations have been reduced, they remain high enough for the contaminants to migrate into indoor air. Elevated contaminant concentrations combined with other characteristics such as depth to groundwater, groundwater movement, and building attributes, greatly increase the likelihood for volatile organic compounds to migrate from groundwater into indoor air of buildings located above contaminant plumes. Some of the groundwater contaminants have the potential to migrate into the building's indoor air due to their volatility. Additionally, the 23 groundwater contamination areas have contamination in the surficial aquifer. In general, the surficial groundwater at NAS Cecil Field is at a depth of 0 to 50 or 100 feet and primarily discharges to local lakes and creeks on the Main Base area. Water is recharged locally in the Yellow Water Weapons Area and flows from the groundwater to the lakes and creeks on the Main Base area. The upward groundwater movement of the recharge effect that flows into lakes and creeks slows the downward push of contaminants to deeper aquifers (Hillford, 1996) allowing contaminants to stay at the groundwater surface close to the soil interface.

In addition to the groundwater attributes (e.g., shallow, concentrated), the building characteristics can also contribute to the groundwater off-gassing into the buildings. Soil gas can diffuse directly though the various openings that penetrate the foundation through cracks, gaps, footers, basement walls and walls below grade level, and poor seals around utility entry points. The action of

mechanical ventilation, exhaust fans, and ventilation systems may increase air exchange and also increase soil gas movement (migration) into the building.

The number of small closed rooms create pockets where gases can accumulate, confined spaces especially below grade, and closed windows, running air conditioning, lowers the air exchange rate allowing increased build up of gas concentrations. Contaminated groundwater seeping into the building or draining into a sump may also release gases.

Current Situation

In the public comment version of this public health assessment, ATSDR considered the groundwater attributes and building characteristics and determined that groundwater could be off-gassing into the buildings. We recommended that indoor air safety should be confirmed.

In response, the Navy determined the locations with the greatest potential for indoor air contaminant migration. The analysis showed 55 locations across the facility had the greatest potential for indoor air migration. The Navy evaluated all locations within 100 feet of a building; that resulted in 18 locations. In all cases, the Navy decided on " no further action" because the buildings either no longer existed or the current use of the building has constant air exchange (e.g., open airplane hangers). The Navy concluded that any future development of the contaminated area will require design to prevent indoor air contamination due to underlying contamination. Appendix D shows the Navy's evaluation.

Future Use

Given the right conditions, new or restructured buildings in at least the 55 locations evaluated in Appendix E could be at risk for indoor air contamination. The Navy notifies new property owners of existing groundwater contamination by way of the Findings of Suitability to Transfer (FOST) document. However, the hazards of building on top of contaminated groundwater are not outlined. The redevelopment authority should distribute educational material to developers informing them of possible indoor air contaminant hazards when building over the contaminated groundwater areas. Developers should consider installing vapor barriers when building in areas with shallow groundwater contamination. Developers should also consider sampling indoor air in new buildings. That sampling should include biogenic gasses (e.g., methane, ethane, etc), chlorinated hydrocarbons (e.g., TCE, TCA, etc), and hydrocarbons (e.g., benzene, ethylbenzene, etc). EPA and the Navy should consider implementing an assessment of new or restructured buildings at risk for indoor air contamination as part of the Superfund Comprehensive Five Year Review.

Appendix E provides information on Strategies for Indoor Air Sampling for those considering future use of enclosed buildings over contaminated groundwater areas.

2. *People Using the Base Wells or Installing New Wells in the Future.- Potential Migration to Drinking Water Wells*

There remain a number of base drinking water wells in use that draw water from the deeper groundwater aquifer. Several wells are near areas of surficial groundwater contamination although the Navy reports that the wells are hydrologically upgradient from contamination. Figures 5a and 5b show the groundwater contamination locations and current supply wells.

Existing Wells

The drinking water system is being turned over to the city of Jacksonville. If the city chooses to use the existing supply wells, they could still be at risk even though the Navy predicts that the current supply wells are upgradient from the groundwater contamination areas. The risk comes from the old (1940s) well casings that could breakdown and carry contamination into the drinking water zone. Even though the groundwater flow in the shallow aquifer appears to naturally flow away from the existing wells, if enough pumping takes place, groundwater can be pulled toward a well even when it is naturally flowing in the opposite direction, especially if the well casing is compromised. Future well head protection programs should include monitoring the integrity of the 1940 well construction materials including grout, and corrosion control of the casings.

New Wells

The city of Jacksonville's Jacksonville Electric Authority (JEA) has indicated that they plan to close all existing potable wells on the Cecil Commerce Center (CCC) and build new ones except for those on Jacksonville Port Authority (JPA) property which will be used for fire fighting. Because of the remaining groundwater contamination, routine sampling of new or existing wells is prudent. This should be performed by the system operators. Routine drinking water sampling (possibly every three years) should be done on any systems fed by wells on base. New well installation should be restricted without wellhead protection, corrosion resistant casings, aquifer protection during drilling, and if needed, water treatment.

Notification of the groundwater hazards, including the location of contamination horizontally and vertically (3-dimensional presentation), should also be given to developers and be on file with the city and county.

Future sampling should consider additives. Aviation gasoline (Avgas) continues to contain significant concentrations of alkyl lead, typically at levels greater than 1,000 ppm. Icing inhibitor, antioxidant, corrosion inhibitor, metal deactivator, static dissipater, anti-oxidants, biocides, conductivity additives, detergent additives, oxygenates including methyl tertiary butyl ether (MTBE), and thermal stability additives were in JP-5, Mogas, Avgas, and other historical used fuels (AFCEE, 1999). Appendix F lists common fuel additives for jet fuels and provides more detail on their use.

Table 1 outlines the possible exposure situations from contaminated groundwater.

PUBLIC HEALTH ACTION PLAN - GROUNDWATER CONTAMINATION ON BASE

CONCLUSIONS

People using on-base buildings over or near the areas with surficial groundwater contamination.

1. Groundwater contamination in numerous areas on base from past chemical disposal, leaks, and spills could seep into the indoor air of buildings (particularly enclosed buildings) on top of the polluted areas. Utility lines (water, sewage, etc.) could also aid in carrying the contaminants indoors by acting as a conduit. (Future - Indeterminate Public Health Hazard, Current - No Public Health Hazard)

People using the base wells or installing new wells in the future.

2. Because the on-base wells have limited wellhead protection, they could act as a conduit to drive shallow groundwater contaminants to the deeper aquifer where drinking water is drawn. (Future - Indeterminate Public Health Hazard, Current - No Public Health Hazard)

ACTIONS TAKEN

1. The Navy has taken initial steps to determine the buildings with the greatest potential for indoor air contaminant migration. As ATSDR recommended, the Navy has compared the levels of gases found in soil and groundwater to the Connecticut Department of Environmental Protection published Reference Table A (Connecticut DEP). The Navy determined that buildings within 100 feet of the areas with the greatest potential for migration were not currently at risk. The Navy concluded that any future development of the contaminated area will require design to prevent indoor air contamination due to underlying contamination.

2. The Navy notifies new property owners are of existing groundwater contamination by way of the Findings of Suitability to Transfer (FOST) document. The owners are subject to groundwater use restrictions by way of deed restrictions in those areas where groundwater contamination has been identified.

RECOMMENDATIONS

Indoor Air

1. The Navy should distribute educational material to developers and future occupants informing building occupants of possible indoor air contaminant hazards.

2. Developers should consider installing vapor barriers when building in areas with shallow groundwater contamination.

3. Developers should also consider sampling indoor air in new or restructured buildings. That sampling should include biogenic gasses (e.g., methane, ethane, etc.), chlorinated hydrocarbons (e.g., TCE, TCA, etc.), and hydrocarbons (e.g., benzene, ethylbenzene, etc.).

4. EPA and the Navy should consider implementing an assessment of new or restructured buildings at risk for indoor air contamination as part of the Superfund Comprehensive Five Year Review.

Use of On-base Groundwater

5. Routine drinking water sampling (possibly every 3 years) should continue to be done by the operators of any systems fed by wells on base. The analysis should include metals, VOCs, and SVOCs. ATSDR is also recommending sampling for additives.

6. Well owners should implement wellhead protection and evaluation of the casing integrity starting with the wells closest to the plumes.

7. Notification of the groundwater hazards should be given to developers and be on file with the city and county. The information should include groundwater flow directions in each of the aquifers, 3-dimensional delineation of the contaminant plumes, the cone of influence for the current supply wells, and a check of the casing integrity. This information should also be provided in the Findings of Suitability to Transfer (FOST).

8. The St. Johns River Management District, state, or county, whichever is appropriate, should restrict new well installation in areas near groundwater contamination without wellhead protection, corrosion resistant casings, aquifer protection during drilling, and if needed, perform water treatment.

9. EPA and the Navy should consider implementing an assessment of new and existing wells at risk for contamination as part of the Superfund Comprehensive Five-Year Review.

B. JET FUEL PIPELINE AND OTHER OFF-BASE HAZARDS - Two exposure situations are possible from past leaks from the jet fuel pipeline and other sources of pollution in the vicinity of the pipeline: (1) drinking water wells near the areas where the pipeline had leaked in the past could be or become contaminated, and (2) fuel components and other pollutants could seep into indoor air. More data and information are needed to determine if pollutants have gotten into wells or indoor air and if so, if the levels would pose a health hazard. *(Indeterminate Public Health Hazard)*

The 103rd Street pipeline is an 8" diameter pipeline that extends 15 miles from NAS Jacksonville to NAS Cecil Field underneath Roosevelt, Timaquana, and 103rd Streets. The pipeline is currently out of service and was emptied, cleaned, and abandoned in place. Although no catastrophic leaks have been reported, it is possible that an undetermined amount of jet fuel leaked from the pipeline (at on- and off-base locations) for some period of time during the pipelines 43 year operation. A 1994 investigation of the pipeline required several of the previously identified 81 anomalies to be excavated and the section of pipe checked for its integrity (repaired or replaced). The amount and extent of soil and groundwater contamination at the repaired locations has not been investigated. In a supplemental investigation in 1999, the Navy determined that new anomalies investigated did not have significant soil or groundwater contamination. However the 1994 repairs were not re-investigated.

Additionally, many other businesses (e.g., gas stations, etc.) are or were along this 15-mile stretch that have contributed to soil and groundwater contamination. According to EPA reports, there are as many as 25 other current chemical or fuel hazard sources along the pipeline and an unknown number of past sources. The extent of groundwater contamination and private well use in this area is not well characterized; therefore, the extent of the hazard is unknown. This is a heavily populated area where water, sewer, and other utility lines could move the local contamination further from those sources.

Because of the variety and number of contamination sources in this area, there is enough risk to advise people using private wells for drinking water and bathing to test their water annually for volatile organic compounds, semi-volatile organic compounds, pesticides, and metals. Since the contaminants could also move into indoor air, people should report strong odors to the fire department for investigation.

INFORMATION FOR WELL USERS AND BUILDING OCCUPANTS NEAR THE 103RD STREET PIPELINE

WELL USE NEAR 103RD, ROOSEVELT, and TIMAQUANA STREETS

It is important to have wells tested annually!

If you are using a well:

- Have well water tested annually for volatile organic compounds, semi-volatile organic compounds, pesticides, and metals. (Yellow Pages under Analytical Laboratories or call Florida Department of Environmental Protection, Bureau of Emergency Response (904) 807-3300 for information).
- Report positive tests to the Duval County Health Department so other nearby well users can be notified.
- Report fuel odors in indoor air or water to the Florida Department of Environmental Protection, Bureau of Emergency Response (904) 807-3300 or the local fire department.

Report well contamination to **Duval County Health Department (904) 630-3300**

Background

Historically, NAS Cecil Field received approximately 200,000 gallons of jet fuel each day through an eight-inch diameter underground pipeline which extends from the NAS Jacksonville tank farm to NAS Cecil Field North Fuel Farm (NAS Cecil Field, 1997b). Put into service in 1954, the pipeline has been used to transport both JP-4 and JP-5 type aviation fuel for 15 miles along, and almost entirely underneath, Roosevelt, Timaquana, and 103rd Streets in the city of Jacksonville (Figure 6) (Delaney, 1996; ABB-ES, 1995a). The pipeline also passes through several wetland areas. The pipeline is buried at depths from 2 to 15 feet. The shallow water table ranges from 2 to 6 feet deep.

There are no reported catastrophic releases from the pipeline in its 43-year use. However, beginning in 1989, releases from the pipeline were discovered. As a result, in 1990, the Navy began conducting corrosion surveys. Even small leaks from this high volume pipeline (estimated to have transported 200,000 gallons per day more than 43 years) could have resulted in thousands of gallons of fuel lost. Those fuel leaks, compounded with leaks from underground storage tanks from abandoned service stations and other possible hazardous substance releases along Roosevelt, Timaquana, and 103rd Street, put private well users at greatest risk. The pipeline is currently out of service and was emptied, cleaned and abandoned in place starting in 1997.

Additionally, there are reportedly as many as 25 other current chemical or fuel hazard sources along the pipeline and an unknown number of past sources.

Land uses adjacent to the pipeline path are residential, commercial, and light industrial. Private and public wells are reportedly used in the area, although to what extent, we were not able to determine. Some reports indicate that 25 private wells are within a one quarter mile radius of NAS Cecil Field (Jamel, 1990).

Exposure Evaluation and Public Health Implications

We discuss here the documented releases, results of the corrosion surveys, and possible exposure situations.

Documented Releases from the Pipeline

Release from the 103rd Street Jet Fuel Line, Kerr/McGee, and Texaco properties

In 1989, a release of JP-5 jet fuel from the pipeline was discovered to be co-mingled with petroleum (gasoline) releases from adjacent sources, including the Kerr-McGee and Texaco retail fuel properties (Jamel, 1990; Professional Service Industries, 1991). Shallow ground water and soil at this spill area were contaminated with benzene, toluene, ethylbenzene, xylenes, methyl-terbutyl ethylene, naphthalenes, and lead (Jamel, 1990; Professional Service Industries, 1991; Bechtel,1996). No water wells were located on these properties. Gross contamination of the soils and groundwater was remediated in 1996 through free product recovery and soil removal.

Migration and degradation of the groundwater contamination is currently being monitored (Lancaster, 1997; NAS Jacksonville, Public Works files, 1997).

The petroleum contamination extended underneath an adjacent residence on 103rd Street. During the course of the investigation, from 1989 through 1996, the family continued to live in their home. Repeated rounds of sampling over an eight-year period demonstrated that the well water supply for the residence was never impacted by the shallow groundwater contamination (NAS Jacksonville, Public Works files, 1997). The residential property was ultimately purchased in 1996 by the Navy in support of soil and groundwater clean up activities (Bechtel, 1996).

Under circumstances of shallow groundwater contamination, volatile chemicals may migrate through soils and into homes through the backfill material along utility service lines entering the home and through cracks in building foundations. Indoor air sampling was not performed at the residence on 103rd Street to determine if gas migration from the shallow groundwater contamination was entering the home; therefore, no conclusions can be drawn regarding whether the indoor air quality was impacted. No complaints of indoor air odors were expressed by the residents to the Navy (Lancaster, 1997).

103rd Street and "A" Avenue spill site, 1997

In July 1997, stressed vegetation was noted near the intersection of 103rd Street and Avenue "A" on base. Sampling results, pipeline repair, and clean up work indicated that approximately 6,000 gallons of jet fuel had been released to soils and shallow groundwater from a 1/16 -1/8 inch diameter hole in the pipeline. All soil within 30 feet of the pipeline leak was excavated down to a depth of one foot below the surface of the groundwater. The soil was treated and disposed off-site and the excavation was backfilled. Monitoring wells were installed at the site of the release to assess the extent of groundwater contamination and to determine if additional remediation was needed (NAS Cecil Field, 1997b).

In response to the 1997 leak at "A" Avenue, the Navy Defense Fuels Supply Command determined that the pipeline should be put on stand-by status. The pipeline was removed from service in September 1997 and the base received fuel by truck transport on a daily basis (Tetra Tech, 1999a).

Pipeline Inspections, Other Soil Excavations, and Pipeline Closure

Four corrosion surveys have been performed on the pipeline; in 1990, 1994, 1996, and 1999. Corrosion surveys estimate pipe wall thickness; areas where the wall thickness appears to be below a minimally required thickness are termed "anomalies". Anomalies represent areas where pipeline leaks may be occurring, or may occur in the future.

A 1990 corrosion survey identified 90 anomalies (PM&A, 1992). Excavations were performed in four areas suggested by the 1990 survey: Bent Creek, the Go Cart Track, an additional home on 103rd Street, and one location at NAS Cecil Field. The only leak found was the one adjacent to the residence at 103rd Street. In September 1990, the Navy performed soil borings at several

suspected anomaly locations along the pipeline to determine if there were any additional fuel releases; no releases were found (Delaney, 1996).

A 1994 corrosion survey identified 23 anomalies (ABB-ES, 1995a). In 1994, a pipe integrity investigation was conducted and 81 thickness anomalies were discovered along the pipeline. According to recent information from the Navy, based on conversations with former Navy Public Works Center personnel, some areas of potential concern (called "anomalies") were investigated in order to verify the accuracy of the instrumentation used to inspect the pipeline thickness. The Public Works Center personnel did not identify soil or groundwater contamination when excavating these areas in order to cut the pipe to confirm its thickness. (U.S. Navy, 2001a).

In 1996 another survey was conducted that identified 19 principal anomalies and 13 of the approximately 15 original valves (Tetra Tech, 1999a).

In July 1997 a leak was detected in the pipeline 1/4 mile from gate A of NAS Cecil Field. An investigation was ongoing in 1999 (Tetra Tech, 1999a). An air sparging/soil vapor extraction system at Avenue "A" was placed in operation in May 2000 (RAB Site update, 2000).

From the work conducted based on the 1999 work plan for investigation, the Navy identified 32 principal anomalies and valves (this included the 19 discovered in 1996) along and under the 15 miles of road between NAS Cecil Field and NAS Jacksonville (Tetra Tech, 1999a). The Navy completed the investigation of the anomalies and valves along the pipeline in March 2000. The work (Tetra Tech, 1999a) included an average of four soil borings at each of the 32 locations identified to have anomalies. Groundwater sampling of each of the soil borings was conducted for boring below the water table. Permanent groundwater monitoring wells were installed at locations in which contamination was identified from soil and groundwater sampling. Soil gas evaluation using a Photoionization Detector of unsaturated soils (vadose soils) was performed for borings above the water table. Methane was assumed to be present, but was not sampled (Tetra Tech, 1999a). From this investigation, the Navy determined that limited soil and groundwater contamination was present from the 32 anomalies and 13 valve locations. However, the repaired locations from 1994 were not re-investigated (Tetra Tech, 1999a).

The jet fuel pipeline was closed, cleaned, and abandoned in place. In-place closure was necessary since the pipeline runs underneath the heavily trafficked 103rd Street. The closure and investigation activities will be integrated and conducted under the Florida Department of Environmental Protection (FDEP) underground storage tank program.

Possible Exposure Situations

ATSDR evaluated the possible current and future exposure situations at or near the jet fuel pipeline and outlined them in Table 2.

1. ***People using private wells in the vicinity of the jet fuel pipeline and other potential sources along 103rd Street***

We were unable to determine the extent of private well use near or along the pipeline. Within a one-quarter mile radius of the NAS Cecil Field, there are 25 private or privately-owned small (producing less than 100,000 gallons per day) public water supply wells (Jamel, 1990).

EPA Enviromapper lists as many as 25 possible sources of environmental pollution along the pipeline (See Figure 7). Past leaks from the pipeline along with contaminants from other sources could contaminate nearby wells, especially shallow wells. The extent of groundwater contamination in this area is not well characterized; therefore, the extent of the hazard is unknown.

2. ***People breathing gases that have migrated from the groundwater and soil contamination into buildings***

Although not as likely as the private well water contamination situation, highly concentrated soil or groundwater areas could release volatile gases into buildings and pose a health risk. Since the extent of contamination has not been determined, people should report strong odors to the fire department for investigation.

PUBLIC HEALTH ACTION PLAN - JET FUEL PIPELINE AND OTHER OFF-BASE GROUNDWATER HAZARDS

CONCLUSIONS

1. Past leaks from the Jet Fuel Pipeline and possible leaks from as many as 25 other local sources (e.g., service stations) puts private wells in the vicinity of Roosevelt, Timaquana, and 103rd Street at risk for contamination and pose an indeterminate public health hazard.

2. Utility lines (water, sewage, etc.) could carry the undetermined amount of fuel and other contaminants that remain in the soil and groundwater along the same streets, into indoor air posing an indeterminate public health hazard.

ACTIONS TAKEN OR PLANNED

1. Jet fuel leaks discovered from the 103rd Street pipeline have been cleaned up. Migration and degradation of the groundwater plumes are being monitored by NAS Cecil Field.
2. The NAS Cecil Field Base Clean-up Team conducted investigations of pipeline wall thickness anomalies in 1990, 1994, 1996, and 1999 to ensure that no additional jet fuel leaks occurred prior to removal of the pipeline from service.
3. The pipeline was removed from service in 1999 as such, additional leaks will not occur.
4. The Florida Department of Transportation has been informed of all the known locations of soil and groundwater contamination along the pipeline, for their use in planning and management of road construction projects.

RECOMMENDATIONS

Wells

1. As soon as possible, but within 6 months, the Florida Department of Environmental Protection should provide educational material (such as radio or television broadcast or printed material in the newspaper) warning well owners of the possible regional contamination hazards and prompting them to have their well sampled annually. Alternatively, a complete well survey can be conducted and people notified individually.

2. Because individual private, and especially shallow, wells can be affected by fuel leaks, improperly functioning septic tanks, small industrial waste disposal practices, and residential use and disposal of pesticides, people should have their wells tested for volatile organic compounds, semi-volatile organic compounds, pesticides, and metals.

3. Florida Department of Environmental Protection should provide notification and information to planning/permitting departments on the possibility of local groundwater contamination so that developers or residents can be informed that new wells need wellhead protection, the aquifer should be protected during drilling, and water may need treatment before consumption.

Indoor Air

1. Building occupants should report fuel odors in indoor air to the Florida Department of Environmental Protection, Bureau of Emergency Response 1-800 320-0519 or (904) 807-3300 or to the local fire department.

C. SITE 15 AND OTHER AREAS OF THE YWWA -Three exposure situations could exist at or near Site 15 (Blue 10 Ordnance): (1) current trespassers and future recreational users could be exposed to harmful levels of lead and other contaminants in soils, sediment, surface water and possibly other firing ranges on the Yellow Water Weapons Area (YWWA) *(Current - No Apparent Public Health Hazard, Future - Indeterminate Public Health Hazard,* (2) people could be eating contaminated fish or turtles from Yellow Water or Sal Taylor Creek draining Site 15 *(No Apparent Public Health Hazard),* and (3) unexploded ordnance could be a future hazard for people digging or excavating near Site 15 and other portions of the YWWA.

Site 15, a former munitions burning area, is slated for redevelopment as a wildlife corridor. Future activities within the corridor could include recreational uses such as horseback riding, biking, and hiking. Lead poses the greatest hazard here as it has been found in soil, sediment, and surface water. The reported median lead level in soil here (at unspecified depths) is 163 ppm, the average is 1,157 ppm, and the maximum level found was 65,500 ppm. Those levels are extremely high and frequent contact with soils (i.e., several time a week) here could present a health hazard for children under six years of age. The Navy, FDEP, and EPA are working to prevent people from having frequent contact with soils by implementing deed restrictions, monitoring during the Superfund Comprehensive Five Year Review, and possibly conducting limited soil removal. ATSDR's concern is that long-term, land use controls are difficult to maintain and it is possible that the area could become residential 50 years from now. We are recommending vigilant followup by all stakeholders on this issue.

High dissolved lead levels (a median of 205 ppb) have been found in surface water samples that run off Site 15 and during heavy rain events, possibly into Yellow Water Creek. We are recommending that the Superfund Comprehensive Five Year Review include an evaluation of whether increased use of this area is resulting in more frequent harvesting of fish and turtles, especially if Site 15 soils are left unremediated.

What is lead?

Lead is a naturally occurring, bluish-gray metal found in small amounts of the earth's surface. It is often used in batteries, pipes, brass, solder, bullets, casings and paints. Lead can also be found in the environment from automotive exhaust near roads (when leaded gasoline was used) and from past industrial operations. People can be exposed to lead in soils by breathing dust or incidentally ingesting soils. The amount and wide-range use of lead has decreased over the last several years because of the harmful neurotoxic effects of lead in people.

What are the possible health effects from lead exposure?

Studies of lead's health effects on people are based on blood lead levels, a measure of the amount of lead absorbed by the body, not the amount of lead detected in soil or some other medium. Blood lead is measured in micrograms per deciliter (µg/dL). Children, infants, and the unborn are highly sensitive to the effects of lead. In infants and young children, lead exposure has been shown to decrease intelligence, slow growth, and cause hearing problems. The Centers for Disease Control and Prevention's (CDC's) action level for blood lead is 10 µg/dL. If action levels are exceeded, sources of the lead should be found and removed and followup blood lead sampling may be advised.

Additionally, since unexploded ordnance has also been found at and near Site 15, clearing and reporting procedures need to be in place before people dig or excavate.

Background and Land Use

Site 15, also known as Blue 10 Ordnance and part of Operable Unit 5, is a 10-acre area located in the southwestern part of the Yellow Water Weapons Area (YWWA; Figure 8). During the 1940s and 1950s, this area was used as a skeet and trap range (ABB-ES, 1997a). Around 1967 and ending in 1977, diesel fuel was used to ignite ordnance in a metal burn tank. After burning, the ash and residual metals were spread on the ground for disposal (ABB-ES, 1994a). The types of ordnance burned included small arms, flares, rocket ignitors and nitroglycerin-based solid rocket propellent.

Historical ordnance disposal activities have resulted in contamination of the soils, sediment, surface water and groundwater in the area. Contaminants include metals, pesticides, volatile and semi-volatile organic compounds, and explosive residues (nitroaromatics) (ABB-ES, 1994a). Polyaromatic hydrocarbons (PAHs) and pesticides have been detected in soil samples; however, the levels are not exceedingly high. Short term, infrequent contact should not result in harmful health effects, although exposure to PAHs and pesticides would need to be reevaluated if the land use changes to more active use (e.g., residential). Some of the PAHs may have low bioavailability potential since they are in skeet and trap clay targets others may be associated with munition ash (ATSDRa, 2001). Lead contamination is the major public health hazard due to the extremely high levels. Therefore, ATSDR's discussion below focuses primarily on lead contamination.

Additionally, unexploded ordnance (UXO) locations have been identified on the Yellow Water Weapons Area (YWWA) including Site 15. Other locations with suspect UXO at YWWA are Site 14, PSC 49 (Skeet Range Facility 804 in operation since 1968, and PSC 4, Mobile Target Area. Those UXOs were left over from the firing range activities and would therefore tend to be smaller, less powerful rounds. *(See UXO section for more details).*

YWWA

Access to the YWWA is unrestricted and casual use by community members can occur. An existing bike/hike trail and network of roads through the area enhances Site 15's accessibility to recreational users of the YWWA. The site is posted with signs alerting recreational users of the YWWA roads and trails to the chemical hazards in this area. Runoff from the site is drained by the Yellow Water River, which flows on-base near the boundary of the YWWA and the Yellow Water military housing area (ABB-ES, 1997a). The boundary of the YWWA is fenced between Site 15 and the housing area, preventing children from directly accessing the contaminated area from the housing complex. Yellow River exits the base and continues to flow south across Normandy Boulevard and drains into Sal Taylor Creek. Yellow Water and Sal Taylor Creek are classified as Class III water bodies allowing use for recreation, propagation, and maintenance of fish and wildlife populations. Therefore, fishing could be taking place in those creeks.

Exposure Evaluation and Public Health Implications

ATSDR evaluated the possible current and future exposure situations at or near Site 15. They are outlined in Table 3; our evaluation conclusions follow.

Site 15 (Blue 10 Ordnance)				
Exposure Situation	**Activity**	**Time Frame**	**People Exposed?**	**Hazard Category**
1.People contacting on-site soil, dust, creeks, groundwater, and unexploded ordnance	Trespassing	Current	Yes	No Apparent Public Health Hazard
	Recreational activities	Future	Possible	Indeterminate (Potential) - missing cleanup and use information
2. People who eat fish or turtles from Yellow Water or Sal Taylor Creek draining Site 15	Eating fish or turtles	Current	Unconfirmed	Current - No Apparent Public Health Hazard
3. People disturbing UXO * See UXO section of document				

1. People contacting on-site soil, dust, creeks, groundwater, and unexploded ordnance

Current

The only current potential exposure situation at Site 15 is by way of trespassing. ATSDR assumes that there is a minimum amount of trespassing since the boundary of the YWWA is fenced between Site 15 and the housing area, preventing children from directly accessing the contaminated area from the housing complex.

To reduce the hazard more, the Navy has posted signs on paths leading onto the site. The signs state, *"Warning No Trespassing, Contaminated Area Avoid Contact with Soil and Water"* and provide a phone number for additional information. ATSDR recommended and the Navy provided residents of the nearby housing area, educational material on the need to stay out of Site 15 until it is cleaned up. Additionally, the Navy increased the number of sign postings around Site 15.

ATSDR also assumes that there is limited contact with the most contaminated soils since a majority of the area is covered by vegetation or some other material. The Navy reports that there

is up to six inches of leaves and pine needles covering the contaminated lead soils. This also, reduces the likelihood of dust generation, thus reducing the potential exposure to lead.

Future

Source Areas of the Lead

The primary site-related source areas identified in Navy documents include: (1) lead dust, metallic lead and corroded lead from the sheet and trap range (shooting positions, targets, berms and traps), and (2) lead associated with ash from burned munitions that was reportedly spread over 10 acres (exact locations have not been identified). Other sources may include: (3) lead from historical exhaust deposited by car, truck and aircraft using leaded fuels and oil, and (4) lead associated with buried unexploded ordnance including small rounds and primary metallic explosives (lead). Lead contamination needs to be addressed at other firing ranges in the Yellow Water Weapons Area.

Sampling Techniques and Sampling Data

Lead poses the greatest potential hazard because it has been found in all media sampled (soil, surface water, sediment, groundwater) and in very high concentrations, except in groundwater. The reported median lead level in soil is 163 parts per million (ppm), the average is 1,157 ppm, and the maximum level found was 65,500 ppm.

The lead levels reported are a composite (mixture) of soil taken between the surface and one foot below the surface. Since lead tends to accumulate in the

Fate and Transport of Lead

Lead can be moved at Site 15 by: (1) airborne particulate lead (stirred up by activity on the soils, winds, fire, etc.) and (2) lead in sediment and dissolved lead in surface water moving across the site during storm water events especially in flood plains, lakes and ponds. Lead in surface water or runoff deposition areas will generally have smaller or finer grained particle sizes and may be associated with sediments that have higher total organic carbon. Particle size and solubility of lead particles are important in evaluating the risk from over exposure by inhalation, ingestion and dermal contact.

Inhalation pathway: Inhalation of airborne dust less than 10 microns in diameter may present health risks although, risks increase with particles less than 5 microns and especially less than 2.5 microns in diameter. More soluble forms of lead, including lead carbonates, would have a higher bioavailability potential once they reach the lungs.

Ingestion pathways: Ingestion of soil particles and food contaminated with lead may increase lead exposure. Fine particles smaller than 250 microns in diameter can be incidentally ingested (Duggan, 1985). Soluble forms of lead would have a greater bioavailablity potential for ingestion, but uptake may be reduced by factors such as the amount and type of food eaten before exposure.

Dermal Contact: Dermal exposure is of primary concern for soil particles 100 to 200 microns or less (fine particles) because they adhere to skin while larger particles are easily brushed off (ProAct Fact Sheet TI#17472, June 1998). Other researches have identified 40 microns or smaller as being the most likely to adhere to hands.

soil surface, usually within 1 to 2 inches of the surface, and concentrations decrease with depth (U.S. EPA, 2001), this method mixes contaminated soil with uncontaminated soil from the surface to one foot depths. Therefore, the reported lead concentrations and associated statistical averages are less than the levels that would be found at the surface at each sampling location. For example, the surface levels may be as much as 15 times higher than current sampling results show including statical averages.[1]

Similarly, at a shooting range like the one at NAS Cecil Field, 91% of shot is found in the top one inch of soil at a trap and skeet range (Vyas, 2000). Therefore, the surface concentrations at the shooting range may also have higher averages.

Figure 9 shows the sampling locations. We suggest that interested readers get a copy of the Navy's electronic version of this document to view the contaminant trends and concentrations at each location on Site 15.

The current preliminary sampling data provides information on the general trend of (diluted) lead contamination. However, additional sampling to determine the range of dilution would be needed if people, especially children, would be in contact with soils at Site 15 on a more frequent basis (i.e., several times a week). If the range of dilution can be determined by a focused sampling plan (e.g., using an X-Ray Fluorescence (XRF) machine in combination with confirmation sampling), then a dilution factor could be used to better estimate the lead concentration that people would come in contact with. That information could then be used to generate a map identifying soil concentration trends and areas with different contamination histories which may have a different bioavailability potential. For this trend map, surface soil should be defined as the top 0-3 or 0-6 inches of soil. If the surface is grassed covered, surface soil is considered the 2 inches below the grass layer (U.S. EPA, 1992a).

Lead Bioavailability in the Environment

The ash deposits with lead may have a higher human bioavailability potential than areas with just lead shot and bullets since the ash will be finer grain. The weight of evidence for potential bioavailability (i.e., how much lead can be absorbed by people) includes consideration of the following combination of soil properties (1) soil cation exchange potential, and (2) percentage of clay and percentage of each clay type, and organic content, and pH. Metals may be tightly bound and difficult to separate from soils with high clay content. A bioavailability study requires samples be tested for pH, TOC, cation exchange capacity, particle size, total metals, and available anions (PO_4, SO_4, CO_3) (Naval Facilities Engineering Command, 1999). A bioavailability study would help to determine the future safety of this area and may reduce or increase the amount of lead contaminated soils that would need to be cleaned up if the land use at Site 15 changes to more active use.

