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PUBLIC HEALTH ASSESSMENT NAS CECIL FIELD FL  
8/30/2001  
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

# Public Health Assessment for

NAVAL AIR STATION CECIL FIELD  
(a/k/a CECIL FIELD NAVAL AIR STATION)  
JACKSONVILLE, DUVAL COUNTY, FLORIDA  
EPA FACILITY ID: FL5170022474  
JUNE 22, 2001

*For Public Comment*

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

Comment Period Ends:

**AUGUST 30, 2001**



**PUBLIC HEALTH ASSESSMENT**

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(a/k/a CECIL FIELD NAVAL AIR STATION)**

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**EPA FACILITY ID: FL5170022474**

**Prepared by:**

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

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment-Public Comment Release 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. This document represents the agency's best efforts, based on currently available information, to fulfill the statutory criteria set out in CERCLA section 104 (i)(6) within a limited time frame. To the extent possible, it presents an assessment of potential risks to human health. Actions authorized by CERCLA section 104 (i)(11), or otherwise authorized by CERCLA, may be undertaken to prevent or mitigate human exposure or risks to human health. In addition, ATSDR will utilize this document to determine if follow-up health actions are appropriate at this time.

This document has previously been provided to EPA and the affected state in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. Where necessary, it has been revised in response to comments or additional relevant information provided by them to ATSDR. This revised document has now been released for a 30-day public comment period. Subsequent to the public comment period, ATSDR will address all public comments and revise or append the document as appropriate. The public health assessment will then be reissued. This will conclude 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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1-888-42ATSDR or  
Visit our Home Page at: <http://www.atsdr.cdc.gov>

## 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 be addressed as follows:

Attention: Chief, Program Evaluation, Records, and Information Services Branch, Agency for Toxic Substances and Disease Registry, 1600 Clifton Road (E56), Atlanta, GA 30333.

**SUMMARY**

Naval Air Station (NAS) Cecil Field is located approximately 14 miles southwest of Jacksonville in northeastern Florida. NAS Cecil Field had been in operation except for brief periods from 1941 to September 30, 1999 when operations ceased. When operational, 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, and the remainder will be transferred to NAS Jacksonville.

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. Activities associated with fulfilling this mission have included waste disposal practices and accidental spills of chemicals. Shallow groundwater, surface water, and soils have become contaminated from these activities, resulting in the 1989 listing of NAS Cecil Field on the National Priorities List (NPL) for hazardous waste site investigation and clean-up. Twelve Operable Units consisting of fourteen (14) separate sites have been identified as well as numerous potential sources of contamination. Investigations at NAS Cecil Field are in varying stages of completion.

From data and information gathered during our site visits, we identified nine situations which have the potential for human exposure. One of the situations poses a health hazard. The hazard is base-wide where people could accidentally or purposefully disturb yet undiscovered unexploded ordnance (UXO). UXO surveying and clearing have been done at a majority of the high risk areas. Although this scenario has a reduced risk of occurring, people should be warned of the hazards.

Seven situations require more data or information about whether contamination has reached areas where people are living or working. Those include the following: 1) Current and future on-base building occupants could be exposed to indoor air contaminants, 2 & 3) Off base, leaks from the jet fuel pipeline could pollute private wells and/or indoor air, 4) Children who would frequently contact lead contaminated soils at Site 15, 5) People could be eating contaminated fish or turtles from Yellow Water or Sal Taylor Creek draining Site 15, 6) People eating possibly contaminated fish and other biota in lakes/creeks on-base, and 7) Current and future building occupants, particularly children, could be exposed to lead-based paint, lead in tap water, and asbestos insulation found in many buildings on base. Finally, one situation (currently drinking water from base wells) poses no public health hazard.

Based on the information and data we evaluated, past exposures in eight situations pose no public health hazard. However, the likelihood of significant exposure to lead based paint and asbestos in buildings is conditional and based on how well these materials were maintained. It is possible that children could have been exposed to lead based paint in housing units. Due to lack of blood lead sampling or exposed lead levels in homes, it is not possible for ATSDR to make determinations about this exposure; therefore, this situation represents an indeterminate public health hazard.

*Our recommendations - many for additional education - focus on safely managing the remaining hazards in all nine exposure situations. ATSDR will followup on these recommendations and review new data and information when it becomes available.*

**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 1991, 1997, and 1998.

SITUATION	CONCLUSION CATEGORY*	RECOMMENDATIONS
<p><i>A. On-Base Groundwater</i></p> <p>1) Current and future building occupants could be exposed to fuel components and other volatile compounds seeping into indoor air from on base groundwater contamination.</p>	<p>Indeterminate Public Health Hazard</p>	<p>For <u>indoor air</u>, ATSDR recommends the Navy determine the 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 is also recommending 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. If indoor air sampling is indicated from the modeling, the Navy should sample indoor air in those buildings as soon as possible, but within a year. The sampling should include biogenic gasses (e.g., methane, ethane, etc), chlorinated hydrocarbons (e.g., TCE, TCA, etc), and hydrocarbons (e.g., benzene, ethylbenzene, etc).</p> <p>The redevelopment authority should also distribute educational material to developers and future occupants informing building occupants of possible indoor air contaminant hazards. Developers should consider installing vapor barriers when building in areas with shallow groundwater contamination.</p>

SITUATION	CONCLUSION CATEGORY*	RECOMMENDATIONS
<p>2) In the future, building occupants could be exposed to contaminated drinking water on base.</p>	<p>Currently, No Public Health Hazard)</p>	<p>Precautions needed for future use of on-base groundwater as <u>drinking water</u> include: 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, notification of the groundwater hazards should be given to developers and be on file with the county, and new well installation should be restricted without wellhead protection, corrosion resistant casings, aquifer protection during drilling, and if needed, water treatment.</p>
<p><i>B. Jet Fuel Pipeline</i> (between NAS Cecil Field and NAS Jacksonville)</p> <p>3) Drinking water wells near the areas with pipeline leaks could become contaminated.</p>	<p>Indeterminate Public Health Hazard</p>	<p><u>Wells</u> -As soon as possible, but within 6 months, the Florida State Department of Environmental Protection should provide educational material to be broadcast on radio or television or printed in the newspaper warning well owners of the possible <i>regional</i> contamination hazards prompting them to have their well sampled annually. The recommendation for sampling should include testing for volatile organic compounds, semi-volatile organic compounds, pesticides, and metals.</p> <p>Florida State Department of Environmental Protection should provide notification/information to planning/permitting departments on 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.</p>
<p>4) Current and future building occupants living near the 103<sup>rd</sup> Street Jet Fuel Pipeline could be exposed to fuel components seeping into indoor air.</p>	<p>Indeterminate Public Health Hazard</p>	<p><u>Indoor Air</u> - The Navy should advise local fire departments of the location of pipeline leaks found to date so they can provide future hazard management.</p> <p>Building occupants should report fuel odors in indoor air to the Florida State Environmental Protection Agency, Bureau of Emergency Response 1-800 320-0519 or (904) 448-4320 or the local fire department.</p>

SITUATION	CONCLUSION CATEGORY*	RECOMMENDATIONS
<p><i>C. Site 15 (Blue Ordnance 10)</i></p> <p>5) Current trespassers and future recreational users could be exposed to harmful levels of lead and other contaminants in soils, sediment, and surface water at firing ranges on the Yellow Water Weapons Area (YWWA) if unremediated.</p>	<p>Current- No Apparent Public Health Hazard                      Future- Indeterminate</p>	<p><u>Contact with soils</u></p> <p>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.</p> <p>As soon as possible, the Navy should provide residents of the nearby housing area educational material on the need to stay out of Site 15 until it is cleaned up.</p> <p>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).</p>

SITUATION	CONCLUSION CATEGORY*	RECOMMENDATIONS
<p>6) People could be eating contaminated fish or turtles from Yellow Water or Sal Taylor Creek draining Site 15.</p> <p>Unexploded ordnance could be a future hazard for people digging or excavating near Site 15. *</p> <p>*See UXO section</p>	<p>Indeterminate Public Health Hazard</p> <p>Disturbing UXO presents a health hazard.</p>	<p><u>Eating locally caught fish and turtles</u></p> <p>Because there is soluble lead in drainage areas of Site 15, ATSDR recommends that the Navy in conjunction with state or local health and environmental agencies determine within one year if people are harvesting fish or turtles from Yellow Water or Sal Taylor Creek. If so, continue to take a representative sampling of the fish and turtles to determine if they are safe to eat or provide educational material and post the creeks "Do not eat fish or turtles from Yellow Water or Sal Taylor Creek". If sampling is needed, sample surface water, sediments, fish and aquatic animals in Yellow Water and Sal Taylor Creek and other creeks downstream from Site 15 should be sampled for metals (especially lead and mercury), PAHs and pesticides.</p> <p><u>Contact with Unexploded Ordnance</u></p> <p>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 of this public health assessment provides some educational information on clearing and reporting procedures.</p>

SITUATION	CONCLUSION CATEGORY*	RECOMMENDATIONS
<p><i>D. Lead and Asbestos in Base Housing</i></p> <p>7) Current and future building occupants, 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 efficacy of the hazard management (i.e., preventing paint chipping, flushing water lines, covering insulation) is unknown.</p>	<p>Indeterminate Public Health Hazard</p>	<p>The Navy or the redevelopment authority should provide information to new residents, developers, and tenants on the location of the lead paint and asbestos in buildings and ways 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 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, elderly, and women of child bearing age.</p>

SITUATION	CONCLUSION CATEGORY*	RECOMMENDATIONS
<p><i>E. Eating Fish and Turtles from On-Base Lakes and Creeks</i></p> <p>8) In 1997, fish in Lake Fretwell were found to be contaminated with low levels of mercury, lead, PCBs, and other chemicals at levels not likely to result in adverse health effect in people who eat the fish. At the time of the 1997 sampling, there weren't enough fish to support a regular recreational or subsistence fishing population. Because the source(s) of the contaminants have not been determined, there is a potential for contaminant levels to increase in the future. Additionally, no other lakes or ponds on base that support edible biota (fish and turtles) have been sampled including the lake that feeds into Lake Fretwell. Future use of the lakes and streams has not been determined and may in the future be stocked with sufficient fish to support recreational or subsistence fishing. The unknown source of contamination, the uncertainty of contaminant levels to increase, undetermined future use, and unknown contaminant levels in other water bodies, make on-base lakes and creeks an indeterminate public health hazard with potential to pose a health risk to people who eat fish and other biota caught on base.</p>	<p>Current and Future Indeterminate Public Health Hazard</p>	<p>The state should provide information to future users of the possible regional mercury hazards in fish. Due to bioaccumulation and bioconcentration hazards especially in larger/older fish, the state should suggest a ban on consumption of fish and biota from on-base lakes unless safe consumption rates are established.</p> <p>The state or Navy should sample fish in on-base lakes to confirm that current mercury and other contaminant levels are low and that eating fish and turtles from this area is safe or post warning signs.</p> <p>If fish are sampled, the following information should be collected:</p> <ul style="list-style-type: none"> <li>• How long had fish been stocked before sampling</li> <li>• Were fish considered wild or breeding populations</li> <li>• Size fish, age, sex of fish sampled</li> <li>• Types, genus and species of fish sampled</li> <li>• Skin on or off filets</li> <li>• Were fish trimmed of fat</li> <li>• Lipid content of fish</li> <li>• Wet weight and dry weight concentration of COPC</li> <li>• Documentation of abnormalities or lack of abnormalities</li> <li>• Documentation of presence of egg masses.</li> <li>• Sample Specific Quantization Limit (SQL)</li> <li>• Cross reference of information on fish with samples and concentrations on CD-Rom</li> </ul>

SITUATION	CONCLUSION CATEGORY*	RECOMMENDATIONS
<p><i>F. Unexploded Ordnance</i></p> <p>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.</p>	<p>Disturbing UXO presents a health hazard.</p>	<p>The Navy and new tenants should provide public education on the locations and hazards associated with disturbing UXO. Institutional controls (i.e., no digging) may be needed in multiple areas.</p> <p>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.</p>

\* Conclusion Categories are explained in Appendix A.

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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 $1 \times 10^{-6}$ . 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.
CAIS	Chemical Agent Identification Sets
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
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

<p>HI/HQ hazard index/quotient</p>	<p><b>Hazard Quotient (HQ):</b> 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.</p> <p><b>Hazard Index:</b> 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.</p>
<p>ingestion</p>	<p>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</p>
<p>IRP</p>	<p>Installation Restoration Program (Department of Defense)</p>
<p>J</p>	<p>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.</p>
<p>JP-5</p>	<p>Jet propulsion fuel (number 5), primarily kerosine with additives</p>
<p>L</p>	<p>Liter</p>
<p>MCL</p>	<p>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.</p>
<p>median</p>	<p>the middle value, same number of samples above and below the middle value</p>
<p>migration</p>	<p>Moving from one location to another</p>
<p>mg/kg</p>	<p>Milligram per kilogram</p>
<p>mg/m<sup>3</sup></p>	<p>Milligrams per cubic meter; a measure of the concentration of a chemical in a known amount (a cubic meter) of air, soil, or water</p>
<p>Minimal Risk Level (MRL)</p>	<p>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.</p>
<p>Mogas</p>	<p>Automotive gasoline</p>

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 <sup>3</sup>	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
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	<p>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 <math>1 \times 10^{-6}</math> 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.</p> <p>A noncancer health risk is expressed as a hazard quotient (HQ, this term is defined in this glossary).</p>
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
$\mu\text{g/L}$	Micrograms per liter. A measure of the concentration of a chemical in a known amount (a liter) of air, soil, or water
$\mu\text{g/dL}$	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
$\mu\text{g/m}^3$	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. 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).

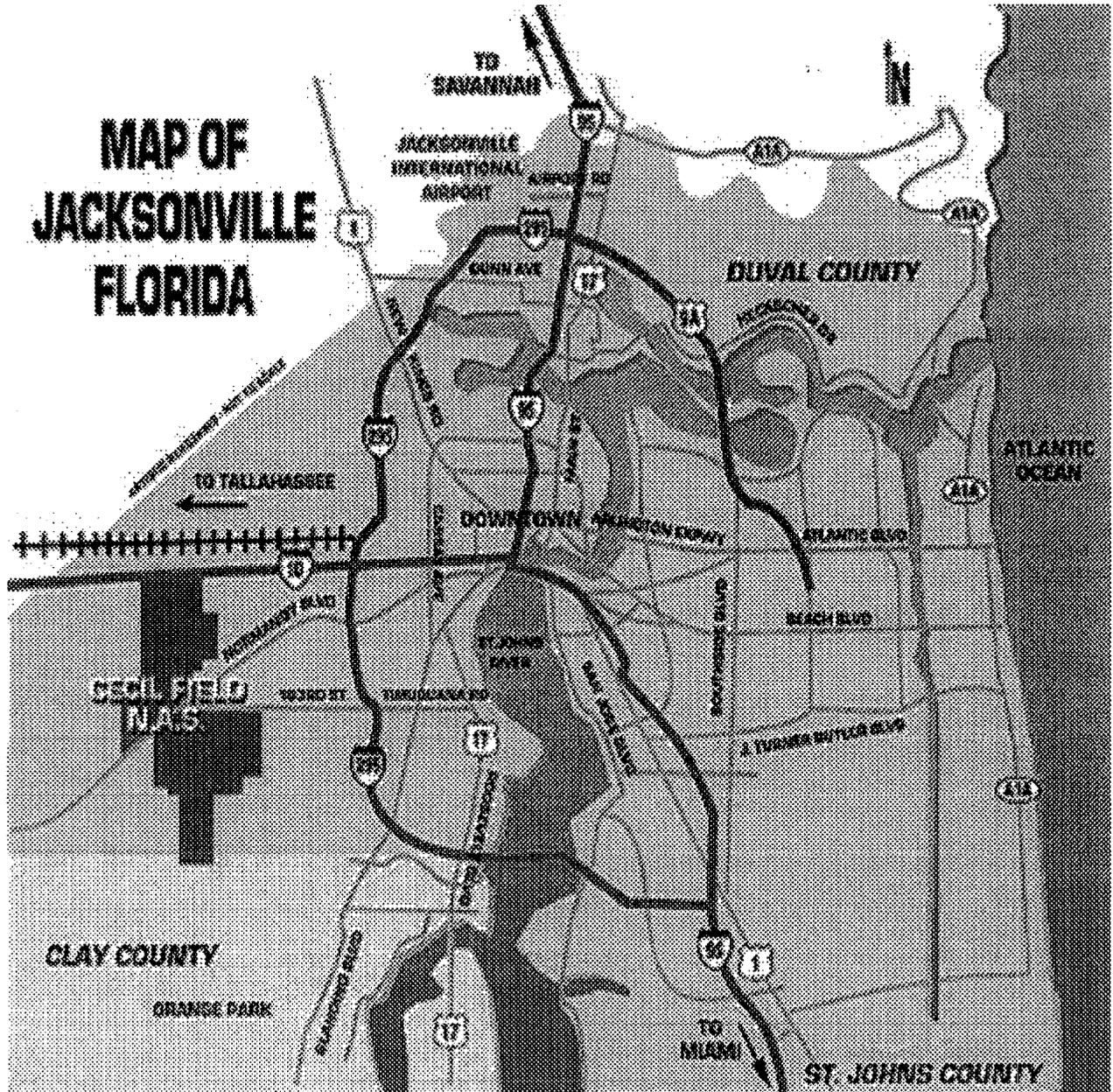
Prior to development as a naval air station, the surrounding properties were undeveloped rural farm lands (U.S. Navy, 1997b; Arthur Andersen LLP, 1996). Today, the station is bordered on the southeast, northeast and northwest by a low-density residential and agricultural properties. The land southwest 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 Appendix B.