[1] Assume that all of the contamination is in the top 2 cm and the samples were takes at 0-30 cm (30 cm = 12 inches). 30 cm is 15, 2 cm intervals. For simplicity, assume a total concentration of 10 ppm, then (X ppm + 0 ppm)/15 = 10 ppm. X=150, therefore, the top 2 cm is 15 times the average over 30 cm.

Future Land Use

The Base Reuse Plan for NAS Cecil Field envisions a wildlife corridor that will extend along the western edge of the base, from the south (Main Base area) to the north (YWWA), and incorporating Site 15. Future activities within the wildlife corridor may include forest management and recreational uses such as horseback riding, biking, and hiking (Arthur Andersen LLP, 1996).

The current record of decision on the cleanup remedy is yet unsigned as of this document release. If changes in the economy or regional vision for NAS Cecil Field redevelopment result in a proposed residential reuse or recreational activities where children could have frequent (i.e., several times a week) contact with the soils, and *in the absence of soil clean-up or information on the bioavailability of the lead, future recreational or residential exposure to the Site 15 surface soils poses an unacceptable health hazard.*

Public Health Implications

Children who, in the future, may play on the unremediated parts of Site 15 in the Yellow Water Weapons Area (YWWA) may be exposed to lead in soil at levels that may result in adverse health effects. The perimeter of the YWWA is fenced but untended. The community has open access to most of this area. Sites 14 (Blue 5 Ordnance Disposal) and 15 (Blue 10 Ordnance Disposal) are located in relatively remote, interior areas of YWWA, are heavily wooded, and posted with no trespassing signs. It is not likely that children and youth will come into contact with contaminants in these areas prior to completion of investigation and clean-up activities by the base. However, left unremediated, routine contact (i.e., several times a week) with soil at Site 15 may increase blood lead levels, especially in children, to unsafe levels. The lead sampling method of combining higher lead contaminated soil with uncontaminated soil under estimates potential exposures to lead. However even these diluted concentrations are of public health concern for those coming in contact with lead contamination.

Exposure Issues and Data Needs for Future More Active Use of Site 15

There are several factors that make evaluation of the possible future exposure and health effects at Site 15 difficult. Those factors include:

- The soil data results represent 0-1' of mixed soil which dilutes the results that represent exposure concentrations. Even diluted, the soil levels for lead are extremely high. Additional sampling to establish the dilution factor and lead particle size would help in our health evaluation.
- There are different sources of lead (e.g., ash, lead shot) at Site 15 that would have different bioavailabilities (i.e., how much can be absorbed by people). Identifying the different source areas and performing some limited bioavailability measures would help in our health evaluation and possibly reduce the amount of soil considered harmful.

The median lead levels (actual media would be higher when adjusted for dilution) in soil (at

unspecified depths) were 163 ppm with maximum levels as high as 65,500 ppm. Calculated increases in blood lead levels ranged from 8 to 34 µg/dL. Adding these values to the baseline blood lead concentrations for U.S. children, one arrives at predicted blood lead levels ranging from approximately 11 to 38 µg/dL for children exposed daily to the soils at Site 15. Therefore, the predicted exposures could possibly result in increases in blood lead levels which exceed the 10 µg/dL screening criterion. The algorithm, soil lead data, assumptions, and calculations are provided in Appendix G.

CDC recommends that all children be screened for lead poisoning at least annually, especially children between the ages of 6 months and 6 years of age (CDC, 1991a). Young children and children exposed in utero are most vulnerable to lead toxicity for several reasons, including: (1) greater absorption and metabolism of lead than adults, (2) rapidly developing nervous systems, and (3) for children, higher intakes of air, food, and water on a body weight basis. In addition, children age 3 and under tend to chew and mouth their hands, toys, and other objects, exposing them to lead dusts and paints (CDC, 1991a). Blood lead levels of 10-40 micrograms per deciliter (µg/dL) may not cause distinctive symptoms of lead poisoning, but are associated with impaired central nervous system development, lower IQs, and hearing problems in children (CDC, 1991a; ATSDR, 1999a).

The groundwater at Site 15 has been shown to have antimony and lead contamination at levels of health concern. Currently, groundwater is not used as drinking water in the vicinity. Future changes in the base reuse plan should restrict the installation of potable water wells at, or downgradient of, Site 15 without water treatment.

Unexploded ordnance (UXO) at Site 15 is likely left over from the firing range and would be smaller, less powerful rounds that would require lots of force to cause them to explode. However, one 500-pound general purpose high explosive blast and fragmentation bomb was found and removed. Reportedly, only a visual inspection for other UXO was conducted. Therefore, digging or excavating in the area could be hazardous if the area is not cleared first. Reporting and clearing procedures need to be in place if future use includes any digging, clearing, and excavation. *See the UXO section for reporting and clearing procedures.*

2. *People who may eat fish or turtles from Yellow Water or Sal Taylor Creek draining Site 15*

High dissolved lead levels (a median of 205 parts per billion (ppb)) have been found in surface water samples that run off Site 15. Dissolved lead means the lead is much more bioavailable and can accumulate easily in fish and other wildlife. Bioconcentration levels of lead are above the bioaccumulation factor of 1,000 (U.S. EPA, 1999). During high water events, Yellow Water Creek drains portions of Site 15 then flows into Sal Taylor Creek. Yellow Water and Sal Taylor Creek could be used for recreation and fishing.

Because there is soluble lead in drainage areas of Site 15, ATSDR recommended that the Navy in conjunction with state or local health and environmental agencies determine if fish and turtle sampling was necessary. In response, the Navy modeled lead contamination in fish and predicted a very low (<0.01 mg/day) average daily intake for people eating fish from this area. It is still unknown whether people are harvesting fish and turtles from this area, but it seems unlikely that they would be harvesting it frequently (daily). Therefore, currently, this situation poses no apparent public health hazard.

If Site 15 soils are left unremediated, more soluble lead and possibly other metals could enter drainage areas. If more people use this area for the recreational harvesting of fish or turtles from Yellow Water or Sal Taylor Creek, ATSDR recommends sampling surface water, sediments, fish, and aquatic animals in Yellow Water and Sal Taylor Creek and other creeks downstream from Site 15 for metals (especially lead and mercury), PAHs and pesticides. This possibility should be evaluated as part of the Superfund Comprehensive Five Year Review.

PUBLIC HEALTH ACTION PLAN- SITE 15 AND OTHER AREAS OF THE YWWA

CONCLUSIONS

People contacting on-site soil, dust, creeks, groundwater, and unexploded ordnance

1. People currently trespassing on Site 15 would have incidental contact with the contamination in soil and creeks. Those exposures pose no apparent public health hazard.

2. Under the proposed forest management/wildlife corridor reuse scenario and in the absence of soil clean-up activities or additional information on the bioavailability of lead, the lead in soils may still present a public health hazard to children under 6 years of age who would have contact with soils several times a week. Exposure-based sampling data for lead is not available. Current sampling data and reported statistical concentrations underestimate the surface lead levels. Since the future use and remediation plans are still uncertain, Site 15 poses an indeterminate (potential) public health hazard.

3. Unexploded ordnance (UXO) near Site 15 in the YWWA is likely left over from the firing ranges or munition burning operations and are expected to be smaller, less powerful rounds that would require lots of force to cause them to explode. However, one 500 pound general purpose high explosive blast and fragmentation bomb was found and removed. Reportedly, only a visual inspection for other UXO was conducted. Therefore, digging or excavating in the area could be hazardous if the area is not cleared first.

People who eat fish or turtles from Yellow Water or Sal Taylor Creek draining Site 15

4. The nature and extent of sediment and surface water, and fish contamination has not been fully investigated. Dissolved lead levels in surface water samples indicate lead is bioavailable and could accumulate in wildlife. A Navy model predicted very low (<0.01 mg/day) average daily intake for people who may eat fish from this area. It is still unknown whether people are harvesting fish and turtles from this area, but it seems unlikely that they would be harvesting it frequently (daily). Therefore, currently, this situation poses no apparent public health hazard.

ACTIONS TAKEN OR PLANNED

Current

1. Site 15 is currently posted with signs alerting recreational users of the YWWA roads and trails to the chemical hazards in this area. Recently, the Navy increased the number of sign postings around Site 15.

2. ATSDR recommended and the Navy provided residents of the nearby housing area educational material on the need to stay out of Site 15 until it is cleaned up. Additionally, the Navy increased the number of sign postings around Site 15.

3. ATSDR recommended that the Navy in conjunction with state or local health and environmental agencies determine if fish and turtle sampling was necessary. In response, the Navy modeled lead contamination in fish and predicted a very low (<0.01 mg/day) average daily intake for people eating fish from this area.

Future

4. EPA and Naval Facilities Engineering Command - Southern Division (NAVFACENGCOM-SOUTHDIV) have met with the Cecil Field Reuse Planning Committee and stressed that recreational activities planned for the Yellow Water Weapons Area should avoid Site 15 within the wildlife corridor. Placing this area off limits to residential or regular recreational use will ensure that people are not exposed to residual chemical contaminants in the soils at levels posing a health risk.

5. The Navy plans remediation or removal activities as needed to reduce the levels of contaminated soils.

6. ATSDR will review the Proposed Plan for Site 15 clean-up when it becomes available to ensure that the proposed remedy is protective of recreational users.

RECOMMENDATIONS

Contact with soils

1. ATSDR recommends that the Cecil Field Reuse Planning Commission retain sign postings at Site 15 to aid in protection of the health of future recreational users of the YWWA until the Proposed Plan clean-up activities are completed.

2. ATSDR recommends stakeholder evaluation of the effectiveness of the signs in keeping individuals from entering the area (e.g., query the nearby neighbors, look for signs of trespassing, etc.), especially if Site 15 is left unremediated. This is required as part of the Superfund Comprehensive Five Year Review.

3. When making choices on soil cleanup levels, the Navy should consider the bioavailability of lead at Site 15, lead particle size, and the correlation of sample results at different depths to get a better average concentration for surface soil samples. Additionally, the Navy should verify where the ash spread area was located. Accomplishing those evaluations will ensure that the surface soil samples are representative and that the most bioavailable lead is remediated.

4. ATSDR recommends continuing evaluation of the land use controls during the Superfund Comprehensive Five Year Review to determine if changes in the economy or the regional vision for NAS Cecil Field redevelopment result in a proposed residential reuse or recreational activities where children could have frequent (i.e., several times a week) contact with the soils.

Eating locally caught fish and turtles

5. If Site 15 soils are left unremediated (thus allowing more soluble lead and possibly other metals to enter drainage areas), the increased use and harvesting of fish and turtles from this area should be evaluated as part of the Superfund Comprehensive Five Year Review.

Contact with Unexploded Ordnance

6. Since unexploded ordnance has also been found at and near Site 15, clearing and notification procedures need to be in place if future use includes digging and excavation. Educational material should be developed and distributed by the Navy. The UXO section provides some educational information on clearing and reporting procedures.

Use of Groundwater

7. ATSDR's review of the Navy's shallow groundwater data shows that there are some contaminants (e.g., antimony (46.2 ppb) and lead (21.7 ppb)) in the groundwater at Site 15 that would exceed the drinking water standards set by EPA. Therefore, we recommend that the groundwater use situation be part of the Superfund Comprehensive Five Year Review.

D. LEAD AND ASBESTOS IN BASE HOUSING - Current and future building occupants and visitors, particularly children, could be exposed to lead-based paint, lead in tap water, and asbestos insulation found in many buildings on base. These hazards are indeterminate as the hazard management efficacy (preventing paint chipping, flushing water lines, covering insulation) is unknown. *(Indeterminate Public Health Hazard)*

There are several ways building occupants can be exposed to lead, including eating or inhaling lead-based paint or dusts or drinking water from plumbing containing lead. In 1995, the Navy surveyed base buildings and found lead-based paint hazards. The surveys determined that base housing, and Base Officer Family Housing units have varying levels of lead-based paint as well as the former Child Care Center facilities (Buildings 24 & 118). The survey stated that residential housing units constructed between 1942 and 1957 have paint with 20-25% lead. The base buildings also have asbestos insulation remaining that, if disturbed, could present a health hazard.

The Navy has disclosed information concerning lead and asbestos via the Finding of Suitability to Transfer (FOST) documents for parcels transferred to the city of Jacksonville and the Jacksonville Port Authority. The Navy or the redevelopment authority should provide information to new residents, developers, or tenants on not only the location of the lead paint and asbestos buildings, but ways to manage those hazards.

The Navy has also identified copper drinking water pipes with lead solder. Lead solder is known to leach into drinking water under certain conditions. The Navy should determine if the lead solder is leaching into the drinking water at action levels (15 ppb). If so, either remove the lead hazard or provide information to new occupants on flushing techniques and frequency. Future occupants and frequent visitors should consult with their health care provider as to whether routine (annual) blood lead sampling is needed based on their medical condition. Those at greatest risk are children under 6 years old, the elderly, and women of child bearing age.

INFORMATION FOR BUILDING OCCUPANTS

MANAGEMENT OF LEAD AND ASBESTOS HAZARDS IN BUILDINGS ON BASE

It is important to perform regular maintenance and continue to flush water lines!

If you have lead paint in your building:

- Inspect for chipping or peeling and re-paint if necessary.
- Do not sand or otherwise stir up paint dust.
- Have children under six years of age tested annually to determine their blood lead level.

If you have lead in outside soils:

- Keep bare soil areas covered with vegetation and don't eat vegetables grown there.
- Keep children out of these areas.

If you have asbestos insulation:

- Inspect insulation regularly and keep it covered.
- Report and repair broken or torn insulation.

Exterior lead paint may have also peeled off the housing exterior and deposited into soils possibly presenting a hazard if children play there or if soil is used for vegetable gardening. The Navy has sampled the soils and determined that the levels do not present a health hazard.

Possible Past Exposures to Lead

Children who attended Building 24 Day Care operations at the base may have been exposed to lead at levels of health concern. Surveys conducted in 1995 demonstrated that interior and exterior surfaces of this facility were painted with lead-based paint. Areas of deteriorated paint were noted in the infant room, pre-toddler room, 3 year old and 4 year old rooms, and in common areas. In 1997, NAS Cecil Field day care activities were moved from Building 24 to Buildings 109 and 118. No lead hazard has been identified at Building 109, but Building 118 is documented as having lead-based paint and extreme deterioration of painted surfaces.

Additionally, children who lived in base housing may have been exposed to lead at levels of health concern. The 1995 surveys determined that Base Officer Family Housing and Base Enlisted Housing units have lead-based painted surfaces.

No risk reduction or abatement activities were initiated by NAS Cecil Field or the Naval Facilities Engineering Command-Southern Division in response to the results of the 1995 lead paint survey. Baseline and follow-up blood lead screenings were not performed so there is no information to determine if children were being exposed to lead in the day care and residential environments at levels posing a health risk. Therefore, ATSDR also concludes that in the past, those children attending base day care facilities, living in base enlisted housing, or both, may have experienced exposures to lead at levels posing a health hazard. Since the base closing, the day care and Base Officer Family Housing have been taken out of service.

Possible Future Exposures to Lead

In the absence of risk reduction or lead abatement activities, the lead in the NAS Cecil Field housing units may pose a health hazard to children 6 years and under, the elderly, and women of child-bearing age who use these units for permanent or vacation housing in the future.

INFORMATION FOR
BUILDING OCCUPANTS

MANAGEMENT OF LEAD AND ASBESTOS HAZARDS IN ON-BASE BUILDINGS CONTINUED

It is important to perform regular maintenance and continue to flush water lines!

If you have lead in your tap water:
Short-term remedies an individual can use to reduce the lead concentrations in your drinking water and thus your exposure to lead are included below. You cannot see, taste, or smell lead in your drinking water, so it is important to perform these precautionary steps.

1) Let the water run from the tap for 30 seconds to 2 minutes before using it for drinking or cooking. The longer water stays in a building's pipes, the more lead it may contain. Water that has sat in the pipes for more than four hours should be flushed for 3 to 5 minutes; for example, first thing in the morning and when you arrive home in the evening. A good indication of when to stop flushing the cold water tap is when the water becomes noticeably colder.
2) Use cold water even for cooking or making infant formula because water from the hot water tap dissolves lead more quickly.

If a water sampling test for lead indicates that your tap water at home or at work contains lead in excess of 15 ppb even after flushing, you may want to consider taking the following additional measures.

1) You may choose to use bottled water instead of tap water for drinking or cooking purposes.
2) You may choose to use a water purification system. Purification systems range in size and cost from the water pitcher filtration systems to entire home-sized purification systems.

To verify if you have lead paint or lead in your tap water, you can buy home based testing kits found at most hardware stores.

For information on blood lead, call **Duval County Health Department (904) 630-3300**

PUBLIC HEALTH ACTION PLAN - LEAD AND ASBESTOS IN BASE HOUSING

CONCLUSIONS

1. Current and future building occupants or visitors, particularly children, could be exposed to lead-based paint, lead in tap water, and asbestos insulation found in many buildings on base. Lead in soils near housing was determined to not present a hazard. These hazards are indeterminate as the hazard management (preventing paint chipping, flushing water lines, covering insulation) efficacy is unknown.

RECOMMENDATIONS

1. The Navy or the redevelopment authority should provide information to new residents, developers, and tenants on not only the location of the lead paint and asbestos buildings, but how to manage those hazards.

2. The Navy should determine if the lead solder is leaching into the drinking water at action levels (15 ppb). If so, either remove the lead hazard or provide information to new occupants on tap water flushing techniques.

3. If the lead hazards remain unabated, future occupants and frequent visitors should consult with their health care provider as to whether routine (annual) blood lead sampling is needed based on their medical condition. Those at greatest risk are children under 6 years old, elderly, and women of child bearing age.

E. EATING FISH AND TURTLES FROM ON-BASE LAKES AND CREEKS - People could be exposed to contaminants that accumulate in fish and turtles as new lakes or enlargement of existing lakes may inadvertently bring contamination to the water bodies from nearby remaining source areas. *(Current - No Apparent Public Health Hazard)*

According to Navy documents, there are five fishable lakes including Lake Fretwell, Lake Newman, Lake Wright, Lake Yellow Water, and Lake Burrel, and numerous creeks as well as wetland areas with standing water, capable of supporting fish on NAS Cecil Field. While the base was in operation, people were fishing in the lakes. With the turnover of NAS Cecil Field, more fishing is likely. The fish have only been sampled in one lake, Lake Fretwell, and found to be contaminated with low levels of mercury, lead, PCBs, and other chemicals, but at levels not likely to result in adverse health effects in people. New lakes or enlargement of existing lakes in the future may inadvertently bring contamination to the water bodies from nearby remaining source areas. Future use of the lakes and streams has not been determined and they may, in the future, be stocked with sufficient fish to support recreational or subsistence fishing. This situation would therefore, warrant periodic reassessment.

Background

There are five man-made lakes on NAS Cecil Field, including Lake Fretwell, Lake Newman, Lake Wright, Lake Yellow Water, and Lake Burrel, and numerous creeks, as well as wetland areas with standing water, capable of supporting fish. Fish resources in the impoundments include large mouth bass, red ear sunfish, warmouth perch, channel catfish, bullhead catfish. Channel catfish are found in lake impoundments and creeks and rivers feeding lakes.

Exposure Evaluation and Public Health Implications

Current and Future Exposure to Chemical Contaminants in Lake Fretwell Fish

Lake Fretwell, located in the western portion of the Main Station, was created by damming Rowell Creek. The northern and western parts of the base drain to Lake Fretwell and Rowell Creek, which ultimately discharges to Sal Taylor Creek. Sal Taylor Creek continues off-base to the south and eventually drains to the St. Johns River. In the past, the Lake Fretwell was stocked by NAS Cecil Field for recreational fishing. Lake Fretwell is the only on-base lake where fish were sampled.

In February 1995, fishing restrictions were placed on Lake Fretwell after sampling results indicated PCB and pesticide contamination in lake sediments (NAS Cecil Field IRP, 1996a). A subsequent investigation was conducted to determine if fish tissue was contaminated and whether consumption of fish from the lake posed an unacceptable health risk (U.S. EPA, 1995a). The results of the investigation led the Florida Department of Health and Rehabilitative Services (HRS) to issue a Health Advisory for fish establishing a consumption rate of two 8-ounce servings of Lake Fretwell fish per month (Florida DEP, Undated). However, it was subsequently

determined that the fish samples may not have been representative of game fish contaminant concentrations; therefore, additional fish were collected and analyzed by the Navy in January 1997.

The 1997 fish sampling event was designed to generate an optimum data set for drawing conclusions about the public health risks associated with eating fish from Lake Fretwell. Forty-seven adult fish, belonging to the popular game fish species, were caught and the fillets analyzed for PCBs, pesticides, and mercury. The Navy estimated cancer and non-cancer health risks for four different potential fishing populations using standard EPA risk assessment methodology; recreational fisherman, avid fisherman, subsistence fisherman, and fisherman consuming fish according to ingestion rates and frequency defined by the Florida HRS as typical of fishers in Florida. The risk evaluation assumed that 50% of all fish consumed by an individual were caught from Lake Fretwell. Analysis of the 1997 fish tissue data indicated that consumption of fish from Lake Fretwell did not pose a health risk to people. (ABB-ES, 1997b).

There are not currently enough fish in Lake Fretwell to feed those with diets of fish at subsistence or recreational levels. Other lakes are believed by stakeholders to be upgradient of possible source areas. Nevertheless, the lack of available fish in Lake Fretwell does not support eating fish at subsistence (e.g., eating fish a few times a week) or recreational consumption levels (e.g., eating fish a few times a month) and therefore, contaminants would be below levels of health concern.

Possible Contaminant Sources

The 1997 sampling results demonstrated that Lake Fretwell is safe for recreational fishing use. The multiple possible sources of contamination to Lake Fretwell include:

- Site 4 Grease Pits
- Site 5 Oil and Sludge Disposal Pits
- Site 6 Lake Fretwell Rubble Disposal Area
- Site 7 Old Fire Fighting Training Area
- Site 11 Golf Course Pesticide Disposal
- Site 19 Rowell Creek Rubble Disposal Area
- Sewage Treatment Plant
- Aircraft Wash Rack

References: ABB-ES, 1994a ; ABB-ES, 1997c.

Some site-specific sources of mercury used, stored, or disposed at NAS Cecil Field include the following: paints, calibration gauges, batteries, and munitions (e.g., mercury fulminate is an initiating explosive that may be used as either a primer or a detonator (Department of the Navy. 1969). Additionally, EPA's Mercury Report to Congress shows the Jacksonville area with a moderate mercury deposition (i.e., 5-10 $\mu g/m^2$) (EPA, 1997a).

Besides mercury, when NAS Cecil Field was in operation, many fuel spills - some quite large- ran off into creeks and streams. The contaminants from those spills could have included lead, fuels, and possibly other chemicals. Additionally, small impoundments (lakes and ponds) near old firing ranges and the gunnery school have not been sampled and lead and explosives possibly present in soil could impact those waters.

Future Uncertainty of Fish Contamination

If future use of the property includes expanding or creating new lakes, a review of the remaining contaminant locations and migration information should be conducted to determine if the lakes could become contaminated.

PUBLIC HEALTH ACTION PLAN - LAKES AND CREEKS ON BASE

CONCLUSIONS

1. Currently, eating fish from Lake Fretwell poses no apparent public health hazard for recreational fisherman.

2. Contamination is possible in other lakes' fish from past disposal areas, spills, and state-wide deposition of mercury, however, it is unlikely that those lakes would support enough fish for consumption.

3. New lakes or enlargement of existing lakes in the future may inadvertently bring contamination to the water bodies from nearby remaining source areas (soil and groundwater). Future use of the lakes and streams has not been determined, and they may in the future be stocked with sufficient fish to support recreational or subsistence fishing, and therefore, warrant periodic reassessment

RECOMMENDATIONS

1. ATSDR recommends that a review of the potential for fish and turtles to become contaminated in the future be investigated as part of the Superfund Comprehensive Five Year Review.

2. If fish are sampled, the following information should be collected:

   - How long had fish been stocked before sampling
   - Were fish considered wild or breeding populations
   - Size fish, age, sex of fish sampled
   - Types, genus, and species of fish sampled
   - Skin on or off filets
   - Were fish trimmed of fat
   - Lipid content of fish
   - Wet weight and dry weight concentration of COPC
   - Documentation of abnormalities or lack of abnormalities
   - Documentation of presence of egg masses.
   - Sample Specific Quantization Limit (SQL)
   - Cross reference of information on fish with samples and concentrations on CD-Rom

F. UNEXPLODED ORDNANCE HAZARDS - Unexploded ordnance (UXO) could be a future explosion hazard for people digging or excavating near many areas on the Main Base and on the Yellow Water Weapons Area.

The Navy has evaluated a number of areas on the Main Base and Yellow Water Weapons Area where explosives and ordnance may have been located. At least ten primary areas were identified with unexploded ordnance (UXO). The type of ordnance found was generally smaller, less powerful rounds that require much force to cause them to explode. However, more powerful, 20 mm rounds and rocket warheads, were also found in one area on the Main Base (PSC 18 - Ammunition Disposal Area). A 500-pound high explosive blast and fragmentation bomb (inert) was found at site 15. Because the more powerful munitions were found in a creek (Sal Taylor Creek), people should use caution in waterways, ponds, lakes, and wetlands as those areas have not been fully investigated. The Navy also used at least four off-base areas during the WWII era for bombing ranges. These areas have been identified by the Army as formerly used defense sites. Those areas are currently developed. No UXO investigations have taken place there.

UXO investigations do not find all UXO items. UXO in waterways and wetlands are extremely unlikely to be discovered as are bulk explosives or any UXO buried below two meters.

INFORMATION FOR THOSE WHO DISCOVER UNEXPLODED ORDNANCE OR UNIDENTIFIED GLASS VIALS

UXO SAFETY AND REPORTING

It is important to understand how to react responsibly in the presence of UXO (unexploded ordnance).

If you encounter UXO:

- STOP! Do not move closer.
- DO NOT touch, move, or disturb UXO.
- Do not transmit radio frequencies (walkie-talkies, citizens band radio, cellular telephones, etc.).
- Do not attempt to remove anything near UXO.
- Clearly mark the area where UXO is found.

In case of a UXO emergency, call 911 or the **Jacksonville Sheriff's Office (904) 630-7600**

(Excerpted from the **BRAC Environmental Fact Sheet, SPRING 1999)**

The Navy should coordinate with the Army Corps of Engineers and new tenants to ensure the proper program provides public education on the locations and hazards associated with disturbing UXO. Institutional controls (i.e., no digging) may be needed in multiple areas. The Navy should verify emergency phone numbers and reporting information and provide clearing and reporting procedures to residents, developers, utility contractors, and municipalities before people dig or excavate in UXO locations.

Background and Land Use

Several activities in the NAS Cecil Field mission used or stored munitions and explosives including: training ranges for aircraft bombing, small arms firing ranges, and explosive and munition storage. After construction of NAS Cecil Field in 1941, the Navy used the base for flight training operations during WWII (Hardin Lawson, 1999). At least four bombing ranges (now off-base) were used until 1947 for training missions (U.S. COE, 2000). Part of the training mission included small arms firing ranges. Munitions storage in storage bunkers was also a part of the mission here.

Exposure Evaluation and Public Health Implications

In 1994, the Navy conducted geophysical surveys in several areas on the Main Base and Yellow Water Weapons Area to locate possible unexploded ordnance (UXO). Excavation of suspect areas identified by the surveys was also performed. The UXO survey areas were identified based on records search, aerial photograph review, and interviews with Navy personnel (Harding Lawson, 1999).

At least ten primary UXO areas were identified on base. The type of munitions found was generally smaller, less powerful rounds that require much force to cause them to explode. However, more powerful, 20 mm rounds and rocket warheads were also found in one area on the Main Base (PSC 18 Ammunition Disposal Area near Sal Taylor Creek). Because the more powerful munitions were found in a creek, people should use caution in waterways, lakes, ponds, and wetlands as those areas have not been fully investigated. ATSDR's review of the available information shows that approximately 3-4% of the base has been geophysically investigated and those investigations covered up to four feet deep.

The Navy also used at least four off-base areas during the WWII era for bombing ranges. Those areas are currently developed, and no UXO investigations have taken place there.

A summary of ATSDR's review of the available documents referencing ordnance or explosives is provided in the table below. The on-base locations are on Figure 10. More information on the off-base area can be found at the bibliography of bombing ranges listed with the References.

List of known UXO areas on NAS Cecil Field and on previously owned Navy (FUDS) property nearby		
Location ID or Name	**Location**	**Description of use/ UXO found**
Main Base Areas		
Ammunition Disposal Area (PSC 18)	East of the runways along Sal Taylor Creek	Waste ordnance explosive waste materials were trucked from 1940-1950. Recovered 231 UXO items. 75-2.75 rocket war heads, 50-20-mm rounds, 1-MK4 cartridge, 1-50 caliber round Army Corps of Engineers Note: High water may have prevented discovery of items believed to be in the creek under the bridge
Aviation Ordnance Area	Northeast of runways in the Main Base area	2,000 acres with 30 Magazines, Buildings 225-230, 515-534, and 594-597
Bore Site Range (Site 8)	Southwest corner of runways near old Fire fighter training area.	Was used as a machine gun and small arms practice range. Spent bullets and casings found.
Dummy bomb discovery areas	unknown locations	Dummy bombs with spotting charges found in one location, possibly dropped as part of training mission.
Pistol Range (AOI 24)	Northeast of Main Base	
Roswell Creek Ordnance Disposal Area (AOI 34)	Western perimeter at intersection of Perimeter Road and Roswell Creek	MK 24 flare
Yellow Water Weapons Area		
Mobile Target Area - PSC 4		
Site 14		Used for open burning and detonation of high explosives
Site 15		One 500-pound blast and fragmentation bomb (inert) found. Visual inspection did not locate other UXO. Used for the combustion of munitions in a chamber and subsequent spreading of the munition residues and ashes over the surrounding ten acres
Skeet Range (PSC 49)		Likely used for small arms practice.
Target Range		Likely used for small arms practice.

List of known UXO areas on NAS Cecil Field and on previously owned Navy (FUDS) property nearby		
Location ID or Name	**Location**	**Description of use/ UXO found**
60-Acre Naval Gun School	Area is in St Johns River basin. Old Yellow Water Road and unpaved sections of McCracken Road cut across the Old Gunnery School.	60-acre parcel, Yellow Water Weapon Area used for Naval Gunnery school activities. Navy firing range 1945 to late 1950. In the Fall 1995, UXO survey conducted in some areas. Munitions/UXO found on site included: two 50 caliber bullets, several spent 20 mm, 7.62mm and .45 caliber and .50 caliber shells, numerous spent .50 caliber projectiles and castings on north side of Old Yellow Water Road. Site covered with dense undergrowth. The report (US Navy, 1996a) states that electrical current needed to detonate the 20 mm round but a .50 caliber rounds could detonate if sufficient energy is imparted to the firing mechanisms of the bullet. The report notes ".. A full disclosure of UXO Survey Results and the fact that there is potential for the presence of additional live rounds should be made available to potential lessees for their evaluation and references (ABB-ES, 1996b).
*11 areas surveyed on map. Some overlap of the above sites		Small arms ammunition found (7.62 mm primarily)

List of known UXO areas on NAS Cecil Field and on previously owned Navy (FUDS) property nearby		
Location ID or Name	**Location**	**Description of use/ UXO found**
Areas Evaluated By US Army Corps of Engineers and Determined to be Formerly Used Defense Sites		
Chafee Bomb Target Site	Duval County, Florida; USGS 7.5' quadrangle topographic map, Marietta, FL; SE portion: Section 36, T2S, R24E, and in Section 1 T3S, R24E. Site is located on the western side of Chaffee Road, approximately ½ mile north of Normandy Boulevard, adjacent to Naval Air Station (NAS) Cecil Field.	Between September 1941 and November 1947, the United States acquired 435.45 acres of land in fee, by condemnation, for use by the U.S. Navy as a bomb target site. Property use prior to Federal acquisition was rural/agricultural. The property was used by the Navy as an auxiliary naval air station and as a bombing range. Records on file at the Corps of Engineers, Jacksonville. The property was transferred to the Duval County Board of Public Instruction by a quitclaim deed dated 24 July 1952. The quitclaim deed states that the property was used as a naval air station and bomb target site; that various types of ordnance were introduced; and the federal government could not certify that the property had been completely decontaminated. Current property records indicate ownership is divided between 4 major land owners and several other landowners with smaller interests. USCOE conducted a site visit on 17 July 1991. Both properties are used for a golf course, residential, and agricultural purposes at this time. The owner of Great Meadows Golf Course, was interviewed on the site. He stated that ordnance items were found regularly (approximately 10-15 in the most recent years) in working on the golf course. He did not know if the ordnance was live or practice type, and did not know of any explosions which had occurred. He knew of no injuries associated with the ordnance. No other visual evidence of the former facility remained on the property.
Clay Bomb Target Site	Clay county	Prior to 1942 the United States leased approximately 664 acres for a naval bomb target site. There is no indication that the Navy constructed anything at this site other than a target in the shape of a ship and fencing. Correspondence dated 14 January 1947 stated the leasehold had been canceled, but did not specify the date. USCOE conducted a site visit on 28 May 1993. The site is privately owned and is currently a planted pine forest and has been logged and replanted since used as a bomb target. The only discovered information available for the site is an engineering drawing which shows the location and details of site design. No evidence was found of cratering in 1953 aerial photos.

List of known UXO areas on NAS Cecil Field and on previously owned Navy (FUDS) property nearby		
Location ID or Name	**Location**	**Description of use/ UXO found**
Keystone Bomb Target Site	Near Keystone Heights, Clay County, Florida; USGS 7.5' quadrangle topographic map, Gold Head Branch, FL; SW portion: Section 15, T85, R23E. Site is located approximately 2.5 miles northeast of the town of Keystone Heights.	In the early part of World War II, the U.S. government apparently leased the property for use as a bombing target site in support of training operations at Naval Air Station (NAS) Jacksonville near Jacksonville, Florida. In addition, the War Department used the site as an auxiliary infantry replacement training target range for the Camp Blanding military reservation. An office memorandum dated 14 November 1944 from the U.S. Government (Chief of the War Department's Real Estate division) to the U.S. Army's acquisition branch at Camp Blanding, Florida, described the site as one entire section (640.0 acres; Section 15, T85, R23E). At that time the property was under the jurisdiction of the U.S. Navy Department. A final project ownership map dated 14 November 1947 for Camp Blanding shows the area relinquished by the War Department to the Navy on 18 July 1946. The Navy subsequently relinquished the property to the owners. Current property records indicate the property has been extensively subdivided and numerous roads have been built on the area.
Spencer Bomb Target Site	Located in Clay County approximately four miles southeast of the NAS Cecil Field.	The Navy utilized the site as a bomb target range and constructed a concrete block building, security fencing and drainage ditches. The site was active until August 1958 when its mission was completed and the site was no longer needed. The Navy declared the entire site, consisting of 372.71 acres of fee land, excess to the General Services Administration (GSA) on 11 February 1959. Between July 1959 and September 1959, GSA sold the 372.71 acres of fee land to five individuals or corporations. The five quitclaim deeds from GSA did not contain any restrictions, recapture clauses or warranties, but were subject to existing easements for roads, highways, railroads, pipelines, and public utilities. The property is now being used for residential, agricultural, and logging purposes.
References: Harding Lawson, 1999; U.S. COE, 2000 . Bibliography of information on the Off-Base Bombing Ranges (in Ref List)		

PUBLIC HEALTH ACTION PLAN - UNEXPLODED ORDNANCE

CONCLUSIONS

1. Although munitions and explosives storage were a major part of the NAS Cecil Field mission, most do not remain on base. UXO surveys have not recovered substantial amounts of ordnance. The primary UXO discovered were smaller, less powerful rounds in 10-15 primary areas on base although some higher explosives was discovered (20 mm rounds, rocket warheads) and one 500-pound blast and fragmentation bomb (inert). The possibility of finding UXO still exist and disturbing UXO presents a health hazard.

RECOMMENDATIONS

1. The Navy should coordinate with the Army Corps of Engineers and new tenants to ensure the proper program provides public education on the locations and hazards associated with disturbing UXO. Institutional controls (i.e., no digging) may be needed in some areas.

2. The Navy should verify emergency phone numbers and reporting information and provide clearing and reporting procedures to residents; bombing range owners, developers, utility contractors, and municipalities before people dig or excavate in UXO locations.

III. Community Health Concerns

ATSDR briefed the NAS Cecil Field Restoration Advisory Board (RAB) in 1997 and 1998 on our intent to complete a public health assessment and solicited comments and concerns from those attending. No concerns were expressed by the people present. ATSDR also phoned the RAB Community Co-Chair who confirmed the same issues we have identified (groundwater, lead in soil, and UXO) and on the past use of radioactive materials. ATSDR conducted interviews of local, state, and other federal government officials to identify any community health concerns. During these interviews, no additional community health concerns were brought to our attention.

Did NAS Cecil Field use, store, or dispose of radioactive materials on-base? Could reuse in those area be harmful to people's health?

A complete radiological survey of the entire base was not accomplished. ATSDR currently has no indication that high-level radioactive material remains on NAS Cecil Field. Some low-level radiation may still be present in landfills from past disposal of dials, etc. ATSDR recommends that a re-evaluation of all information, including the evaluation of data gaps, be part of the Superfund Comprehensive Five Year Review.

If you have concerns you would like to relay to ATSDR, please direct them to the following address.

Program Evaluation, Records, and Information Services Branch
Re: NAS Cecil Field
ATSDR, Division of Health Assessment and Consultation
1600 Clifton Road, MS E-56
Atlanta, GA 30333

Questions may also be directed to Robert Safay, the ATSDR senior regional representative in Region 4, at 404-562-1782 or to the ATSDR information line at 888-42ATSDR or 888-422-8737. Please mention that you are calling about NAS Cecil Field.

A. ATSDR Child Health Initiative

ATSDR's Child Health Initiative recognizes that the unique vulnerabilities of infants and children demand special emphasis in communities faced with contamination of their water, soil, air, or food. Children are at greater risk than adults from certain kinds of exposures to hazardous substances emitted from waste sites and emergency events. They are more likely to be exposed because they play outdoors and they often bring food into contaminated areas. They are shorter than adults, which means they breathe the dust, soil, and heavy vapors close to the ground. Children are also smaller, resulting in higher doses of chemical exposure per body weight. The developing body systems of children can sustain permanent damage if toxic exposures occur during critical growth stages. Most importantly, children depend completely on adults for identifying behaviors and situations that may place their health at risk and for access to medical care (ATSDR, 1998).

Conclusions about Child Health at NAS Cecil Field

ATSDR evaluated the likelihood for children living on-base or in the community around NAS Cecil Field to be exposed to base contaminants at levels of health concern. ATSDR identified one current and one future scenario and two situations in the past in which children may have been exposed to lead at the NAS Cecil Field. The first population is, in the future, children may play on the unremediated parts of Site 15 in the Yellow Water Weapons Area (YWWA). The second population is those children who attended Building 24 Day Care operations at the base. The third population are children who lived in base housing. The 1995 surveys determined that Base Officer Family Housing and Base Enlisted Housing units have lead-based painted surfaces. These situations are discussed in greater detail within their corresponding section headings in the body of the document. Plus, might be better to put in list form rather than sentence form, like:

IV. Health Outcome Data

ATSDR conducts a review of existing health outcome data (e.g., birth and death certificates, birth defects registries, cancer registries, etc.), when available, if people have been exposed to site contaminants in concentrations possibly posing a public health hazard or if the community has concerns related to specific health outcomes. The evaluation of health outcome data may give a general picture of the health of a community, or it may confirm the presence of excess disease or illness in a community. However, elevated rates of a particular disease may not necessarily be caused by hazardous substances in the environment. Other factors such as personal habits, socioeconomic status, and occupation, also may influence the development of disease. In contrast, even if elevated rates of disease are not found, a contaminant may still have caused illness or disease.

At NAS Cecil Field, ATSDR did not review health outcome data because records were not available or the exposed population was too small to evaluate the trends of adverse health effects. For on-base exposure to lead, records were not available since routine testing was not done. Without blood level data at the time of exposure, ATSDR cannot verify exposure to lead in the soils and paint. Furthermore, examining current blood samples for lead will not identify past exposure because the half-life of lead in blood is approximately 32 days, in soft tissue 40 days, and in bone approximately 27 years. Blood and soft tissue lead levels will likely fall after exposure ceases with slow replenishment from the bone. However, the much higher half-life in blood would keep blood lead levels low. Therefore, examining current blood levels will not provide information about past exposure to lead. Further, examining current lead levels in bone would not provide exposure information about a single source, such as lead in soils, since bone lead levels represent a lifetime of exposure from many sources. Lead is prevalent in the environment. Since troop rotations were five to nine years and the houses have been vacant for two years, people in the houses could have been exposed before they moved to NAS Cecil Field or after. Therefore, current blood lead data would provide information about lead exposure from all sources and not just base housing or the day care facility.

V. Summary of Conclusions and Recommendations

Exposure Situation and Hazard Summary Table - *Cecil Field Naval Air Station, FL*

Exposure Situation	When/ People Exposed	Hazard	Actions Taken/Planned	Recommendations	Comments
ON-BASE GROUNDWATER Groundwater contamination on a *major portion of the main base* migrating into indoor air and deep drinking water wells. Contaminants: TCE & other solvents, metals, jet fuel	current & future - possible	**Indoor Air** current - No hazard future - Indeterminate (more data needed) **DW wells** current & future -No hazard	Actions ▫ The Navy notifies new property owners are of existing groundwater contamination by way of the Findings of Suitability to Transfer (FOST) document. The owners are subject to groundwater use restrictions by way of deed restrictions in those areas where groundwater contamination has been identified.	*Indoor Air* 1. The Navy should distribute educational material to developers and future occupants informing building occupants of possible indoor air contaminant hazards. 2. Developers should consider installing vapor barriers when building in areas with shallow groundwater contamination. 3. Developers should also consider sampling indoor air in new or restructured buildings. That sampling should include biogenic gasses (e.g., methane, ethane, etc.), chlorinated hydrocarbons (e.g., TCE, TCA, etc.), and hydrocarbons (e.g., benzene, ethylbenzene, etc.). 4. EPA and the Navy should consider implementing an assessment of new or restructured buildings at risk for indoor air contamination as part of the Superfund Comprehensive Five Year Review. *Use of On-base Groundwater* 5. Routine drinking water sampling (possibly every 3 years) should continue to be done by the operators of any systems fed by wells on base. The analysis should include metals, VOCs, and SVOCs. ATSDR is also recommending sampling for additives. 6. Well owners should implement wellhead protection and evaluation of the casing integrity starting with the wells closest to the plumes. 7. Notification of the groundwater hazards should be given to developers and be on file with the city and county. The information should include groundwater flow directions in each of the aquifers, 3-dimensional delineation of the contaminant plumes, and the cone of influence for the current supply wells, and a check of the casing integrity. This information should also be provided in th Findings of Suitability to Transfer (FOST). 8. The St. Johns River Management District, State, or county, whichever is appropriate, should restrict new well installation in areas near groundwater contamination without wellhead protection, corrosion resistant casings, aquifer protection during drilling, and if needed, perform water treatment. 9. EPA and the Navy should consider implementing an assessment of new and existing wells at risk for contamination as part of the Superfund Comprehensive Five Year Review.	• Groundwater contamination could seep into the indoor air of buildings (particularly enclosed buildings) Utility lines (water, sewage, etc.) could aid this. • The old well casing could breakdown and carry contamination to DW zone *Summary- Need for indoor air sampling should be re-evaluated, info on upgraded well head protection plan, and notification of future well users.*

Exposure Situation and Hazard Summary Table - *Cecil Field Naval Air Station, FL*

Exposure Situation	When/ People Exposed	Hazard	Actions Taken/Planned	Recommendations	Comments
JET FUEL PIPELINE Jet fuel (JP-4 and JP-5) migrating to private wells and indoor air in homes and businesses from *the 103rd Street pipeline.* (15 miles underneath Roosevelt, Timaquana, and 103rd Streets between NAS Jacksonville and NAS Cecil Field in the City of Jacksonville). Contaminants: Jet fuels, other fuels, metals	current & future - possible	**DW wells** current & future- Indeterminate hazards - more data needed **Indoor Air** past- No (apparent) hazard current & future - Indeterminate (more data needed)	Actions ▫ Migration and degradation of known groundwater contamination is being monitored. ▫ The pipeline wall thickness anomalies checked in 1990, 1994, 1996, and 1999. No major failures/ fractures discovered, but between 32 and 90 anomalies requiring further investigation.	Recommendations *Wells* ▫ As soon as possible, but within 6 months, the Florida Department of Environmental Protection should provide educational material (such as radio or television broadcast or printed material in the newspaper) warning well owners of the possible regional contamination hazards prompting them to have their well sampled annually. Alternatively, a complete well survey can be conducted and people notified individually. ▫ Because individual private, and especially shallow, wells can be affected by fuel leaks, improperly functioning septic tanks, small industrial waste disposal practices, and residential use and disposal of pesticides, people should have their wells tested for volatile organic compounds, semi-volatile organic compounds, pesticides, and metals. ▫ Florida Department of Environmental Protection should provide notification/information to planning/permitting departments on the possibility of local groundwater contamination so that developers or residents can be informed that new wells need wellhead protection, the aquifer should be protected during drilling, and water may need treatment before consumption. *Indoor Air* 1. Building occupants should report fuel odors in indoor air to the Florida Department of Environmental Protection, Bureau of Emergency Response 1-800 320-0519 or (904) 807-3300 or the local fire department.	• For 43 years, 200,000 gallons/ day flowed through fuel pipeline extending from NAS Jacksonville to NAS Cecil Field. Even a very small loss per day would result in thousands of gallons of fuel over that time period. • There could be many private wells in the area with conduits in the area (sewers, waterlines, etc.) that could move the contamination to wells & indoors. • Other sources along 103rd, especially old gas stations, could also possibly pollute the GW.

Exposure Situation and Hazard Summary Table - *Cecil Field Naval Air Station, FL*

Exposure Situation	When/ People Exposed	Hazard	Actions Taken/Planned	Recommendations	Comments
SITE 15 (BLUE 10) Contact with contaminated soils (primarily lead) at *Site 15* (Blue 10 Ordnance) and consumption of fish and turtles caught in *Yellow Water and Sal Taylor Creek.* Contaminants: lead, mercury, other metals, PAHs, pesticides, UXO	Soil & Fish current & future - possible	**Soil Contact** Recreational current - No apparent future- Indeterminate **Eating Fish/Biota** current - No apparent	▫ Site 15 is currently posted with signs alerting recreational users of the YWWA roads and trails to the chemical hazards in this area. ▫ ATSDR will review the Proposed Plan for Site 15 clean-up when it becomes available to ensure that the proposed remedy is protective of recreational users.	*Contact with soils* • ATSDR recommends that the Cecil Field Reuse Planning Commission retain sign postings at Site 15 to aid in protection of the health of future recreational users of the YWWA until the Proposed Plan clean-up activities are completed. • ATSDR recommends stakeholder evaluation of the effectiveness of the signs in keeping individuals from entering the area (e.g., query the nearby neighbors, look for signs of trespassing, etc.), especially if Site 15 is left unremediated. This is required as part of the Superfund Comprehensive Five Year Review. • When making choices on soil cleanup levels, the Navy should consider the bioavailability of lead at Site 15, lead particle size, and the correlation of sample results at different depths to get a better average concentration for surface soil samples. Additionally, the Navy should verify where the ash spread area was located. • ATSDR recommends continuing evaluation of the land use controls during the Superfund Comprehensive Five Year Review to determine if changes in the economy or the regional vision for NAS Cecil Field redevelopment result in a proposed residential reuse or recreational activities where children could have frequent (i.e., several times a week) contact with the soils. *Eating locally caught fish and turtles* • If Site 15 soils are left unremediated (thus allowing more soluble lead and possibly other metals to enter drainage areas), the increased use and harvesting of fish and turtles from this area should be evaluated as part of the Superfund Comprehensive Five Year Review. *Contact with Unexploded Ordnance* • Since unexploded ordnance has also been found at and near Site 15, clearing and notification procedures need to be in place if future use includes digging and excavation. Educational material should be developed and distributed by the Navy. *Use of Groundwater* • ATSDR's review of the Navy's shallow groundwater data shows that there are some contaminants (e.g., antimony (46.2 ppb) and lead (21.7 ppb)) in the groundwater at Site 15 that would exceed the drinking water standards set by EPA. Therefore, we recommend that the groundwater use situation be part of the Superfund Comprehensive Five Year Review.	• EPA and Naval Facilities Engineering Command - Southern Division (NAVFACENGCOM-SOUTHDIV) have met with the Cecil Field Reuse Planning Committee and stressed that recreational activities planned for the Yellow Water Weapons Area should avoid Site 15 within the wildlife corridor. • The Navy plans remediation or removal activities as needed to reduce the levels of contaminated soils. • Unexploded ordnance (UXO) at Site 15 is likely left over from the firing range and would be smaller, less powerful rounds that would require lots of force to cause them to explode.

Exposure Situation and Hazard Summary Table - *Cecil Field Naval Air Station, FL*

Exposure Situation	When/ People Exposed	Hazard	Actions Taken/Planned	Recommendations	Comments
FORMER HOUSING AND OTHER BUILDING HAZARDS Lead based paint, lead in piping, and asbestos insulation in *on-base buildings* to be reused. Contaminants: lead and asbestos	current & future - possible	**Lead in Paint, DW, Asbestos Insulation** current & future- Indeterminate hazard	▫ In 1995, the Navy conducted a lead based paint survey. ▫ In 1999, the Navy sampled the drip lines (soil under the roof where water falls to the ground) and yards near housing units. ▫ The Navy plans to inform new occupants of the lead hazards. ▫ The Navy confirmed that the cooper piping has lead solder.	• The Navy or the redevelopment authority should provide information to new residents, developers, and tenants on not only the location of the lead paint and asbestos buildings, but how to manage those hazards. • The Navy should determine if the lead solder is leaching into the drinking water at action levels (15 ppb). If so, either remove the lead hazard or provide information to new occupants on tap water flushing techniques. • If the lead hazards remain unabated, future occupants and frequent visitors should consult with their health care provider as to whether routine (annual) blood lead sampling is needed based on their medical condition. Those at greatest risk are children under 6 years old, elderly, and women of child bearing age.	*Summary - More information is needed on lead in drinking water and on the notification of lead and asbestos hazards to future users.*

Exposure Situation and Hazard Summary Table - *Cecil Field Naval Air Station, FL*

Exposure Situation	When/ People Exposed	Hazard	Actions Taken/Planned	Recommendations	Comments
LAKE HAZARDS Eating fish and other biota caught in *lakes/creeks on-base (Lake Fretwell, Lake Newman, Lake Wright, Lake Yellow Water, Lake Burrel)* Contaminants: mercury, lead, others?	future - possible	**Eating Fish** current- No apparent future- Indeterminate hazard (more data needed)	▫ The Navy has sampled fish from Lake Fretwell. The sampling has depleted the fish population so accumulation is less likely in new fish.	• ATSDR recommends that a review of the potential for fish and turtles to become contaminated in the future be investigated as part of the Superfund Comprehensive Five Year Review. • If fish are sampled, the following information should be collected: ▪ How long had fish been stocked before sampling ▪ Were fish considered wild or breeding populations ▪ Size fish, age, sex of fish sampled ▪ Typas, genus and species of fish sampled ▪ Skin on or off filets ▪ Were fish trimmed of fat ▪ Lipid content of fish ▪ Wet weight and dry weight concentration of COPC ▪ Documentation of abnormalities or lack of abnormalities ▪ Documentation of presence of egg masses. ▪ Sample Specific Quantization Limit (SQL) ▪ Cross reference of information on fish with samples and concentrations on CD-Rom	
UNEXPLODED ORDNANCE Unexploded ordnance and other physical hazards at least *10 major locations on-base and four former bombing ranges off-base.*	current & future - possible	**UXO Contact** current & future- Hazard	▫ The Navy has identified possible UXO locations on the main base and Yellow Water Weapons area.	• The Navy should coordinate with the Army Corps of Engineers and new tenants to ensure the proper program provides public education on tha locations and hazards associated with disturbing UXO. Institutional controls (i.e., no digging) may be needed in some areas. • The Navy should verify emergency phone numbers and reporting information and provide clearing and reporting procedures to residents, bombing range owners, developers, utility contractors, and municipalities before people dig or excavate in UXO locations.	*Summary- need map of possible UXO locations and educetional material. Need information on planned notification of new residents, utility contractors, and developers.*

VI. Preparers of Report

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APPENDIX A: SUMMARY OF SITE EVALUATIONS, NAS CECIL FIELD

(Future reuse categories obtained from NAS CF Base Reuse Plan, Table 4-51)

Base Area and Site Name	Public Health Evaluation	Comments
Main Station: by proposed future use category		
Forestry Site 17: Oil/Sludge Disposal Pit AOI 35: PCBs on Perimeter Road	■ No past exposure situations were identified for these sites ■ No one is currently coming into contact with contaminated materials at levels posing a potential health hazard ■ Lease and transfer documents will provide notification of residual contamination left on site, if any, minimizing the likelihood that workers will be exposed during future development of the properties	■ Investigations complete - remedial action on-going: Site 17 ? What is the status of AOI 35?
Light Industry No sites are located in the area proposed for light industry reuse	■ Since no waste sites or areas of interest are located in this area, no past, current, or future exposure situations were identified	■ Not applicable

Base Area and Site Name		Public Health Evaluation	Comments
Parks and Recreation	Site 3: Oil/Sludge Disposal Pit Site 4: Grease Pits Site 5: Oil Disposal Area Site 6: Lake Fretwell Rubble Disposal Site 11: Golf Course Pesticide Disposal Site 19: Rowell Creek Rubble Disposal AOI 20: Hazardous Waste Storage AOI 21: Golf Course Maintenance Area AOI 22: Golf Course Fairway 7 Disposal AOI 35: PCBs on Perimeter Road Lake Fretwell	■ No past exposure situations were identified for these sites ■ No one is currently coming into contact with contaminated materials at levels posing a potential health hazard ■ Lease and transfer documents will provide notification of residual contamination left on site, if any, minimizing the likelihood that workers will be exposed during future development of the properties ■ Testing of Lake Fretwell game fish by NAS CF demonstrates that past and current consumption of fish from this lake does not pose a health hazard. However, there is uncertainty in (i) whether releases of contaminants to the lake are on-going and (ii) whether the investigations of the remaining potential source areas will permit identification and mitigation of the source.	■ Investigations complete - no further action required to protect public health and the environment: Lake Fretwell ■ Investigations complete - remedial action in 1998: Sites 3, 5, 11 ■ Investigations complete - remedial action selection in 1998: Sites 4, 6, 19 ■ ATSDR recommends that the Cecil Field Development Commission develop and implement a fish tissue monitoring plan to ensure that future concentrations of mercury and PCBs in fish do not pose a hazard to the health of Lake Fretwell fishers.
Heavy Industry	Site 12: Public Works Rubble Disposal AOI 25: Transformer Storage Yard AOI 26: Building 81 DDT Site AOI 27: Building 81 HAZMAT Shed AOI 35: PCBs on Perimeter Road	■ No past exposure situations were identified for these sites ■ No one is currently coming into contact with contaminated materials at levels posing a potential health hazard ■ Lease and transfer documents will provide notification of residual contamination left on site, if any, minimizing the likelihood that workers will be exposed during future development of the properties	■ Investigations complete - remedial action selection in 1998: Site 12 ? What is the status of AOIs 25, 26, 27, 35?

Base Area and Site Name		Public Health Evaluation	Comments
Aviation-related	Site 7: Old Fire Fighting Training Area Site 16: AIMD Seepage Pit AOI 28: North TCP Site AOI 29: Building 313 TCP Site AOI 30: Building 313 AOI 31: South TCP site AOI 32: Supply Building 35 HAZMAT Storage Area AOI 33: DRMO Storage Area AOI 35: PCBs on Perimeter Road	■ No past exposure situations were identified for these sites ■ No one is currently coming into contact with contaminated materials at levels posing a potential health hazard ■ Lease and transfer documents will provide notification of residual contamination left on site, if any, minimizing the likelihood that workers will be exposed during future development of the properties	■ Investigations complete - remedial action in 1998: Sites 7, 16 ? What is the status of AOIs 28, 29, 30, 31, 32, 33?
General Aviation	Site 3: Oil/Sludge Disposal Pits Site 4: Grease Pits Site 17: Oil/Sludge Disposal Pit SW AOI 35: PCBs on Perimeter Road	■ No past exposure situations were identified for these sites ■ No one is currently coming into contact with contaminated materials at levels posing a potential health hazard ■ Lease and transfer documents will provide notification of residual contamination left on site, if any, minimizing the likelihood that workers will be exposed during future development of the properties	■ Investigations complete - remedial action on-going: Sites 3, 17 ■ Investigations complete - remedial action selection in 1998: Site 4

Base Area and Site Name		Public Health Evaluation	Comments
Forestry/ Airport Reserve	Site 1: Old Landfill Site 2: Recent Landfill Site 8: Bore Site Range/Hazardous Waste Storage Area/Fire Training Site 9: Recent Grease Pits Site 10: Rubble Disposal Area Site 18: Ammunition Disposal Area AOI 23: Aviation Ordnance Area (AVORD) AOI 24: AVORD Pistol Range AOI 34: Rowell Creek Ordnance Disposal AOI 35: PCBs on Perimeter Road	■ No past exposure situations were identified for these sites ■ No one is currently coming into contact with contaminated materials at levels posing a potential health hazard ■ Lease and transfer documents will provide notification of residual contamination left on site, if any, minimizing the likelihood that workers will be exposed during future development of the properties	■ Investigations complete - no further action required to protect public health and the environment: Sites 9, 10 ■ Investigations complete - remedial action in 1998: Sites 1, 2, 8 ■ Investigations complete - remedial action selection in 1998: Sites 18 ? What is the status of AOIs 23, 24, 34?
Commercial	No sites are located in the area proposed for commercial reuse	■ Since no waste sites or areas of interest are located in this area, no past, current, or future exposure situations were identified	■ Not applicable
Conservation	No sites are located in the area proposed for conservation reuse	■ Since no waste sites or areas of interest are located in this area, no past, current, or future exposure situations were identified	■ Not applicable

Base Area and Site Name		Public Health Evaluation	Comments
Yellow Water Weapons Area (YWWA): by proposed future use category			
Forestry	No sites are located in the area proposed for forestry reuse	■ Since no waste sites or areas of interest are located in this area, no past, current, or future exposure situations were identified	■ Not applicable
Light Industry	Yellow Water Weapons Complex	■ No past exposure situations were identified for these sites ■ No one is currently coming into contact with contaminated materials at levels posing a potential health hazard ■ Lease and transfer documents will provide notification of residual contamination left on site, if any, minimizing the likelihood that workers will be exposed during future development of the properties	■ Eastern and central portion of the Yellow Water Area. The YWWC is categorized as a "grey" area requiring further investigation to determine whether environmental contamination has occurred from the previous storage and maintenance of radiochemical weapons. USEPA is providing oversight of radiation surveys to be conducted by NAS CF and Navy RASO during the summer, 1998.

Base Area and Site Name		Public Health Evaluation	Comments
Parks and Recreation	Site 15: Blue 10 Ordnance Disposal Area Site 14: Blue 5 Ordnance Disposal Area AOI-20: Haz. Waste Storage-Bldg. 610 Abandoned Wastewater Treatment Plant Abandoned Transportation Maint. Facility Abandoned Munitions Magazines Former Artillery Range	■ No past exposure situations were identified for these sites ■ No one is currently coming into contact with contaminated materials at levels posing a potential health hazard ■ Lease and transfer documents will provide notification of residual contamination left on site, if any, minimizing the likelihood that workers will be exposed during future development of the properties ■ Levels of soil contaminants at Site 15 present a potential health hazard to current and future recreational users. USEPA and the NAVFACENGCOM-South Division have recommended to the Cecil Field Development Commission that future recreational activities planned for the YWWA avoid Site 15	■ Investigations complete - no further action required to protect public health and the environment: Sites 14 ■ Investigations complete - remedial action selection in 1998: Sites 15 ? What is the status of AOI 20, the wastewater treatment plant, transportation maintenance facility, munitions magazines, and former artillery range? ■ Currently, Site 15 is posted with signs alerting users to the chemical hazards in the area and remedy selection is scheduled for 1998.
Heavy Industry	No sites are located in the area proposed for heavy industry reuse	■ Since no waste sites or areas of interest are located in this area, no past, current, or future exposure situations were identified	■ Not applicable
Commercial	No sites are located in the area proposed for commercial reuse	■ Since no waste sites or areas of interest are located in this area, no past, current, or future exposure situations were identified	■ Not applicable

Base Area and Site Name		Public Health Evaluation	Comments
Main Station Systems			
Petroleum Storage Tanks and Pipelines	North Fuel Farm South Fuel Farm Jet Engine Test Cell Underground Storage Tanks Day Tank 2 Tank 199 103rd Street Jet Fuel Pipeline	■ No past exposure situations were identified for these sites ■ No one is currently coming into contact with contaminated materials at levels posing a potential health hazard ■ Past releases of jet fuel from the 103rd Street pipeline at on- and off-base locations did not pose a health hazard: private wells and the indoor air quality of nearby buildings were not impacted. The pipeline is currently out of service and is scheduled for in-place abandonment and closure in conjunction with the closure of NAS CF in 1999. In-place closure does not pose a public health hazard.	■ Petroleum products stored in tanks includes aviation and motor fuel, oil, heating fuel, lubricants, and hydraulic fluids. NAS CF will remove all tanks and remediate all tank areas prior to closure in 1999. ■ The State of Florida is responsible for administering the underground storage tank program. ■ In general, for all petroleum sites, soil removals and free product recovery from groundwater are complete or on-going. Remedial actions and groundwater monitoring on-going.

Base Area and Site Name	Public Health Evaluation	Comments
Potable Water System	■ Backflow prevention devices are not in place in the distribntion system to prevent the flow of non-potable water into potable water lines. ■ The distribution system is believed to be composed of copper pipe with lead welded joints; however, compliance testing of taps indicates that lead and copper concentrations in drinking water are below state and federal standards and, therefore, safe for household use. ■ NAS CF has been abandoning non-potable wells and monitoring wells that are no longer needed throughout the facility. These wells are being abandoned per FDEP and the St. John River Water Management District requirements.	■ The NAS CF water supply (and wastewater supply) system will be upgraded and consolidated into the City of Jacksonville public water supply at base closure.

APPENDIX B: ATSDR's EXPOSURE EVALUATION PROCESS

INFORMATION ON HOW ATSDR ASSESSES EXPOSURE

What is meant by exposure?

ATSDR's public health assessments are driven by exposure or contact. Chemicals released into the environment have the potential to cause harmful health effects. Nevertheless, *a release does not always result in exposure*. People can only be exposed to a chemical if they come in contact with that chemical. If no one comes into contact with a chemical, then no exposure occurs, thus no health effects could occur. Often the general public does not have access to the source area of the environmental release; this lack of access becomes important in determining whether the chemicals are moving through the environment to locations where people could come into contact with them.

Pathway Elements

The five elements of an exposure pathway are: (1) source of contamination, (2) environmental media, (3) point of exposure, (4) route of human exposure, and (5) receptor population. The source of contamination is where the chemical was released. The environmental media (i.e., groundwater, soil, surface water, air, etc.) transport the chemical. The point of exposure is where people come in contact with the contaminated media. The route of exposure (i.e., ingestion, inhalation, dermal contact, etc.) is how the chemical enters the body. The persons actually exposed are the receptor population.

The route of a chemical's movement is the *pathway*. ATSDR identifies and evaluates exposure pathways by considering how people might come into contact with a chemical. An exposure pathway could involve air, surface water, groundwater, soil, dust, or even plants and animals. Exposure can occur by breathing, eating, drinking, or by skin contact with a substance containing the chemical.

How does ATSDR determine which exposure situations to evaluate?

ATSDR scientists evaluate site-specific conditions to determine whether people are being exposed to site-related contaminants. When evaluating exposure pathways, ATSDR identifies whether exposure to contaminated media (soil, water, air, waste, or biota) is occurring through ingestion, dermal (skin) contact, or inhalation.

If exposure is possible, ATSDR scientists then consider whether contamination is present at levels that might affect public health. ATSDR selects chemicals for further evaluation by comparing them against health-based comparison values. Comparison values are developed by ATSDR from available scientific literature concerning exposure and health effects. Comparison values are derived for each of the media and reflect an estimated chemical concentration that is *not expected* to cause harmful health effects for a given chemical, assuming a standard daily contact rate (e.g., amount of water or soil consumed or amount of air breathed) and standard body weight.

Comparison values are not thresholds for harmful health effects. ATSDR comparison values represent chemical concentrations many times lower than levels at which no effects were observed in experimental animal or human epidemiologic studies. If chemical concentrations are above comparison values, ATSDR further analyzes exposure variables (e.g., duration and frequency) for health effects, including the toxicology of the chemical, other epidemiology studies, and the weight of evidence.

Some comparison values used by ATSDR scientists include ATSDR's environmental media evaluation guides (EMEG), reference dose media evaluation guides (RMEG), and cancer risk evaluation guides (CREG). EMEGs, RMEGs, and CREGs are non-enforceable, health-based comparison values developed by ATSDR for screening environmental contamination for further evaluation. Risk-based concentrations (RBCs) and soil screening levels (SSLs) are health-based comparison values developed by EPA Region III to screen sites not yet on the National Priorities List (NPL), respond rapidly to citizens inquiries, and spot-check formal baseline risk assessments.

More information about the ATSDR evaluation process can be found in ATSDR's Public Health Assessment Guidance Manual at http://www.atsdr.cdc.gov/HAC/HAGM/ or by contacting ATSDR at 1-888-42-ATSDR. For reference, Appendix A defines some of the technical terms used in this public health assessment and a List of Acronyms is available after the Table of Contents.

If someone is exposed, will they get sick?

Exposure does not always result in harmful health effects. The type and severity of health effects that occur in an individual as the result of contact with a chemical depend on the exposure concentration (how much), the frequency and duration of exposure (how long), the route or pathway of exposure (breathing, eating, drinking, or skin contact), and the multiplicity of exposure (combination of chemicals). Once exposure occurs, characteristics such as age, sex, nutritional status, genetics, lifestyle, and health status of the exposed individual influence how that individual absorbs, distributes, metabolizes, and excretes the chemical. Taken together, these factors and characteristics determine the health effects that can occur as a result of exposure to a chemical in the environment.

Considerable uncertainty exists regarding the true level of exposure to environmental contamination. To account for that uncertainty and to protect public health, ATSDR scientists typically use high-end, worst-case exposure level estimates to determine whether harmful health effects are possible. These estimated exposure levels are usually much higher than the levels to which people are really exposed. If the exposure levels indicate harmful health effects are possible, a more detailed review of exposure, combined with scientific information from the medical, toxicologic, and epidemiologic literature about the health effects from exposure to harmful substances, is performed.