### **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). Activities associated with fulfilling this mission have included waste disposal practices and accidental spills of chemicals. Shallow groundwater, surface water, and soils have become contaminated from these activities, 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 and the Florida Department of Environmental Protection 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; however, an additional 1,000 acres have been designated as "gray areas" requiring further study to ensure protection of public health and the environment (U.S. Navy, 1997b). The majority of contaminated sites are located on the Main Base primarily to the west of the north-south runways (Figure 2). A summary of ATSDR's public health evaluation of these sites is provided in Appendix C

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 Main Station and the Yellow Water Weapons Area properties will be returned to the Jacksonville community for redevelopment. 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. 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 will be retained by the Navy (Arthur Andersen LLP, 1996).

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) Outlying Landing Field (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 (heavy industrial - 1,030 acres, light industrial - 3,400 acres, residential/light office - 220 acres, commercial - 300 acres, parks - 2,260 acres, conservation - 3,991 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 3 shows the Proposed Base Reuse Map (City of Jacksonville, 2000).

Twelve Operable Units (OUs) consisting of fourteen (14) 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 these 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 with knowledge of the base. 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 (PHA), 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. Therefore, a number of locations named in the electronic report can not be crossed referenced to hard-copy reports provided to ATSDR. 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.

## INFORMATION ON HOW ATSDR ASSESSES EXPOSURE

### *What is meant by exposure?*

People can only be exposed to a chemical if they come in contact with the chemical. Contact (exposure) can occur by breathing, eating, or drinking a substance containing the contaminant or by skin contact with a substance containing the contaminant.

### *How do ATSDR scientists determine which exposure situations and contaminants to evaluate?*

ATSDR's public health assessments are exposure, or contact, driven. Chemical contaminants disposed or released into the environment have the potential to cause adverse health effects under certain conditions. However, *a release does not always result in exposure.*

ATSDR scientists evaluate site conditions to determine if people could have been (a past scenario), are (a current scenario), or will be (a future scenario) exposed to site-related contaminants. When evaluating exposure pathways, ATSDR identifies whether exposure to contaminated media (soil, water, air, waste, or biota) has occurred, is occurring, or will occur through ingestion, dermal (skin) contact, or inhalation.

If exposure was or is possible, ATSDR applies a weight-of-evidence approach as to whether people may develop adverse health effects. First, ATSDR scientists select contaminants for further evaluation by comparing them against health-based values. Comparison values are developed by ATSDR from scientific literature available on exposure and health effects. These comparison values are derived for each of the different media and reflect the estimated contaminant concentration that is *not likely* to cause adverse 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 body weight. *Comparison values are not thresholds for adverse health effects.* ATSDR comparison values establish contaminant concentrations many times lower than levels at which no effects were observed in experimental animals or human epidemiological studies. Some of the comparison values used by ATSDR scientists include ATSDR's environmental media evaluation guides (EMEG), reference dose media guides (RMEG), cancer risk

### *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 from contact with a contaminant depend on the exposure concentration (how much), the frequency and/or duration of exposure (how long), the route or pathway of exposure (breathing, eating, drinking, or skin contact), and the multiplicity of exposure.

(combination of contaminants). Once exposure occurs, characteristics such as age, gender, nutritional status, genetics, life style, and health status of the exposed individual influence how the individual absorbs, distributes, metabolizes, and excretes the contaminant. Together, these factors and characteristics determine the health effects that may occur as a result of exposure to a contaminant in the environment.

There is considerable uncertainty about the true level of exposure to environmental contamination. To account for this uncertainty and to be protective of public health, ATSDR scientists typically use high-end, worst case exposure level estimates as the basis for determining whether adverse health effects are possible. These estimated exposure levels usually are much higher than the levels that people are really exposed to. If the exposure levels indicate that adverse health effects are possible, then a more detailed site-specific review of exposure combined with scientific information from the toxicological and epidemiological literature about the health effects from exposure to hazardous substances is performed. Considering all of this weight-of-evidence information, ATSDR makes a determination whether adverse health effects are likely.

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 1-888-42ATSDR (1-888-422-8737).

## II. 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 current and future public health hazards. From this review, ATSDR identified nine situations which have the potential for human exposure. Two of the situations pose a health hazard, six require more data or information about whether contamination has reached areas where people are living or working, and one currently posing no public health hazard. These nine exposure situations are discussed in the following sections. They are organized by areas or in situations people could be exposed and are as follows:

### *A. On-Base Groundwater*

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

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

- 3) Drinking water wells near the areas with pipeline leaks could become contaminated. (Indeterminate Public Health Hazard)
- 4) Current and future building occupants living near the 103<sup>rd</sup> Street Jet Fuel Pipeline could be exposed to fuel components seeping into indoor air. (Indeterminate Public Health Hazard)

### *C. Site 15 (Blue Ordnance 10)*

- 5) 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) if unremediated or remediation is limited. (Current - No Apparent Public Health Hazard, Future - Indeterminate Public Health Hazard)
- 6) People could be eating contaminated fish or turtles from Yellow Water or Sal Taylor Creek draining Site 15. (Indeterminate Public Health Hazard)

Unexploded ordnance could be a future hazard for people digging or excavating near Site 15. \*see UXO section

### *D. Lead and Asbestos in Base Housing*

- 7) Current and future building occupants, 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) Fish and other biota in lakes/creeks on-base (Lake Fretwell, Lake Newman, etc) may be contaminated with mercury, lead, others contaminants. If contaminated, the fish and other biota may pose a health risk to people eating them. (Indeterminate 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** - Two exposure situations could exist from on-base groundwater contamination: a) Current and future building occupants could be exposed to fuel components and other volatile compounds seeping into indoor air from on base groundwater contamination. (*Indeterminate Public Health Hazard*) b) In the future, building occupants could be exposed to contaminated drinking water on base. (*Currently, 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 floating close to the ground surface beneath numerous buildings on base. ATSDR is concerned that water, sewer, and other utility lines coming into the buildings would provide a channel which increases 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 has taken initial steps to determined the buildings most susceptible to groundwater contaminant migration into indoor air. Modeling the potential for indoor air migration would help to rule in or out the need for indoor air sampling.*

*Drinking water for the base is supplied by deep wells. Several deep wells are near and downgradient of areas where contamination has been detected in the shallow aquifer. Old well casing 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 Navy in conjunction with other stakeholders improve the wellhead protection program and maximize the use of monitoring data.*

**INFORMATION FOR BUILDING OCCUPANTS**

**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 State Environmental Protection Agency, Bureau of Emergency Response (904) 448-4320 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 positive tests to the Duval County Health Department so other nearby well users can be notified.

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

## Background and Land Use

Contaminants that possibly spilled or that leaked into the groundwater includes: volatile organic compounds, chlorinated hydrocarbons, aromatic hydrocarbons (benzene, toluene, ethylbenzene, and xylene (BTEX)), paraffin hydrocarbons, mercury, and fuel additives.

## Exposure Evaluation and Public Health Implications

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 4).

### Cecil Field Known Areas of Groundwater Contamination

Plumes have been identified and monitoring in 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. Those include 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. Day Tank 2 (DT2)
9. Site 21
10. Site 25
11. Site 45      Underground Storage Tank (UST)

#### Sites with Groundwater Contamination:

12. North Fuel Farm/Truck Stand (NFF/TS)
13. South Fuel Farm (SFF)
14. Day Tank 1 (DT1)
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

We identified two situations in which building occupants could be exposed to groundwater contaminants in on-base buildings.

Groundwater On Base				
Exposure Situation	Activity	Time Frame	People Exposed?	Hazard Category
1. People using on-base buildings over or near the areas with surficial groundwater contamination.	Building use	Current Future	Unconfirmed	Indeterminate Public Health Hazard - More information needed
2. People using the base wells or installing new wells in the future.	Use of new of old base wells, specifically for drinking	Current Future	No	No Public Health Hazard

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

Migration of contaminants from groundwater to indoor air is dependent upon characteristics of the groundwater, the underlying soils, and the buildings. Some of the groundwater contaminants have the potential to migrate into the base building's indoor air due to their volatility. Migration is more likely in areas with high concentrations of volatile organic compounds and groundwater contamination is close to the ground surface. Several areas have these attributes. 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 to the lakes and creeks on the Main Base area. The recharge effect and the discharge to lakes and creeks slows the downward push of contaminants to deeper aquifers (Hillford, K., J., 1996). Most of the 23 groundwater contamination areas not only have surficial contamination, but have volatile fuels and solvents floating on the groundwater surface. Appendix D shows the large quantity of fuels spilled over the years of operation.

Many of the groundwater contamination areas have highly concentrated compounds that can give off vapors. 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).

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 through 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 but increase soil gas movement(migration) into the building.

The number of small closed rooms that could create pockets where gases accumulated, confined spaces especially below grade, and closed windows, especially when 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.

*Considering that the groundwater attributes and building characteristics could contribute to groundwater off-gassing into the buildings, indoor air safety should be confirmed.* This would include screening indoor air for chlorinated and non-chlorinated hydrocarbons, fuel components and breakdown products of chlorinated hydrocarbons and fuels.

Soil gas sampling between source areas and buildings, and along groundwater flow paths are insufficient to rule out potential movement of contaminants (vapor intrusion) into indoor air. The nature and extent of soil gas plumes and groundwater plumes including 3-dimensional delineation of the plumes is not currently available. No soil gas sampling or indoor air sampling is available for the majority of buildings close to source areas. Methane and associated trace gases may move 1.5 miles from source areas including movement in fill associated utility and fuel lines.

Consequently, ATSDR recommended the Navy determine the 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 recommended 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.

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 breakdown products of petroleum products and the primary (chlorinated hydrocarbon) chemicals released to the environment (Wiedemeier et al., 1995; Newell et al., 1995). ATSDR is recommending 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).

ATSDR is recommending field screening followed by confirmation sampling. Since PID instruments have been selected for monitoring gasses along the Jet Fuel pipeline and other locations, that technology can also be used for screening here, but should be used in combination with other methods. ATSDR is recommending specific indoor air sampling at selected buildings (criteria for selection discussed in subsequent paragraph) using the follow criteria.

- 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<sub>2</sub> 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<sub>2</sub> 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.

***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 drawing water from the deeper groundwater aquifer. Several wells are near areas of surficial groundwater contamination although the Navy reports that the wells are hydrologically upgrading from contamination. The old (1940s) well casings could breakdown and carry contamination into the drinking water zone. An improved well head protection plan should be implemented to notify future users and regulators of the location of contamination horizontally and vertically (3-D presentation) relative to groundwater production wells. A well head protection program should include monitoring of integrity of 1940 well construction materials including grout, and corrosion control of the casings. Also needed is the identification of capture zones of all existing monitoring wells and plans for periodic monitoring.

Routine drinking water sampling (possibly every three years) should be done on any systems fed by wells on base. Notification of the groundwater hazards should also be given to developers and on file with the county.

ATSDR is also recommending re-evaluating the groundwater sampling to ensure sampling considered 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, corrosion inhibitors, 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).

New well installation should be restricted without wellhead protection, corrosion resistant casings, aquifer protection during drilling, and if needed, water treatment. Table 1 outlines the exposure situations.

TABLE 1: Description of current and future exposure from the contaminated groundwater possibly contaminating indoor air in the on-base buildings and in the future, seeping into the deep drinking water wells.								
PATHWAY NAME	TIME	CONTAMINANTS	EXPOSURE PATHWAYS ELEMENTS				POTENTIALLY EXPOSED POPULATION	COMMENTS
			SOURCE	ENVIRONMENTAL MEDIA	POINT OF EXPOSURE	ROUTE OF EXPOSURE		
<b><i>**People using on-base buildings over or near the areas with surficial groundwater contamination.</i></b>	Current 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, underground 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	Current and 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. Many buildings are near or on top of those areas. Many conduits in the area (sewers, waterlines, etc) could move the contamination indoors. Contaminants could seep into the buildings polluting the indoor air. No indoor sampling has been done to confirm the indoor air safety.

**TABLE 1: Description of current and future exposure from the contaminated groundwater possibly contaminating indoor air in the on-base buildings and in the future, 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	
<b>**People using the base wells or installing new wells in the future.</b>	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 the base well system	Future- users of drinking water fed by the on-base well system. Users of new wells drilled in or near contaminated areas	<p>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 well head protection program is needed to keep surficial contaminants from reaching the deeper groundwater-where the base wells are drawing their water.</p> <p>Notification of the groundwater hazards should be given to developers and on file with the county.</p> <p>New well installation should be restricted without wellhead protection, corrosion resistant casings, aquifer protection during drilling, and if needed, water treatment.</p>

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

**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 on top of the polluted areas. Utility lines (water, sewage, etc) could also aid carrying the contaminants indoors by acting as a conduit.

*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.

**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).

**RECOMMENDATIONS***Indoor Air*

1. Additionally, ATSDR recommends the Navy continue the screening process to determine the 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 is also recommending that levels of gases found in soil and groundwater be used and compared with the screening model and Tier-2 groundwater model developed by Johnson and Ettinger Model (1991) for subsurface vapor intrusion into buildings.
2. If indoor air sampling is indicated from the modeling, the Navy should sample indoor air in those buildings as soon as possible, but within a year. The sampling should include biogenic gasses (e.g., methane, ethane, etc), chlorinated hydrocarbons (e.g., TCE, TCA, etc), and hydrocarbons (e.g., benzene, ethylbenzene, etc).
3. The Navy should distribute educational material to developers and future occupants informing building occupants of possible indoor air contaminant hazards.
4. Developers should consider installing vapor barriers when building in areas with shallow groundwater contamination.

*Use of On-base Groundwater*

5. Routine drinking water sampling (possibly every 3 years) should be done on any systems fed by wells on base. The analysis should include metals, VOCs, and SVOCs. ATSDR is also recommending re-evaluating the groundwater sampling to ensure sampling considered 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 county.
8. New well installation should be restricted without wellhead protection, corrosion resistant casings, aquifer protection during drilling, and if needed, water treatment.

**B. JET FUEL PIPELINE** - Two exposure situations could exist as a result of past leaks from the jet fuel pipeline: a) In the future, drinking water wells near the areas with pipeline leaks could become contaminated (*Indeterminate Public Health Hazard*), b) Current and future building occupants living near the 103<sup>rd</sup> Street Jet Fuel Pipeline could be exposed to fuel components seeping into indoor air. More data and information are needed to determine if pollutants have gotten into wells or indoor air at levels that pose a health hazard.

*The 103<sup>rd</sup> Street pipeline is an 8" diameter pipeline that extends 15 miles from NAS Jacksonville to NAS Cecil Field underneath Roosevelt, Timaquana, and 103<sup>rd</sup> Streets. A 1994 investigation of the pipeline required several of the previously identified 81 anomalies to be excavated and the section of pipe repaired or replaced. 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 pipeline's 45 year operation. 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 the 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 miles stretch that have contributed to soil and groundwater contamination. This is a heavily populated area and water, sewer, and other utility lines could move the local contamination further from those sources. Because of the variety and volume of contamination sources in this area, people using private wells for drinking water and bathing could be at health risk and should have their water tested annually for volatile organic compounds, semi-volatile organic compounds, pesticides, and metals.*

*Since the contaminants could also move into indoors, indoor air should be sampled in areas with high levels of soil or groundwater contamination. Local fire departments should be advised of the location of pipeline leaks found to date so they can provide future hazard management. The pipeline is currently out of service and was cleaned and abandonment in place.*

**INFORMATION FOR WELL USERS AND BUILDING OCCUPANTS NEAR THE 103<sup>RD</sup> STREET PIPELINE**

**WELL USE NEAR 103<sup>RD</sup>, ROOSEVELT, & 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 State Environmental Protection Agency, Bureau of Emergency Response (904) 448-4320 for information)
- Report any 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 State Environmental Protection Agency, Bureau of Emergency Response (904) 448-4320 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). Placed 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 103<sup>rd</sup> Streets (Figure 5) in the city of Jacksonville (Delaney, K.F, 1996; ABB-ES, 1995a). The pipeline also passes through several wetland areas. The pipeline is buried at depths from two to 15 feet. The shallow water table ranges from two to 6 feet deep. Land uses adjacent to the pipeline path are residential, commercial and light industrial. Private and public wells are used in the area.