APPENDIX C. FUEL RELATED SPILLS AT NAS CECIL FIELD

Fuel Related Spills at NAS Cecil Field				
Location	**Year of Release**	**Gallons released**	**Reported Type of Fuel**	**Action to Date**
North Fuel Farm	1985	2200	JP-5	See North Fuel Farm, Tank 76-E CA completed at the site, RAP completed in FY 1997, Revision to RAP December 1997. Free product will continue to be collected as long as tanks remain in operational status. Soil remediation and groundwater remediation will be initiated upon tank decommissioning.
North Fuel Farm	August 1987	22, 772	JP-5	
North Fuel Farm	February 1991	913000	JP-5	
North Fuel Farm, Tank 76	Novemb er 1993	1, 800	JP-5	
North Fnel Farm spill and release to Sal Taylor Creek Contaniinate Area and Possum Dani	February 1991	Not identified	JP-5	CAR 1994, CAR Addendum 1996 and 1997 that recommends NFA except at Possum Dam
Truck Stand (Facility 372)	Decemb er 1990		JP-5	Ca and CAR Completed. CAR addendum submitted July 1994. IRA (soil removal) completed , CAR addendum submitted July 1994. Monitoring Only Plan (MOP) has been implemented for Groundwater.
South Fuel Farm	July 1991	Not identified	Not identified	All Tanks Removed. CA, CAR, RAP Completed ?. RAP implementation to begin in early FY98

Fuel Related Spills at NAS Cecil Field				
Location	**Year of Release**	**Gallons released**	**Reported Type of Fuel**	**Action to Date**
Jet Engine Test Cell Facility (Facilities 334, 339, 328 and 811)	October 1989	Failed precision fitness testing	JP-5	CA, CAR, CAR addendum, RAP Completed. Tanks Removed and RAP implemented in FY97
NAS Jacksonville - NAS Cecil Field Jet Fuel Pipeline	July 1989	Unknown	JP-5	**Site Transferred to NAS Jacksonville** CA and RAP Completed. RAP implemented (soil removed and groundwater being monitored).
NAS Jacksonville - NAS Cecil Field Jet Fuel Pipeline	July 1997	6,100 gallons	JP-5	Contaminated soil removed under emergency response. CA to be initiated by end of FY97
Helicopter Crash Site	February 1992	1,800 gallons	JP-5	PCAR submitted in January 1994. Car submitted in FY 95. S-3 Crash Site : IRA completed in August 1994 . Designated by regulatory community as NFA (No further action required)

Fuel Related Spills at NAS Cecil Field				
Location	**Year of Release**	**Gallons released**	**Reported Type of Fuel**	**Action to Date**
S-3 Crash Tank	December 1991	Unknown ? Worst Case gallon of fuel that S-3 can carry including supplemental tanks	Not identified	IRA completed in August 1994.
Day Tank 1	1981	497, 000 gallons	JP-5	CA completed. CAR completed. RAP completed, Free produce will continue to be collected as long as tank remains in and operational status Soil remediation and ground water remediation will be initiated upon tank decommissioning
Day Tank 2	1996	Unknown, 29,000 gallons of free product recovered	JP-5	Tank was taken out of service and removed in August of 1997. IRA completed in August 1997. CA initiated.
Tank 199	?	Unknown	Heating oil	CA Completed in June 1997. Monitoring only required by Regulatory Stakeholders

Fuel Related Spills at NAS Cecil Field				
Location	**Year of Release**	**Gallons released**	**Reported Type of Fuel**	**Action to Date**
CA = Contamination Assessment CAR = Contamination Assessment Report FY = Fiscal year (October to September) IRA = Interim Remedial Action		NFA = No Further Action PCAR = Preliminary CAR RAP = Remedial Action Plan S-3 = UST = Underground Storage Tank		
Source: Table 2-27 Tank Investigation Program Sites, NAS Cecil Field Date??				
Fuel Tanks, Fuel Lines and Abandoned fuel lines from fuel farms, to runways, under hangers and other structures	1940-2000	Unknown	JP- 5 Other Fuels Other Fuel Additives	Not investigated to date. Some closed with fuel remaining in lines

APPENDIX D. NAVY'S EVALUATION OF INDOOR AIR

TETRA TECH NUS, INC.
661 Andersen Drive ▪ Pittsburgh, Pennsylvania 15220-2745
(412) 921-7090 ▪ FAX (412) 921-4040 ▪ www.tetratech.com

PITT-04-1-067

April 27, 2001

Project 0039

Commander, Southern Division
Naval Facilities Engineering Command
Attn: Mr. Mark Davidson (Code 1879)
2155 Eagle Drive
North Charleston, South Carolina 29406

Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order 0078

Subject: Indoor Air Evaluation
Naval Air Station Cecil Field
Jacksonville, Florida

Dear Mr. Davidson:

Please find enclosed a copy of the Potential Indoor Air Evaluation Locations Due to Underlying Contaminated Groundwater presentation report. This report was presented to the RAB during the April meeting.

Copies have also been distributed to the Partnering Team Members as indicated below.

If you have any questions, please contact Mark Jonnet at (412) 921-8622 or me at (412) 921-8916.

Sincerely,

Mark P. Speranza, P.E.
Task Order Manager

MPS/kf

Enclosure

cc: S. Glass, SOUTHDIV (1 copy)
D. Vaughn-Wright, U.S. EPA (1 copy)
D. Grabka, FEDP (1 copy)
S. Ross, J.A. Jones (1 copy)
C. Grossess, ATSDR (1 copy)
D. Wroblewski (Cover Letter Only)
Mark Perry/File 0039 (1 copy unbound)

bcc: J. Johnson, Tetra Tech NUS, Inc. (2 copies)
R. Simcik Tetra Tech NUS, Inc. (1 copy)
M. Jonnet Tetra Tech NUS, Inc. (1 copy)
B. Davis, Tetra Tech NUS, Inc. (1 copy)
R. Miller, Tetra Tech NUS, Inc. (1 copy)
J. Logan, Tetra Tech NUS, Inc. (1 copy)

Potential Indoor Air Evaluation Locations

due to underlying contaminated groundwater at NAS Cecil Field (February 2001)

Purpose

- To determine if human exposure from all media including soil, groundwater, surface water and ***air*** are controlled per GPRA (RCRA) criteria.
- To determine if current and future building occupants could be exposed to indoor air contamination resulting from groundwater contamination.

Potential Indoor Air Areas of Concern

- Criteria used to identify areas
  - Connecticut Groundwater Standards for Protection of Indoor Air
  - Used most recent groundwater sample
  - Selected any result within 100 feet of building

Potential Indoor Air Sample Locations

- Step One
  - Select most recent groundwater analysis of parameters that corresponded to State of Connecticut Table provided by EPA in December 11, 2000 email
  - The State of Connecticut has implemented numeric groundwater standards for protection of indoor air since 1996.
  - The State of Florida has not developed a similar table to date.
  - Most recent groundwater analytical results were judged to be most representative of current and future conditions.

CT State GW Std for (ug/l)			
Volatile Organic Substances	Volatilization Residential	Drinking (GA/GAA GP)	Xtimes Factor*
1,1-Dichloroethylene (1,1-DCE)	1	7	0.14
Vinyl Chloride	2	2	1
Ethylene dibromide (EDB)	4	0.05	80
4-1,3-Dicholoropropane	6	0.5	12
1,1,1,2-Tetrachloroethane	12	1	12
1,2-Dichloropropane	14	5	3
Carbon Tetrachloride	16	5	3
1,2-Dichloroethane (1,2-DCA)	21	1	21
1,1,2,2-Tetrachloroethane	23	0.5	46
Trichloroehylene (TCE)	210	5	42
Benzene	215	1	215
Chloroform	287	6	48
Styrene	580	100	6
Bromoform	980	4	245
Tetrachloroethylene (PCE)	1,500	5	300
chlorobenzene	1,800	100	18
1,1,2-Trichloroethane	8,000	5	1,600
1,1,1-Trichoroethane (TCA)	20,400	200	102
Xylenes	21,300	530	40
Toluene	23,500	1,000	23
1,3-Dichlorobenzene (3 DCB)	24,200	600	40
1,2-Dichlorobenzene (2 DCB)	30,500	600	51
1,1-Dichloroethane (1,1 DCA)	34,500	70	493
Acetone	50,000	700	71
2-Butanone (MEK)	50,000	400	125
1,4-Dichlorobenzene (4 DCB)	50,000	75	667
Ethylbenzene	50,000	700	71
Methyl-tert-butyl-ether (MTBE)	50,000	100	500
Methyl isobutyl ketone (MIBK)	50,000	350	143
Acrylonitrile	Not Established	0.5	-
Dibromochloromethane	Not Established	0.5	-
cis-1,2-Dichloroethylene	Not Established	70	-
trans-1,2-Dichloroethylene	Not Established	100	-
Total Petroleum Hydrocarbons	Not Established	500	-

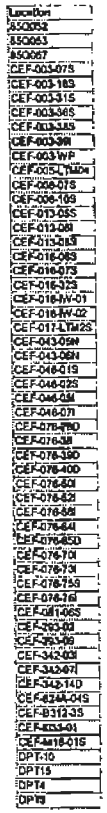
* - Not from CT table, created here to show how many times the volatilazation standard is above the drinking water ingestion standard.

Potential Indoor Air Sample Locations

- ## Step Two

  Compared the results of Step One to the criteria. Resulted in 64 instances where an exceedance occurred.

  The 65 instances correspond to 55 locations across the facility.

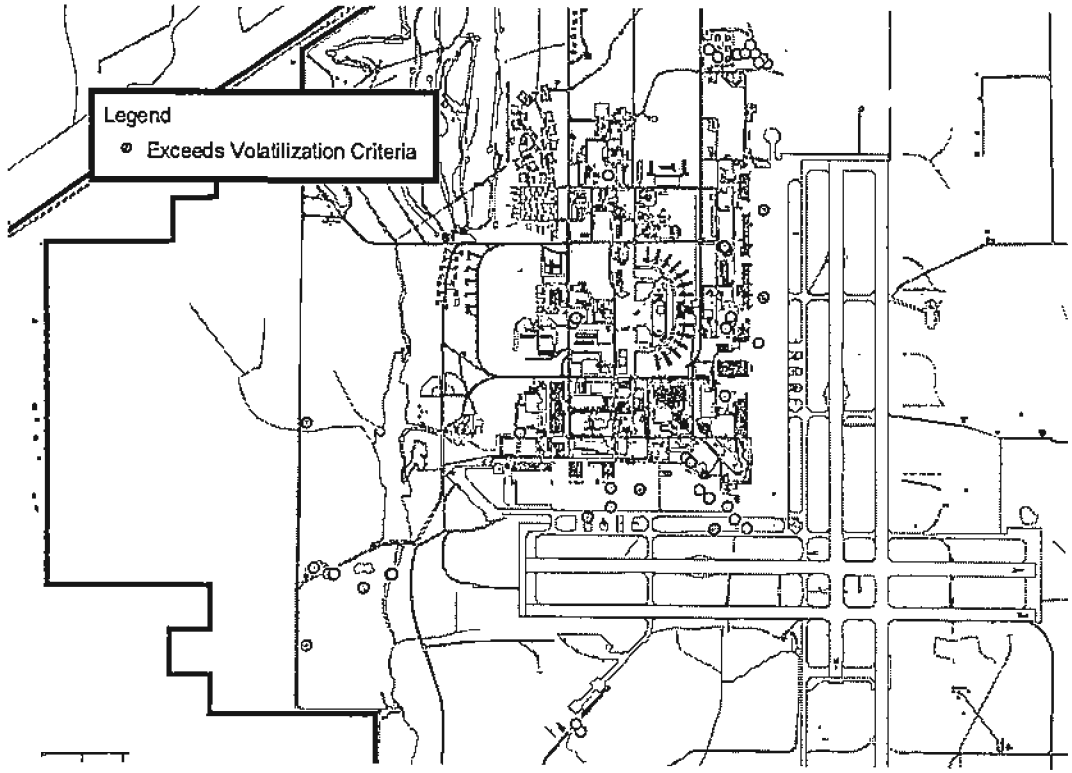


LOCATION	QIS_DATE	PARAMETER	RESULT	QUALIFIER	UNITS	CRITERIA
850052	19950415	1,1-DICHLOROETHENE	6200.0		UG/L	1.0
850053	19950415	1,1-DICHLOROETHENE	40.0		UG/L	1.0
850067	19950414	1,1-DICHLOROETHENE	19.0		UG/L	1.0
CEF-003-07S	19980723	1,1-DICHLOROETHENE	260.0		UG/L	1.0
CEF-003-07S	19980723	TRICHLOROETHENE	480.0		UG/L	210.0
CEF-003-19S	19970817	1,1-DICHLOROETHENE	5.8		UG/L	1.0
CEF-003-31S	19980730	1,1-DICHLOROETHENE	21.0		UG/L	1.0
CEF-003-35S	19981209	1,1-DICHLOROETHENE	1.7	J	UG/L	1.0
CEF-003-38S	20000720	1,1-DICHLOROETHENE	29.7		UG/L	1.0
CEF-003-39I	20000720	1,1-DICHLOROETHENE	15.3		UG/L	1.0
CEF-003-WP	20001102	VINYL CHLORIDE	38.5		UG/L	2.0
CEF-005-LTM04	20000204	VINYL CHLORIDE	4.3	J	UG/L	2.0
CEF-008-07S	19980805	1,1-DICHLOROETHENE	8.2		UG/L	1.0
CEF-008-10S	19970624	1,1-DICHLOROETHENE	84.0		UG/L	1.0
CEF-013-05S	19981116	1,1-DICHLOROETHENE	1.4		UG/L	1.0
CEF-013-05S	19981116	BENZENE	7340.0		UG/L	215.0
CEF-013-06I	19981116	1,1-DICHLOROETHENE	3640.0		UG/L	1.0
CEF-013-06I	19981116	1,2-DICHLOROETHANE	35.6		UG/L	21.0
CEF-013-06I	19981116	VINYL CHLORIDE	27.4		UG/L	2.0
CEF-013-06S	19981114	BENZENE	4070.0		UG/L	215.0
CEF-015-06S	19911120	TRICHLOROETHENE	2700.0		UG/L	210.0
CEF-015-07S	19940610	TRICHLOROETHENE	620.0		UG/L	210.0
CEF-015-32S	19970829	TRICHLOROETHENE	220.0		UG/L	210.0
CEF-015-IW-01	19980831	1,1-DICHLOROETHENE	3.5	J	UG/L	1.0
CEF-015-IW-01	19980831	TRICHLOROETHENE	10600.0	J	UG/L	210.0
CEF-015-IW-02	19980831	1,1-DICHLOROETHENE	26.3	J	UG/L	1.0
CEF-015-IW-02	19980831	TRICHLOROETHENE	1400.0	J	UG/L	210.0
CEF-017-LTM2S	19971124	VINYL CHLORIDE	3.0		UG/L	2.0
CEF-043-05N	19950607	BENZENE	460.0		UG/L	215.0
CEF-043-06N	19950601	BENZENE	340.0		UG/L	215.0
CEF-046-01S	19960603	BENZENE	13000.0		UG/L	215.0
CEF-046-01S	19960603	TOLUENE	45000.0		UG/L	23500.0
CEF-046-02S	19960603	BENZENE	1200.0		UG/L	215.0
CEF-046-05I	19960602	BENZENE	250.0		UG/L	215.0
CEF-046-07I	19960602	BENZENE	8700.0		UG/L	215.0
CEF-076-28D	19950829	BENZENE	1500.0		UG/L	215.0
CEF-076-38	19940518	BENZENE	250.0		UG/L	215.0
CEF-076-39D	19970902	BENZENE	6200.0		UG/L	215.0
CEF-076-40D	19970902	BENZENE	7600.0		UG/L	215.0
CEF-076-50I	19950512	BENZENE	690.0		UG/L	215.0
CEF-076-52I	19950726	BENZENE	3600.0		UG/L	215.0
CEF-076-58I	19970903	BENZENE	1100.0		UG/L	215.0
CEF-076-64I	19970904	BENZENE	2900.0		UG/L	215.0
CEF-076-65D	19970904	BENZENE	1100.0		UG/L	215.0
CEF-076-70I	19970902	BENZENE	5200.0		UG/L	215.0
CEF-076-73I	19950430	BENZENE	370.0		UG/L	215.0
CEF-076-75S	19970904	BENZENE	1500.0		UG/L	215.0
CEF-076-76I	19970903	BENZENE	3100.0		UG/L	215.0
CEF-081-06S	19980617	1,1-DICHLOROETHENE	1.1		UG/L	1.0
CEF-293-02	19960911	BENZENE	520.0		UG/L	215.0
CEF-293-09	19960911	BENZENE	240.0		UG/L	215.0
CEF-342-03I	19980626	BENZENE	1400.0		UG/L	215.0
CEF-342-07I	19980625	1,3-DICHLOROPROPANE	10.0		UG/L	8.0
CEF-342-14D	19980626	BENZENE	260.0		UG/L	215.0
CEF-342-14D	19980626	TRICHLOROETHENE	930.0		UG/L	210.0
CEF-424A-04S	20000915	BENZENE	259.0		UG/L	215.0

Potential Indoor Air Sample Locations

- Step Three

The results of Step Two were displayed in ArcView.

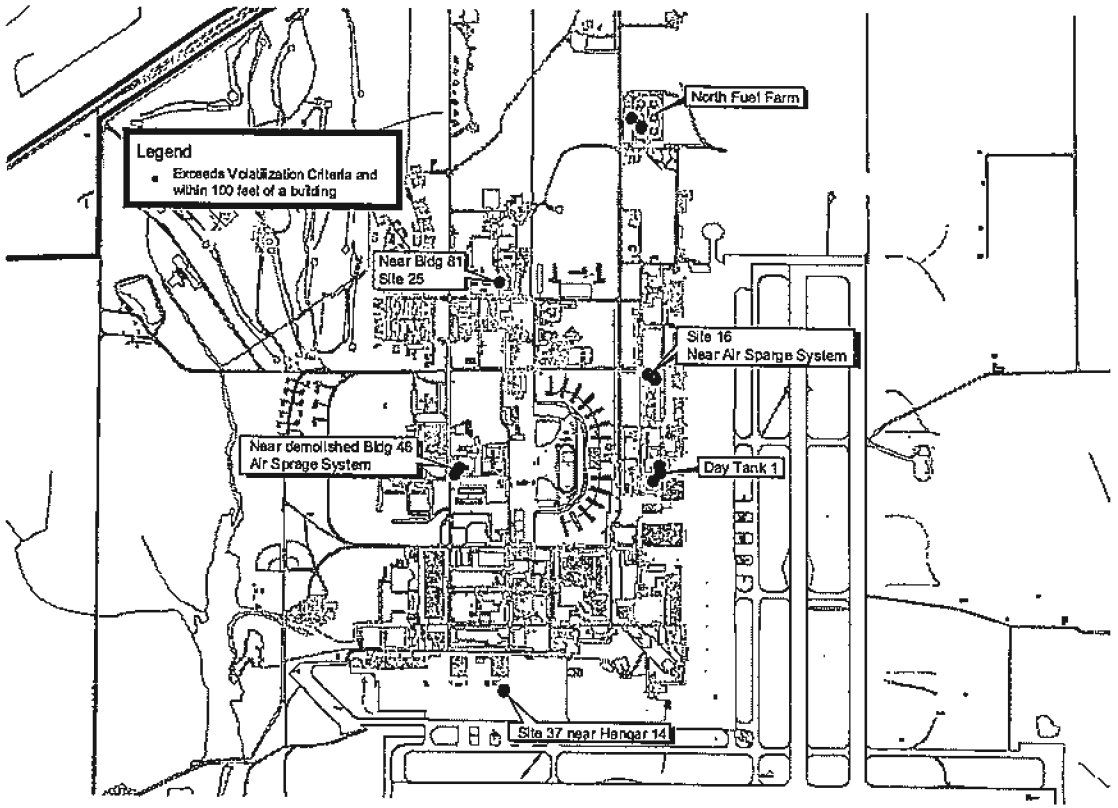


Potential Indoor Air Sample Locations

- Step Four

  Select all locations within 100 feet of any building displayed in ArcView.

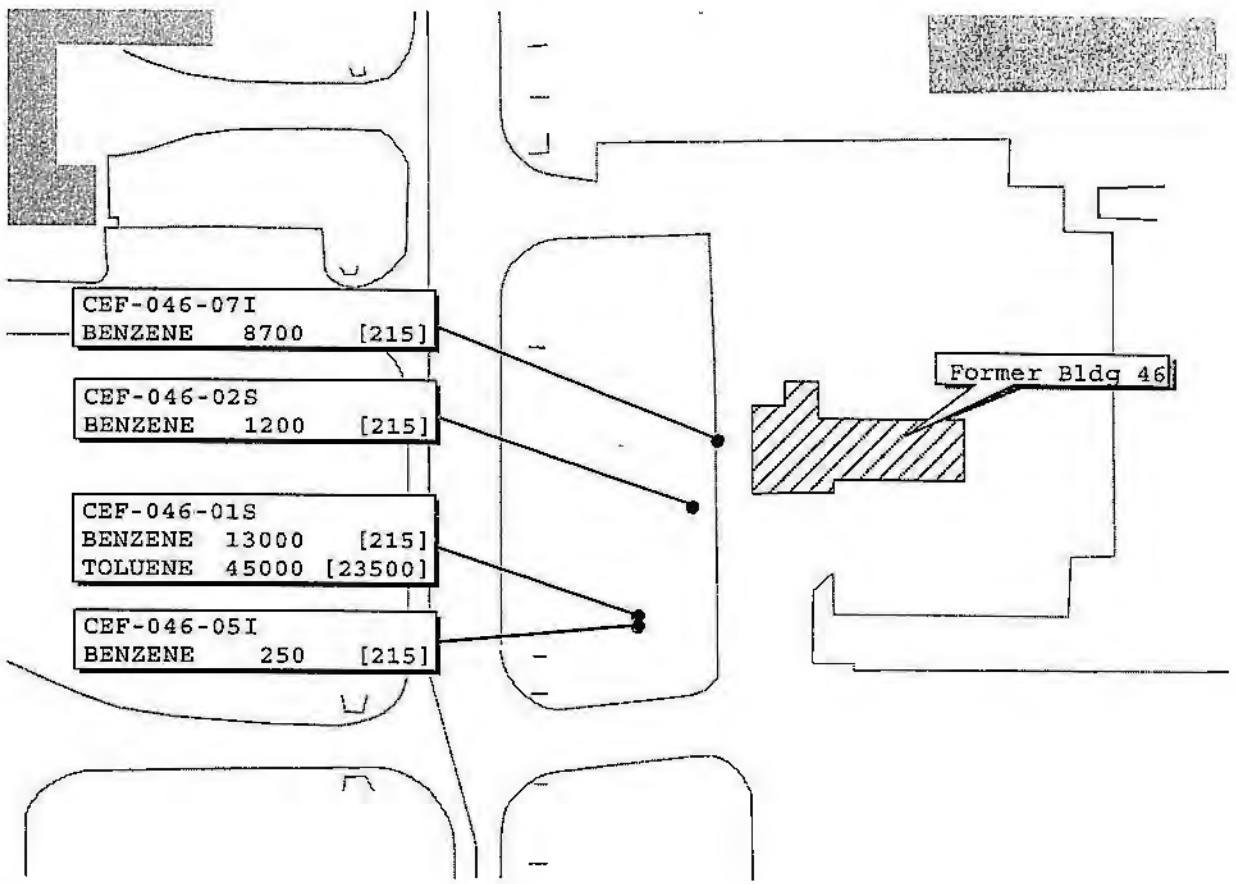
  Corresponds to 18 locations across the facility.



Potential Indoor Air Areas of Concern

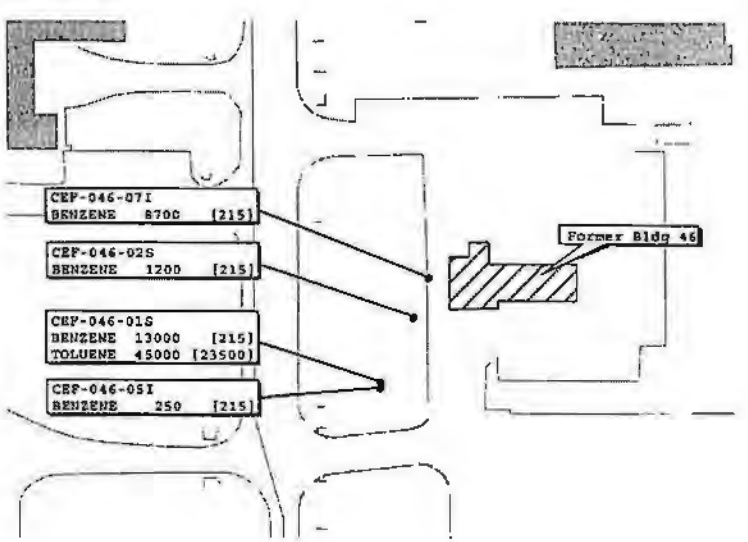
Area	Location	Date	Parameter	Result	Qualifier	Units	Criteria
Bldg 46	CEF-046-01S	19980603	BENZENE	13000.0		UG/L	215.0
Bldg 46	CEF-046-01S	19980603	TOLUENE	45000.0		UG/L	23500.0
Bldg 46	CEF-046-02S	19980603	BENZENE	1200.0		UG/L	215.0
Bldg 46	CEF-046-05I	19980602	BENZENE	250.0		UG/L	215.0
Bldg 46	CEF-046-07I	19980602	BENZENE	8700.0		UG/L	215.0
Bldg 81	CEF-081-06S	19980617	1,1-DICHLOROETHENE	1.1		UG/L	1.0
Day Tank 1	CEF-293-02	19960911	BENZENE	520.0		UG/L	215.0
Day Tank 1	CEF-293-09	19960911	BENZENE	240.0		UG/L	215.0
NFF	CEF-076-38	19940518	BENZENE	250.0		UG/L	215.0
NFF	CEF-076-75S	19970904	BENZENE	1500.0		UG/L	215.0
NFF	CEF-076-76I	19970903	BENZENE	3100.0		UG/L	215.0
Site 16	CEF-016-06S	19911120	TRICHLOROETHENE	2700.0		UG/L	210.0
Site 16	CEF-016-07S	20010115	TRICHLOROETHENE	629.0		UG/L	210.0
Site 16	CEF-016-IW-01	19980831	1,1-DICHLOROETHENE	3.5	J	UG/L	1.0
Site 16	CEF-016-IW-01	19980831	TRICHLOROETHENE	10600.0	J	UG/L	210.0
Site 16	CEF-016-IW-02	19980831	1,1-DICHLOROETHENE	26.3	J	UG/L	1.0
Site 16	CEF-016-IW-02	19980831	TRICHLOROETHENE	1400.0	J	UG/L	210.0
Site 37	85Q052	19960416	1,1-DICHLOROETHENE	6200.0		UG/L	1.0
Site 37	CEF-013-05S	19981116	1,1-DICHLOROETHENE	1.4		UG/L	1.0
Site 37	CEF-013-05S	19981116	BENZENE	7340.0		UG/L	215.0
Site 37	CEF-013-06I	19981116	1,1-DICHLOROETHENE	3640.0		UG/L	1.0
Site 37	CEF-013-06I	19981116	1,2-DICHLOROETHANE	35.6		UG/L	21.0
Site 37	CEF-013-06I	19981116	VINYL CHLORIDE	27.4		UG/L	2.0

Building 46 - Evaluation

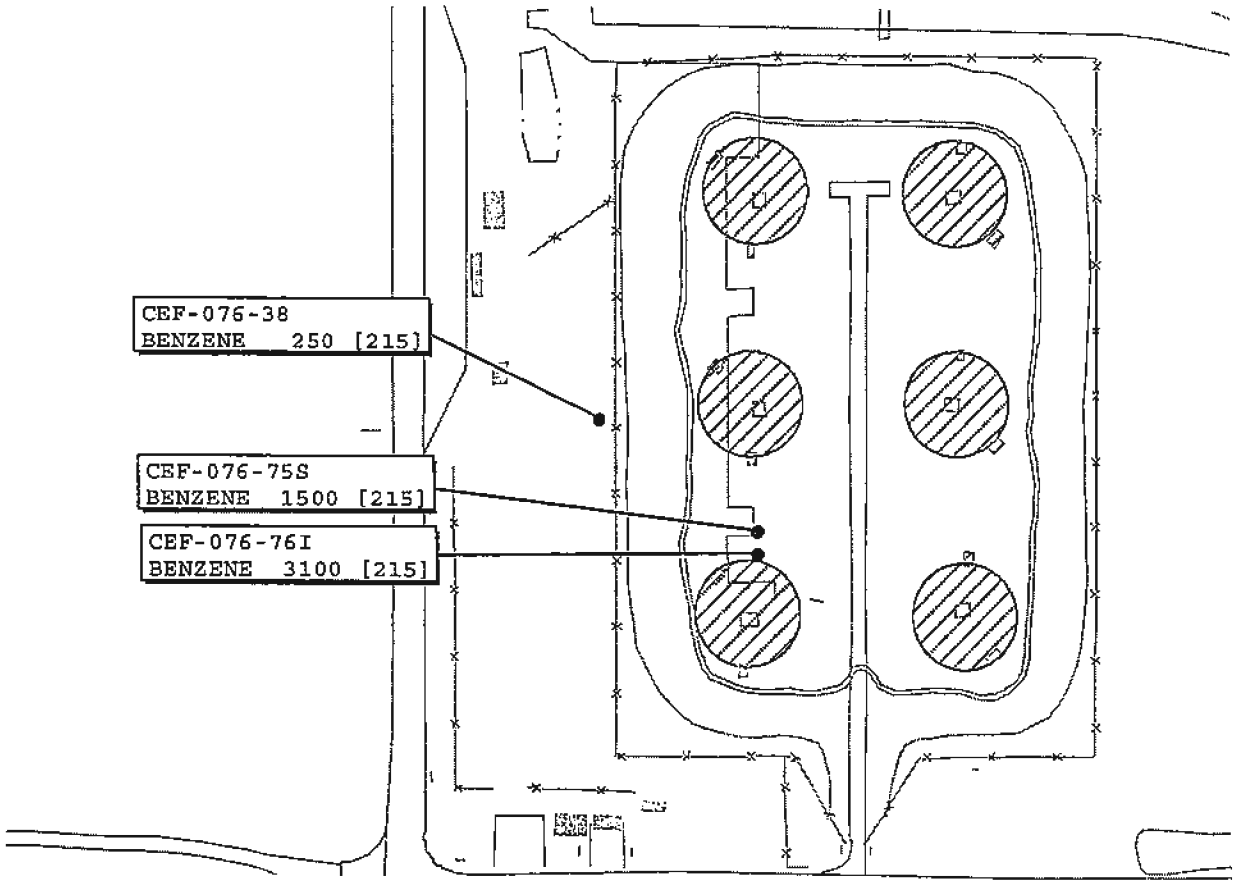


Building 46 - Evaluation

- Building 46 not longer exists
- Plume has an air sparging (AS) system in-place
- Future building construction is not anticipated due to road expansion.
- Institutional controls for groundwater will be implemented.
- Clean up goals should be reached by 2002.
- Indoor Air issues do not apply

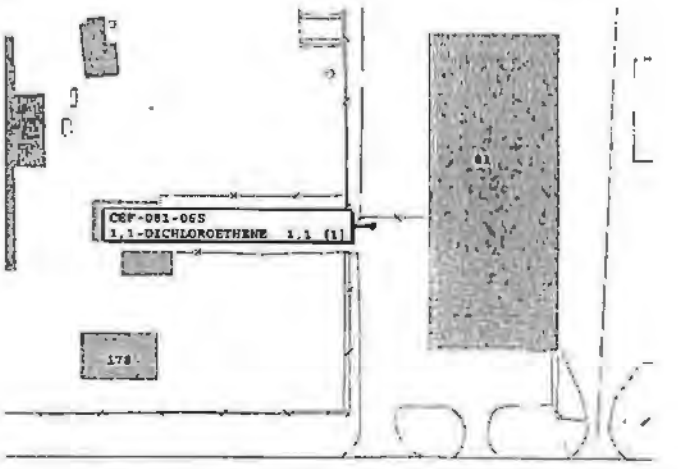


North Fuel Farm - Evaluation



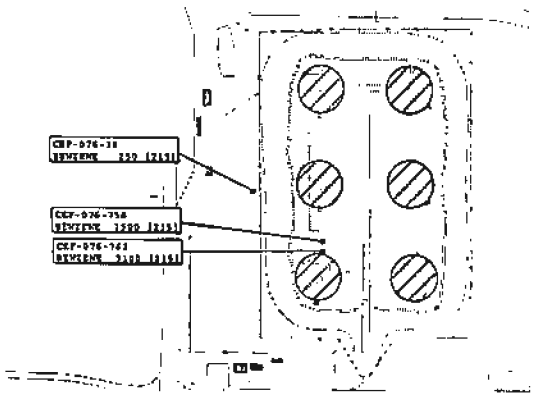
Building 81 - Evaluation

- 1,1-DICHLOROETHENE @ 1.1 criteria of 1.0
- Sample approximately 45 feet west of building
- No plume identified
- Building 81 is planned to be demolished
- Indoor Air issues do not apply

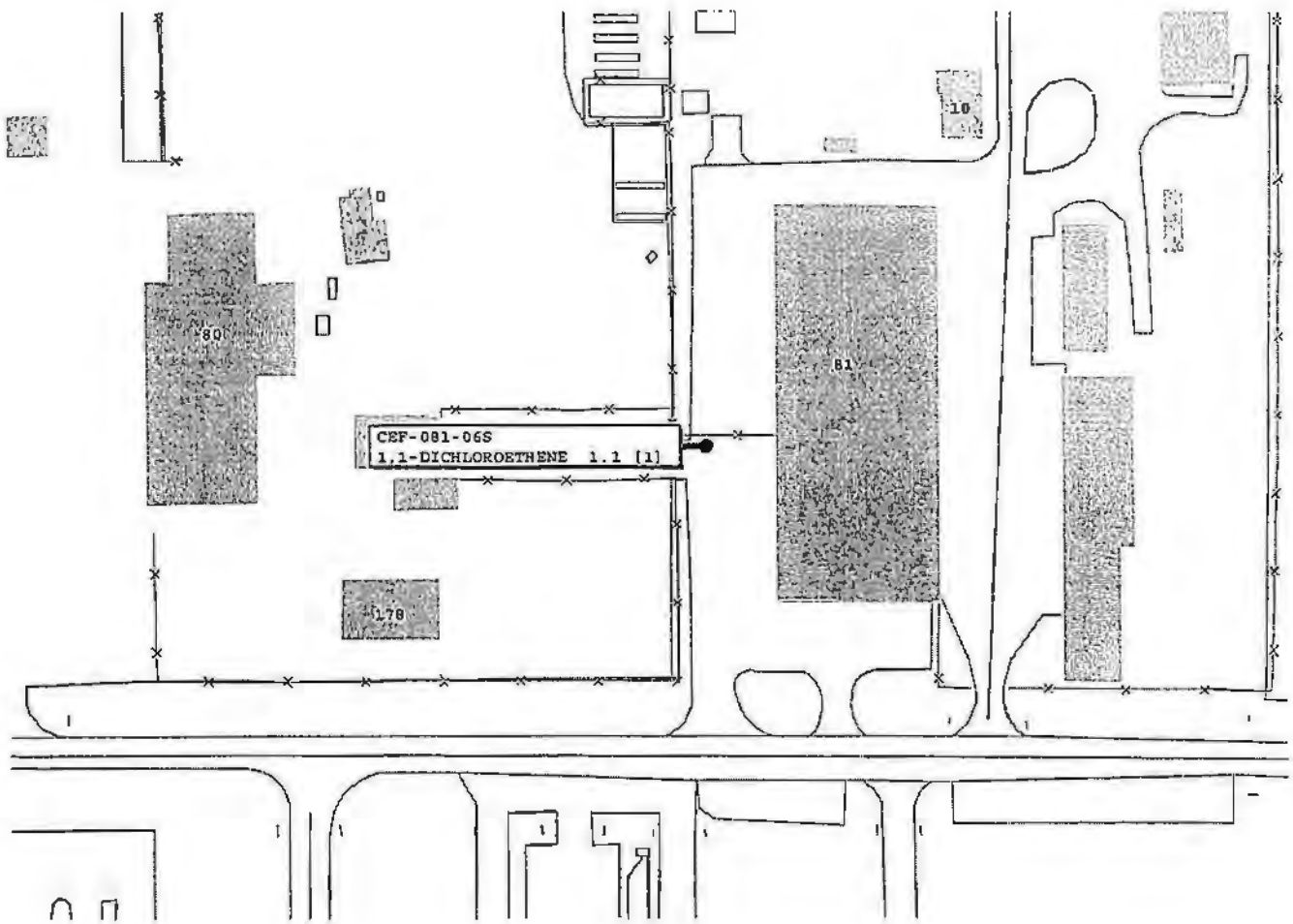


North Fuel Farm - Evaluation

- Contaminated soils have been removed.
- Former Fuel Tanks have been removed.
- All buildings were demolished during removal
- Institutional Controls will be implemented for groundwater.
  - Any future development will have to evaluate underlying contamination
  - Reuse is to develop an Aviation Commercial/Business Park
- Remedial actions for groundwater are under evaluation.
- Indoor Air issues do not apply

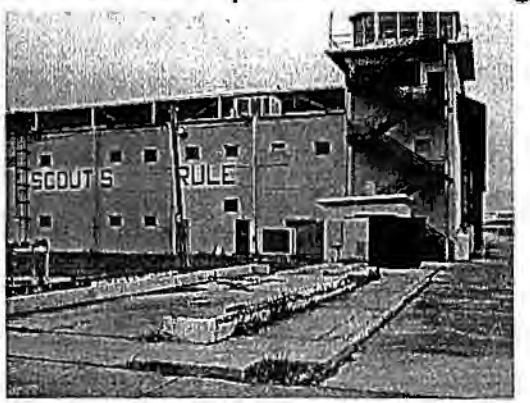


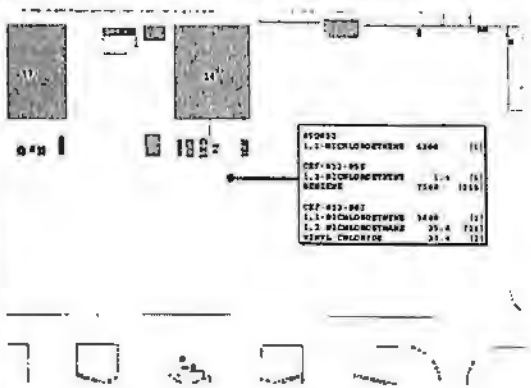
Building 81 - Evaluation



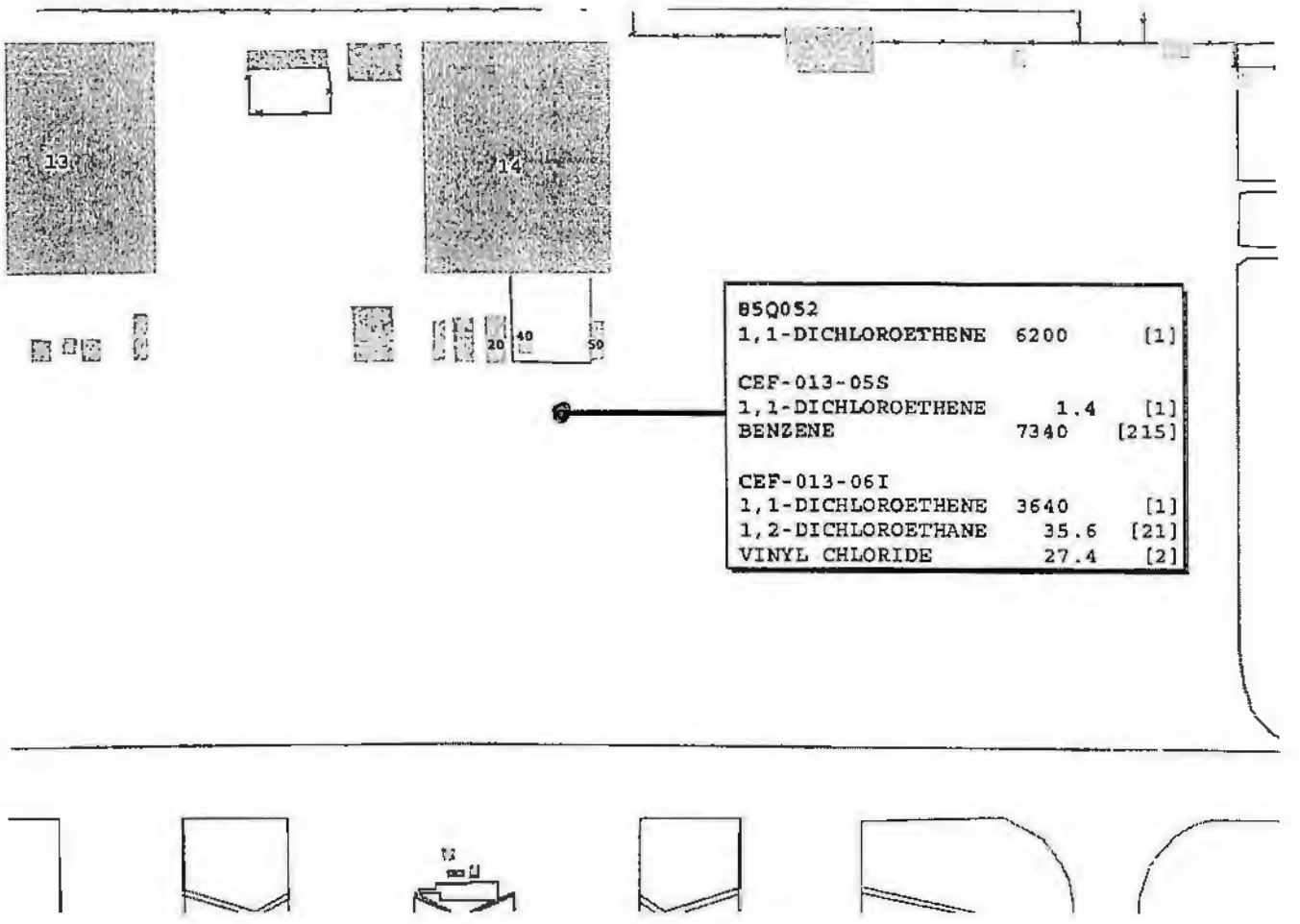
Site 37 - Evaluation

- Activities include: Air plane service and parking
- Closest buildings are 14,20, 40, and 50
  - Building 14 is a Aircraft Maintenance Hangar with open bay doors on the east and west sides
  - Building 20 is a skid mounted storage building - No direct pathway is present
  - Building 40 is to be removed during Site 36 soil excavation
  - Building 50 has been removed
- AS system to be put in-place
  - Institutional Controls will be implemented for groundwater exposure
- No utilities are present within the foot print of the groundwater plume
- Indoor Air contamination not expected due to groundwater contamination



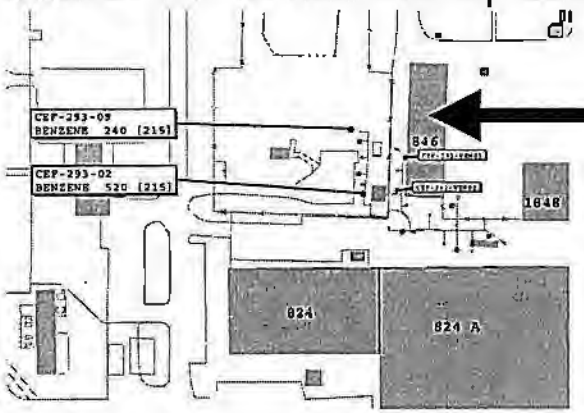


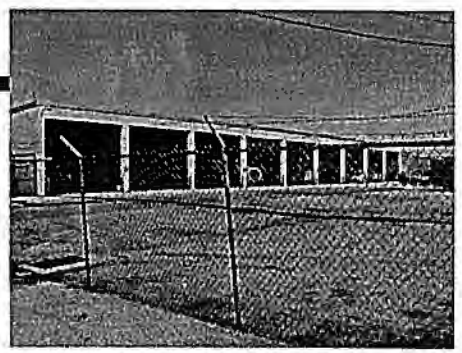
Site 37 - Evaluation



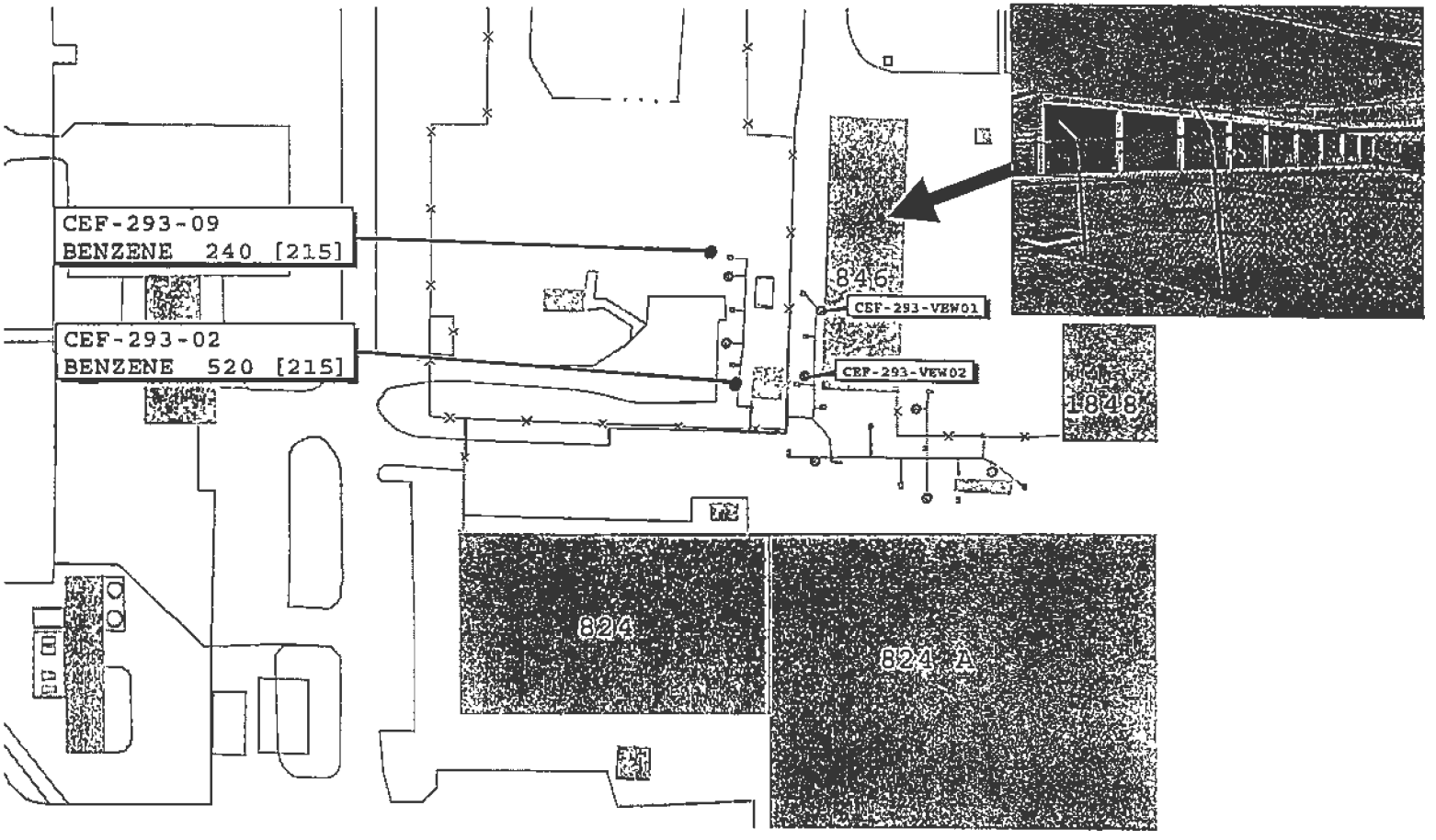
Day Tank One - Evaluation

- Closest building is 846
  - 846 is a garage with the eastern side of the building constantly open. This building may have indoor air concerns due to the nature of the garage activities; but not expected from groundwater contamination plume.
- A Biosparge Vapor Collection system in-place
- Surrounding vapor extraction wells have been non detect
  - Vapor Extraction wells 1 & 2 have had free product
- Indoor Air is not anticipated to be an issue.

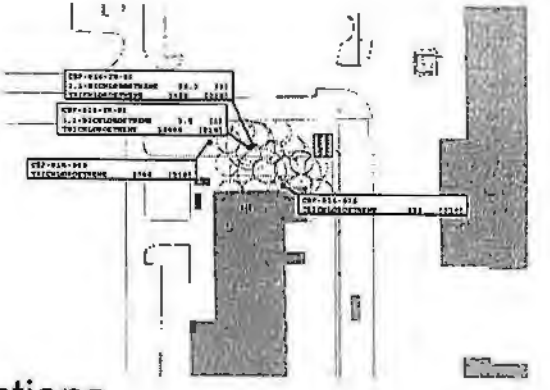




Day Tank One

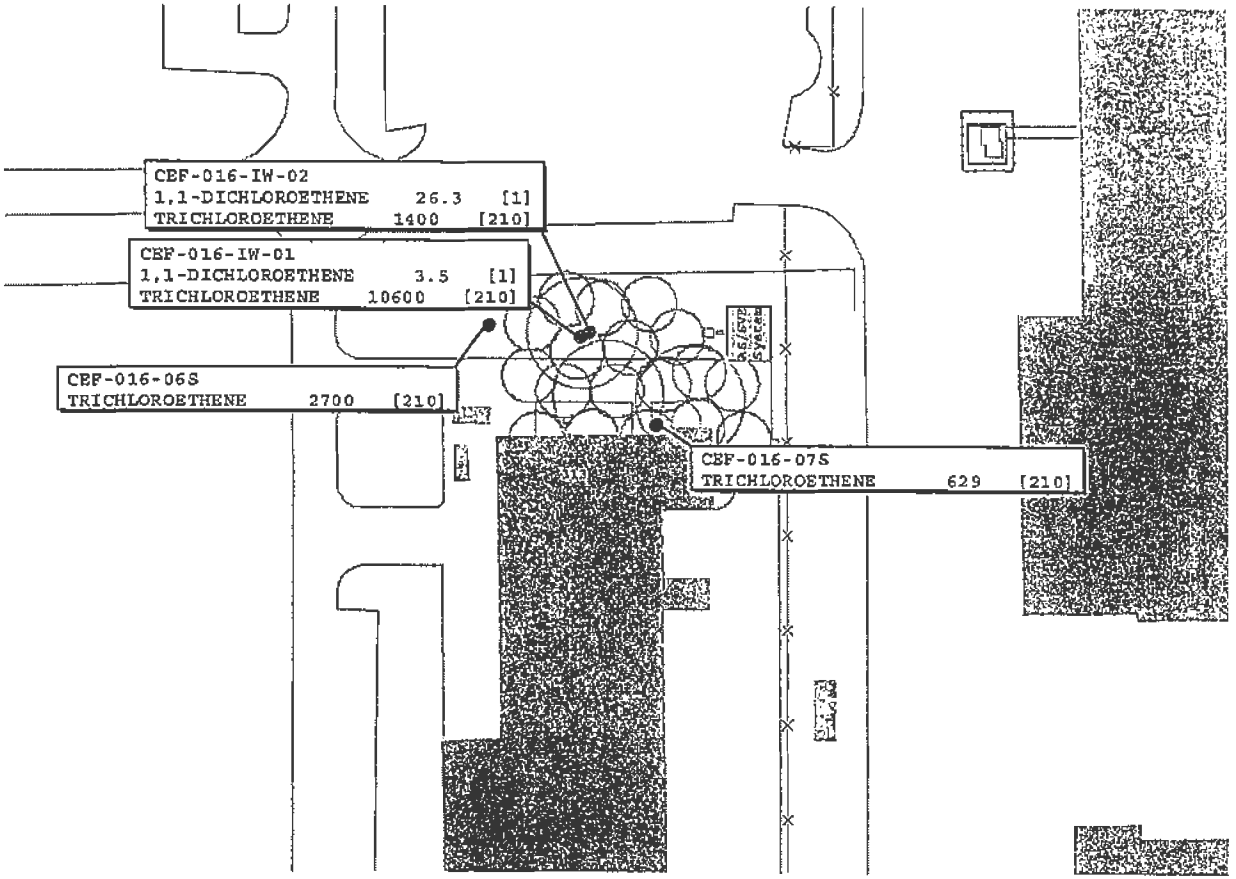

CEF-293-09
BENZENE 240 [215]
CEF-293-02
BENZENE 520 [215]
846
CEF-293-VEW01
CEF-293-VEW02
1848
824
824 A

Site 16 - Evaluation



- Closest building 313
- 313 activities similar to prior occupants
  - storage and repairs to marine and power plant turbine engines
- AS/VS system in-place
  - System operation
    - continuously from 06/99 To 05/00
    - operation has been in pulse mode since
- Dated sample results due to AS/VE system operations
  - IW-01 & 02 were last sampled on 08/98
  - 6S last sampled 11/99, has been abandoned
- 7S last sampled 01/01
- Piezometers located around Building 313
  - Air data collected 12/99 was evaluated with SCREEN3 (USEPA approved air model) indicated that concentrations in the piezometers were below published criteria for worker exposure
- Utilities are present within the foot print of the groundwater plume
  - These underground pathways may present a pathway to the building
- May have Indoor air contamination due to nature of building activities, but not expected due to contaminated groundwater

Site 16 - Evaluation



Recommendations

Area	Recommendation	Rationale
Bldg 46	NFA	No Building Present and future reuse
NFF	NFA	No Building Present and future reuse
Site-25 / Bldg 81	NFA	Low level exceedance No plume identified
Bldg 14	NFA	Aircraft maintenance building Type of activity in building Building has bay doors on the east and west sides of the building that provide ventilation
Bldg 20	NFA	Aircraft storage building Type of activity in building Building is skid mounted which provides ventilation between bottom of building and groundsurface
Bldg 846	NFA	Building is open on east side allowing constant air exchanges
Bldg 313	NFA	Piezometer data and reuse

Conclusions

- Groundwater contamination was not identified above the Connecticut screening levels in any residential areas.
- Institutional Controls will be implemented to address groundwater usage, tampering with groundwater remedial systems, surface and subsurface soils. Therefore any future development of the contaminated area will require design to prevent indoor air contamination due to underlying contamination.

APPENDIX E. INDOOR AIR SCREENING AND SAMPLING STRATEGIES

1. Evaluating Possible Indoor Air Locations (due to underlying contaminated groundwater at NAS Cecil Field)

Determining buildings with the greatest potential for indoor air contaminant migration and determine if indoor air sampling would be necessary. To help select buildings to be screened, ATSDR recommends that levels of gases found in soil and groundwater be compared to Oregon Department of Environmental Quality published Tier 1 Look-up Table (Oregon DEQ, 1999) and Connecticut Department of Environmental Protection published Reference Table A (Connecticut DEP), as well, as use and comparison with the screening model and Tier-2 groundwater model developed by Johnson and Ettinger Model (1991) for subsurface vapor intrusion into buildings. Comparisons with all three of the above should be considered conservative estimates and should be considered for planning purposes only. Nevertheless, the results of comparisons to these tables and the modeling effort can aid in the planning and development of a more comprehensive field program to help determine the levels of indoor air contamination from soil and groundwater vapor migration. Comparison should be used to identify a representative sample of buildings most likely to have elevated levels near source areas, plumes or utility pipe lines.

2. Field Screening

ATSDR recommends field screening followed by confirmation sampling.

- Screen cracks, openings, drains, utility passages, of selected building with probes that can measure, methane and carbon dioxide that may indicate the presence of the biogenic gases. Using a FID (Flame Ionization Detector) and CO_2 meter or combination of the two should be used. A portable gas chromatograph with PID and ECD with concentrator should be used for other chemicals. Cracks or locations that show high methane should be flagged for confirmation sampling including those that cause the FID to flame out because of lack of O_2 or other factors such as humidity. FID can detect methane and most compounds with carbon-hydrogen or carbon-carbon bonds. The FID is effected, but less sensitive then the PID to humidity, but light hydrocarbon gases eliminate the ability to detect toxic gases (EPA, 1996a). EPA's Environmental Response Team identifies that the FID can only read organic compounds but responds poorly to hydrocarbons, and halogenated hydrocarbons and fuel. The FID as with the PID, instrument response is affected by high and low temperatures, electrical fields, and FM radio transmissions. Not only will high levels of methane cause the FID to flame out, but moisture can also cause the FID to flame out or not light at all.

- After determining the methane levels, ATSDR recommends the use of a portable GC with combination of sensors to include PID (11.7 EV lamp)/ ECD with

concentrator that is capable of measuring ppb/ppt range depending on concentration ranges of other contaminants that may mask readings or other potable GC with greater capability based on available funding. Dust and humidity reduce sensitivity and the PID. EPA identifies that high concentrations of methane can cause a down scale deflection of the PID meter (EPA, 1996a).

There are other technologies that meet or exceed these standards.

3. Indoor Air Sampling

If indoor air sampling is indicated from the modeling, ATSDR is recommending indoor air sampling for aerobic and anaerobic breakdown products. Publications by the U. S. Air Force Center for Environmental Excellence indicate that anaerobic biodegradation processes create both biogenic gases and petroleum breakdown products and the primary chemicals released to the environment are chlorinated hydrocarbons (Wiedemeier et al., 1995; Newell et al., 1995). ATSDR recommends indoor air sampling should include the following:

- Biogenic gasses including methane, ethane, propane and other gases from hydrocarbons breakdown and fuels (aviation fuels, turbine fuels and aviation gasoline, JP5; diesel fuel; heating oils; and motor gasoline).

- Chlorinated hydrocarbons (trichloroethylene (TCE), trichloroethane (TCA) dichloroethylene (DCE), dichloroethane (DCA), carbon tetrachloride, chlorobenzene, and vinyl chloride).

- Hydrocarbons including benzene, ethylbenzene, toluene, xylene, diethylene glycol monomethyl ether, fuel hydrocarbon fractions and trimethylbenzene (found in JP5).

APPENDIX F. LIST OF ADDITIVES IN JET FUEL

NAVY ENVIRONMENTAL HEALTH CENTER
FUELS COMPARISON CHART

	JP-8	Jet A	JP-5	JP-4	Regular Gasoline, Unleaded
USES	*DOD Jet Fuel since 1991, used predominately by the Army and the Air Force to power aircrafts and land vehicles. Also now used by the Navy at land based activities.	Commercial Airline Jet Fuel	Jet Fuel used aboard ships, Navy vehicles and equipment from about 1952.	DOD Jet Fuel from 1951. Was phased out beginning in 1991 and completely in 1996. Used to power Navy aircrafts and Marine Corps land vehicles	Used in commercial automobiles by the general public.
SPECIFICATION**	MIL-T-83133	ASTM D 1655	MIL-T-5624	MIL-T-5624	ASTM D 4814
Primary Constituents (typically > 98% total volume)- All petroleum products are made from *crude oil*. Crude oil contains primarily hydrocarbon compounds made up of mostly carbon and hydrogen. In hydrocarbon compounds, the carbon atoms link together in chains of different carbon lengths. In a refinery, these chains are separated by heating (distillation). The crude oil is heated and the different compounds separate into groups based on their boiling points and density. The boiling point and density ranges of these groups are also related to the number of linked carbons the individual compounds contain. *Gasoline* is a blend of some of the shorter chain molecules that boil off first in the refining process. The chain lengths range from four to twelve, C4 – C12. *Kerosene* contains more of the middle distillate, or middle boiling point compounds in the C6 to C18 range. Kerosene is followed by *diesel fuel* and heavier fuel oils (like heating oil for houses) that contain longer chain compounds. Gasoline typically contains more benzene and higher amounts of aromatic (benzene containing compounds) than the kerosene based jet fuels. Crude oil composition varies depending on its source.					
	> 98 % Kerosene containing compounds in the C7 through C18 range	> 98% Kerosene containing compounds in the C7 through C18 range	> 98% Specially blended Kerosene containing compounds in the C8 through C17 range	> 98% Mixture of 65% Gasoline and 35% Petroleum Distillates – mixture contains compounds in the C5 through C14 range	> 98% Refined Petroleum Hydrocarbon containing compounds in the C4 through C12 range
Additives (combined typically < 2% total volume) - Additives are used in Jet Fuel to improve its performance under varying conditions. Typical additives to Jet Fuels and Gasoline include antioxidants, metal deactivators, static dissipator, corrosion inhibitors, fuel system icing inhibitors, octane enhancers, ignition controllers, and detergents/dispersants. These additives are used only in specified amounts, as governed by the military (MIL) and or commercial (ASTM) specification. The specification will decide which additives are required and which may be OPTIONAL. Whether an additive is optional or required, if it is added, it must be chosen from one of the chemical listed below. The chemicals listed below for each additive are not all used at once but represent the lists from which to choose.					
ANTIOXIDANT[1]	**OPTIONAL may contain one or more of the following:** 2,6-di-tert-butyl-4-methylphenol 2,6-di-tert-butylphenol 2,4-dimethyl-6-tert-butylphenol 75% min-2,6-di-tert-butylphenol 25% max tert-butylphenols and tri-tert-butylphenols 72% min 2,4-dimethy-6-tert-butylphenol 28% max tert-butyl-methylphenols and tert-butyl-dimethylphenols 55% min 2,4-dimethyl-6-tert-butylphenol 15% min 2,6-di-tert-butyl-4-methylphenol 30% max mixed methyl and dimethyl tert-butylphenols	**OPTIONAL may contain one or more of the following:** 2,6-di-tert butyl-4-methyl phenol 2,6-di-tert butyl phenol 2,4-dimethyl-6-tert-butylphenol 75% min-2,6-di-tert-butylphenol 25% max mix tert-butylphenols and tri-tert-butylphenols 72% min 2,4-dimethyl-6-tert-butyl phenol 28% max tert-butyl-methylphenols and tert-butyl-dimethylphenols 55% min 2,4-dimethyl-6-tert-butylphenol 15% min 2,6-di-tert-butyl-4-methylphenol remainder: monomethyl and dimethyl tert- butylphenols	**REQUIRED contains one or more of the following:** 2,6-di-tert-butyl-4-methylphenol 2,6-di-tert-butylphenol 2,4-dimethyl-6-tert-butylphenol 75% min-2,6-di-tert-butylphenol 25% max tert-butylphenols and tri-tert-butylphenols 72% min 2,4-dimethy-6-tert-butylphenol 28% max tert-butyl-methylphenols and tert-butyl-dimethylphenols 55% min 2,4-dimethyl-6-tert-butylphenol 15% min 2,6-di-tert-butyl-4-methylphenol 30% max mixed methyl and dimethyl tert-butylphenols	**OPTIONAL may contain one or more of the following:** 2,6-di-tert-butyl-4-methylphenol 6-tert-butyl-2,4-dimethylphenol 2,6-di-tert-butylphenol 75% min-2,6-di-tert-butylphenol 25% max tert-butylphenols and tri-tert-butylphenols 72% min 6-tert-butyl-2,4-dimethyphenol 28% max tert-butyl-methylphenols and tert-butyl-dimethylphenols 55% min 2,4-dimethyl-6-tert-butylphenol 15% min 2,6-di-tert-butyl-4-methylphenol 30% max mixed methyl and dimethyl tert-butylphenols	**REQUIRED contains one or more of the following:** N,N-dialkylphenylenediamines 2,6-dialkylphenols 2,4,6-trialkylphenols butylated methyl phenols butylated ethyl phenols butylated dimethyl phenols triethylene tetramine di(monononylphenolate)

October 2001

APPENDIX G. LEAD IN SOIL UPTAKE ALGORITHM

Application, to the NAS Cecil Field, Site 15 soil data set, of the algorithm relating soil lead concentrations to potential increases in blood lead levels.

Application of the Algorithm
The following formula describes the observed relationship between soil lead concentrations and increases in blood lead (PbB) levels (ATSDR, 1992a):

$$ln(PbB) = 0.879 + 0.241\ ln(Pb\ soil)$$

where the PbB data are expressed in units of μg/dL and the concentrations of lead in soil (Pb soil) are expressed as parts per million (ppm) (i.e., μg/g, mg/kg).

If the baseline PbB levels are defined, and the potential increase in PbB levels is calculated using the above formula, the sum of the two values provides an estimate of the predicted total lead concentration in blood if blood lead testing were performed. This value is compared to the CDC public health PbB screening criterion for children of 10 μg/dL to determine if PbB testing of the exposed population is recommended :

Testing is recommended if:

$$PbB\ baseline\ level + increase\ in\ PbB \geq 10\ \mu g/dL$$

Testing is not recommended if:

$$PbB\ baseline\ level + increase\ in\ PbB < 10\ \mu g/dL$$

Assumptions:

Baseline blood lead (PbB) levels
Baseline PbB values in exposed communities will vary depending on a number of socio-demographic factors including age, gender, race, income level, and environment (CDC, 1991a).

The National Health and Nutrition Examination Survey (NHANES) for 1976 - 1991 provides baseline PbB data for the U.S. population (ATSDR, 1999a). These data are averaged over age group categories for children, e.g, 1-2 years, 3-5 years, 6-11 years, etc. Neither baseline PbB data nor site-specific demographic data were available for the children residing nearby; therefore, for the purposes of these calculations it was assumed that the mean baseline PbB values for the area are not significantly different from the national averages for the overall U.S. population (CDC, 1991a). Based on the CDC recommendation for blood lead screening of children ages 6 years and under (CDC, 1991a), we used the NHANES 1-2 year and 3-5 year age group mean values:

Age	Mean PbB level (µg/dL)
1-2 years	4.1
3-5 years	3.4

Exposure

The calculations assume that the children regularly play in the lead-contaminated soils around the Site 15. This may lead to an overestimate in the potential increase in PbB levels due to soil exposure. However, the calculations do not integrate the increases in PbB which may occur due to exposure to other sources of lead in the environment particularly residential settings including inhalation and ingestion of household dusts and ingestion of indoor paint chips.

Calculations

At Site 15, lead in soil (unspecified depths) ranges from 1 ppm to 65,500 ppm. The mean concentration is 1,557 ppm and the median concentration is 163 ppm. Samples from unspecified soil depths above 2,000 ppm are wide spread across the site.

For the median soil Pb concentration, the calculated potential increase in PbB is 8 µg/dL:

$$\ln(PbB) = 0.879 + 0.241 \ln(163554)$$
$$\ln(PbB) = 2.1$$
$$PbB = 8\ \mu g/dL$$

For the highest soil Pb concentration, the calculated potential increase in PbB is 34.8 µg/dL:

$$\ln(PbB) = 0.879 + 0.241 \ln(65{,}500)$$
$$\ln(PbB) = 3.55$$
$$PbB = 34.8\ \mu g/dL$$

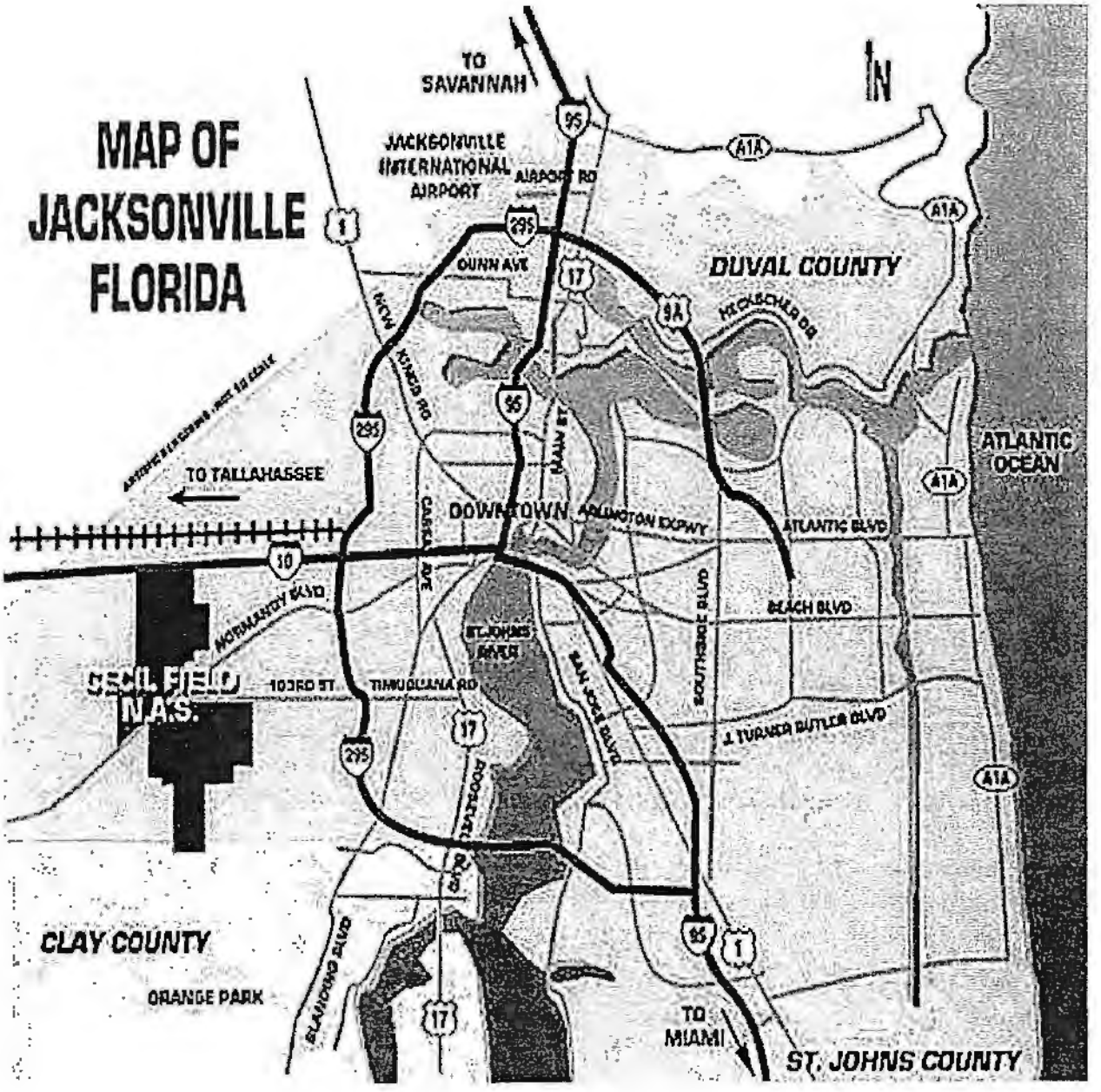
The predicted increase in PbB due to exposure to lead contaminated soils at this median concentration exceeds the screening criterion. Frequent exposure to the highest soil levels exceeds the screening criterion by a factor of 3. *Compare the sum of the baseline PbB and increase in PbB to the screening criterion of 10 µg/dL:*

1-2 years	4.1 + 8 = 12.1 µg/dL PbB
3-5 years	3.4 + 8 = 11.4 µg/dL PbB

For children 5 years of age and under, the predicted PbB levels exceed the screening criterion of 10 µg/dL .