## Exposure Evaluation and Public Health Implications

### *Documented Releases from the Pipeline*

#### *Release from the 103<sup>rd</sup> 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 the site 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, D. 1997; NAS Jacksonville, Public Works files, 1997).

The petroleum contamination extended underneath an adjacent residence at 6952 103<sup>rd</sup> 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 at 6952 103<sup>rd</sup> 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, D. 1997).

A city of Jacksonville municipal water supply line runs parallel to 103<sup>rd</sup> Street and provides water service for most of the adjacent properties. However, within a one-quarter mile radius of the site there are 25 private or privately-owned small (producing less than 100,000 gallons per day) public water supply wells. Most of these wells are located upgrading of the site including one large community supply well (#7040) about one-quarter mile west of the site (Jamel, 1990).

#### 103<sup>rd</sup> Street and "A" Avenue spill site, 1997

In July 1997, stressed vegetation was noted near the intersection of 103<sup>rd</sup> 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 placed in 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 (also known as magnetic flux or "pig") 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 103<sup>rd</sup> Street, and one location at NAS Cecil Field. The only leak found was the one adjacent to the residence at 103<sup>rd</sup> Street. In September 1990, the Navy performed soil borings at the several suspected anomaly locations along the pipeline to determine if there were any additional fuel releases: no releases were found (Delaney, K.F, 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. "Several" areas were excavated and the section of the 8" fuel pipeline was replaced or repaired (Tetra Tech, 1999a). The amount and extent of soil and groundwater contamination at the repaired locations has not been investigated.

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. A investigation was ongoing in 1999 (Tetra Tech, 1999a). An air sparging/soil vapor extraction system at Avenue "A" was placed in operation in May of 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 is 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 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 ran underneath a heavily trafficked street, 103<sup>rd</sup> Street. The closure and investigation activities will be integrated and conducted under the Florida Department of Environmental Protection (FDEP) underground storage tank program.

### **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 103<sup>rd</sup> Street***

Past leaks have been discovered from the pipeline. Even small leaks from this high volume pipeline (estimated to have transported 200,000 gallons/day more than 45 years) could result in thousands of gallons of fuel lost. These fuel leaks are compounded by leaks from underground storage tanks from service stations along Roosevelt, Timaquana, and 103<sup>rd</sup> Street. With several sources of groundwater contamination in the area utility lines could possibly carry the contamination further from the sources. Private wells in the area are at risk for contamination and therefore private well owners should have their wells tested regularly.

#### ***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 pockets 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.

Table 2: Description of current and future exposure from the jet fuel pipeline leaks possibly contaminating 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	
<p><b>**People using private wells for drinking water, cooking, and bathing in the vicinity of the 103<sup>rd</sup> Street Jet Fuel pipeline and other possible sources (e.g., service stations) in the area</b></p> <p><b>**People using buildings over or near the areas with concentrated surficial groundwater contamination</b></p>	<p>Current Future</p>	<p>Jet Fuel (JP 4 and 5 containing volatile and semi-volatile organic compounds), and possibly metals</p>	<p>1. Historical leaks from the Jet Fuel pipeline.</p> <p>2. Underground storage tank leaks from service stations.</p> <p>3. Other local industries</p>	<p>Private wells (groundwater)</p> <p>Indoor air</p>	<p>Private wells and possibly indoor air in buildings in vicinity of Jet Fuel pipeline (pipeline runs 15 miles underneath Roosevelt, Timaquana, and 103<sup>rd</sup> Street between NAS JAX and Cecil Field)</p>	<p>Ingestion of contaminated groundwater, and inhalation of vapors during bathing</p> <p>Breathing indoor air contaminants seeping in from underground</p>	<p>Current and Future - private wells users and building occupants near the pipeline and service stations</p>	<p>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.</p> <p>Within ¼ mile of NAS Cecil Field, there are 25 private wells.</p> <p>Many conduits in the area (sewers, waterlines, etc) could move the contamination indoors.</p> <p>There are many businesses along this road, especially old gas stations that also possibly leaked fuel from the underground tanks.</p> <p><i>Summary- need more info on notification of local authorities and public so they can provide hazard management.</i></p>
<p><b>**Potential Pathway = exposure not occurring or confirmed, but possible</b></p>								

**PUBLIC HEALTH ACTION PLAN - JET FUEL PIPELINE****CONCLUSIONS**

1. Past leaks from the Jet Fuel pipeline and other local sources (e.g., service stations) puts private wells in the vicinity of Roosevelt, Timaquana, and 103<sup>rd</sup> 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**

- Jet Fuel leaks discovered from the 103<sup>rd</sup> Street pipeline have been cleaned up. Migration and degradation of the groundwater plumes are being monitored by NAS Cecil Field.
- 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.
- The pipeline was removed from service in 1999 so additional leaks will not occur.

**RECOMMENDATIONS***Wells*

1. As soon as possible, but within 6 months, the Florida State 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. The wells should be sampled for volatile organic compounds, semi-volatile organic compounds, pesticides, and metals.
2. Florida State Department of Environmental Protection should provide notification/information to planning/permitting departments on 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. The Navy should advise local fire departments of the location of pipeline leaks found to date so they can provide future hazard management.
2. Building occupants should report fuel odors in indoor air to the Florida State Environmental Protection Agency, Bureau of Emergency Response 1-800 320-0519 or (904) 448-4320 or 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): a) 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*), b) People could be eating contaminated fish or turtles from Yellow Water or Sal Taylor Creek draining Site 15 (*Indeterminate Public Health Hazard*), and c) 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 and has been found in soil, sediment, and surface water. The initially reported median lead level in soil here (at unspecified depths) is 554 ppm with a maximum level of 59,800 ppm. Routine contact with even the median lead soil levels could increase blood lead content to unsafe levels especially for children. Signs are posted on paths leading onto the site stating, "Warning No Trespassing, Contaminated Area Avoid Contact with Soil and Water". Signs also provide a phone number for additional information. However, some signs are blocked by overgrown vegetation. The Navy continues to determine the location and variation in soil contamination levels before cleanup begins. Until cleaned up, this area remains a hazard and stakeholders should evaluate the effectiveness of the current warning signs. 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. Fish and turtles in Yellow Water and Sal Taylor Creek could accumulate metals and people eating fish or turtles could be at health risk. Warning signs need to be in place until it is confirmed that eating fish and turtle from this area is safe. 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.*

#### 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 ( $\mu\text{g}/\text{dL}$ ). 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  $\mu\text{g}/\text{dL}$ . If action levels are exceeded, sources of the lead should be found and removed and followup blood lead sampling may be advised.

## Background and Land Use

Site 15, also known as Blue 10 Ordnance, is a 10-acre area located in the southwestern part of the Yellow Water Weapons Area (YWWA; Figure 6). For approximately 10 years 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 propellant. Historical ordnance disposal activities have resulted in contamination of the soils, sediment, surface water and groundwater in the area. Wooden pallets or crates were likely burned here as well. Those wooden structures may have been treated with polycyclic aromatic hydrocarbon (PAHs) compounds, like creosote or with pesticides causing some of the soil contamination found at Site 15. During the 1940s and 1950s, this area was used as a trap and skeet range (ABB-ES, 1997a). Pesticides were likely used in the past at the skeet range for weed and mosquito control also contributing to the pesticides found in the soils. Contaminants include metals, pesticides, volatile and semi-volatile organic compounds, and explosive residues (nitroaromatics) (ABB-ES, 1994a). However, lead contamination is the major public health hazard due to the extremely high levels and population of children that could be impacted. 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 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 and our evaluation and conclusions are below.

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	Recreational or trespassing activities	Current	Yes	No Apparent Public Health Hazard
	Residential use, digging, and use of untreated groundwater for drinking water	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 Future	Unconfirmed	Indeterminate (Possible)-missing use and contaminant data
3. People disturbing UXO * See UXO section of document				

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

*Current*

The current activities at Site 15 are recreational and trespassing. 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. The initially reported median lead level in soil here is 554 parts per million (ppm) with maximum levels as high as 59,800 ppm. The soil sampling depths were a composite of soil taken between the surface and one foot below the surface. Routine 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. ATSDR needs more information on the soil depth range that lead is found to obtain a dilution factor to determine what levels people are exposed to in surface soil, the lead particle size, and information on why both filtered and unfiltered samples show lead remaining at high levels in the surface water on site.

To reduce the hazard, 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. Some signs are blocked by overgrown vegetation. Most of the area is covered by vegetation or some other material reducing the exposure potential more. The Navy continues to determine the location and variation in soil contamination levels before cleanup begins. Until cleaned up, this area remains a hazard; therefore, stakeholders should evaluate the effectiveness of the current warning signs and notification mechanisms.

### *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 trap and sheet 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.

### *Fate and Transport of the Lead*

Here, the lead can be moved by: (1) airborne particulate lead, 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 have a tendency to found with smaller or finer grained particle sizes and may be associated with sediments with 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 it reached 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 bio-available 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 primary of concern when soil particles 100 to 200 microns or less are ingested when fine particles 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.

### *Sampling Techniques and Sampling Data*

There is limited exposure-based sampling data of source areas and locations where people may be directly affected by lead (Figure 7). Surface dust is the top 0-2 inches of soil that can be carried by the wind and tracked into houses. Surface soil is the top 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 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). ATSDR believes that sampling is needed for levels of lead present in the surface soils at Site 15 and in the unremediated areas surrounding Site 15.

At a similar shooting range, 91% of shot is found in top 1 inch of soil at a trap and skeet range (N.B. Vyas, 2000).

Soil sampling technique used here mixed contaminated soil with uncontaminated soil from the surface to one foot depths. Therefore the reported lead concentrations and associated statistical averages are less than actual levels at each sampling location. Sampling levels for areas may range from 2-20 times higher than current sampling results including statistical averages.

The current preliminary sampling data does provide information on the general trend of (diluted) lead contamination. However, additional sampling is needed to determine the range of dilution. 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 using the area would routinely come in contact with. Analysis is then needed to compare trends in soil information and descriptions with chemical concentrations so that a map to identify trends and identify areas with different contamination histories and different bioavailability potential can be generated.

#### *Lead Bioavailability in the Environment*

The ash deposits with lead may have a higher human bioavailability potential than areas just with 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 ( $\text{PO}_4$ ,  $\text{SO}_4$ ,  $\text{CO}_3$ ) (Naval Facilities Engineering Command, 1999). A bioavailability study will help to determine the current safety of this area and may reduce or increase the amount of lead contaminated soils that needs to be cleaned up.

#### **Exposure Issues and Data Needs for Site 15**

There are several factors that make evaluation of the possible 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 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 bioavailabilities measures would help in our health evaluation.

*Other Soil Contaminants*

Polyaromatic hydrocarbons (PAHs) and pesticides have also been detected in soil samples; however, the levels are not exceedingly high. Short term, infrequent contact should not result in harmful health effects. However concentration levels will need to be reevaluated if land use changes. 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 (personal communication, EPA 2001).

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	
<i>*People contacting on-site soil, dust, and creeks during recreational or trespassing activities at Site 15 (Blue 10 Ordnance)</i>	Current	Metals (lead and mercury), pesticides, volatile and semi-volatile organic compounds, explosive residues, and unexploded ordnance	1. Historical ordnance disposal activities: burning of ordnance and possibly treated wooden crates with diesel fuel and spreading the ash and residual metals on the ground (approximately 1967 - 1977) 2. Possibly pesticide application on skeet range	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	Current - recreational users and trespassers	Current levels of lead in soil are very high (initially reported median 554 ppm). Routine contact with those levels may post a health hazard for children. Casual site users such as bikers and hikers would not likely be at health risk. NAS Cecil Field has posted signs alerting users of the chemical hazards in the Site 15 area.  A decision about the scope of the clean-up for Site 15 is forthcoming.

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	
<b>**People contacting on-site soil, dust, and creeks if the Site 10 is used for residential use.</b>	Future	Metals (lead and mercury), pesticides, volatile and semi-volatile organic compounds, explosive residues, and possibly unexploded ordnance	1. Historical ordnance disposal activities: burning of ordnance and possibly treated wooden crates with diesel fuel and spreading ash and residual metals on the ground (approximately 1967 - 1977) 2. Possibly pesticide application on skeet range	Soils, sediment, surface water, and shallow groundwater	Soils in the burn and disposal area, ditches draining the area, drinking water from groundwater wells	Incidental ingestion of, direct skin contact with, contaminated surface soils and inhalation of soil particulates during recreational property use. Ingestion of groundwater	Future-recreational users and trespassers including children	<p>Current levels of lead contamination in soil would pose a health hazard to future residential and recreational users. It is likely the site will be cleaned up or restrictions placed on living here.</p> <p>Because UXO have been found in the area, if construction/digging takes place, people, especially workers, need to be aware of and follow precautionary clearing procedures.</p> <p>Groundwater is contaminated in this area, so future use should exclude use of this water as potable source without treatment.</p>

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	
<b>**People who eat fish or turtles from Yellow Water or Sal Taylor Creek draining Site 15</b>	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	<p>Whether fish or turtles have accumulated contaminants is unknown. The creeks are designated as fishable streams.</p> <p>High <u>dissolved</u> lead levels (a median of 205 ppb) have been found in surface water samples that run off Site 15. Dissolved lead levels are more easily taken up by fish and turtles and could be as high as the dissolved levels.</p> <p>ATSDR recommends that the Navy in conjunction with state or local health and environmental agencies determine if people are harvesting fish or turtles from Yellow Water or Sal Taylor Creek. If so, post the creeks "Do Not Eat Fish or Turtles From Yellow Water and Sal Taylor Creek" or take a representative sampling of the fish and turtles to determine if they are safe to eat.</p>
*Completed Pathway = exposure occurred or is occurring **Potential Pathway = exposure not occurring or confirmed, but possible								

*Future*

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 will include forest management and recreational uses such as horseback riding, biking, and hiking (Arthur Andersen LLP, 1996). Although the Site 15 property is designated for wildlife and recreational reuse, changes in the economy or regional vision for NAS Cecil Field redevelopment could result in a proposed residential reuse of this site. *In the absence of soil clean-up activities or information on the bioavailability of the lead, future recreational or residential exposure to the Site 15 surface soils poses an unacceptable health hazard.*

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 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 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 concentration are of public health concern for those coming in contact with lead contamination. The 1999 median lead levels (actual media would be higher when adjusted for dilution) in soil there (at unspecified depths) were 554 ppm with maximum levels as high as 59,800 ppm. Calculated increases in blood lead levels ranged from 11 to 34  $\mu\text{g}/\text{dL}$ . Adding these values to the baseline blood lead concentrations for U.S. children, one arrives at predicted blood lead levels ranging from approximately 14.1 to 37.5  $\mu\text{g}/\text{dL}$  for children routinely exposed to soils at Site 15. Therefore, the predicted exposures could possibly result in increases in blood lead levels which exceed the 10  $\mu\text{g}/\text{dL}$  screening criterion. (The algorithm, soil lead data, assumptions, and calculations are provided in Appendix F.)

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: (i) greater absorption and metabolism of lead than adults, (ii) rapidly developing nervous systems, and (iii) 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 ( $\mu\text{g}/\text{dL}$ ) 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, 1997a).

*Effectiveness of Land Use Controls and Clean Up Strategy*

ATSDR agrees with the National Research Council that land use controls cannot be relied on to protect public health since land use controls can not be maintained over time especially if the land is resold (NRC, 1999). It is appropriate, therefore, to examine the potential risks posed to future adult and child residents of the site.