APPENDIX H. FIGURES

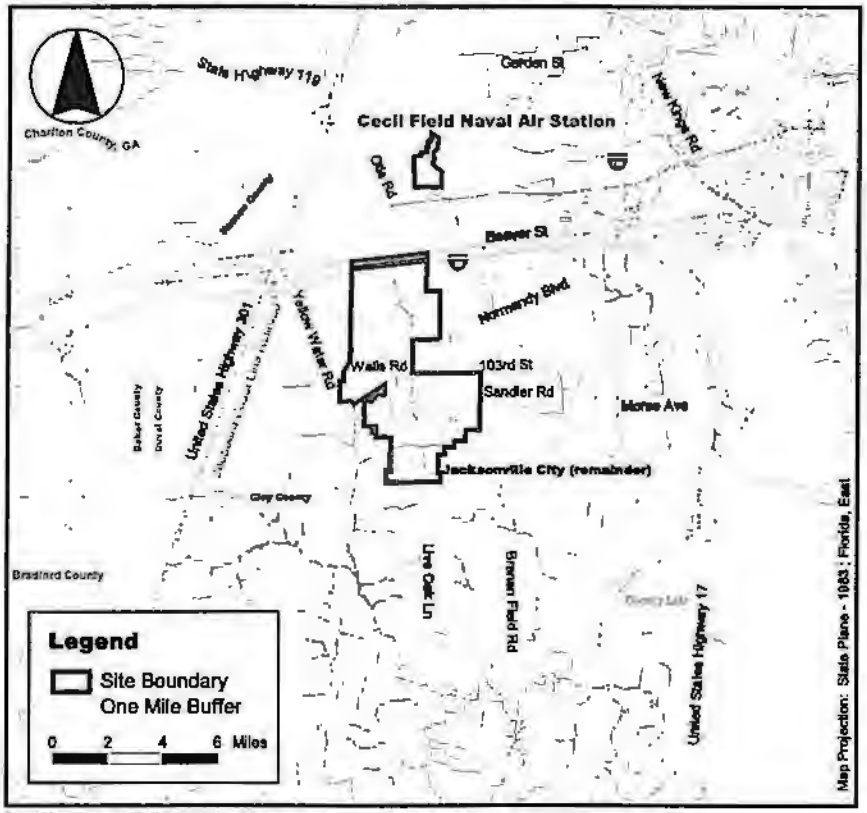
Figure 1. Location of NAS Cecil Field (City of Jacksonville, 2000).



Cecil Field Naval Air Station

Jacksonville, Florida

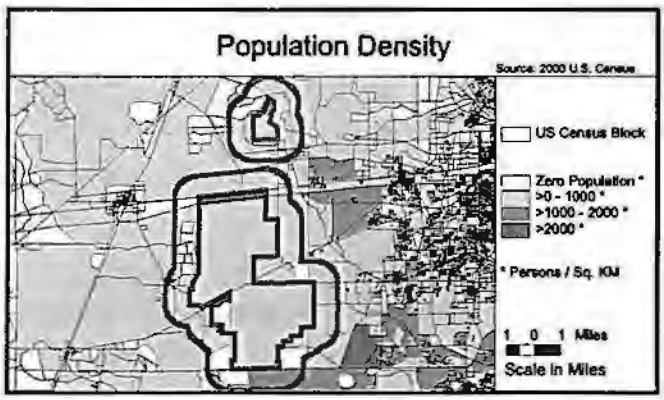
EPA Facility ID FL5170022474

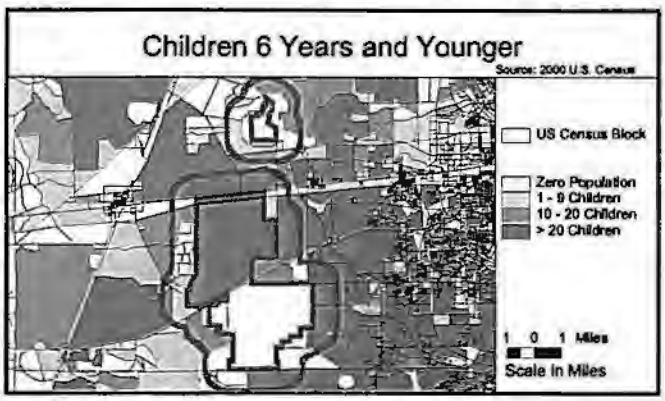


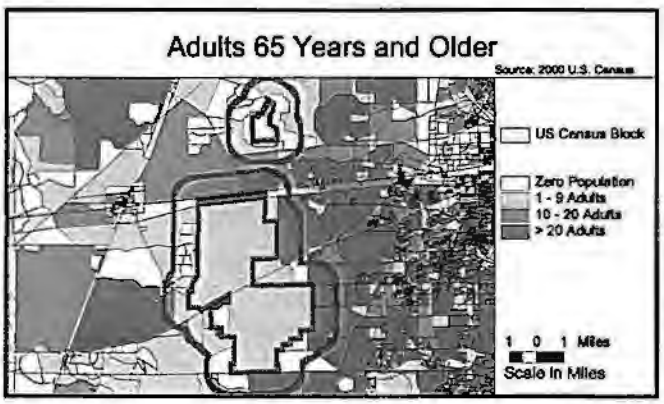
Base Map Source: 1995 TIGER/Line Files

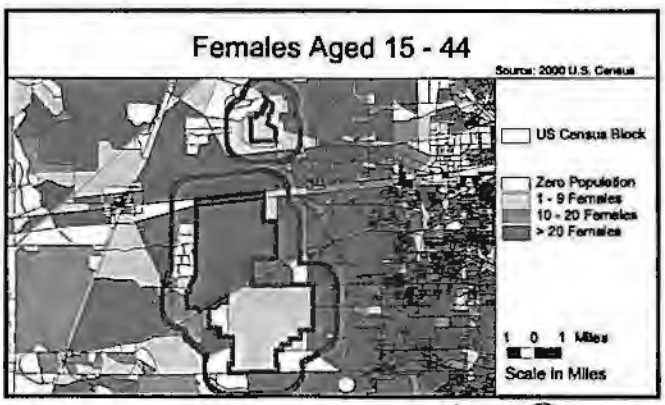
Demographic Statistics Within One Mile of Site*	
Total Population	4551
White alone	3838
Black alone	476
Am. Indian and Alaska Native alone	18
Asian alone	69
Native Hawaiian and Other Pacific Islander alone	7
Some other race alone	76
Two or More races	70
Hispanic or Latino	183
Children Aged 6 and Younger	595
Adults Aged 65 and Older	266
Females Aged 15 - 44	1052
Total Housing Units	1706

Demographics Statistics Source: 2000 US Census
*Calculated using an area-proportion spatial analysis technique









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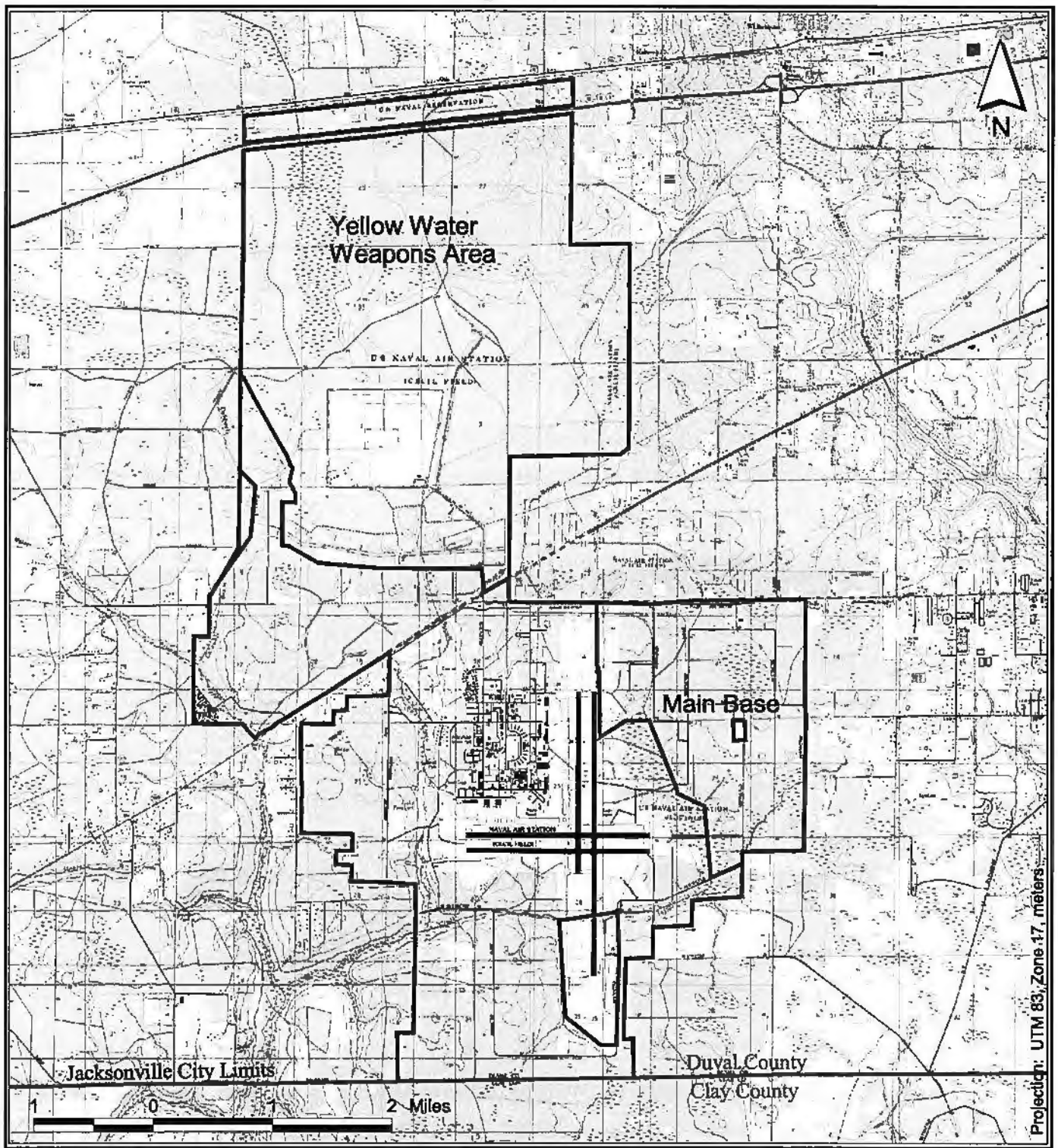
ATSDR GIS SAIDS

Figure 2

Figure 3



Source: USGS 24,000 topo sheets - National Geographic Topo!

Naval Air Station
Cecil Field

Jacksonville, Florida

VICINITY MAP

ATSDR GIS SAIDS

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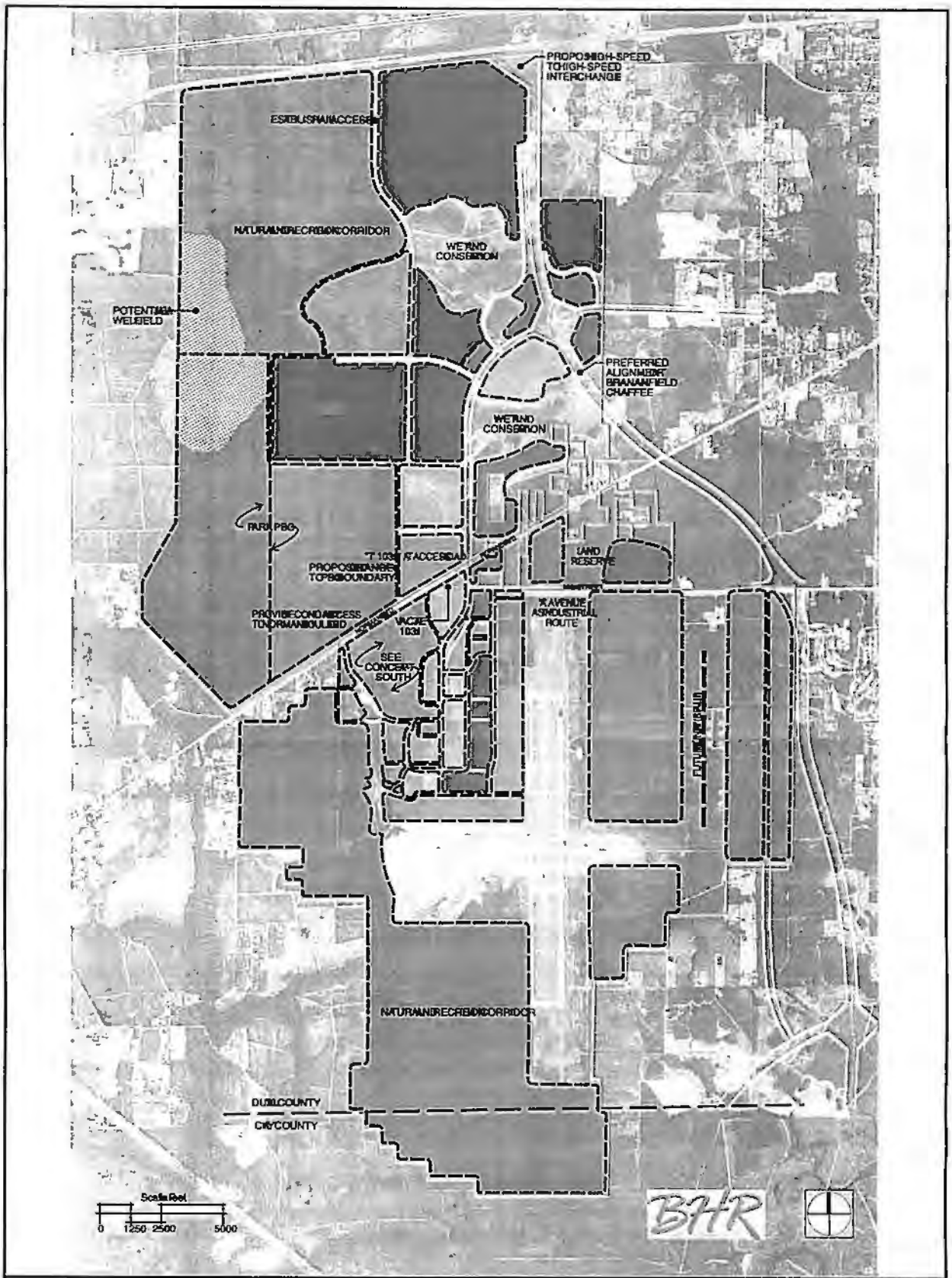
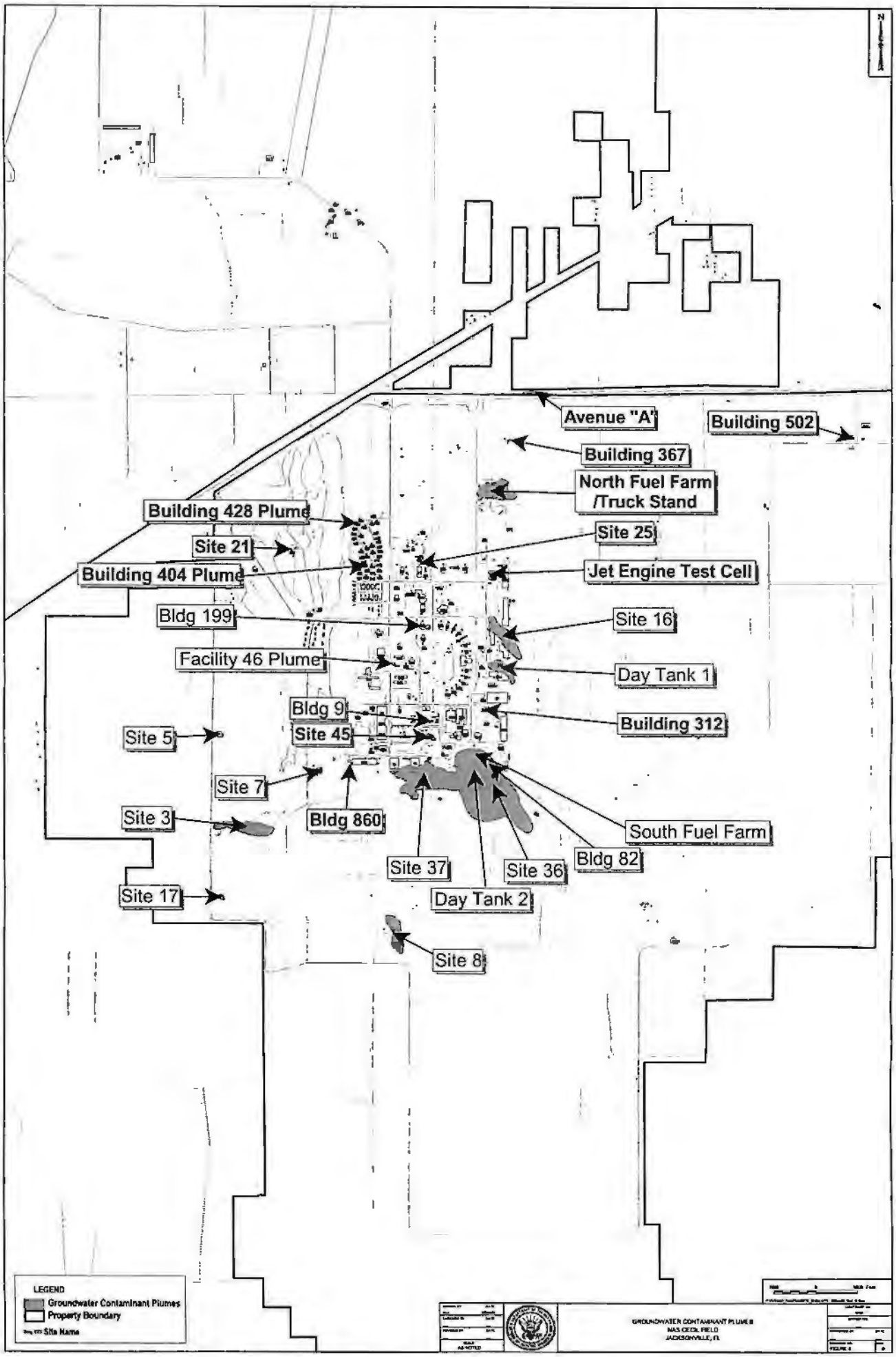


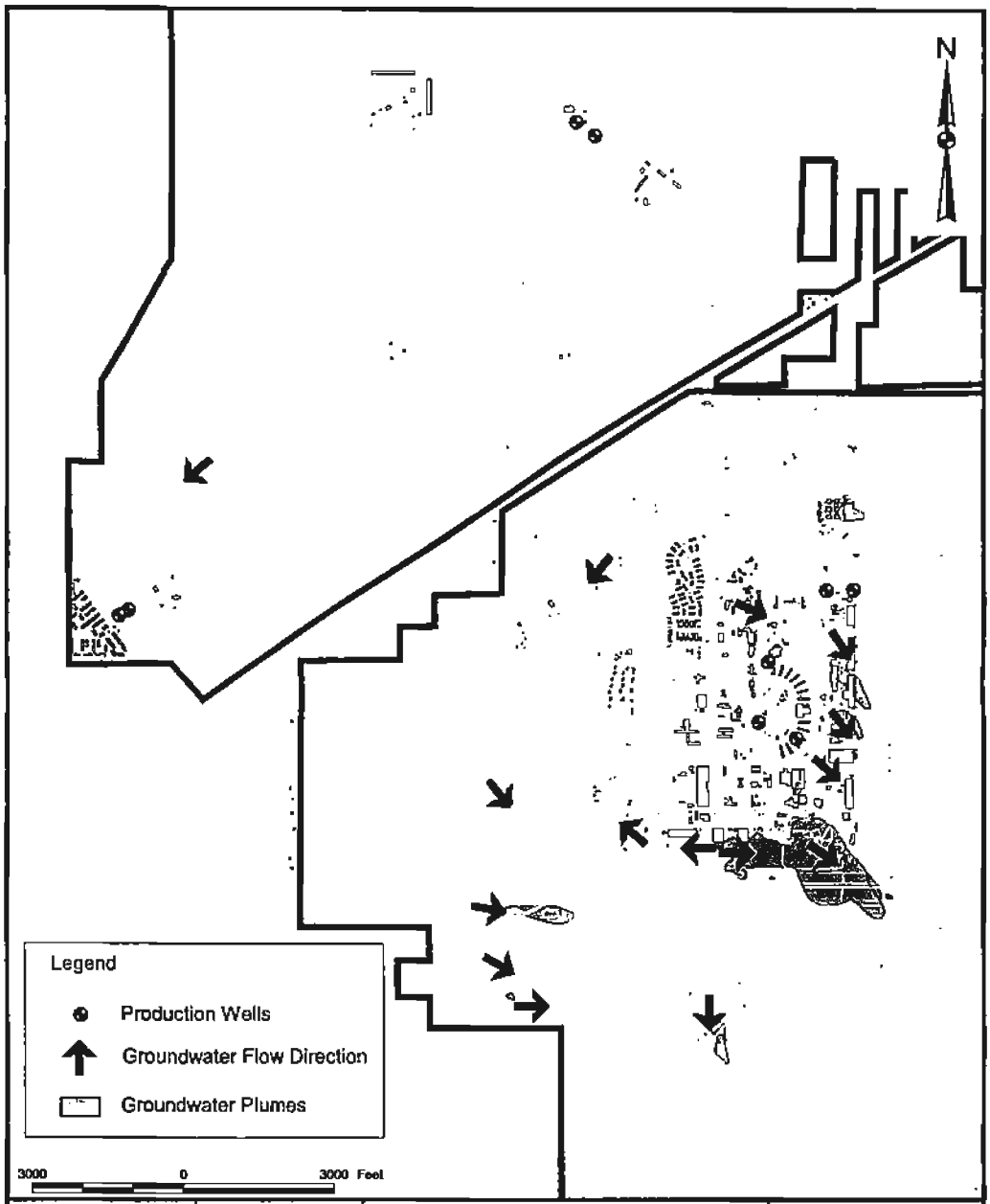
JEDC
Cecil Field Redevelopment

Figure 4
Proposed Land Use

LEGEND

- Commercial
- Office
- Housing
- Military
- Utility
- Golf
- Educational
- Aviation Dependent (Manufacturing)
- Aviation Support (Logistics / Warehousing
- Aviation Activities/Flightline
- Park/Buffer
- Natural Resource Corridor


Avenue "A"
Building 502
Building 367
North Fuel Farm
/Truck Stand
Building 428 Plume
Site 25
Site 21
Building 404 Plume
Jet Engine Test Cell
Bldg 199
Site 16
Facility 46 Plume
Day Tank 1
Bldg 9
Building 312
Site 5
Site 45
Site 7
Site 3
Bldg 860
South Fuel Farm
Site 37
Site 36
Bldg 82
Site 17
Day Tank 2
Site 8
LEGEND
Groundwater Contaminant Plumes
Property Boundary
Site Name
GROUNDWATER CONTAMINANT PLUMES
NAS CECIL FIELD
JACKSONVILLE, FL



DRAWN BY: MJJ	DATE: 15Aug01	PRODUCTION WELLS AND GROUNDWATER PLUME MAP SITE-15 AREA NAS CECIL FIELD JACKSONVILLE, FLORIDA	CONTRACT NUMBER: —
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COST/SCHEDULE-AREA			APPROVED BY: — DATE: —
SCALE: AS NOTED			DRAWING NO.: — REV: 0

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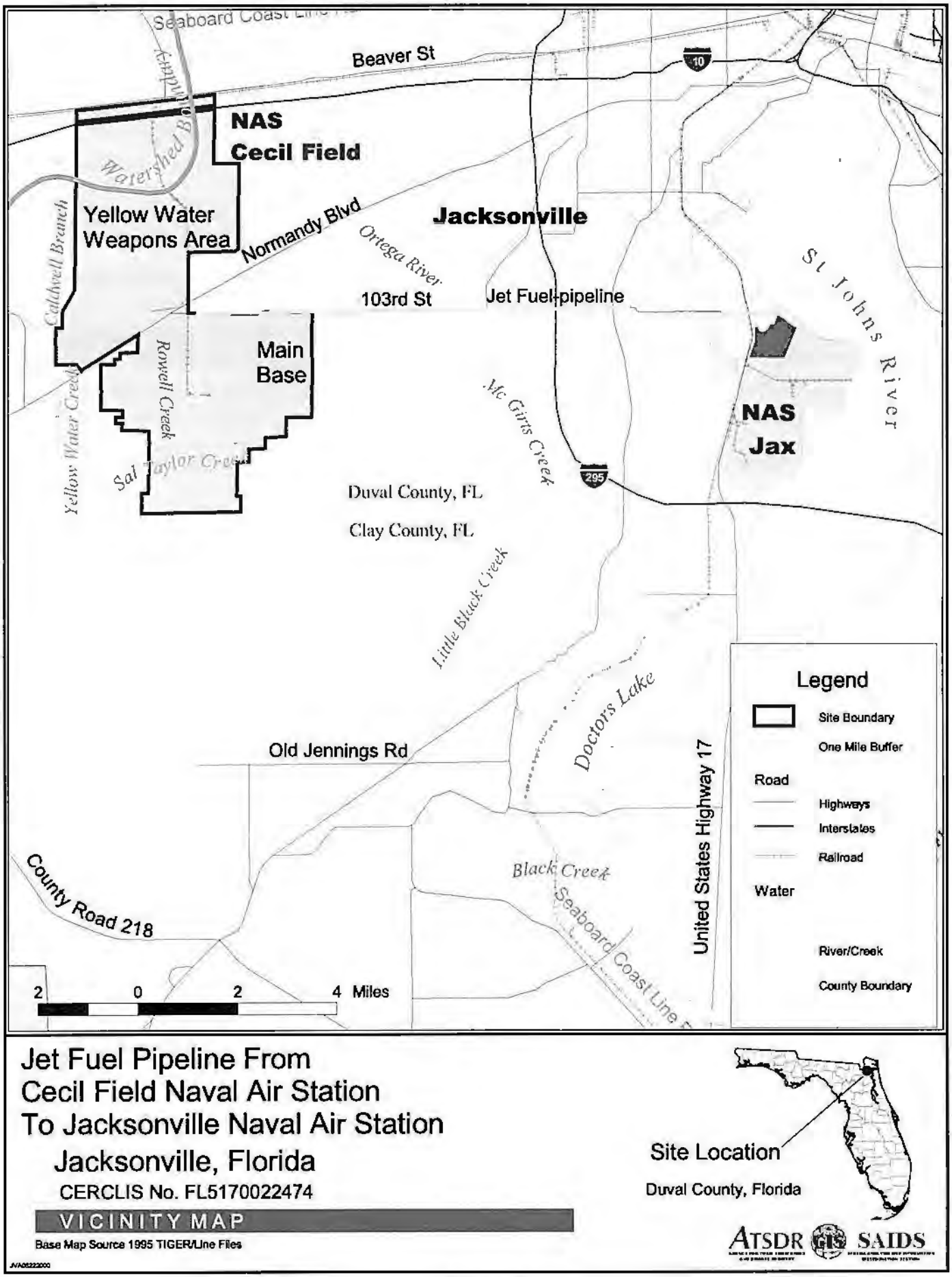


Jet Fuel Pipeline From Cecil Field Naval Air Station To Jacksonville Naval Air Station

Jacksonville, Florida

CERCLIS No. FL5170022474

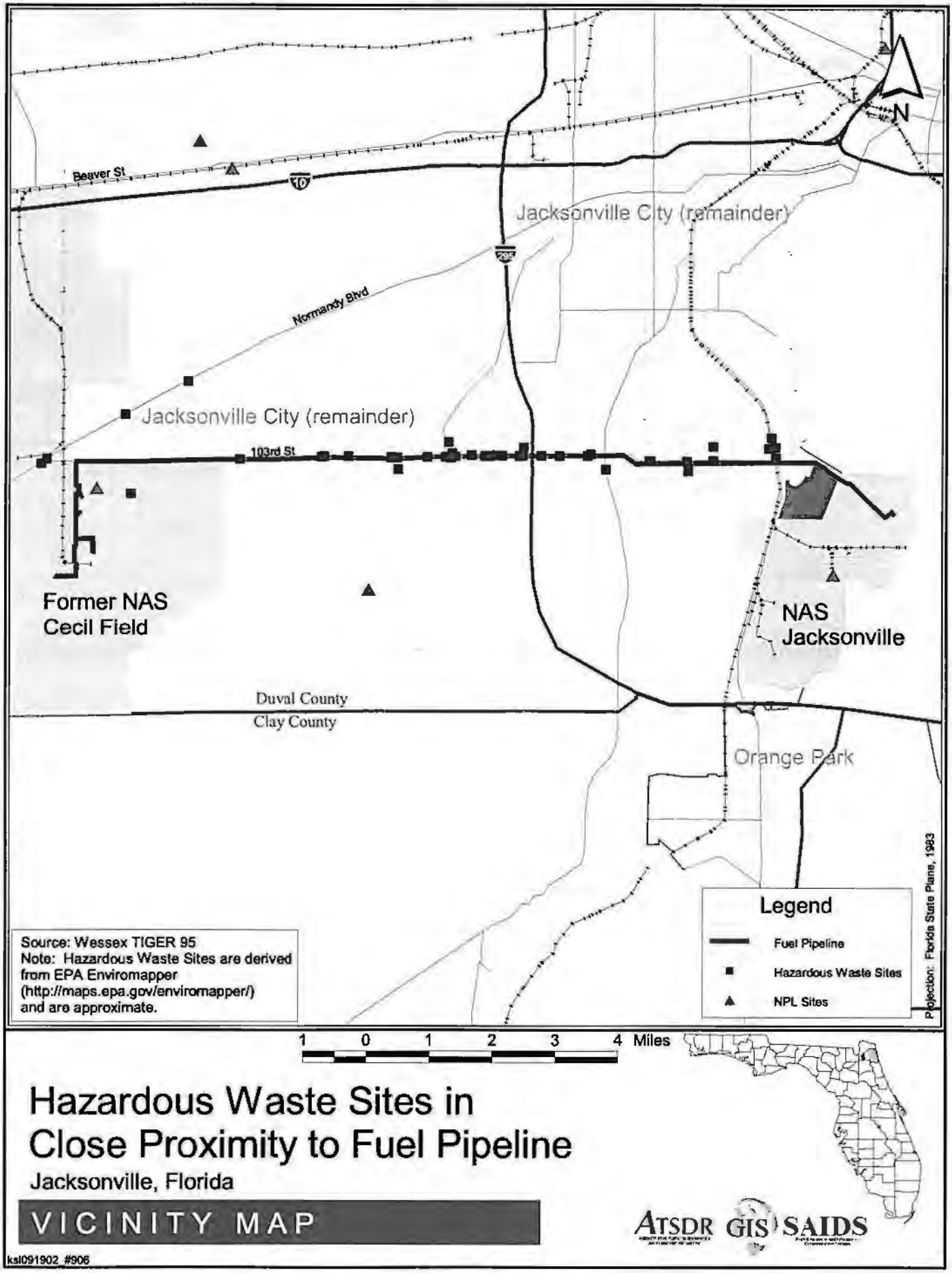
VICINITY MAP

Base Map Source 1995 TIGER/Line Files

ATSDR GIS SAIDS

Figure 6

Figure 6A



Hazardous Waste Sites in Close Proximity to Fuel Pipeline

Jacksonville, Florida

VICINITY MAP

ATSDR GIS SAIDS

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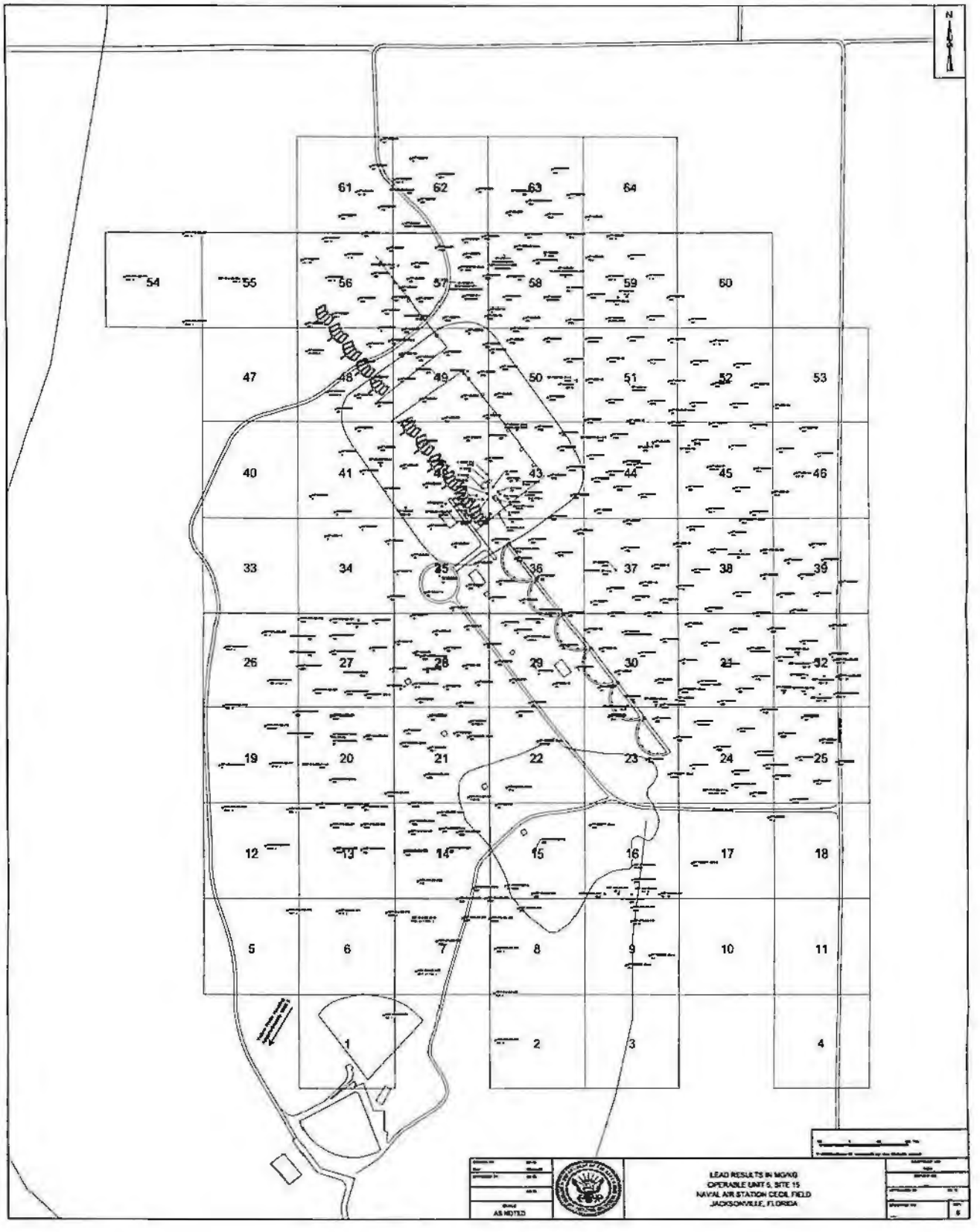
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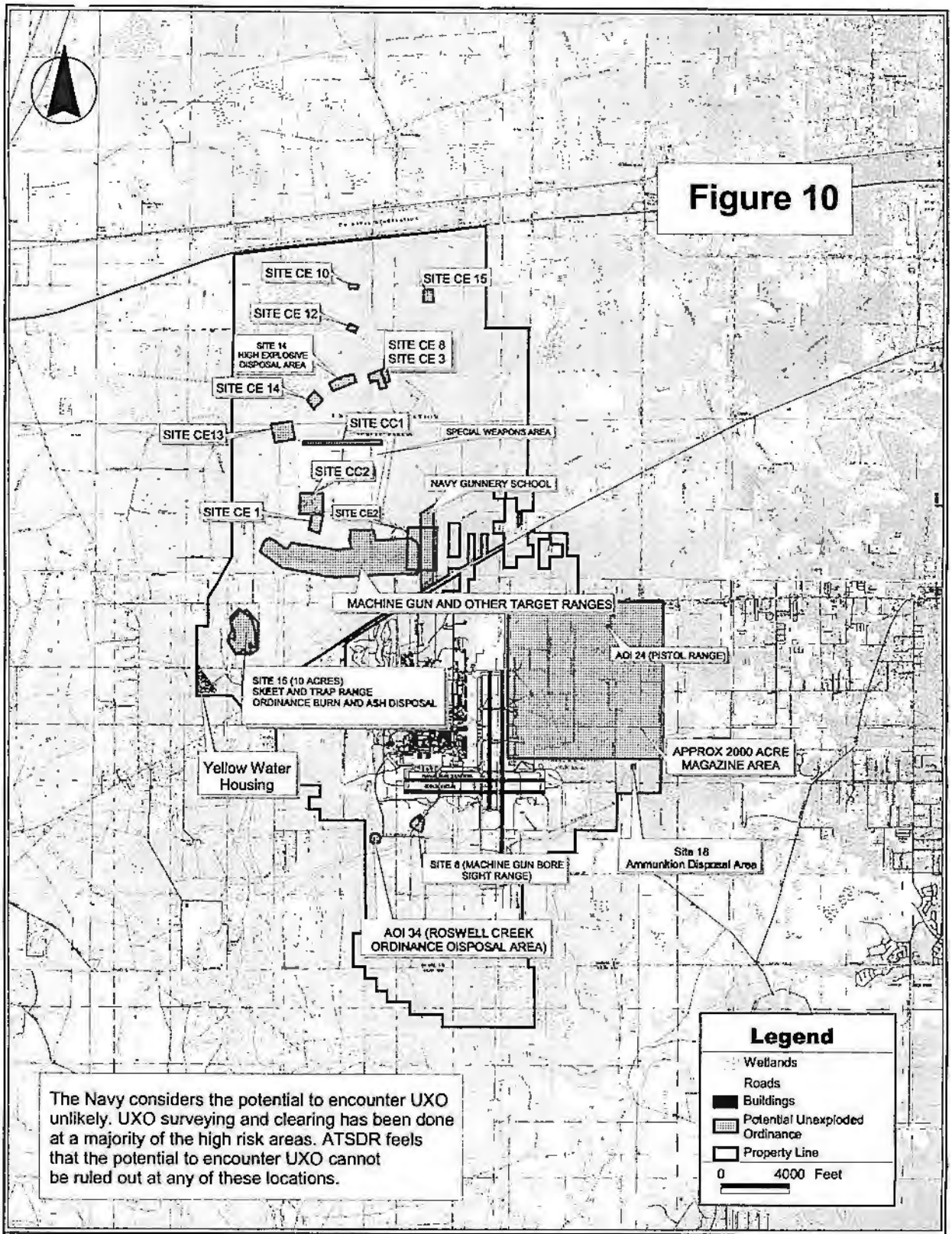
LEAD RESULTS IN MG/KG
OPERABLE UNIT 5, SITE 15
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
AS NOTED



UXO Locations Identified at Cecil Field Naval Air Station

All creeks, lakes* and wetland areas would also be suspected UXO areas. Potential to encounter UXO at these and other locations cannot be ruled out.

Boundaries of locations are subject to verificaton by the US Navy. All coordinates were not provided.

*Four man-made lakes not shown on map

Atsdr SAIC GIS

APPENDIX I. PATHWAYS TABLES

Table 1: Description of future exposures from the contaminated groundwater possibly contaminating indoor air in the on-base buildings and seeping into the deep drinking water wells.

PATHWAY NAME	TIME	CONTAMINANTS	EXPOSURE PATHWAYS ELEMENTS					COMMENTS
			SOURCE	ENVIRONMENTAL MEDIA	POINT OF EXPOSURE	ROUTE OF EXPOSURE	POTENTIALLY EXPOSED POPULATION	
People using on-base buildings over or near the areas with surficial groundwater contamination.	Future	Fuels, (JP 4 and 5), solvents (including TCE) and semi-volatile organic compounds	Historical leaks and spills from flightline operations, the jet fuel pipeline, under-ground and above ground storage tanks, and waste disposal areas	Groundwater possibly affecting indoor air	Possibly indoor air in buildings in vicinity of the contaminated groundwater areas	Breathing pollutants seeping into buildings from underground contamination	Future - building occupants near the groundwater contamination areas	Numerous areas on base have groundwater contamination. Some of those are highly concentrated, contain volatile compounds, and are close to the ground surface. The Navy assessed buildings within 100 feet of the worst areas. Current buildings in that range are not likely to have indoor air hazards from the groundwater contaminants because they had open air exchange (e.g., hangers). Many conduits remain in the area (sewers, waterlines, etc.) that could move the contamination indoors. In the future, contaminants could seep into more enclosed buildings polluting the indoor air. Simple precautions could prevent those situations.

Table 1: Description of future exposures from the contaminated groundwater possibly contaminating indoor air in the on-base buildings and seeping into the deep drinking water wells.

PATHWAY NAME	TIME	CONTAMINANTS	EXPOSURE PATHWAYS ELEMENTS					COMMENTS
			SOURCE	ENVIRONMENTAL MEDIA	POINT OF EXPOSURE	ROUTE OF EXPOSURE	POTENTIALLY EXPOSED POPULATION	
***People using the base wells or installing new wells in the future.**	Future	Fuels, (JP 4 and 5), solvents (including TCE) and semi-volatile organic compounds, and possibly metals	Same as above	Groundwater possibly affecting Base drinking water wells	New and old drinking water wells on base	Ingestion of contaminated groundwater from wells on base	Future- users of drinking water fed by the on-base well system. Users of new wells drilled in or near contaminated areas	There remain a number of base drinking water wells in use; several are near areas of groundwater contamination. Routine drinking water sampling (every 3 yrs) should be done on any systems fed by wells on base. An upgraded wellhead protection program is needed to keep surficial contaminants from reaching the deeper groundwater-where the base wells are drawing their water. Notification of the groundwater hazards should be given to developers and on file with the city and the county. New well installation should be restricted without wellhead protection, corrosion resistant casings, aquifer protection during drilling, and if needed, provide water treatment.

***Potential* Pathway = exposure not occurring or confirmed, but possible**

Table 2: Description of current and future exposure from past jet fuel pipeline leaks and other sources of pollution along 103rd Street that could contaminate private well water and indoor air.

PATHWAY NAME	TIME	CONTAMINANTS	EXPOSURE PATHWAYS ELEMENTS					COMMENTS
			SOURCE	ENVIRONMENTAL MEDIA	POINT OF EXPOSURE	ROUTE OF EXPOSURE	POTENTIALLY EXPOSED POPULATION	
People using private wells for drinking water, cooking, and bathing in the vicinity of the 103rd Street Jet Fuel pipeline and other possible sources (e.g., service stations) in the area **People using buildings over or near the areas with concentrated surficial groundwater contamination	Current Future	Jet Fuels, (JP 4 and 5), solvents (including TCE) and semi-volatile organic compounds, and possibly metals Other pollutants commonly found in industrial and residential settings such as pollutants from improperly functioning septic tanks, small industrial waste disposal practices, and residential use and disposal of pesticides.	1. Historical leaks from the Jet Fuel pipeline. 2. Underground storage tank leaks from service stations. 3. Other local industries and residential use of pesticides.	Private wells (groundwater) Indoor air	Private wells and possibly indoor air in buildings in vicinity of Jet Fuel pipeline (pipeline runs 15 miles underneath Roosevelt, Timaquana, and 103rd Street between NAS JAX and Cecil Field)	Ingestion of contaminated groundwater, and inhalation of vapors during bathing Breathing indoor air contaminants seeping in from underground	Current and Future - private wells users and building occupants near the pipeline, old service stations , and other sources of pollution.	Between 1954 and 1999, approximately 200,000 gallons/ day of fuel flowed through this pipeline extending from NAS Jacksonville to NAS Cecil Field. Even a very small loss per day could result in thousands of gallons of fuel over that time period. Many conduits in the area (sewers, waterlines, etc.) could move the contamination indoors. There are many businesses along this road, especially old gas stations, that also possibly leaked fuel from the underground tanks. *Summary- private well owners need to be identified and notified of the possible hazards.*

****Potential* Pathway = exposure not occurring or confirmed, but possible**

Table 3: Description of current and future exposure to Site 15 (Blue 10 Ordnance) soils, sediment, surface water, fish/turtles and UXO

PATHWAY NAME	TIME	CONTAMINANTS	EXPOSURE PATHWAYS ELEMENTS					COMMENTS
			SOURCE	ENVIRONMENTAL MEDIA	POINT OF EXPOSURE	ROUTE OF EXPOSURE	POTENTIALLY EXPOSED POPULATION	
People contacting on-site soil, dust, and creeks during recreational or trespassing activities at Site 15 (Blue 10 Ordnance)	Current Future	Metals (lead), pesticides, volatile and semi-volatile organic compounds, explosive residues, and unexploded ordnance	1. Historical ordnance disposal activities: burning of ordnance with diesel fuel and spreading the ash and residual metals on the ground (approximately 1967 - 1977)	Soils including dusts, sediment, surface water	Soils in the burn and disposal area, ditches draining the area	Incidental ingestion of, direct skin contact with, contaminated surface soils and inhalation of soil particulates during recreational property use or wildfires	Current - trespassers Future - recreational users	People currently trespassing on Site 15 would have incidental contact with the contamination in soil and creeks. Those exposures pose no apparent public health hazard. Under the proposed forest management/wildlife corridor reuse scenario and in the absence of soil clean-up activities or additional information on the bioavailability of lead, the lead in soils may still present a public health hazard to children under 6 who would have contact with soils several times a week. Since unexploded ordnance has also been found at and near Site 15, clearing and notification procedures need to be in place if future use includes digging and excavation.

Table 3: Description of current and future exposure to Site 15 (Blue 10 Ordnance) soils, sediment, surface water, fish/turtles and UXO

PATHWAY NAME	TIME	CONTAMINANTS	EXPOSURE PATHWAYS ELEMENTS					COMMENTS
			SOURCE	ENVIRONMENTAL MEDIA	POINT OF EXPOSURE	ROUTE OF EXPOSURE	POTENTIALLY EXPOSED POPULATION	
People who eat fish or turtles from Yellow Water or Sal Taylor Creek draining Site 15	Current Future	Possibly metals, including lead and mercury, PAHs and pesticides although not confirmed.	Historical ordnance disposal activities as above	Fish and turtles	Yellow Water Creek and Sal Taylor Creek	Eating fish or turtles	People eating fish or turtles from Yellow Water or Sal Taylor Creek	The nature and extent of sediment and surface water, and fish contamination has not been fully investigated. Dissolved lead levels in surface water samples indicate lead is bioavailable and could accumulate in wildlife. A Navy model predicted very low average daily intake for people who may eat fish from this area. Therefore, currently, this situation poses no apparent public health hazard. If Site 15 soils are left unremediated (thus allowing more soluble lead and possibly other metals to enter drainage areas), the increased use and harvesting of fish and turtles from this area should be evaluated as part of the Superfund Comprehensive Five Year Review.

**Completed* Pathway = exposure occurred or is occurring ***Potential* Pathway = exposure not occurring or confirmed, but possible

APPENDIX J. ATSDR HAZARD CATEGORIES

Category	Definition	Criteria
A. Urgent public health hazard	This category is used for sites that pose an urgent public health hazard as the result of short-term exposures to hazardous substances.	• evidence exists that exposures have occurred, are occurring, or are likely to occur in the future AND • estimated exposures are to a substance(s) at concentrations in the environment that, upon short-term exposures, can cause adverse health effects to any segment of the receptor population AND/OR • community-specific health outcome data indicate that the site has had an adverse impact on human health that requires rapid intervention AND/OR • physical hazards at the site pose an imminent risk of physical injury
B. Public health hazard	This category is used for sites that pose a public health hazard as the result of long-term exposures to hazardous substances.	• evidence exists that exposures have occurred, are occurring, or are likely to occur in the future AND • estimated exposures are to a substance(s) at concentrations in the environment that, upon long-term exposures, can cause adverse health effects to any segment of the receptor population AND/OR • community-specific health outcome data indicate that the site has had an adverse impact on human health that requires intervention
C. Indeterminate (potential) public health hazard	This category is used for sites with incomplete information.	• limited available data do not indicate that humans are being or have been exposed to levels of contamination that would be expected to cause adverse health effects; data or information are not available for all environmental media to which humans may be exposed AND • there are insufficient or no community-specific health outcome data to indicate that the site has had an adverse impact on human health
D. No apparent public health hazard	This category is used for sites where human exposure to contaminated media is occurring or has occurred in the past, but the exposure is below a level of health hazard.	• exposures do not exceed an ATSDR chronic MRL or other comparable value AND • data are available for all environmental media to which humans are being exposed AND • there are no community-specific health outcome data to indicate that the site has had an adverse impact on human health
E. No public health hazard	This category is used for sites that do not pose a public health hazard.	• no evidence of current or past human exposure to contaminated media AND • future exposures to contaminated media are not likely to occur AND • there are no community-specific health outcome data to indicate that the site has had an adverse impact on human health

APPENDIX K. RESPONSE TO COMMENTS FROM PUBLIC COMMENT RELEASE

ATSDR received comments from the Navy, USEPA, Florida Department of Environmental Protection (FDEP), Duval Co Health Department (DOH), JA Jones Management Services for Jacksonville Economic Development Commission, Jacksonville Airport Authority, & Jacksonville Electric Authority (JEA)

A. ON-BASE GROUNDWATER

COMMENTS ON GROUNDWATER CONTAMINANTS MIGRATING TO INDOOR AIR

NAVY: **Based on comparisons of gronndwater concentrations to the Connecticnt Department of Environmental Protection reference concentrations and to evaluations of the proximity and use of potentially impacted buildings, the Navy does not believe a hazard from groundwater plumes impacting indoor air quality exists. The Connecticut reference valnes are considered protective of human health in a residential basement setting. These values were used as a conservative screening method at Cecil Field although buildings have only aboveground rooms generally of larger size than residential basements. The majority of the soil that represents the primary source of groundwater contamination has been removed, and all significant sonrces of groundwater contamination have remediation systems in place or planned. The indoor air analysis condncted by the Navy and approved by the United States Environmental Protection Agency (U.S. EPA) and the Florida Department of Environmental Protection (FDEP).**

FDEP: **If there had been complaints or odors from those bnildings, the Department wonld have required that the odors be investigated and the potential for volatile compounds to seep into buildings assessed. The Navy has used the Connecticut Department of Environmental Protection's reference concentrations as a screening tool to determine where possible problems to indoor air may exist. At this time, there are no indications that groundwater contamination on the base is adversely affecting indoor air. Also, the sampling for biogenic gases (methane, ethane, etc.) does not appear warranted as the concentrations of those gases from anaerobic degradation of contaminants in groundwater would unlikely be at concentrations that would result in a threat to public health.**

J.A. Jones Management Services: **The Navy is tracking potential air contaminant plumes, per your recommendation, with data from soil and water testing (Connecticut DEP parameters).**

ATSDR: In the public comment version of this public health assessment, ATSDR considered the groundwater attributes and building characteristics and determined that groundwater contamination could be off-gassing into the buildings. We recommended that indoor air safety should be confirmed. In response, the Navy used the screening tool and determined that 55 locations had the greatest potential for indoor air contaminant migration. The Navy evaluated all locations within 100 feet of a building; and narrowed the list to 18 locations. In all cases, the Navy decided on no further action because the buildings either no longer existed or the current use of the building has constant air

exchange (e.g., hangers). The Navy concluded that any future development of the contaminated area will require design to prevent indoor air contamination due to underlying contamination.

Anaerobic biodegradation processes create both biogenic gases and breakdown products of petroleum.(Wiedemeier et al., 1995; Newell et al., 1995). Biogenic gases can occur at dangerous levels especially in confined spaces. New or modified building characteristics can contribute to the groundwater off-gassing into the buildings. ATSDR is unaware of groundwater contaminant concentrations at which anaerobic degradation reduces the potential biogenic gases to migrate indoors. Because many factors influence the travel path for contaminants (e.g., gasses can diffuse directly through foundations through cracks, gaps, footers, basement walls and walls below grade level, poor seals around utility entry points), each situation should be evaluated individually.

USEPA: **Several years ago, EPA released the spreadsheet version of the Johnson-Ettinger model, which simulates vapor intrusion into a basement from soil or groundwater contaminated with volatile organic carbons (VOCs). Several state regulatory agencies took issue with the model on the basis of indoor air samples. Subsequently, these samples were shown to be nonrepresentative of the model outcomes and the comparison was not appropriate. It should be kept in mind that the model simulates a room with poor air exchange, such as a basement. This is not the situation at NAS Cecil Field as buildings do not have basements. Also, validating the model at a site becomes problematic due to the widespread use of products containing VOCs. This is the situation at the buildings evaluated at Cecil Field.**

ATSDR recommends using the model solely for screening which buildings would be the best candidates for indoor air sampling. The model can only be used to predict the concentration as a result of vapor intrusion and does not take into account the effect of other sources. At other sites, ATSDR has found actual indoor air levels to be higher than the model predicted primarily because of other sources in the buildings. Because the model assumptions are very conservative, we were also suggesting that a field screening (described in the next question and answer) be used to narrow the building choices even more.

USEPA: **The text contains general recommendations that carbon dioxide and methane should be measured in building interiors as indicators that infiltration of soil vapors may be occurring. However, the text does not provide any specific guidelines. Carbon dioxide is present in ambient outdoor air and is present in high concentrations that vary according to ventilation in all buildings in which people may be present. It is not clear from the recommendations at what levels carbon dioxide concentrations would be indicative of soil gas intrusion. Similarly, there are no indications of concentrations that would suggest that methane intrusion may be a concern.**

ATSDR: We suggested using the screening model to determine the buildings most at risk for indoor air pollution from groundwater off gassing. We also suggested that field screening may be useful for the buildings most at risk. To determine which buildings would be good choices for indoor air sampling, we suggested that cracks, openings, drains, and utility passages, of selected building be screened with probes that can measure methane and carbon dioxide.

Bacteria that attack hydrocarbons generate carbon dioxide under aerobic conditions and methane under anaerobic conditions. Those biogenic gases are often the largest magnitude of components in the entire soil gas mixture. In general, the longer the pollution is present in the subsurface environment, the higher are these biogenic gas levels. Both carbon dioxide and methane can be field screened (measured) with reasonable accuracy in the field using infrared detectors. All screening results, however, should be supported by more rigorous laboratory analyses performed under stringent QA/QC procedures (Exploration Technologies, Inc., 1998).

The presence of a concentrated petroleum source such as gasoline, diesel, kerosene, etc., causes a concentrated buildup of carbon dioxide in the subsurface. The average concentration of carbon dioxide in ambient air is only 0.03 percent. Biodegradation of typical soil organic matter generally yields carbon dioxide concentrations between 0.2 to 3-5 percent. Higher concentrations of carbon dioxide measured in various soil vapor samples collected in the vicinity of subsurface petroleum contamination yields values as high as 5 to 30 percent, an indication that biodegradation is significantly enhanced within the area of the contaminant plume (Exploration Technologies, Inc., 1998).

Ambient air methane ranges from 1.5 to 2 ppm by volume. Methane concentrations generally range from 0.5 to 1 ppm in areas where there is no pollution or deep gas migration, suggesting that normal soils act as a sink for atmospheric methane. Since biogenic methane is generated under anaerobic conditions, it is usually generated deeper in subsurface sediments than carbon dioxide and appears to correlate mainly with the location of free (liquid) product. As with carbon dioxide, the longer that the pollution is present in the subsurface environment, the higher are the methane soil gas levels. Petroleum contaminated sites often exhibit biogenic methane concentrations ranging from several thousand parts per million (ppm) to percent levels (Exploration Technologies, Inc., 1998).

Because of the influences from other carbon dioxide sources, we suggest a comparison of the methane and carbon dioxide levels detected at the cracks vs. what is found in other parts of the building. If higher, this might indicate infiltration from an outside source, possibly groundwater off gassing. Since methane and carbon dioxide can serve as carriers for other gases (e.g., vinyl chloride) and are easy to sample, we recommended using this simple field screening approach.

A. ON-BASE GROUNDWATER

COMMENTS ON PEOPLE USING BASE WELLS OR INSTALLING NEW WELLS IN THE FUTURE

NAVY: **The PHA states that "In the future, building occupants could be exposed to contaminated drinking water on base." The Navy does not consider any of the identified groundwater plumes to be "near" or "downgradient" from existing drinking water wells. All existing drinking water wells are considered to be located an adequate distance away from any plume to preclude potential impact from any identified groundwater plume. Ongoing monitoring is being conducted to evaluate potential future migration. A map, included in Enclosure (3) to the cover letter, shows that all identified groundwater plumes are upgradient or side gradient of existing water supply wells. Groundwater flow is possible only in a downgradient direction; therefore,**

contaminated groundwater cannot flow toward water supply wells.

USEPA: **The [on-base well sampling] recommendations are based upon the possibility of downgradient surficial aquifer contamination being drawn against gradient into upgradient production wells that draw water from a deeper groundwater aquifer. While this type of production well contamination is possible, the probability of such an event actually occurring is not likely. A review of available hydrologic data for the production wells and the monitoring wells in contaminant areas should be reviewed and appropriate safeguards should be developed based upon the data.**

ATSDR: We agree that a review of the hydrologic data would be useful especially for those wells closest to the groundwater contamination. Even though the groundwater flow in the shallow aquifer appears to naturally flow away from the existing wells, if enough pumping takes place, groundwater can be pulled toward a well even when it naturally flows in the opposite direction, especially if the well casing is compromised. Therefore, we suggest that in addition to the review of hydrologic data, detailed information on the groundwater flow directions in each of the aquifers, 3-dimensional delineation of the contaminant plumes, the cone of influence for the current supply wells, and a check of the casing integrity should be provided in the Findings of Suitability to Transfer (FOST), to developers, the St. Johns River Management District, and on file with the city and county.

ATSDR also recommends that future use of on-base groundwater as drinking water include the following precautions: routine drinking water sampling (possibly every 3 years) should be done on any systems fed by wells on base, well owners should implement wellhead protection and evaluation of the casing integrity starting with the wells closest to the plumes, and new well installation should be restricted without wellhead protection, corrosion resistant casings, aquifer protection during drilling, and if needed, water treatment.

USEPA: **Recommendations for use of on-base groundwater are appropriate. The EPA, State, Navy, and city of Jacksonville are presently negotiating methods for implementing and monitoring land use controls pertaining to groundwater contamination plumes. The State and local regulatory agencies already have programs in place that monitor wellhead protection and the installation of potable water wells.**

FDEP: **The Department regulates drinking water facilities under Chapter 62-550, Florida Administrative Code, which spells out the frequency of monitoring of water quality provided by the system. The abandonment of old wells and installation of new wells is regulated by the St. Johns River Water Management District, which provides specific criteria for well abandonment and installation. Under an agreement undertaken between the Navy, EPA, and the Department, for those areas where groundwater contamination has been detected above Florida Groundwater Cleanup Target Levels, Land Use Control Implementation Plans restricting groundwater use are developed by the Navy as long as the property remains in Navy ownership. At the time of property transfer to a subsequent owner, Restrictive Covenants implementing institutional controls will be recorded in the deeds that will restrict installation of wells and use of groundwater.**

NAVY: **The PHA includes "users of new wells drilled in or near contaminated areas" as a "Potentially Exposed Population." New property owners are notified of existing groundwater contamination by way of the FOST and are subject to groundwater use restrictions by way of deed restrictions in those areas where groundwater contamination has been identified. These deed restrictions will prevent installation of new wells into contaminated groundwater.**

Duval County Health Department (DOH): **As the Cecil Field NAS is on the EPA National Priority List, we recommend that any new drinking water well constructed on the base meets the requirements of the Florida Administrative Code, Chapter 62-524 regarding new potable water well permitting in delineated areas as well as any pertinent requirements of the city of Jacksonville.**

J.A. Jones: **The City's Jacksonville Electric Authority (JEA) plans to close all existing potable wells on the Cecil Commerce Center (CCC) and build new ones except for those on Jacksonville Port Authority (JPA) property which will be used for fire fighting.**
Tenants and private sector owners will have Navy/EPA/FDEP imposed Land Use Controls (LUC) in their leases or deeds which restrict or prohibit the use of shallow groundwater in those areas with contaminated groundwater plumes.

ATSDR: From these comments, it appears that the responsibilities for control of groundwater monitoring programs, drinking water monitoring, well installation, well abandonment are with different agencies or seem to shift depending on the ownership and uses. This could create some confusion on who has responsibility for what activities. Land use controls are still being negotiated so the responsibilities to be outlined there are not known. ATSDR's recommendations are to ensure that detailed information is available in several places (i.e., the FOST, to developers, the St. Johns River Management District, and on file with the city and county) so that depending on what people are planning to do, the best available information is available on the groundwater situation for them to make decisions. Additionally, as a final safeguard, we suggest that the EPA and the Navy consider implementing an assessment of new and existing wells at risk for contamination as part of the Superfund Comprehensive Five Year Review. These steps may be critical because it is our experience that deed restrictions do not "prevent" activities. In fact the National Research Council determined that land use controls cannot be relied on to protect public health since land use controls cannot be maintained over time especially if the land is resold (NRC, 1999).

FLDEP: **ATSDR recommends re-evaluating groundwater sampling and analysis for additives to petroleum including lead, icing inhibitor, anti-oxidants, corrosion inhibitor, metal deactivator, static dissipator, biocides, conductivity additives, detergent additives, thermal stability additives and oxygenates. The Department has specific compounds considered additives that are to be analyzed for at petroleum contaminated sites. These include lead, 1,2-ethylene dibromide, MTBE and 1,2-dichloroethane. the Department has no regulatory authority under Chapter 62-770, Florida Administrative Code, to require further analysis. If ATSDR has information on the specific compounds in the additives listed above, and the EPA methodology to analyze for those compounds, the human health or regulatory criteria applicable to those compounds and specific instances where those compounds were detected, the Department will consider the need to**

implement limited testing of groundwater at locations across the base to determine if those compounds are of concern.

NAVY: **The PHA lists several potential fuel additives that may be found in "... JP-5, Mogas, Avgas, and other historically used fuels." The Navy has conducted groundwater sampling at petroleum sites in accordance with Florida Administrative Code 62-770. This rule specifies which constituents are required to be sampled to comply with State regulations. This rule does include some additives. The Navy does not agree that they or any future property owner should be required to sample for other constituents, in response to petroleum releases that are not otherwise required by State regulations.**

ATSDR: ATSDR believes that some sampling for additives is indicated. JP-5 was widely used at NAS Cecil Field. The additives for JP-5 (detailed below) were antioxidants (methylphenol and butylphenol groups), corrosion inhibitors (organic acids), and fuel system icing inhibitors (Diethylene glycol monomethyl ether, and methylphenol and butylphenol groups). FDEP may want to consider sampling for those constituents at the JP-5 spill areas. We provide in Appendix G common fuel additives for jet fuels and more detail on their use.

JP-5: > 98% Refined Petroleum Hydrocarbon containing
Alkanes, Alkenes, Cycloalkanes, Isoalkanes, Napthalenes, 10 – 25 % Aromatics, and < 0.02 % Benzene

Additives (combined <2% total volume)- Additives are used in jet fuel to improve its performance under varying conditions. Typical additives to Jet fuels and Gasoline include antioxidants, metal deactivators, static dissipator, corrosion inhibitors, fuel system icing inhibitors, octane enhancers, ignition controllers, and detergents/dispersants. These additives are used only in specified amounts, as governed by the military and or commercial specification. The specification will decide which additives are required and which may be **OPTIONAL**. Whether an additive is optional or required, if it is added, it must be chosen from one of the chemicals listed below. The chemicals listed below for each additive are not all used at once but represent the lists from which to choose.

ANTIOXIDANT
REQUIRED
2,6-di-tert-butyl-4-methylphenol
6-tert-butyl-2,4-dimethylphenol
2,6-di-tert-butylphenol
75% min-2,6-di-tert-butylphenol
25% max tert-butylphenols and tri-tert-butylphenols
72% min 6-tert-butyl-2,4-dimethyphenol
28% max tert-butyl-methylphenols and tert-butyl-dimethylphenols
55% min 2,4-dimethyl-6-tert-butylphenol
15% min 2,6-di-tert-butyl-4-methylphenol
30% max mixed methyl and dimethyl tert- butylphenols

CORROSION INHIBITOR
REQUIRED
Organic Acids

FUEL SYSTEM ICING INHIBITOR[5]
REQUIRED
Diethylene glycol monomethyl ether and 50 to 150 ppm by weight of either
2,6-ditert-butyl-4-methylphenol
2,4 dimethyl, 6-tert-butyl-2,4-dimethylphenol
2,6-di-tert-butylphenol
75% min-2,6-di-tert-butylphenol
25% max tert-butylphenols and tri-tert-butylphenols

NAVY: **In the table entitled "Cecil Field Known Areas of Groundwater Contamination," Day Tank 2 (DT2) and Site 36/37 are listed separately under Installation Restoration (IR) Sites with Groundwater Contamination. The Day Tank 2 (DT2) and Site 36/37 groundwater plumes are co-mingled, and a joint remediation effort is in progress. However, if DT2 is to be identified separately from Site 36/37, it shonld be included under the Underground Storage Tank (UST) heading because, by itself, it is a petroleum site. Additional IR sites that should be included are Building 312, now known as Site 58 and Building 824A, now known as Site 57. The UST heading should be on a single line.**

ATSDR: This section was edited in the final version.

NAVY: **Page 11, People Using On-Base Buildings Over Groundwater Contamination, First paragraph, Next to last sentence: This sentence states "Most of the 23 groundwater contamination areas not only have surficial contamination, but have volatile fuels and solvents floating on the groundwater surface." The statement that "most" of the groundwater contamination areas have "volatile fuels and solvents floating on the groundwater surface" is an incorrect and misleading statement. This statement should be deleted from the paragraph. Free product remains at only one site (Day Tank 1) and the extent of the free product identified is very limited.**

ATSDR: This section was edited in the final version.