The Navy is developing a feasibility study that is innovative since it uses the preliminary lead sampling data to determine areas to remediate in and around Site 15. Concentration averaging of lead contaminant levels at varying depths of areas being remediated at Site 15 in this case will be protective of public health. *However, there will remain lead at levels of public health concern in areas that are not remediated especially in areas immediately outside (bordering) the selected areas to be remediated.* Lead would need to be re-evaluated if use increases. This is based on the rationale that results of these statistical analyses for lead are underestimates of lead levels in surface soils that people using the areas would come in contact with during recreational activities. *Information on the bioavailability of the lead in the unremediated areas and the concentration in surface soils would provide the needed information to determine the potential health hazard posed by contact with Site 15 surface soils.*

The groundwater at Site 15 is also contaminated with mercury 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. Therefore, 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. Levels of lead usually accumulate in fresh water fish at the same level found in the water.

Mercury has also been detected in soils in the area. Mercury easily accumulates in fish and turtles. The source of mercury at this location is unknown, but mercury was a component in some explosives. There is also evidence that this whole area of Florida has higher mercury levels from a variety of sources. Mercury has been found at other locations on base.

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. Fish or turtles in those creeks could be or could become contaminated from those metals. If people are eating fish or turtles harvested in those creeks, they could be at risk for harmful health effects. ATSDR recommends that the Navy, in conjunction with state or local health and environmental agencies, determine if people are harvesting fish or turtles from Yellow Water or Sal Taylor Creek. If so, take a representative sampling of the fish and turtles to determine if they are safe to eat or provide educational material and post the creeks "Do not eat fish or turtles from Yellow Water or Sal Taylor Creek".

**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. Current lead levels are high enough in soils that frequent (i.e., daily) contact by children under 6 could result in harmful health effects.
2. Adults or older children currently trespassing on Site 15 would have incidental contact with the contamination in soil and creeks. Those exposures pose no apparent public health hazard.
3. 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.
4. If parts of Site 15 not scheduled for remediation are used for future residential or recreational use, they would pose a cancer and non-cancer health risk. Since the future use and remediation plans are still uncertain, Site 15 poses an indeterminate (potential) public health hazard.
5. Unexploded ordnance (UXO) near Site 15 in the YWWA is likely left over from the firing ranges or munition burning operations. These UXO 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.

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

6. 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. Bioaccumulation of lead could pose a potential hazard to people who eat fish. Since fish and turtles have not been sampled and contamination is possible, eating fish and turtles caught in Yellow Water or Sal Taylor Creek poses an indeterminate (potential) 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.

*Future*

2. 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.
3. The Navy plans remediation or removal activities as needed to reduce the levels of contaminated soils.
4. 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. The Navy should provide educational material as soon as possible for residents of the nearby housing area on the need to stay out of Site 15 until it is cleaned up.
3. 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).
4. 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. Exposure based sampling data for lead is not available. Current sampling data and reported statistical concentrations underestimate lead levels. ATSDR needs more information on the particle size and soil depth range where lead is found. This information should be used to obtain a dilution factor to determine surface soil levels (0-3") or shallower. This would be more representative of what levels of lead people will come in contact with when using the area.

*Eating locally caught fish and turtles*

5. ATSDR recommends that the Navy in conjunction with state or local health and environmental agencies determine within one year if people are harvesting fish, turtles or other biota from Yellow Water or Sal Taylor Creek. If so, continue to take a representative sampling of the fish and turtles to determine if they are safe to eat or provide educational material and post the creeks "Do not eat fish or turtles from Yellow Water or Sal Taylor Creek". If sampling is needed, sample fish and aquatic animals in Yellow Water and Sal Taylor Creek and other man-and lakes or creeks downstream from Site 15 for metals (especially lead and mercury), PAHs and pesticides.

*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. Future changes in the base reuse plan should restrict the installation of potable water wells at, or downgradient of, Site 15 without water treatment.

**D. LEAD AND ASBESTOS IN BASE HOUSING** - Current and future building occupants, 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)*

*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 (Buildings 24 & 118) Child Care Center facilities. The survey stated that residential housing units constructed between 1942 and 1957 have paint with 20-25% lead. The Navy has also identified copper drinking water pipes with lead solder. Lead soldering is known to leach into drinking water under certain conditions.*

*The base buildings also have asbestos insulation remaining that if disturbed could present a health hazard.*

*The Navy or the redevelopment authority should provide information to new residents, developers, or tenants on the location of the lead paint and asbestos buildings and ways 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 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, elderly, and women of child bearing age.*

*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 (U.S. Navy, 1999b).*

**INFORMATION FOR BUILDING OCCUPANTS**

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

*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 (6) routinely tested to determine their blood lead level.

**If you have lead in outside soils:**

1. Keep bare soil areas covered with vegetation and don't eat vegetable from gardens planted there.
2. Keep children out of these areas.

**If you have asbestos insulation:**

1. Inspect insulation regularly and keep it covered.
2. Report & repair broken or torn

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 and operated in 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 also 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. In addition, baseline and follow-up blood lead screenings were not being performed to ensure that the children were not being exposed to lead in the day care and residential environments at levels posing a health risk. Therefore, ATSDR also concludes that children 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 has been taken out of service.

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 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 you can take individually 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, then 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.

If uncertain whether you have lead paint or lead in your tap water, you can buy home based test kits to verify 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, 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 is 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 the location of the lead paint and asbestos buildings and 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 flushing techniques and frequency.
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** - In 1997, fish in Lake Fretwell were found to be contaminated with low levels of mercury, lead, PCBs, and other chemicals at levels not likely to result in adverse health effect in people who eat the fish. At the time of the 1997 sampling, there weren't enough fish to support a regular recreational or subsistence fishing population. Because the source(s) of the contaminants have not been determined, there is a potential for contaminant levels to increase in the future. Additionally, no other lakes or ponds on base that support edible biota (fish and turtles) have been sampled including the lake that feeds into Lake Fretwell. Future use of the lakes and streams has not been determined and may be stocked with sufficient fish to support recreational or subsistence fishing. The unknown source of contamination, the uncertainty of contaminant levels to increase, undetermined future use, and unknown contaminant levels in other water bodies, make on-base lakes and creeks an indeterminate public health hazard with potential to pose a health risk to people who eat fish and other biota caught on base. (*Current and Future Indeterminate Public Health Hazard*)

*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. People are fishing in the lakes and with the turnover of NAS Cecil Field, more fishing is likely. The fish have only been sampled in one lake, Lake Fretwell, where mercury from an unknown source was detected in fish. Some site-specific sources of mercury include paint, munitions, calibration gauges, and batteries. Mercury contamination in fish is a hazard in some areas of Florida and EPA's Mercury Report to Congress shows mercury deposition at high levels in some of the more slow-moving water bodies in Florida. 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. Since fish could be consumed by recreational fisherman and there is a likelihood the fish are contaminated, fish sampling is needed from all the lakes. As a precautionary measure, warning signs need to be in place until it is confirmed that eating fish and turtles from the on-base lakes and creeks is safe.*

## **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.

*Lake Fretwell is the only on-base lake where fish were sampled.* Our review of the Lake Fretwell information shows data gaps there and a concern about the other lakes. Small impoundments (lakes and ponds) near old firing ranges and the gunnery school have not been sampled. Sampling depths and sampling methods in the ranges and gunnery school tend to underestimate the concentration of lead and explosives present in soil. Sampling has not been conducted near the impoundments or lakes in Yellow Water Weapons Area.

## 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 was stocked by NAS Cecil Field for recreational fishing.

In February of 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 the 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 of 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 (47) 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 fifty percent of all fish consumed by an individual was 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).

The 1997 sampling results have demonstrated that Lake Fretwell is safe for recreational fishing use. However, the source, or sources, of mercury and PCBs to the lake have not been identified. 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.

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 upgrading of possible source areas. Nevertheless, the lack of available fish in Lake Fretwell doesn't 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. However, if fish were re-established, mercury levels in fish would need to be evaluated because the contaminant source has not been determined.

Completed investigations have not pinpointed the source of contamination to the lake sediments and fish. ATSDR is concerned that concentrations of mercury and PCBs in fish tissue could increase in the future. This concern is based on several factors, including:

- The uncertainty regarding whether releases of contaminants to the lake are on-going.
- The uncertainty regarding whether the investigations of the remaining potential source areas will permit identification and mitigation of the source.
- There is a reservoir of contaminated sediments in the lake. We cannot predict whether future reuse activities (e.g., stocking, lake maintenance activities such as mechanical plant control and dredging) will increase the availability of the contaminants to Lake Fretwell fish and the people who consume those fish.
- Sampling data and associated information cannot be grouped by age, size, moisture, lipid content, or time when fish were stocked or born in the lake for in-depth evaluation.

#### *Site-Specific Sources of Mercury*

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).

#### *Regional Mercury Deposition*

EPA's Mercury Report to Congress shows the Jacksonville area with a moderate mercury deposition (i.e., 5-10  $\mu\text{g}/\text{m}^2$ ) (EPA, 1997a). (Figure 8) Although there are no current fish advisories in this area for mercury, many other water bodies in Florida with slow moving water (e.g., small lakes, streams, etc) have mercury fish advisories (Florida Fish and Wildlife Conservation Commission, 2000).

*Summary*

The likelihood of fish contamination still exists for the following reasons:

- The Lake Fretwell fish contamination source(s) have not been determined.
- There likely was site-specific disposal of mercury.
- The moderate mercury deposition in Florida reported by EPA.
- Large spills of other contaminants could have reached the lakes and creeks.

Fish samples are needed from all the lakes where fish are consumed by recreational fisherman. As a precautionary measure, warning signs need to be in place until it is confirmed that eating fish and turtles from the on-base lakes and creeks is safe.

**PUBLIC HEALTH ACTION PLAN - LAKES AND CREEKS ON BASE****CONCLUSIONS**

1. The source and source areas of mercury in Lake Fretwell have not been determined. Data is inadequate to determine if mercury levels in fish will increase or decrease in the future. The nature and extent of contamination has not been determined and fish management is currently anticipated to include restocking of fish. Currently eating fish from Lake Fretwell poses a no apparent public health hazard for recreational fisherman. However, because levels may change in the future, eating fish from Lake Fretwell would pose an indeterminate public health hazard for future recreational fisherman.
2. Contamination is possible in other lake's fish from past disposal areas, spills, and state-wide deposition of mercury. However, no other lake's fish have been sampled for ATSDR to evaluate the safety of eating fish there. Therefore, eating fish from Lakes Newman, Wright, Yellow Water, and Burrell poses an indeterminate public health hazard.

**RECOMMENDATIONS**

1. The state should provide information to future users of the possible regional mercury hazards in fish. Due to bioaccumulation and bioconcentration hazards especially in larger/older fish, the state should suggest a ban on consumption of fish and biota from on-base lakes unless safe consumption rates are established.
2. Florida State Department of Environmental Protection or the Navy should either sample sediment and/or fish in on-base lakes to confirm current mercury and other contaminant levels or post warning signs until it is confirmed that eating fish and turtles from this area is safe. As an alternative, anglers should be provided regular information on choosing certain types of fish, smaller fish, and methods of cleaning and preparing the fish that would reduce exposure.
3. 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. Current technology would be unlikely to locate UXO in wetland areas. 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 site. Those areas are currently developed and no UXO investigations have taken place there. Chemical Agent Identification Sets (CAIS) have not been found at Cecil Field. However, because they have been used and found at NAS Jacksonville and personnel from Jacksonville have trained at Cecil Field, it is possible that CAIS may be present.*

*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.*

*The Navy and new tenants should provide public education on the locations and hazards associated with disturbing UXO. Institutional controls (i.e., no digging) may be needed in multiple areas. The*

INFORMATION FOR THOSE  
WHO DISCOVER UNEXPLODED ORDNANCE OR  
UNIDENTIFIED GLASS VIALS

**UXO AND CAIS SAFETY  
AND REPORTING**

*It is important to understand how to react responsibly in the presence of UXO (unexploded ordnance) and CAIS (chemical agent identification sets).*

**If you encounter UXO OR CAIS:**

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

*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 (10) 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 below in Table 3. The on-base locations are on Figure 9. More information on the off-base area can be found at the bibliography of bombing ranges listed with the References.

<b>Table 4. List of known UXO areas on NAS Cecil Field and on previously owned Navy (FUDS) property nearby</b>		
<b>Location ID or Name</b>	<b>Location</b>	<b>Description of use/ UXO found</b>
<b>Main Base Areas</b>		
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 . 1. 75-2.75 rocket war heads 2. 2 unidentified cartridges 3. 50-20-mm rounds 4. 1-MK4 cartridge 5. 1-50 caliber round. 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 bullet s and casing 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
<b>Yellow Water Weapons Area</b>		
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

<b>Table 4. List of known UXO areas on NAS Cecil Field and on previously owned Navy (FUDS) property nearby</b>		
<b>Location ID or Name</b>	<b>Location</b>	<b>Description of use/ UXO found</b>
Skeet Range (PSC 49)		Likely used for small arms practice.
Target Range		Likely used for small arms practice.
60 Acre Naval Gun School	Area is in St Johns River basin. Old Yellow Water Road and unpaved sections of Mc Cracken 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. Navy use from 1941 to 1945 unknown. Fall 1995. UXO survey conducted in some areas with limited interviews and archival searches for years when the area was used. Limited munitions/UXO found on site (Navy report is not internally consistent with what was found) " two 50 Caliber bullets, several spent 20 mm, 7.62mm and .45 caliber and .50 caliber shells." "Numerous spent and .50 caliber projectiles and castings on north side of Old Yellow Water Road... only two live .50 caliber rounds were encounter." (page 14 ) Site covered with dense undergrowth. ATSDR believes this would have hindered visual UXO survey "Interview with Naval Explosive Ordnance Detachment (EOD) experts also indicated there is potential that live munitions may be present in the 60 acre area. The report (US Navy, 1996a) states that electrical current need 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)

Table 4. 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
<b>Areas Evaluated By US Army Corps of Engineers and Determined to be Formerly Used Defense Sites</b>		
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 1/2 mile north of Normandy Boulevard, adjacent to Naval Air Station (NAS) Cecil Field.	<p>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. The Navy constructed a block building and installed a security fence. Property use prior to Federal acquisition was rural/agricultural. The property deed for Federal acquisition could not be located by Duval County Courthouse personnel. 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.</p> <p>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. The conveyance was subject to existing easements for roads, highways, railroads, pipelines, and public utilities. 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.</p>

Table 4. 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
Clay Bomb Target Site	Clay county	<p>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.</p> <p>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.</p>
Keystone Bomb Target Site	<p>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.</p>	<p>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. Records on file at the Corps of Engineers Jacksonville District Office contained no information of actual site use. An office memorandum dated 14 November 1944 from the United States 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.</p>

Table 4. 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
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 was 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 and new tenants should provide 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?*

The radiological sampling results were not made available for ATSDR to review. Consequently, ATSDR cannot address this community concern and it will remain an indeterminate public health hazard. Upon receiving the radiological sampling reports, ATSDR will address this issue. Of note however, EPA Region IV's health physicist reviewed the radiation report and believes that radiation was not a problem. The report did not include Depleted Uranium (DU) storage locations. Low-level radiation may still be present in some landfills from past disposal of dials, etc.

*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 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 situation and three situations in the past in which children may have been exposed to lead at the NAS Cecil Field. The first population is those children in the future, 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.

### *Conclusions about Child Health in areas surrounding NAS Cecil Field*

No current or future exposure pathways were identified by ATSDR for children and youth living in the surrounding community to come into contact with Cecil Field-related environmental contaminants.

#### 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 for 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 the 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 bone, 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

Table 5. Exposure Situation and Hazard Summary Table - Cecil Field Naval Air Station, FL						
Exposure Situation	Time Frame	People Exposed	Hazard	Actions Taken/Planned	Recommendations	Comments
<p><u>ON-BASE GROUNDWATER</u></p> <p>Groundwater contamination on a major portion of the main base migrating into indoor air and deep drinking water wells.</p> <p>Contaminants: TCE &amp; other solvents, metals, jet fuel</p>	<p>current future</p>	<p>possible possible</p>	<p><u>Indoor Air current &amp; future</u> - Indeterminate (more data needed)</p> <p><u>DW wells current &amp; future</u></p> <p>-No hazard</p>	<p><u>Actions</u></p> <ul style="list-style-type: none"> <li>□ groundwater sampling and monitoring is ongoing.</li> </ul>	<p><u>Recommendations</u></p> <p><u>Indoor Air</u></p> <ol style="list-style-type: none"> <li>1. ATSDR recommends the Navy continue the screening process to determine the 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 is also recommending that levels of gases found in soil and groundwater be used and compared with the screening model and Tier-2 groundwater model developed by Johnson and Ettinger Model (1991) for subsurface vapor intrusion into buildings.</li> <li>2. If indoor air sampling is indicated from the modeling, the Navy should sample indoor air in those buildings as soon as possible, but within a year. The sampling should include biogenic gasses (e.g., methane, ethane, etc), chlorinated hydrocarbons (e.g., TCE, TCA, etc), and hydrocarbons (e.g., benzene, ethybenzene, etc).</li> <li>3. The Navy should distribute educational material to developers and future occupants informing building occupants of possible indoor air contaminant hazards.</li> <li>4. Developers should consider installing vapor barriers when building in areas with shallow groundwater contamination.</li> </ol> <p><u>Wells</u></p> <ol style="list-style-type: none"> <li>5. Routine drinking water sampling (every 3 years) should be done on any systems fed by wells on base. Analytes should include metals, VOCs, and SVOCs.</li> <li>6. Well owners should implement wellhead protection and evaluation of the casing integrity starting with the wells closest to the plumes.</li> <li>7. Notification of the groundwater hazards should be given to developers and be on file with the county.</li> <li>8. New well installation should be restricted without wellhead protection, corrosion resistant casings, aquifer protection during drilling, and if needed, water treatment.</li> </ol>	<ul style="list-style-type: none"> <li>• Indoor air has <u>not</u> been sampled, especially over the GW contamination areas. GW contamination is concentrated and near the surface.</li> <li>• Numerous deep drinking water wells are in the vicinity (reportedly cased). The old casing could breakdown and carry contamination to DW zone</li> <li>• Warnings need to be in place for anyone who plans new well installation.</li> </ul> <p><i>Summary-need indoor air sampling, info on upgraded well head protection plan, and notification of future well users.</i></p>

Table 5. Exposure Situation and Hazard Summary Table - Cecil Field Naval Air Station, FL						
Exposure Situation	Time Frame	People Exposed	Hazard	Actions Taken/Planned	Recommendations	Comments
<p><u>JET FUEL PIPELINE</u></p> <p>Jet fuel (JP-4 and JP-5) migrating to private wells and indoor air in homes and businesses from the 103<sup>rd</sup> Street pipeline. (15 miles underneath Roosevelt, Timaquana, and 103<sup>rd</sup> Streets between NAS Jacksonville and NAS Cecil Field in the City of Jacksonville).</p> <p>Contaminants: Jet Fuels, other fuels, metals</p>	<p>past current future</p>	<p>yes possible possible</p>	<p>DW wells <u>current &amp; future</u>- Indeterminate hazards - more data needed</p> <p>Indoor Air <u>past</u>- No (apparent) hazard <u>current &amp; future</u> - Indeterminate (more data needed)</p>	<p><u>Actions</u></p> <ul style="list-style-type: none"> <li>▫ 1996 soil removal and groundwater free product recovery took place.</li> <li>▫ Migration and degradation of known groundwater contamination is being monitored.</li> <li>▫ The pipeline integrity has been checked at least 2 times and it didn't have major failures/fractures, but had between 32 and 90 anomalies requiring further investigation</li> </ul>	<p><u>Recommendations</u></p> <p><u>Wells</u></p> <ol style="list-style-type: none"> <li>1. As soon as possible, but within 6 months, Florida State Department of Environmental Protection should provide educational material (such as radio or television broadcast or printed in the newspaper) warning well owners of the possible regional contamination hazards and prompting them to have their well sampled annually. The wells should be sampled for volatile organic compounds, semi-volatile organic compounds, pesticides, and metals.</li> <li>2. Florida State Department of Environmental Protection should provide notification /information to planning/permitting departments on 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.</li> </ol> <p><u>Indoor Air</u></p> <ol style="list-style-type: none"> <li>3. Local fire departments should be advised by the Navy of the location of pipeline leaks found to date so they can provide future hazard management.</li> <li>4. Building occupants should report fuel odors in indoor air to the Florida State Environmental Protection Agency, Bureau of Emergency Response 1-800 320-0519 or (904) 448-4320 or the local fire department.</li> </ol>	<ul style="list-style-type: none"> <li>• Since 1954 (46 yrs), 200,000 gallons/ day flowed through this 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.</li> <li>• There are many private wells in the area. 25 are known within 1/4 mile.</li> <li>• There are many conduits in the area (sewers, waterlines, etc) that could move the contamination indoors.</li> <li>• There are many businesses along this road, especially old gas stations that also possibly leaked fuel from the underground tanks.</li> </ul> <p><i>Summary- More information is needed on notification of local authorities and public so they can provide hazard management.</i></p>

Table 5. Exposure Situation and Hazard Summary Table - Cecil Field Naval Air Station, FL						
Exposure Situation	Time Frame	People Exposed	Hazard	Actions Taken/Planned	Recommendations	Comments
<p><u>SITE 15 (BLUE 10)</u></p> <p>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.</p> <p>Contaminants: lead, mercury, other metals, PAHs, pesticides, UXO</p>	current future	soil-yes fish-possible soil&fish-possible	<p><b>Soil Contact</b> <u>Recreational</u> current - No apparent <u>Residential</u> future-Indeterminate</p> <p><b>Eating Fish/Biota</b> current &amp; future - Indeterminate</p>	<p>▫ Site 15 is currently posted with signs alerting recreational users of the YWWA roads and trails to the chemical hazards in this area.</p> <p>▫ The Cecil Field Reuse Planning Committee and stressed that recreational</p>	<p><i>Contact with soils</i></p> <ol style="list-style-type: none"> <li>1. Cecil Field Reuse Planning Commission should 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.</li> <li>2. The Navy should provide educational material for residents of the housing area on the need to stay out of Site 15 until it is cleaned up.</li> <li>3. The stakeholders should evaluate the effectiveness of the signs in keeping individuals from entering the area.</li> <li>4. 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 (0-3") or shallower. Additionally, the Navy should verify where the ash spread area was located and if surface sampling data (&lt;0 - 6") was collected there.</li> </ol> <p><i>Eating locally caught fish and turtles</i></p> <ol style="list-style-type: none"> <li>5. The Navy in conjunction with state or local health and environmental agencies should determine if people are harvesting fish or turtles from Yellow Water or Sal Taylor Creek. If so, continue to take a representative sampling of the fish and turtles to determine if they are safe to eat or provide educational material and post the creeks "Do not eat fish or turtles from Yellow Water or Sal Taylor Creek". If sampling is needed, sample fish and aquatic animals in Yellow Water and Sal Taylor Creek and other man-and lakes or creeks down stream from Site 15 should be sampled for metals (especially lead and mercury), PAHs and pesticides.</li> </ol> <p><i>Contact with Unexploded Ordnance</i></p> <ol style="list-style-type: none"> <li>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. The UXO section provides information on clearing and reporting procedures.</li> </ol> <p><i>Use of Groundwater</i></p> <ol style="list-style-type: none"> <li>7. Future changes in the base reuse plan should restrict the installation of potable water wells at, or downgradient of, Site 15 without water treatment.</li> </ol>	<ul style="list-style-type: none"> <li>• Lead levels are high enough in soils that frequent contact by children under 6 could produce harmful health effects therefore, Site 15 poses a public health hazard for children.</li> <li>• Under the proposed forest management/wildlife corridor reuse scenario and in the absence of soil clean-up activities, the lead in soils may still present a public health hazard.</li> <li>• Residential use of Site 15 unremediated poses a cancer and non-cancer health risk.</li> <li>• Unexploded ordnance (UXO) at Site 15 is likely left over from the firing range. Those UXO would be smaller, less powerful rounds that would require lots of force to cause them to explode. Therefore, digging or excavating in the area could be hazardous if the area is not cleared first.</li> <li>• The nature and extent of sediment and surface water, and fish contamination has not been determined. Dissolved lead levels in surface water samples indicate lead is bioavailable and could accumulate in wildlife. Earthworms have also shown mercury contamination.</li> </ul> <p><i>Summary - need info on planned cleanup, proposed uses, and fish posting or sampling.</i></p>

Table 5. Exposure Situation and Hazard Summary Table - Cecil Field Naval Air Station, FL						
Exposure Situation	Time Frame	People Exposed	Hazard	Actions Taken/Planned	Recommendations	Comments
<p><b>FORMER HOUSING AND OTHER BUILDING HAZARDS</b></p> <p><u>Lead based paint, lead in piping, and asbestos insulation in on-base buildings to be reused.</u></p> <p>Contaminants: lead and asbestos</p>	current future	possible possible	<p><b>Lead in Paint, DW, Asbestos Insulation</b></p> <p><u>current &amp; future-</u></p> <p>Indeterminate hazard (more data needed)</p>	<ul style="list-style-type: none"> <li>▫ In 1995, the Navy conducted a lead based paint survey.</li> <li>▫ In 1999, the Navy sampled the drip lines (soil under the roof where water falls to the ground) and yards near housing units.</li> <li>▫ The Navy plans to inform new occupants of the lead hazards.</li> <li>▫ The Navy confirmed that the cooper piping has lead solder.</li> </ul>	<ol style="list-style-type: none"> <li>1. The Navy and the redevelopment authority should provide information on the location of the lead paint and asbestos buildings. Provide specific information on hazard management.</li> <li>2. 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.</li> <li>3. 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.</li> </ol>	<p><i>Summary - More information is needed on lead in drinking water and on the notification of lead and asbestos hazards to future users.</i></p>

Table 5. Exposure Situation and Hazard Summary Table - Cecil Field Naval Air Station, FL						
Exposure Situation	Time Frame	People Exposed	Hazard	Actions Taken/Planned	Recommendations	Comments
<p><u>LAKE HAZARDS</u></p> <p>Eating fish and other biota caught in lakes/creeks on-base (Lake Fretwell, Lake Newman, Lake Wright, Lake Yellow Water, Lake Burrel)</p> <p>Contaminants: mercury, lead, others?</p>	future	possible	Eating Fish future- Indeterminate hazard (more data needed)	<p>▫ The Navy has sampled fish from Lake Fretwell. The sampling has depleted the fish population so accumulation is less likely in new fish.</p>	<ol style="list-style-type: none"> <li>The state should provide information to future users of the possible regional mercury hazards in fish. Due to bioaccumulation and bioconcentration hazards especially in larger/older fish, the state should suggest recreational fishing in on-base lakes unless safe consumption rates are established.</li> <li>Florida DEP or the Navy should either sample fish in on-base lakes to confirm current mercury and other contaminant levels or post warning signs until it is confirmed that eating fish and turtles from this area is safe.</li> <li>If fish are sampled, the following information should be collected:                             <ul style="list-style-type: none"> <li>How long had fish been stocked before sampling</li> <li>Were fish considered wild or breeding populations</li> <li>Size fish, age, sex fish sampled</li> <li>Types, genus and species of fish sampled</li> <li>Skin on or off filets</li> <li>Were fish trimmed of fat</li> <li>Lipid content of fish</li> <li>Wet weight and dry weight concentration of COPC</li> <li>Documentation of abnormalities or lack of abnormalities</li> <li>Documentation of presence of egg masses.</li> <li>Sample Specific Quantization Limit (SQL)</li> <li>Cross reference of information on fish with samples and concentrations on CD-Rom</li> </ul> </li> </ol>	<ul style="list-style-type: none"> <li>The source of the mercury contamination in Lake Fretwell fish has not been determined.</li> <li>EPA lists this portion of the state with moderate mercury deposition 5-10 µg/m<sup>2</sup></li> <li>Other lakes have not been sampled and are thought, by the Navy, to be upgradient of contamination source areas.</li> </ul> <p><i>Summary- need to determine if local mercury levels in edible aquatic animals are widespread and high enough to post lakes "catch and release only". Or provide anglers regular information on choosing certain types of fish, smaller fish, and methods of cleaning and preparing the fish that would reduce exposure.</i></p>
<p><u>UNEXPLODED ORDNANCE</u></p> <p>Unexploded ordnance and other physical hazards at least 10 major locations on-base and four former bombing ranges off-base.</p>	current future	possible	UXO Contact current & future- Hazard	<p>▫ The Navy has identified possible UXO locations on the main base and Yellow Water Weapons area.</p>	<ol style="list-style-type: none"> <li>The Navy and new tenants should provide public education on the locations and hazards associated with disturbing UXO. Institutional controls (i.e., no digging) may be needed in some areas.</li> <li>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.</li> </ol>	<p><i>Summary- need map of possible UXO locations and educational material. Need information on planned notification of new residents, utility contractors, and developers.</i></p>

Table 5. Exposure Situation and Hazard Summary Table - Cecil Field Naval Air Station, FL						
Exposure Situation	Time Frame	People Exposed	Hazard	Actions Taken/Planned	Recommendations	Comments
<p><u>UNEXPLODED ORDNANCE</u></p> <p><u>Unexploded ordnance and other physical hazards at least 10 major locations on-base and four former bombing ranges off-base.</u></p>	<p>current future</p>	<p>possible</p>	<p><u>UXO Contact current &amp; future-Hazard</u></p>	<p>□ The Navy has identified possible UXO locations on the main base and Yellow Water Weapons area.</p>	<p>1. The Navy and new tenants should provide 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.</p>	<p><i>Summary- need map of possible UXO locations and educational material. Need information on planned notification of new residents, utility contractors, and developers.</i></p>

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## APPENDIX A. 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.	<ul style="list-style-type: none"> <li>• evidence exists that exposures have occurred, are occurring, or are likely to occur in the future <b>AND</b></li> <li>• estimated exposures are to a substance(s) at concentrations in the environment that, upon <b>short-term exposures</b>, can cause adverse health effects to any segment of the receptor population <b>AND/OR</b></li> <li>• community-specific health outcome data indicate that the site has had an adverse impact on human health that requires rapid intervention <b>AND/OR</b></li> <li>• physical hazards at the site pose an imminent risk of physical injury</li> </ul>
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.	<ul style="list-style-type: none"> <li>• evidence exists that exposures have occurred, are occurring, or are likely to occur in the future <b>AND</b></li> <li>• estimated exposures are to a substance(s) at concentrations in the environment that, upon <b>long-term exposures</b>, can cause adverse health effects to any segment of the receptor population <b>AND/OR</b></li> <li>• community-specific health outcome data indicate that the site has had an adverse impact on human health that requires intervention</li> </ul>
C. Indeterminate (potential) public health hazard	This category is used for sites with incomplete information.	<ul style="list-style-type: none"> <li>• 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 <b>AND</b></li> <li>• there are insufficient or no community-specific health outcome data to indicate that the site has had an adverse impact on human health</li> </ul>
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.	<ul style="list-style-type: none"> <li>• exposures do not exceed an ATSDR chronic MRL or other comparable value <b>AND</b></li> <li>• data are available for all environmental media to which humans are being exposed <b>AND</b></li> <li>• there are no community-specific health outcome data to indicate that the site has had an adverse impact on human health</li> </ul>
E. No public health hazard	This category is used for sites that do not pose a public health hazard.	<ul style="list-style-type: none"> <li>• no evidence of current or past human exposure to contaminated media <b>AND</b></li> <li>• future exposures to contaminated media are not likely to occur <b>AND</b></li> <li>• there are no community-specific health outcome data to indicate that the site has had an adverse impact on human health</li> </ul>

**APPENDIX B. POPULATION DATA AND CENSUS TRACT MAP**

## Appendix B-1: Population Data Table

Cecil Field Naval Air Station<sup>1</sup>

	1990 <sup>2</sup>
Total persons	38,074
Total area, square mile	277.33
Persons per square mile	137
% Male	52.4
% Female	47.6
% White	90.7
% Black	6.6
% American Indian, Eskimo, or Aleut	0.4
% Asian or Pacific Islander	1.5
% Other races	0.8
% Hispanic origin	1.9
% Under age 10	19.0
% Age 65 and older	4.7

<sup>1</sup> Source: Census of Population and Housing, 1990: Summary Tape File 1A (Florida) [machine-readable data files]. Prepared by the Bureau of the Census, Washington, D.C., 1991.

<sup>2</sup> Census tracts 136.97, 137.21, 137.22, and 137.98 in Duval County, and census tracts 301 and 302 in Clay County.

Appendix B-2: Housing Data Table

Cecil Field Naval Air Station<sup>1</sup>

	1990 <sup>2</sup>
Households <sup>3</sup>	12,205
Persons per household	2.98
% Households owner-occupied	79.1
% Households renter-occupied	20.9
% Households mobile homes	44.8
% Persons in group quarters	4.4
Median value <sup>4</sup> , owner-occupied households, \$	72,900
Median rent paid, renter-occupied households, \$	325

<sup>1</sup> Source: Census of Population and Housing, 1990: Summary Tape File 1A (Florida) {machine-readable data files}. Prepared by the Bureau of the Census. Washington, D.C.: The Bureau [producer and distributor], 1991.