NAVY: **Page 11, People Using On-Base Buildings Over Groundwater Contamination, Second paragraph: The concentrations of trichloroethene (TCE) in groundwater at Site 16 cited in this paragraph, 410,000 parts per billion (ppb) and 700,000 pph were detected before the groundwater remediation air sparging/soil vapor extraction system, was installed in 1999.It should be noted that after startup of the AS/SVE system at Site 16, the highest groundwater concentrations quickly dropped below 1,000 µg/l and the system has been operating in pulse mode to maintain the source area contamination below the 1,000 µg/l source area cleanup goal concentration.**

ATSDR: This section was updated in the final version.

NAVY: **The PHA states that "Methane and associated trace gases may move 1.5 miles from source areas including movement in fill associated with utility and fuel lines." The statement that methane may move 1.5 miles is speculative and should be removed from this paragraph.**

ATSDR: It is difficult to predict the distance that landfill gas will travel because so many factors affect its ability to migrate underground; however, travel distances greater than1,500 feet have been observed (ATSDR, 2001b).

NAVY: **The PHA states that "Routine drinking water sampling (possibly every three years) should be done on any systems fed by wells on base. Notification of tbe groundwater hazards should also be given to developers and on file with the county." The drinking water supply well field is currently owned and operated by the city of Jacksonville. The Navy agrees that public water supply systems should be routinely sampled to remain in compliance with applicable regulations. This is a regulatory requirement and is the responsibility of the City of Jacksonville. However, the Navy does not believe that additional sampling is warranted because none of the identified groundwater plumes are considered threats to the current water supply wells. Future property owners in areas with contaminated groundwater will be notified of contamination and groundwater use restrictions as part of the required Finding of Suitability to Transfer (FOST) documents.**

ATSDR: Jacksonville Electric Authority (JEA) may have plans to close all existing potable wells on the Cecil Commerce Center (CCC) and build new ones except for those on JPA property which will be used for fire fighting. Because of the remaining groundwater contamination, routine sampling of new or existing wells is prudent. The system operators should perform this sampling.

B. JET FUEL PIPELINE AND OTHER OFF-BASE HAZARDS

NAVY: ....the pipeline was taken out of service in 1997 and currently does not contain any fuel. Based on data collected, the Navy has identified minimal soil contamination, confined to the area of the pipeline, at relatively low concentrations. Only two known groundwater contamination locations have been identified (A Avenue and Hawkens Property) and contamination at these sites also is confined to the vicinity of the pipeline. In addition, these areas are being actively remediated and monitored. The Florida Department of Transportation has been informed of all the known locations of soil and groundwater contamination along the pipeline, for their use in planning and management of road construction projects. If ATSDR believes there are other regional contamination problems, other than what is associated with the pipeline or past Navy operations, it should clearly differentiate these or pursue this issue separately from this Public Health Assessment (PHA) for NAS Cecil Field.

NAVY: The 1994 pipeline investigation ATSDR is referencing did not identify any soil or groundwater contamination. Based on conversations with former Navy Public Works Center personnel, in order to verify the accuracy of the instrumentation used to inspect the pipeline, some areas of potential concern (called "anomalies") were excavated during this investigation and the pipe was cut to confirm that the thickness of the pipeline was adequate. No soil or groundwater contamination was identified at these excavated anomalies.

FDEP: ATSDR recommended that the Department should provide educational material to be broadcast on radio or television or printed in the newspaper warning well owners of the possible regional contamination hazards associated with the Jet Fuel Pipeline between NAS Cecil Field and NAS Jacksonville. It is also recommended that the Department prompt them to have their wells sampled annually for VOCs, SVOCs, pesticides and metals. This recommendation does not appear warranted based on the information currently available from the Navy. While the groundwater contamination has been detected at "A" Avenue and 103rd Street and the Hawkins property, the groundwater contamination at these location has been adequately assessed and is under remediation. Several other investigations have not detected groundwater contamination. The latest investigation has only detected low-level Polynuclear Aromatic Hydrocarbons and TRPH in soils in the vicinity of the pipeline. The Department believes that it would be unwarranted to unnecessarily worry residents along the pipeline of contamination without there being indications of potential contamination. Also, because jet fuel is the potential source of contamination, the Department would only require sampling and analysis of the Gasoline and Kerosene Analytical Groups specified in Table B of Chapter 62-770, Florida Administrative Code.

FDEP: ATSDR recommends that the Department provide notification/information to the planning/permitting departments on local groundwater contamination along the 103rd Street Jet Fuel Pipeline so that developers or residents can be informed that new wells need wellhead protection. As stated above, the Department has no information on groundwater contamination associated with the pipeline locations other than those already being addressed by the Navy. The Florida Department of Transportation, which has the right-of-way over most of the Jet Fuel

Pipeline, has been notified of the results of the Navy's investigations. As the latest assessment results have only indicated minor soil contamination, the Navy is attempting to coordinate with FDOT to maintain current land uses for those areas that have indicated contamination. The low-level soil contamination detected should not pose an unacceptable risk to human health or the environment if the FDOT roadways are maintained and residential development is prohibited in the immediate vicinity of those sites.

ATSDR: Leaks are known to have occurred from the pipeline; the largest known leak is estimated at 6,000 gallons (103rd St and Kerr/McGee Texaco property). Additionally, possible leaks could have occurred from as many as 25 other local sources (e.g., service stations) in the vicinity of Roosevelt, Timaquana, and 103rd Street. Numerous utility lines (water, sewage, etc.) in the area can also act as a conduit to carry the contaminants that remain in the soil and groundwater toward private wells. Since the extent of private well use in the area of the pipeline has not been determined and the extent of groundwater contamination in this area is not well characterized, the extent of the hazard in this situation is unknown.

The pipeline inspection information is significant from the standpoint of not identifying catastrophic leaks. However, from the Navy's response, it appears that the purpose of the inspections was to verify pipe thickness, not to confirm soil or groundwater contamination. It also appears that only "some" of the anomalies were investigated. More fuel could also have been lost from the uninvestigated anomalies discovered in 1994. We submit that there are still unknowns about the possible pipeline fuel losses. Since the pipeline is one of the contributors to the groundwater hazards, ATSDR believes it is appropriate to discuss other sources in this document.

With some known and unknown groundwater hazards in the vicinity of the pipeline, ATSDR's intent in presenting this situation as an unknown hazard is to protect public health by having the well owners sample their wells. We believe this is prudent public health practice.

ATSDR recommends that the Florida Department of Environmental Protection provide educational material (such as radio or television broadcast or printed material in the newspaper) warning well owners of the possible regional contamination hazards, prompting them to have their well sampled annually. Alternatively, a complete well survey can be conducted and people notified individually.

NAVY: **This PHA should clearly differentiate between potential public health risks due to past operations at the former NAS Cecil Field and releases from commercial, non-NAS Cecil Field sources. The Navy does not understand why ATSDR is recommending testing for pesticides and metals (other than lead) for a petroleum release. The pipeline carried only fuel. Regardless, the Navy believes that the limited extent of groundwater contamination attributed to the Navy pipeline and the ongoing groundwater monitoring being conducted precludes the need for annual testing of private wells.**

ATSDR: Since there is not documented information on the nature and extent of contamination from any of the known or suspected source areas, differentiating contributions or risks is not possible.

A variety of potential groundwater sources exist that could impact the quality of groundwater for individual local residents using private drinking water wells. The particular sources are not known with certainty. It is the combined sources of contamination, including the past pipeline leaks, that threaten any nearby private wells. Individual private, and especially shallow, wells can also be affected by improperly functioning septic tanks, small industrial waste disposal practices, and residential use and disposal of pesticides. Therefore, it is prudent for private well owners to periodically sample their well water for common contaminants found at industrial and residential settings.

NAVY: **There are no "high" concentrations of soil or groundwater contamination associated with the Navy pipeline that could contribute to indoor air quality problem. The Navy does not believe it is necessary to inform local fire departments of the leak locations because the Navy does not consider the limited contamination to pose a public health threat.**

ATSDR: There remain uninvestigated sections of the pipeline that could have leaked. It would be difficult to determine where those are at this time. Therefore, we have deleted the recommendation for the Navy to advise local fire departments of the location of pipeline leaks found to date so they can provide future hazard management (e.g., fumes, etc.). Additionally, a variety of potential groundwater sources exist that could impact the quality of indoor air. Therefore, we are still recommending that building occupants should report fuel odors in indoor air to the Florida Department of Environmental Protection, Bureau of Emergency Response 1-800 320-0519 or (904) 807-3300 or the local fire department.

Duval DOH: **This health assessment recommends warning well owners in the vicinity of the Cecil Field NAS of the potential regional contamination hazards prompting them to have their well water sampled on an annual basis for volatile and semi-volatile organic compounds, pesticides, and metals. The vast majority of local residents will not be able to afford such testing. Therefore, we suggest that Navy (or other stakeholders) set aside a budget for such private well water testing in the vicinity of the Cecil Field NAS and that the health department performs this sampling and testing followed by residents' notification of the sampling results with health department's recommendations. The State of Florida has in place a Well Remediation Program with the Florida Department of Environmental Protection (FDEP) in partnership with Florida Department of Health (FDOH), which allows us to address the drinking well water contamination issues by providing alternative safe drinking water source and remediation of contaminated water supply wells - free of charge to affected residents.**

ATSDR: The need for alternative safe drinking water has not yet been established, but this is important information in the event private well users need the program. As there are many possible sources of pollution in the area, including sources from residents, such as oil disposal and pesticide application, assigning the cost of testing to any one possible source would be virtually impossible.

It is it prudent for private well owners to annually test their drinking water. If this is cost prohibitive, perhaps they can work with the city and county health and drinking water programs to at least have their water tested once.

Duval DOH: **The Public Health Assessment addresses a concern about potential indoor air pollution from volatilization of fuel and other volatile organic compounds present in ground water contamination plumes on the base and along a fuel pipeline at 103rd Street. However, it does not take under consideration the potential for permeation of these products into potable water supply distribution system lines. Our sampling of public distribution lines at the dry cleaning facilities and gasoline stations indicated occurrence of such permeation incidents. In our opinion, there is a need for testing public drinking water distribution lines in contaminated areas on the base and along 103rd Street for the protection of public health.**

ATSDR: We agree that in certain situations, contamination has been found to permeate distribution lines. However, the extent of groundwater contamination in this area, if any, is unknown. As a first step, we suggest that private well owners test their water since the wells would be more susceptible than pressurized water lines. If widespread well water contamination is discovered, perhaps the distribution lines should be investigated.

Duval DOH: **The health assessment calls for development of educational materials and signs to inform local residents about different present and potential contamination issues existing on the base. As we, [the] local health department, have developed a strong presence in our community, we would suggest that [the] local health department be included in these activities.**

Duval DOH: **In light of aforementioned recommendations, we believe that the local health department should be an active member of the Cecil Field Reuse Commission to enable us to address, and take under consideration, the public health issues associated with development of this base.**

ATSDR: The Restoration Advisory Board (RAB) provides input into the cleanup decisions at the base and what restrictions may be needed for future use of the property. If Duval DOH is not currently part of the Restoration Advisory Board, we suggest you join the board. To get more information about the RAB, you can contact:
Navy Co-Chair
Scott Glass
(843) 820-5587
glasssa@efdsouth.navfac.navy.mil

Community Co-Chair
Richard Darby
(904) 778-4258
radarby@attbi.com

You can contact the reuse commission @ Jacksonville Economic Development Center (JEDC), Cecil Commerce Center Development Office, 904-630-1858.

Duval DOH: **We are striving to be proactive in protecting the health of the residents in our community from [the] adverse impact of environmental pollution. Therefore, we recommend that copies of results of additional testing suggested in the health assessment be provided to our office. This way we would be able to address any potential public health issue in expeditious and effective manner.**

ATSDR: Any data generated from the FDEP, EPA, and Navy would be available through the RAB. We have recommended in the assessment that if people test their well water, that they provide the results of positive testing to you.

C. SITE 15 AND OTHER AREAS OF THE YWWA

COMMENTS ON PEOPLE CONTACTING ON-SITE SOIL, DUST, CREEKS, AND GROUNDWATER

- *Soil - Comments on contaminant characterization and exposure estimates*

NAVY: **Initially, the PHA incorrectly defines the maximum and median lead concentrations at Site 15. The maximum lead concentration is 65,500 mg/kg, not 58,900 mg/kg; the median lead concentration is 163 mg/kg, not 554 mg/kg. The average lead concentration is 1,157 mg/kg.**

The PHA states that "[r]outine contact with soil or breathing soil dusts at those lead levels may increase blood lead levels, especially in children under 6 years old, to unsafe levels. Currently, the area is restricted; therefore, it is unlikely that people would come into "routine contact" with Site 15. Furthermore, the future reuse plan for Site 15 states that the site would remain a green space. No development is planned for this area. Consequently, "routine contact" would be unlikely. Based on the concentrations of lead present at Site 15, residential exposure would be considered unacceptable in accordance with EPA and Florida Department of Environmental Protection screening levels for lead. However, limited exposure, such as once a week, would result in insignificant uptake of lead. Moreover, the presence of leaves and pine needles (up to six inches in depth) reduces direct contact with soil and reduces the likelihood of dust generation, thus reducing the potential exposure to lead.

NAVY: **Surface soil sampling was conducted in accordance with approved sampling work plans and the U.S. EPA Region 4 Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (EISOPQAM). Although it could be argued that the highest lead concentrations may be located in the top 2 inches of soil based on tbe depositional nature of lead shot on the ground, the Navy does not believe that surface soil samples must be limited to the top 2 inches to adequately describe risk from exposure. The Site is covered with a thick layer of pine needle duff. Based on the passive recreational future land use (designated as a natural resource conservation area), this duff layer will remain, thereby minimizing exposure to soils from casual contact. If someone is deliberately digging into the soil, thereby exposing the contaminated mineral soil, they will likely expose more than the top 2 inches, therefore, the Navy believes the sampling techniques that were used adequately represent likely exposure resulting from future contact with surface soils.**

FDEP: **EPA and the Department have been fully involved in the assessment of lead and PAH contamination at Site 15. The Department believes that the Navy has adequately assessed the area in preparation for remedial actions at the site. ATSDR's recommendation that the site be reassessed to determine lead concentrations in the top 3 inches of soil, the distribution of lead within the soil column and the bioavailability of lead in order to determine the lead hazard present would invalidate the data taken so far and would potentially delay the anticipated remediation of the site for years. The Department helieves that a remedial action can be derived from the data collected to date by the Navy that will be protective of human health and the**

environment.

ATSDR: The current characterization is adequate for passive contact with the soils. ATSDR's greatest concern is that the property will be used for activities other than passive recreational use in the future when the property is out of the Navy's or the city of Jacksonville's control. The current estimated soil concentrations (average 1,157 mg/kg, median 163 mg/kg, and high 65,500 mg/kg) could be as much as 15 times higher since lead tends to accumulate in the soil surface (usually within 1 to 2 inches of the surface) and concentrations decrease with depth (U.S. EPA, 2001). The information that ATSDR requested (i.e., 0-3" samples, estimation of a dilution factor, bioavailability information) would be needed to evaluate public health impacts for more active uses of the property. *For that reason, property use should be a main focus of the Superfund Comprehensive Five Year Review.*

NAVY: **The Navy does not plan to do any additional bioavailability studies. Minimal quantities of lead shot have been found at the site, indicating that the majority of the shot has oxidized and the lead is now incorporated into the soil, much like any ash would be. The Navy and the regulatory agencies have agreed on bioavailability criteria used in the risk assessment.**

USEPA: **The recommendations include a discussion on bioavailability of lead. It is not clear that bioavailability data would provide sufficient additional useful information to justify the additional costs involved. The current screening values assume that all of the lead in soil is bioavailable and are therefore protective of human health. Screening values based upon bioavailability studies are likely to assume that some fraction of the lead is not hioavailable and would typically yield higher screening values. Therefore, bioavailability data does not appear warranted so long as protective screening values are used.**

Additionally, ATSDR may not be aware of continuing discussions between Region 4 and FDEP about evaluation of bioavailability of lead in soil with an inexpensive test. In tbe western US, extensive lead contamination at mine smelter sites makes evaluating bioavailability with laboratory studies of animal models (e.g., juvenile swine) cost effective because of high projected cleanup costs. However, because these studies have been performed using mine and smelter slag, they are not applicable to Florida soils. The default value for GI absorption in the lead model is 0.2 and the default relative bioavailability is 0.6.
http://www.epa.gov/supefund/programs/lead/products/adultpb.pdf In the absence of such site specific studies, EPA believes that these default values are appropriately protective and should be used in the determination of a cleanup level.

The Navy is currently conducting an ecological risk assessment. For this assessment, a small area composite soil sample which included the duff layer and upper three inches of mineral soil was collected.

ATSDR: Bioavailability testing should remain a necessary future evaluation tool if the property use changes to a more active use. Bioavailability testing would also be useful if it is decided to remove any of the soils as it would show the areas that posed the greatest health risk and reduce the volume

needing remediation.

- *Soil - Comments on current and future use and how it will be monitored*

Duval DOH: **We recommend that the development of the recreational area at contaminated sites such as "Site 15" be addressed in collaboration with the Health Department.**

ATSDR: Again, we suggest Duval DOH become part of the Restoration Advisory Board and contact the reuse commission.

USEPA: **Currently, there are no recreational activities at Site 15. The only current potential exposure route is via trespassing.**

ATSDR: This information was edited in the final version.

USEPA: **Residential reuse is not planned for this area. Though the investigation for Site 15 is still underway, it is anticipated that any remedial action will meet reuse requirements. The area is to be limited by deed to natural conservation area only. There are no plans by the city at this time to develop the area for any type of active recreational activities. Because nearby areas may be developed as an equestrian center and public ballfields, there will be the potential for trespassers. However, this should still result in only limited exposure time to the site. Preliminary risk assessments of Site 15 have shown no risk to trespassers. If future plans change and the reuse does change to residential as speculated by ATSDR, EPA anticipates that further remedial action will be required.**

USEPA: **ATSDR states that the future activities within the wildlife corridor will be horseback riding, biking, and hiking. This statement is true, however, it is misleading because there are no plans for future riding or hiking trails to be developed through the Site 15 area. The city is fully aware of the presence of Site 15 and potential risks. At the present time, no trails are planned construction in this area. EPA will be closely monitoring the construction of recreational facilities in this area along with any institutional controls that may restrict reuse.**

USEPA: **EPA partially agrees with the recommended stakeholder evaluation. Depending on the outcome of the risk assessment for Site 15 and subsequent remedy selected and presented in the proposed plan, this recommendation may be premature. If the final remedy does include institutional controls and waste is left in place, an evaluation of the effectiveness of this remedy will be required under CERCLA as part of the five-year review. In addition, a routine monitoring of the institutional controls will be scheduled.**

NAVY: **The U.S. EPA and FDEP have agreed that Land Use Controls are a viable remedial action. The Navy is working closely with the U.S. EPA, FDEP and the city of Jacksonville to implement Land Use Controls and deed restrictions that will provide long-term protectiveness of human health.**

ATSDR: ATSDR agrees with routine monitoring of the institutional controls and evaluation of the effectiveness of this remedy in the Superfund Comprehensive Five Year Review. However, it is our experience that deed restrictions do not prevent activities. The National Research Council determined that land use controls cannot be relied on to protect public health since land use controls cannot be maintained over time especially if the land is resold (NRC, 1999).

Groundwater

NAVY: **Groundwater samples collected at Site 15 show that site groundwater has been minimally impacted. The Navy issued a No Further Action Technical Memo (Draft, March 2001) and the regulatory agencies have verbally concurred that no further groundwater monitoring is necessary at Site 15.**

NAVY: **Groundwater sampling has confirmed that site groundwater has been minimally impacted; therefore inclusion of groundwater as a media, exposure point, and route of exposure, along with comments on groundwater contamination, are inappropriately included in this table. The reuse plan prohibits any development of Site 15, and any deeds will include this prohibition; therefore, residential exposure is not considered a viable exposure scenario.**

ATSDR: ATSDR's review of the Navy's shallow groundwater data shows that there are some contaminants (e.g., antimony (46.2 ppb) and lead (21.7 ppb)) in the groundwater at Site 15 that would exceed the drinking water standards set by EPA. Therefore, we recommend that the groundwater use situation be part of the Superfund Comprehensive Five Year Review.

COMMENTS ON PEOPLE EATING FISH OR TURTLES FROM YELLOW WATER OR SAL TAYLOR CREEK DRAINING SITE 15

NAVY: The Navy does not believe it is necessary to place warning signs to "not eat fish and turtle" from the surface waters that receive drainage from Site 15. Elevated contaminant concentrations have not been identified in sediment and surface water that receive drainage from Site 15. The following assessment indicates that concentrations of lead in fish from surface water at Site 15 would not pose a significant human health risk.

The PHA states that "[h]igh dissolved lead levels (a median of 205 ppb) have been found in surface water samples that run off Site 15 and during heavy rain events, possibly into Yellow Water Creek. Fish and turtles in Yellow Water and Sal Taylor Creek could accumulate metals and people eating fish or turtles could be at high risk." Concentrations of lead in surface water range between to below detection limits (less than 1.1 µg/L) to a maximum detected concentration of 398 µg/L. The areas with the highest surface water concentrations are areas where the presence of water is intermittent, i.e., during storm events, and are unlikely to support a continuous fish population. The areas with the nondetect concentrations are areas where there is a continuous water supply. Adapting the U.S. EPA's adult lead model in combination with human health risk assessment exposure assumptions illustrates that the measured concentrations of lead in Site 15 surface water would not pose a significant risk to human health associated with fish caught in the Site 15 surface water.

The U.S. EPA's adult lead model typically addresses nonresidential exposure to soil. The model accounts for lead distribution in the body and its excretion to predict blood lead concentrations in adults who have steady patterns of exposure. Ultimately, the model provides a relationship between the soil lead concentration and the blood-lead concentration in the developing fetus of adult women. It derives a lead concentration in soil that will result in a probability of less than 5% that a fetal blood concentration would be greater than the threshold level of 10 µg/dl. The U.S. EPA's residential screening level for soil of 400 mg/kg was derived using this model. It was based on an assumption that residents ingested 100 mg of soil per day. At a soil concentration of 400 mg/kg and an ingestion rate of 100 mg of soil per day, the intake of lead is 0.04 mg/day.

The concern expressed in the PHA is that consumption of fish that have accumulated lead from the water may adversely effect public health. Based on the lead concentration in surface water, the lead concentration in fish can be predicted. Using a bioconcentration factor of 49 L/kg for lead (U.S EPA 1986, Superfund Public Health Evaluation Manual) in combination with the maximum detected lead concentration in surface water of 398 µg/L, the predicted fish concentration would be 19,502 µg/kg. Multiplying the lead concentration in surface water with the bioconcentration factor derives the predicted fish concentration.

Because the adult model addresses soil consumption, the model was modified to reflect fish consumption. The "site-specific soil lead concentration" in the model was replaced with the predicted fish concentration of 19.5 mg/kg. The "intake rate of soil" was replaced with the mean daily freshwater fish consumption of 6 g/day (U.S. EPA 1997, Exposure Factors Handbook).

This value is the average daily consumption of fish averaged over a year. It also assumes that the fish that is consumed comes from the same source. It is unlikely that Site 15 would be a continuous supply of fish for any individual. Therefore, it is assumed that one's supply of fish from Site 15 would be 10 percent, resulting in average daily fish consumption of 0.6 g/day. Using these exposure assumptions, the average daily intake of lead would be 0.01 mg/day. There is a probability of less than 5% that the fetal blood concentration would exceed the target blood level of 10 µg/L (See attached results of model). U.S. EPA regards this probability as acceptable. Enclosure (3) to the cover letter includes the adult lead model calculations used in this assessment.

FDEP: **ATSDR recommends that fish and turtles be collected from Yellow Water or Sal Taylor Creek draining Site 15. The Department is unaware of data that would indicate that contaminants from Site 15 have impacted either Yellow Water or Sal Taylor Creek. Please identify the source of information that leads ATSDR to believe that this may be the case.**

ATSDR: Because there is soluble lead in drainage areas of Site 15, ATSDR recommended that the Navy, in conjunction with state or local health and environmental agencies; determine if fish and turtle sampling was necessary. In response, the Navy modeled lead contamination in fish and predicted a very low (<0.01 mg/day) average daily intake for people eating fish from this area. It is still unknown whether people are harvesting fish and turtles from this area, but it seems unlikely that they would be doing that frequently (daily). Therefore, we have changed the current situation hazard category to no apparent public health hazard.

We are recommending that the Superfund Comprehensive Five Year Review include an evaluation of whether increased use of this area is resulting in more frequent harvesting of fish and turtles especially if Site 15 soils are left unremediated (thus allowing more soluble lead and possibly other metals to enter drainage areas).

D. LEAD AND ASBESTOS IN BASE HOUSING

COMMENTS ON PEOPLE CONTACTING LEAD AND ASBESTOS IN HOUSING

NAVY: **ATSDR has identified this as an "Indeterminate Public Health Hazard". The Navy agrees that this is an appropriate conclusion based on the fact that lead-based paint (in non-target housing) and asbestos (non-damaged, friable or accessible at time of transfer) exists. It is the Navy's understanding that the city of Jacksonville has a [Lead-Based Paint] LBP and asbestos management plan in place. It should be noted that in support of property transfer, the Navy has surveyed all housiug in accordance with BRAC, HUD and Title 10 requirements for LBP, and surveyed all buildings for asbestos and repaired all damaged, friable or accessible asbestos identified.**

The Navy has already provided disclosure of suspected lead-based paint (LBP) and asbestos in buildings. The Navy has provided to the City and the Jacksonville Port Authority, via FOSTs, notice on suspected asbestos and LBP contained in buildings in accordance witb Navy policy and HUD criteria. Any housing that remains at NAS Cecil Field is not considered "Target Housing", and therefore is not required to be abated for LBP according to HUD guidelines.

ATSDR: The Navy has disclosed information concerning lead and asbestos via the Finding of Suitability to Transfer (FOST) documents for parcels transferred to the city of Jacksonville and the Jacksonville Port Authority. The FOST, however, does not provide information on *management of hazards*. We are asking that this information be included.

NAVY: **The Environmental Baseline Survey for Transfer (EBST) documents show that lead concentrations in recent drinking water samples are below regulatory criteria. The well field is now owned and operated by the city of Jacksonville.**

ATSDR: The Environmental Baseline Survey for Transfer (EBST) is for the drinking water system, not individual buildings. Those samples would be for water delivered to a building before lead solder had a chance to leach. We are still recommending that the Navy determine if the *lead solder is leaching* into the drinking water in *specific buildings* on base above the action level (15 ppb). If so, either remove the lead hazard or provide information to new owners/occupants on flushing techniques and frequency. If the lead hazards remain unabated, future occupants and frequent visitors should consult with their health care provider as to whether routine (annual) blood lead sampling is needed based on their medical condition. Those at greatest risk are children under 6 years old (with immature and developing organs), the elderly (with declining organ function), and women of child bearing age.

J.A. Jones: **Both the Jacksonville Economic Development Commission and the JPA now have an "Asbestos Management Program" and "Lead-Based Paint Management Program" which are actively enforced by their designated Program Manager.**

Currently, only senior citizens may rent the old Navy base housing units.

ATSDR: Adults can also be adversely impacted from lead exposure. Chronic lead exposure in adults can damage the cardiovascular, central nervous, renal, reproductive, and hematologic systems (ATSDR, 1999a). In fact, CDC's Adult Blood Lead Epidemiology and Surveillance (ABLES) program monitors laboratory-reported elevated blood lead levels (BLLs) among adults in the United States. As mentioned above, the elderly are more at risk from the effects of lead exposure because they have declining organ functions. Because people can possibly be exposed to lead-based paint and lead leaching into tap water at Cecil Field, we are recommending that information should be provided to new residents, developers, and tenants on the location of the lead paint in buildings and ways to manage those hazards as well as tap water flushing techniques and frequency.

Besides the risk to the elderly, families with children under 6 years old and women of child bearing age may visit the elders a few times a week and should be reminded of the lead hazards.

Duval DOH: **We recommend that the Lead and Asbestos issue present in the Base Housing be addressed in collaboration with the Health Department.**

ATSDR: We suggest Duval DOH contact the reuse commission.

E. EATING FISH AND TURTLES FROM ON-BASE LAKES AND CREEKS

NAVY: **Sediment and surface water samples collected in the lakes and creeks downstream of known sources do not reveal contamination concentrations that would adversely impact fish or turtles. The Florida Department of Health concluded that there is no health risk from consuming fish from Lake Fretwell. All known sources draining into Lake Fretwell have been cleaned up and were determined to require no further action (NFA) or are contained and in the process of being remediated. [This plan has been] concurred upon by the regulatory agencies, and fishing in the lake has been authorized by the Florida Department of Health. None of the other smaller ponds, lakes or creeks at NAS Cecil Field have any known sources of contamination associated with them that could migrate and enter the surface water bodies. Samples collected at the berms at the target ranges of former Naval Air Gunnery School (NAGS) did not identify any lead contamination in soil above action levels, therefore, migration of lead contamination into surface water bodies located at the former NAGS is unlikely. These berms were used as backstops during target practice, and so are expected to have the highest levels of lead contamination found at the ranges. No other potential source areas have been identified that could potentially impact the remaining creeks and ponds at NAS Cecil Field; therefore, there is no justification to assess these water bodies.**

ATSDR: ATSDR has updated this exposure situation to reflect this new information. We have determined that the current size of the lakes would not likely support a large amount of fishing. Therefore, we have removed our recommendations for the state to provide information to future users of the possible regional mercury hazards in fish and for a ban on consumption of fish and biota from on-base lakes unless safe consumption rates are established. We have also removed our recommendation for the Florida Department of Environmental Protection or the Navy to either sample sediment and/or fish in on-base lakes to confirm current mercury and other contaminant levels, post warning signs until it is confirmed that eating fish and turtles from this area is safe, or to provide anglers with information on choosing certain types of fish, smaller fish, and methods of cleaning and preparing the fish that would reduce exposure.

We are recommending a reevaluation of the fishing situation in the Superfund Comprehensive Five Year Review. Since many source areas (groundwater, soil, and sediment) will remain at NAS Cecil Field, it is prudent to periodically review the situation to determine if future use of the property includes expanding or creating new lakes that could contribute to future fish contamination.

USEPA: **The Public Health Assessment recommends that fish sampling be performed at all water bodies and creeks located at NAS Cecil Field to evaluate mercury levels. ATSDR may not realize that mercury contamination from global deposition has contaminated most water bodies in the southeastern United States. Figure [10] only shows Florida. The earth's atmospbere is a significant reservoir for mercury. Generally, fish in the southeastern United States have endemically high mercury levels due to the global atmospheric load of mercury. The U.S. Geological Survey has a mercury program to measure concentrations in fish tissue nationwide (Reference: Krabbenhoft DO, Wiener JG, Brumbaugh WG, Olson ML, DeWild JF, Sabin TJ, A National Pilot Study of Mercury Contamination of Aquatic Ecosystems along Multiple gradient.**

Available at http://toxics.usgs.gov/pubs/wri99-4018/volume2/sectionB/2301 krabbenhoft/index.html) From these data, EPA estimates the 95% UCL [Upper Confidence Level] of the mean in the southeastern U.S. for mercury in fish tissue to range between 1.9 and 2.3 mg/kg. The levels in fish in Lake Fretwell are about an order of magnitude lower.

ATSDR: ATSDR agrees that the level of mercury detected in the fish could be attributed to atmospheric deposition alone. However, besides mercury, when NAS Cecil Field was in operation, many fuel spills ran off into creeks and streams. The contaminants from those spills could have included lead, fuels, and possibly other chemicals. Because of the reuse uncertainty (i.e., expanding lakes and creeks and developing more recreational fishing) and the fact that many waste areas will remain, again, we are recommending review of the potential for fish and turtles to become contaminated in the future, be investigated as part of the Superfund Comprehensive Five Year Review.

USEPA: **EPA does not agree that if fish were reestablished, mercury and PCB levels would need to be evaluated. As is stated by ATSDR, there are not enough fish in Lake Fretwell to feed those with diets of fish subsistence or recreational levels. It is believed the water bodies at NAS Cecil Field could not support enough fish for even a single individual to consume at a high level. A recreational angler described in the HRS scenario would consume 11 kg of fish per year. When Lake Fretwell was sampled in 1997, 27.5 kg of fish were obtained. Three methods, including stocking, were used to obtain the fish because the quantity needed for a valid study was difficult to obtain. Assuming that 70% of the biomass of fish is required for population sustainability, there would only be 8.25 kg harvested per year. This is another reason why high level fish consumption is not likely at Lake Fretwell or at other smaller lakes located at NAS Cecil Field.**

An ecological risk assessment and a human health risk assessment conducted on the fish, which were sampled from Lake Fretwell, did not find risks that exceeded the EPA's risk range or the State of Florida's risk level of 10E-6. Sources around Lake Fretwell have been evaluated and remedial actions conducted. Therefore, EPA does not believe that past Navy activities will be a continual source of contamination to Lake Fretwell.

ATSDR expresses a concern about the lack of sampling at all water bodies located at Cecil Field. During the course of the multiple investigations at NAS Cecil Field, whenever a waste site or building was evaluated, we assessed all potential pathways. If waste handling or storage did not take place near a lake or creek then it was not sampled. Sampling of fish or turtles were not conducted when we had no reason to believe that warnings are necessary because fish and turtles were not sampled at all of the lakes and creeks on base. The EPA does not believe that additional investigations to examine fish consumer practices or further determination of levels of chemicals in fish are necessary.

ATSDR: New lakes or enlargement of existing lakes in the future may inadvertently bring contamination to the water bodies from nearby remaining source areas. Future use of the lakes and streams has not been determined and they may, in the future, be stocked with sufficient fish to support recreational or subsistence fishing, and therefore, warrant periodic reassessment.