<sup>2</sup> Census tracts 136.97, 137.21, 137.22, and 137.98 in Duval County, and census tracts 301 and 302 in Clay County.

<sup>3</sup> A household is an occupied housing unit, but does not include group quarters such as military barracks, prisons, and college dormitories.

<sup>4</sup> Median value and median rent are adjusted for inflation by the consumer price index for housing for all urban areas, 1982-84=100.

## Appendix B-3: Socioeconomic Data

Cecil Field Naval Air Station<sup>1</sup>

	1990 <sup>2</sup>
Persons age 5 and older	34,189
% Who do not speak English very well	1.4
% Spanish-speaking	0.6
% API-speaking <sup>3</sup>	0.2
Persons age 25 and older	21,514
% With at least a high school diploma	75.5
Total households	12,296
Median Income, \$	30,330
Persons for whom poverty status is determined	35,973
% Below poverty level	9.8
Employed persons age 16 and older	16,568
% In blue-collar jobs	35.3
% In white-collar jobs	64.7

<sup>1</sup> Source: 1990 Census of Population and Housing, Summary Tape File 3 (Florida). Prepared by Bureau of the Census, Washington, D.C.

<sup>2</sup> 1990 census tracts 136.97, 137.21, 137.22, and 137.98 in Duval County, and census tracts 301 and 302 in Clay County.

<sup>3</sup> API: Asian and Pacific Islander languages.

Appendix B-4: Length of Residence in Current Household, 1990<sup>1</sup>

Cecil Field Naval Air Station<sup>2</sup>

Variable	
Total households <sup>3</sup>	12,186
Percent householders moving into current housing unit by time period:	
1989-90	22.4
1985-88	41.5
1980-84	15.4
1970-79	13.1
1960-69	4.3
Before 1960	3.2

<sup>1</sup> Source: Census of Population and Housing, 1990: Summary Tape File 3 (Florida). Prepared by the Bureau of the Census, Washington, D.C.

<sup>2</sup> Census tracts 127, 135.01, 135.21, 137.21, 137.22, and 137.98.

<sup>3</sup> A household is an occupied housing unit, but does not include group quarters such as military barracks, prisons, and college dormitories.

**APPENDIX C: 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
<b>Main Station: by proposed future use category</b>			
Forestry	Site 17: Oil/Sludge Disposal Pit AOI 35: PCBs on Perimeter Road	<ul style="list-style-type: none"> <li>■ No past exposure situations were identified for these sites</li> <li>■ No one is currently coming into contact with contaminated materials at levels posing a potential health hazard</li> <li>■ 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</li> </ul>	<ul style="list-style-type: none"> <li>■ Investigations complete - remedial action on-going: Site 17</li> <li>? What is the status of AOI 35?</li> </ul>
Light Industry	No sites are located in the area proposed for light industry reuse	<ul style="list-style-type: none"> <li>■ Since no waste sites or areas of interest are located in this area, no past, current, or future exposure situations were identified</li> </ul>	<ul style="list-style-type: none"> <li>■ Not applicable</li> </ul>

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	<ul style="list-style-type: none"> <li>■ No past exposure situations were identified for these sites</li> <li>■ No one is currently coming into contact with contaminated materials at levels posing a potential health hazard</li> <li>■ 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</li> <li>■ 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.</li> </ul>	<ul style="list-style-type: none"> <li>■ Investigations complete - no further action required to protect public health and the environment: Lake Fretwell</li> <li>■ Investigations complete - remedial action in 1998: Sites 3, 5, 11</li> <li>■ Investigations complete - remedial action selection in 1998: Sites 4, 6, 19</li> <li>■ 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.</li> </ul>
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	<ul style="list-style-type: none"> <li>■ No past exposure situations were identified for these sites</li> <li>■ No one is currently coming into contact with contaminated materials at levels posing a potential health hazard</li> <li>■ 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</li> </ul>	<ul style="list-style-type: none"> <li>■ Investigations complete - remedial action selection in 1998: Site 12</li> <li>? What is the status of AOIs 25, 26, 27, 35?</li> </ul>

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	<ul style="list-style-type: none"> <li>■ No past exposure situations were identified for these sites</li> <li>■ No one is currently coming into contact with contaminated materials at levels posing a potential health hazard</li> <li>■ 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</li> </ul>	<ul style="list-style-type: none"> <li>■ Investigations complete - remedial action in 1998: Sites 7, 16</li> <li>? What is the status of AOIs 28, 29, 30, 31, 32, 33?</li> </ul>
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	<ul style="list-style-type: none"> <li>■ No past exposure situations were identified for these sites</li> <li>■ No one is currently coming into contact with contaminated materials at levels posing a potential health hazard</li> <li>■ 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</li> </ul>	<ul style="list-style-type: none"> <li>■ Investigations complete - remedial action on-going: Sites 3, 17</li> <li>■ Investigations complete - remedial action selection in 1998: Site 4</li> </ul>

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	<ul style="list-style-type: none"> <li>■ No past exposure situations were identified for these sites</li> <li>■ No one is currently coming into contact with contaminated materials at levels posing a potential health hazard</li> <li>■ 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</li> </ul>	<ul style="list-style-type: none"> <li>■ Investigations complete - no further action required to protect public health and the environment: Sites 9, 10</li> <li>■ Investigations complete - remedial action in 1998: Sites 1, 2, 8</li> <li>■ Investigations complete - remedial action selection in 1998: Sites 18</li> <li>? What is the status of AOIs 23, 24, 34?</li> </ul>
Commercial	No sites are located in the area proposed for commercial reuse	<ul style="list-style-type: none"> <li>■ Since no waste sites or areas of interest are located in this area, no past, current, or future exposure situations were identified</li> </ul>	<ul style="list-style-type: none"> <li>■ Not applicable</li> </ul>
Conservation	No sites are located in the area proposed for conservation reuse	<ul style="list-style-type: none"> <li>■ Since no waste sites or areas of interest are located in this area, no past, current, or future exposure situations were identified</li> </ul>	<ul style="list-style-type: none"> <li>■ Not applicable</li> </ul>

Base Area and Site Name		Public Health Evaluation	Comments
<b>Yellow Water Weapons Area (YWWA): by proposed future use category</b>			
Forestry	No sites are located in the area proposed for forestry reuse	<ul style="list-style-type: none"> <li>■ Since no waste sites or areas of interest are located in this area, no past, current, or future exposure situations were identified</li> </ul>	<ul style="list-style-type: none"> <li>■ Not applicable</li> </ul>
Light Industry	Yellow Water Weapons Complex	<ul style="list-style-type: none"> <li>■ No past exposure situations were identified for these sites</li> <li>■ No one is currently coming into contact with contaminated materials at levels posing a potential health hazard</li> <li>■ 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</li> </ul>	<ul style="list-style-type: none"> <li>■ 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.</li> </ul>

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	<ul style="list-style-type: none"> <li>■ No past exposure situations were identified for these sites</li> <li>■ No one is currently coming into contact with contaminated materials at levels posing a potential health hazard</li> <li>■ 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</li> <li>■ Levels of soil contaminants at Site 15 present a potential health hazard to current and future recreational users. USEPA and the NAVFACENGCOS-South Division have recommended to the Cecil Field Development Commission that future recreational activities planned for the YWWA avoid Site 15</li> </ul>	<ul style="list-style-type: none"> <li>■ Investigations complete - no further action required to protect public health and the environment: Sites 14</li> <li>■ Investigations complete - remedial action selection in 1998: Sites 15</li> <li>? What is the status of AOI 20, the wastewater treatment plant, transportation maintenance facility, munitions magazines, and former artillery range?</li> <li>■ Currently, Site 15 is posted with signs alerting users to the chemical hazards in the area and remedy selection is scheduled for 1998.</li> </ul>
Heavy Industry	No sites are located in the area proposed for heavy industry reuse	<ul style="list-style-type: none"> <li>■ Since no waste sites or areas of interest are located in this area, no past, current, or future exposure situations were identified</li> </ul>	<ul style="list-style-type: none"> <li>■ Not applicable</li> </ul>
Commercial	No sites are located in the area proposed for commercial reuse	<ul style="list-style-type: none"> <li>■ Since no waste sites or areas of interest are located in this area, no past, current, or future exposure situations were identified</li> </ul>	<ul style="list-style-type: none"> <li>■ Not applicable</li> </ul>

Base Area and Site Name	Public Health Evaluation	Comments
<b>Main Station Systems</b>		
<p>Petroleum Storage Tanks and Pipelines</p> <p>North Fuel Farm                      South Fuel Farm                      Jet Engine Test Cell                      Underground Storage Tanks                      Day Tank 2                      Tank 199                      103rd Street Jet Fuel Pipeline</p>	<ul style="list-style-type: none"> <li>■ No past exposure situations were identified for these sites</li> <li>■ No one is currently coming into contact with contaminated materials at levels posing a potential health hazard</li> <li>■ 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.</li> </ul>	<ul style="list-style-type: none"> <li>■ 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.</li> <li>■ The State of Florida is responsible for administering the underground storage tank program.</li> <li>■ 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.</li> </ul>

Base Area and Site Name	Public Health Evaluation	Comments
Potable Water System	<ul style="list-style-type: none"> <li>■ Backflow prevention devices are not in place in the distribution system to prevent the flow of non-potable water into potable water lines.</li>   <li>■ 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.</li>   <li>■ 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.</li> </ul>	<ul style="list-style-type: none"> <li>■ 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.</li> </ul>

**APPENDIX D. FUEL RELATED SPILLS AT NAS CECIL FIELD**

<b>Fuel Related Spills at NAS Cecil Field</b>				
<b>Location</b>	<b>Year of Release</b>	<b>Gallons released</b>	<b>Reported Type of Fuel</b>	<b>Action to Date</b>
North Fuel Farm	1985	2,200	JP-5	See North Fuel Farm, Tank 76-E
North Fuel Farm	August 1987	22, 772	JP-5	
North Fuel Farm	February 1991	913,000	JP-5	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, Tank 76	November 1993	1, 800	JP-5	
North Fuel Farm spill and release to Sal Taylor Creek Contaminate Area and Possum Dam	February 1991	Not identified	JP-5	CAR 1994, CAR Addendum 1996 and 1997 that recommends NFA except at Possum Dam
Truck Stand (Facility 372)	December 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
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

Fuel Related Spills at NAS Cecil Field				
Location	Year of Release	Gallons released	Reported Type of Fuel	Action to Date
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)
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.

Fuel Related Spills at NAS Cecil Field				
Location	Year of Release	Gallons released	Reported Type of Fuel	Action to Date
Tank 199	?	Unknown	Heating oil	CA Completed in June 1997. Monitoring only required by Regulatory Stakeholders
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 E. 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):

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

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

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  $10 \mu\text{g}/\text{dL}$  to determine if PbB testing of the exposed population is recommended :

**Testing is recommended if:**

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

**Testing is not recommended if:**

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

**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, 1997a). 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:

<u>Age</u>	<u>Mean PbB level (<math>\mu\text{g}/\text{dL}</math>)</u>
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 59,800 ppm. The mean concentration is 2,300 ppm and the median concentration is 554 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 11 µg/dL:*

$$\ln(\text{PbB}) = 0.879 + 0.241 \ln(554)$$

$$\ln(\text{PbB}) = 2.4$$

$$\text{PbB} = 11 \text{ µg/dL}$$

*For the highest soil Pb concentration, the calculated potential increase in PbB is 34.1 µg/dL:*

$$\ln(\text{PbB}) = 0.879 + 0.241 \ln(59,800)$$

$$\ln(\text{PbB}) = 3.52$$

$$\text{PbB} = 34.1 \text{ µg/dL}$$

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:*

$$1\text{-}2 \text{ years} \quad 4.1 + 11 = 15.1 \text{ µg/dL PbB}$$

$$3\text{-}5 \text{ years} \quad 3.4 + 11 = 14.4 \text{ µg/dL PbB}$$

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

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

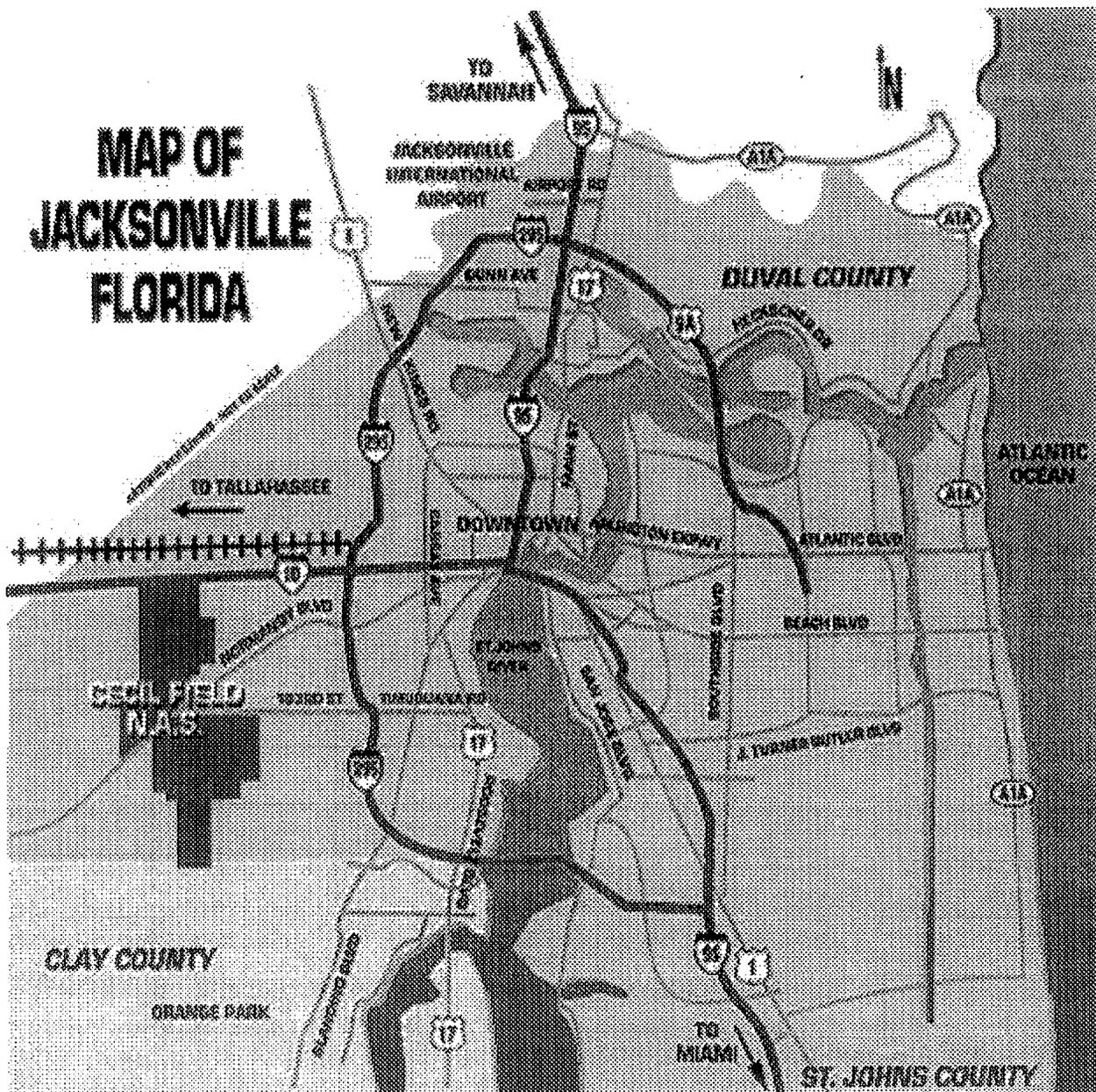
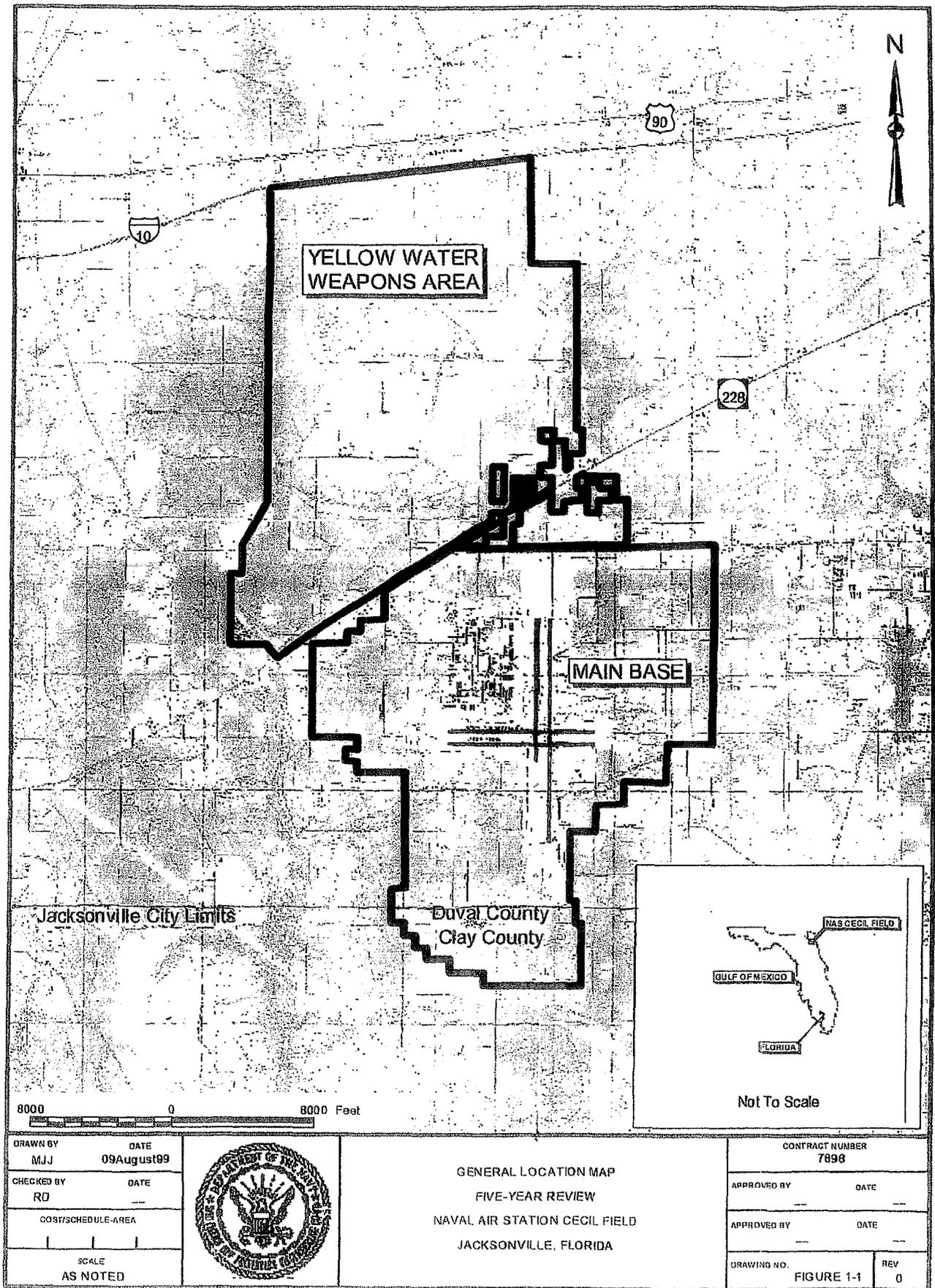


Figure 2



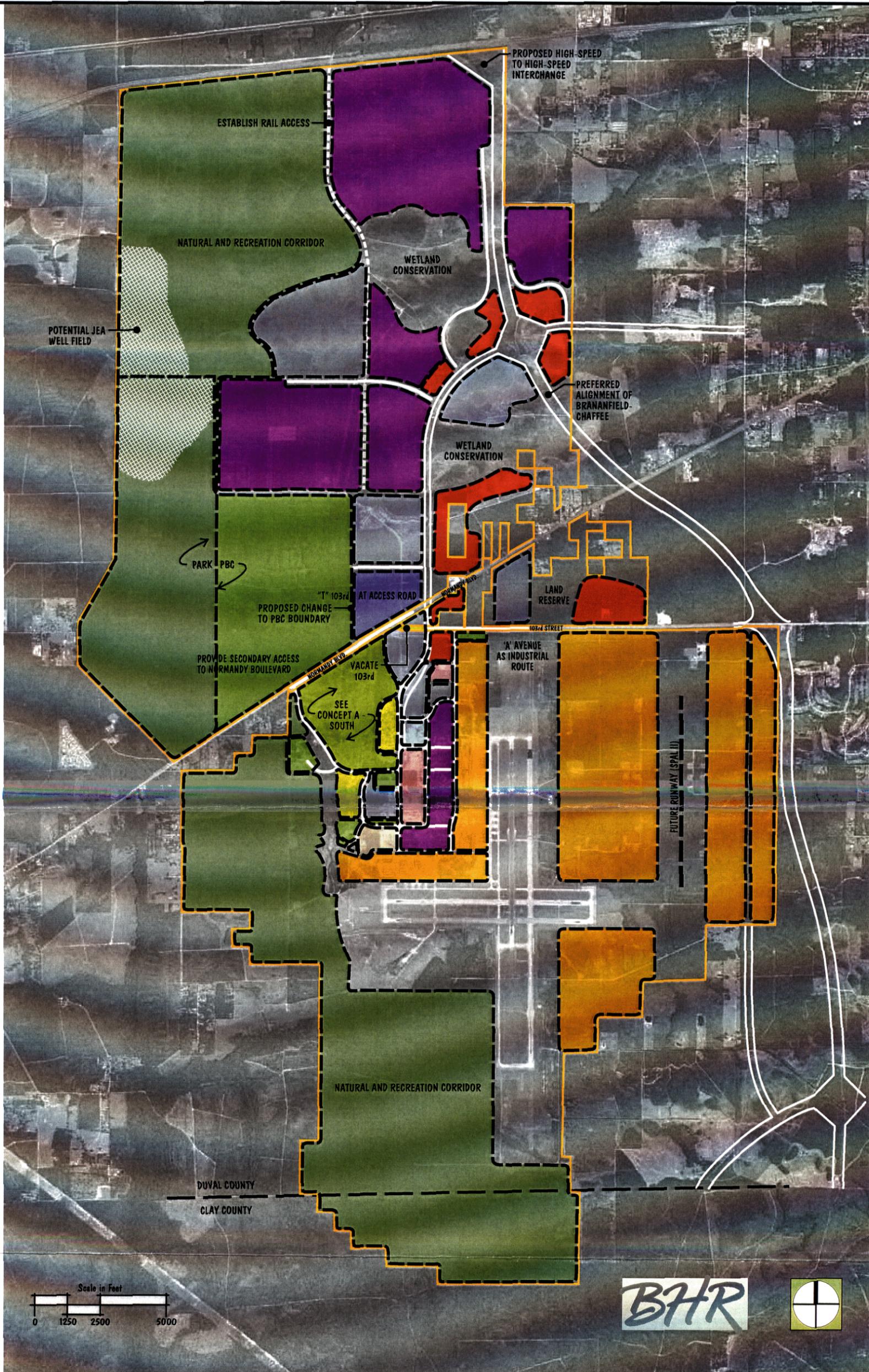
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CHECKED BY RD	DATE ---
COST/SCHEDULE-AREA 	
SCALE AS NOTED	



GENERAL LOCATION MAP  
FIVE-YEAR REVIEW  
NAVAL AIR STATION CECIL FIELD  
JACKSONVILLE, FLORIDA

CONTRACT NUMBER 7898	
APPROVED BY ---	DATE ---
APPROVED BY ---	DATE ---
DRAWING NO. FIGURE 1-1	REV 0

P:\G191CECIL\byr\_rev\aw.apr 10August99 MJJ Figure 1-1



**JEDC**  
**Cecil Field Redevelopment**

Figure 3-1  
**Proposed Land Use**

**LEGEND**

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

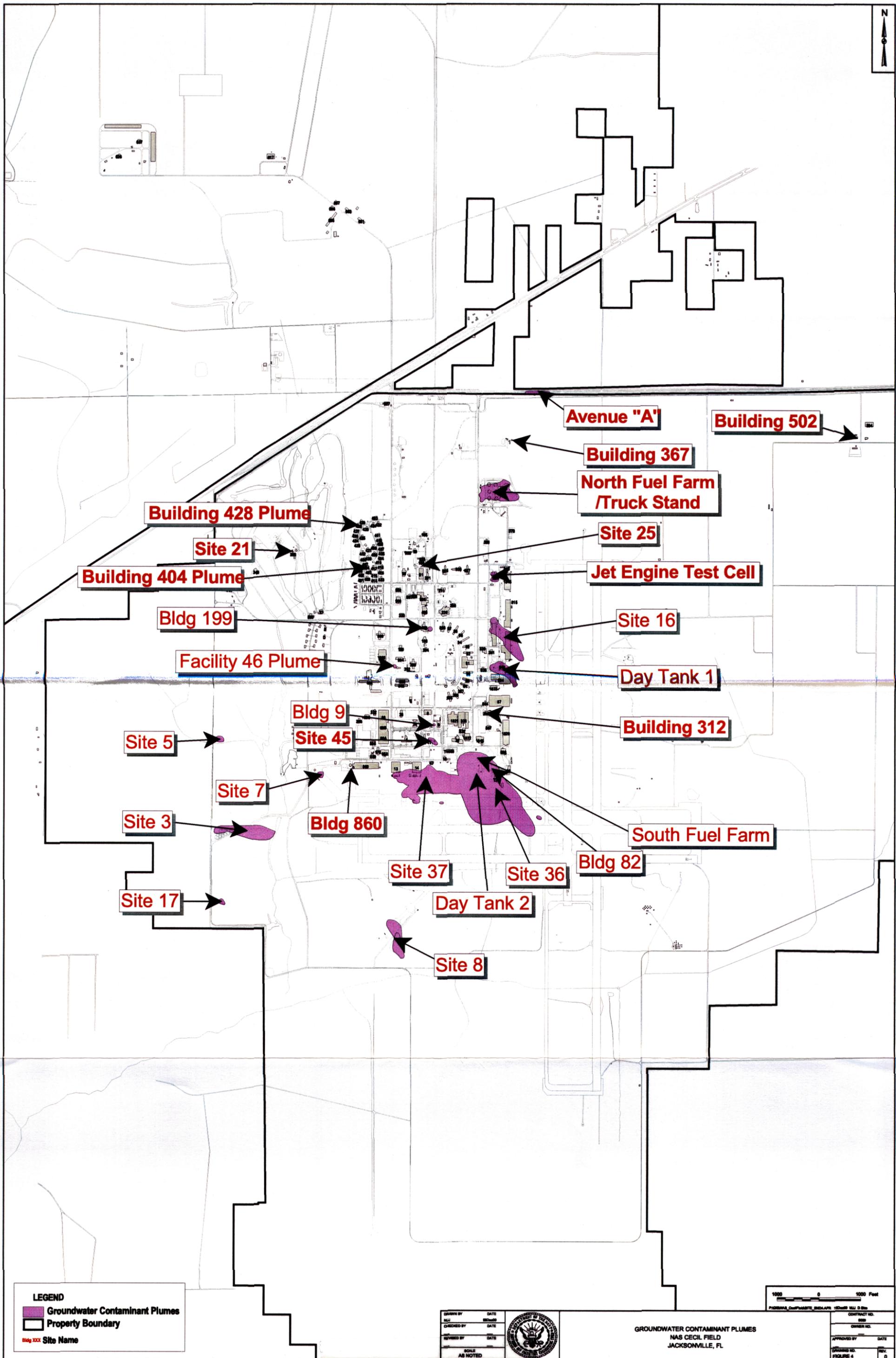
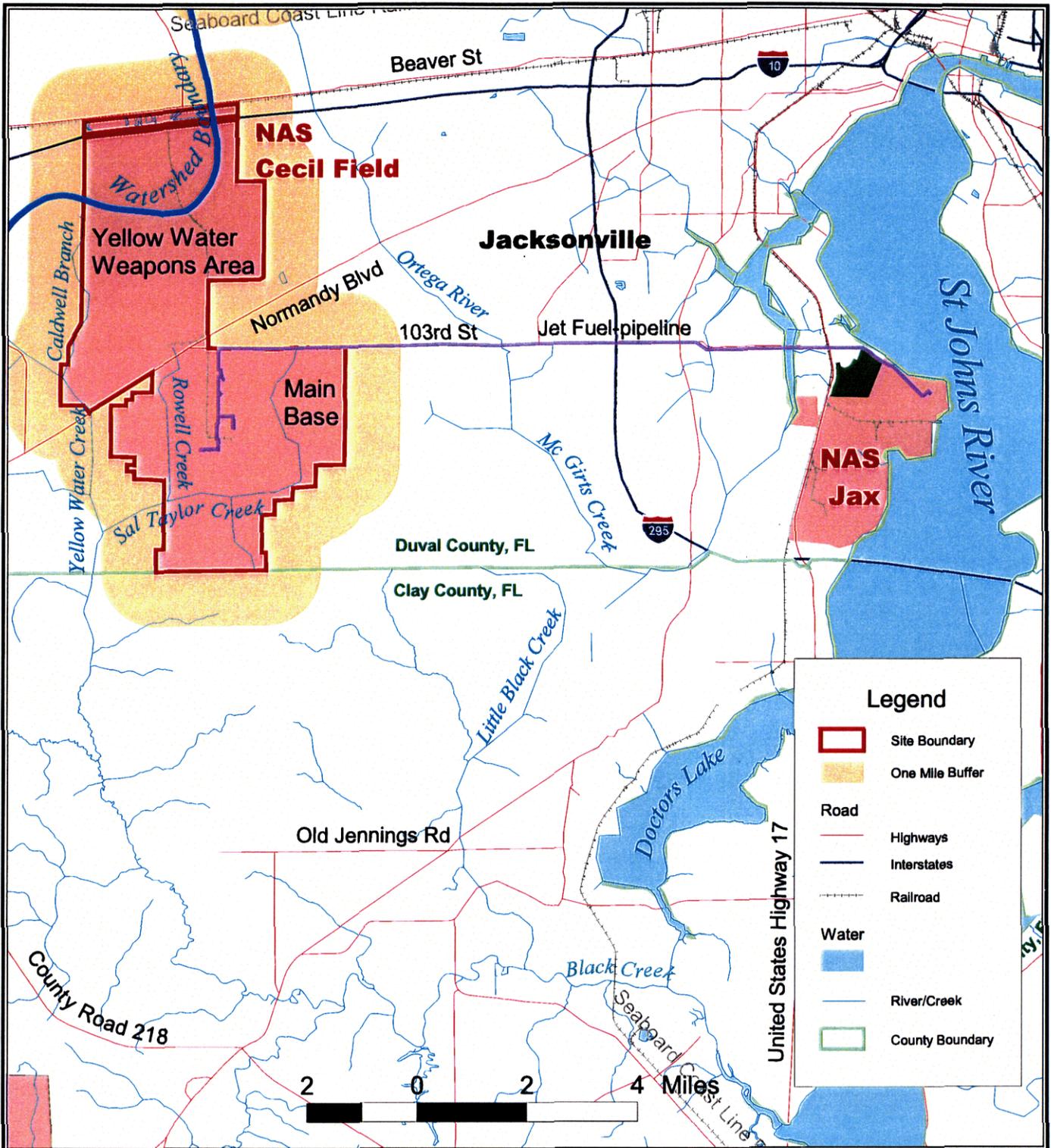


FIGURE 4



**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

JVA0822000



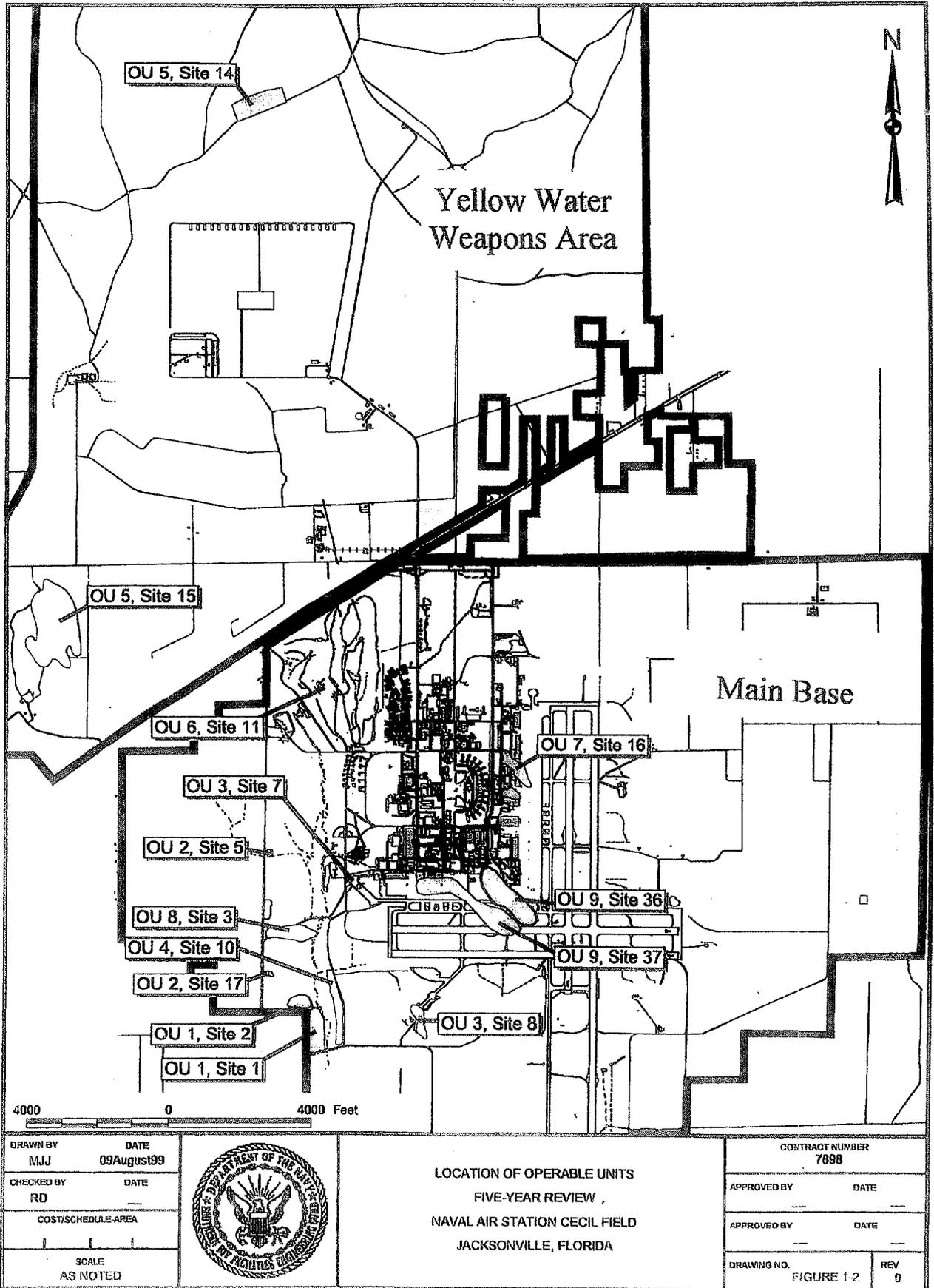
Site Location

Duval County, Florida



**Figure 5**

Figure 6



P:\GIS\CECIL\5yr\_mv\aw\_epr\_18August99 MJJ Figure 1-2

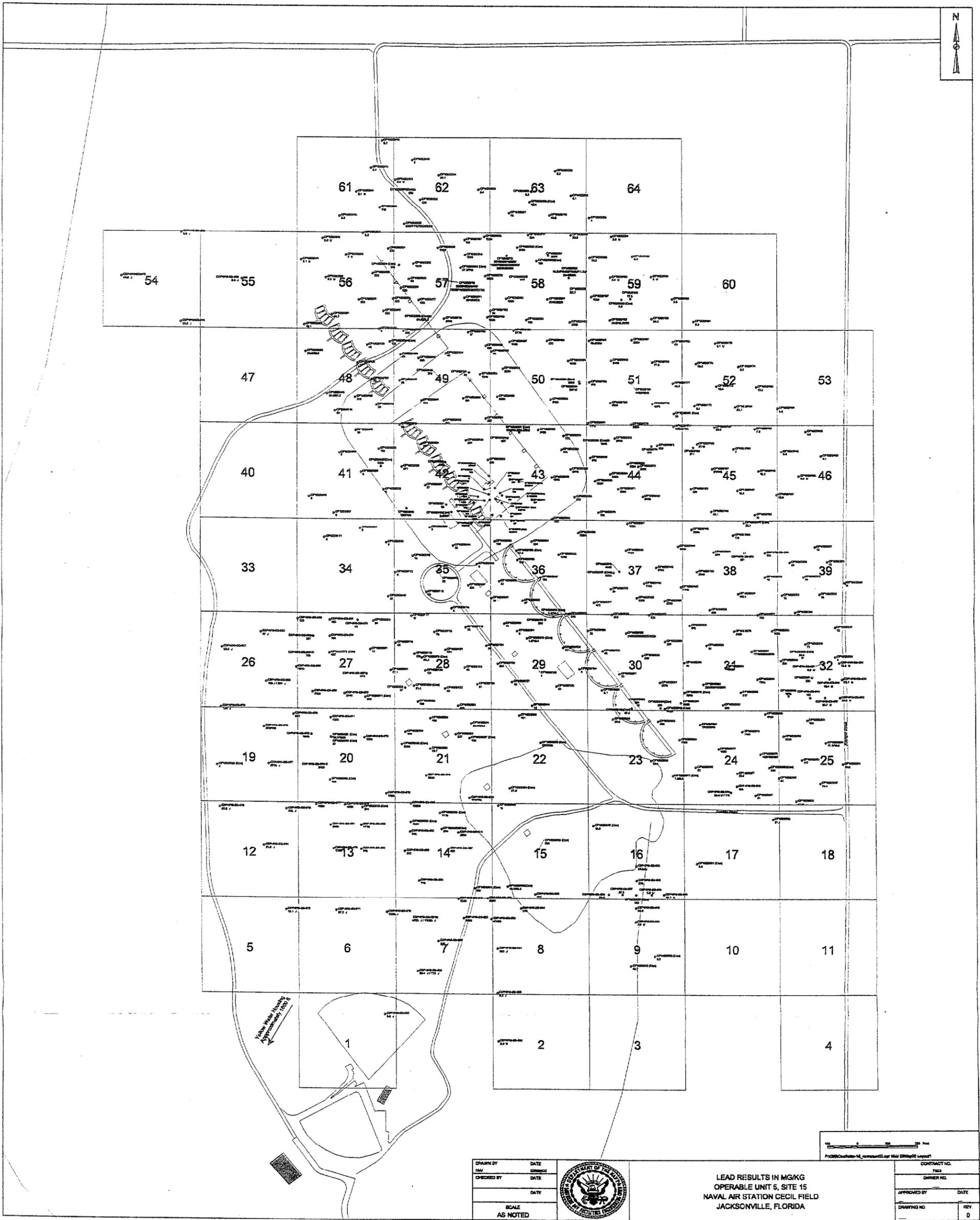
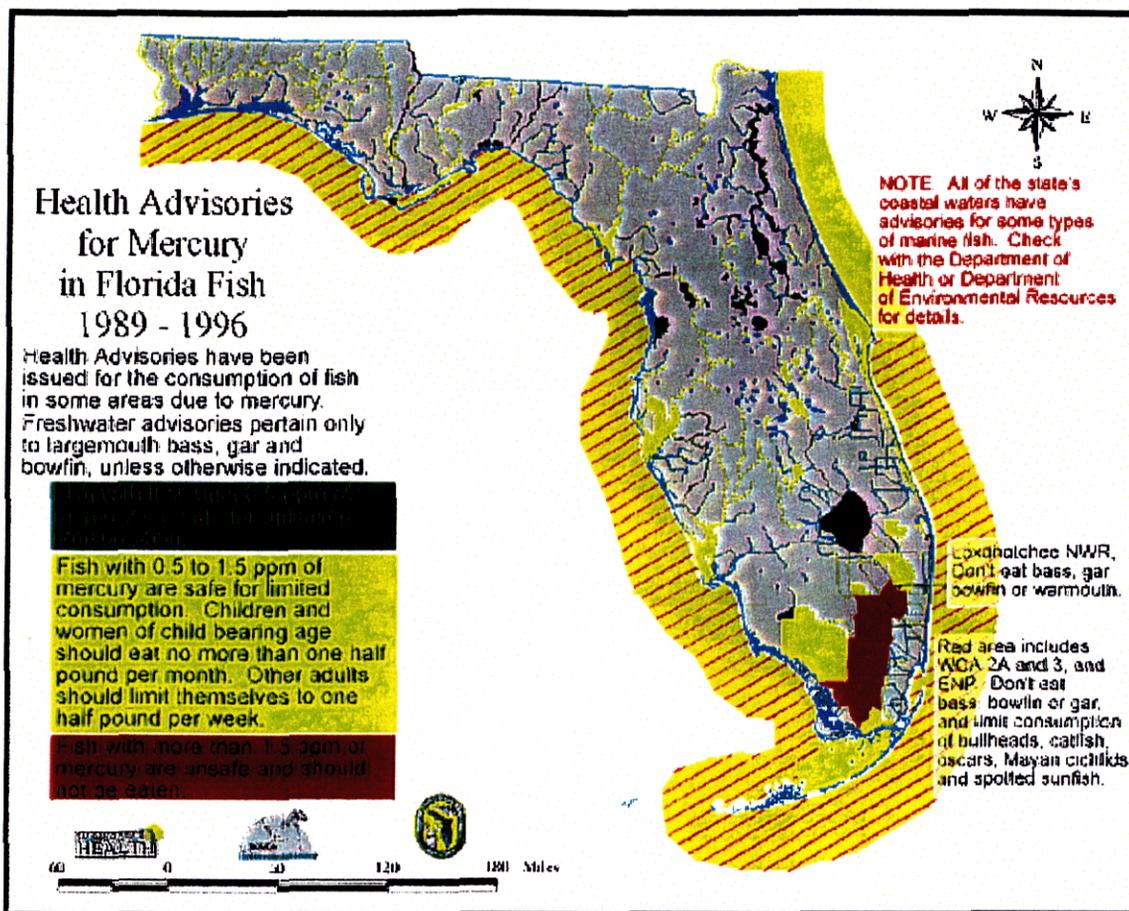


FIGURE 7



Florida Fish and Wildlife Conservation Commission

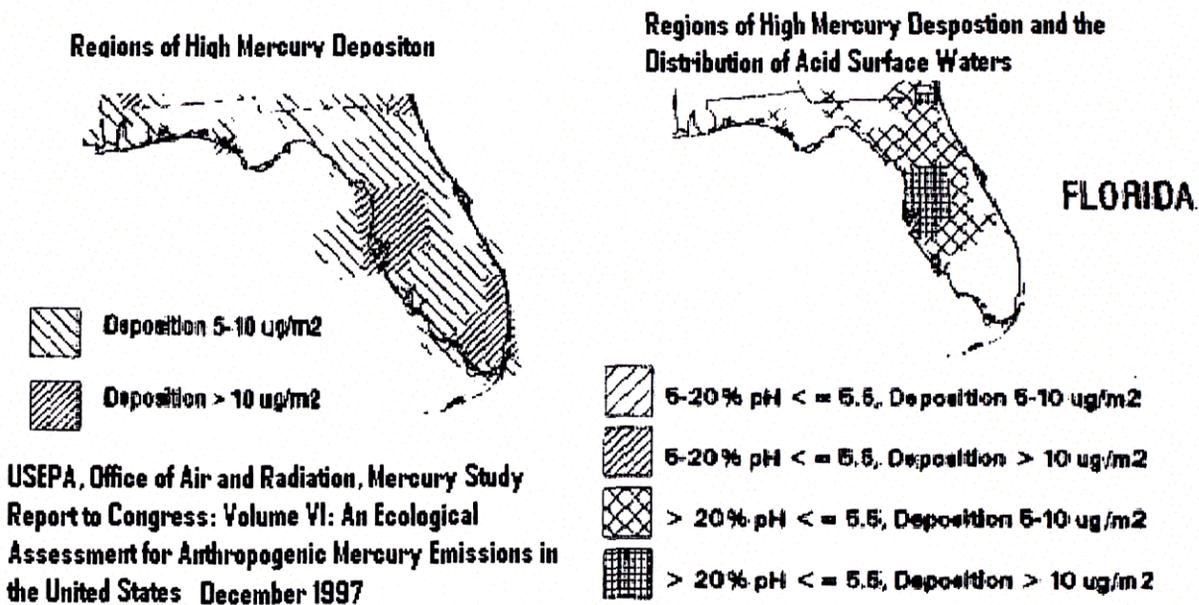
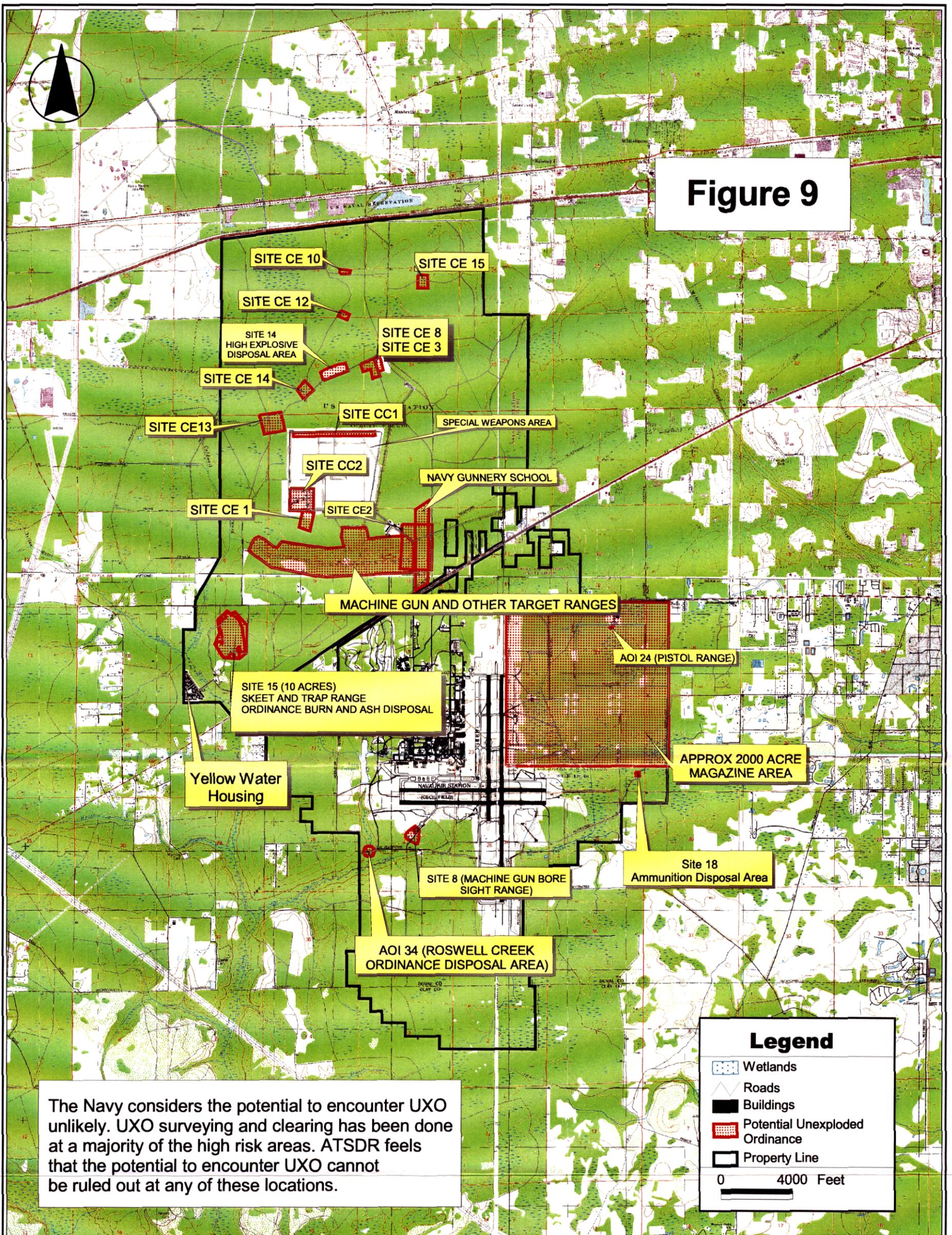


FIGURE 8

PHA SB2Y



**Figure 9**

**Legend**

- Wetlands
- Roads
- Buildings
- Potential Unexploded Ordnance
- Property Line

0 4000 Feet

The Navy considers the potential to encounter UXO unlikely. UXO surveying and clearing has been done at a majority of the high risk areas. ATSDR feels that the potential to encounter UXO cannot be ruled out at any of these locations.

# 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 verification by the US Navy. All coordinates were not provided.

\*Four man-made lakes not shown on map

# Cecil Field Naval Air Station

Jacksonville, Florida

CERCLIS No. FL5170022474

# INTRO MAP

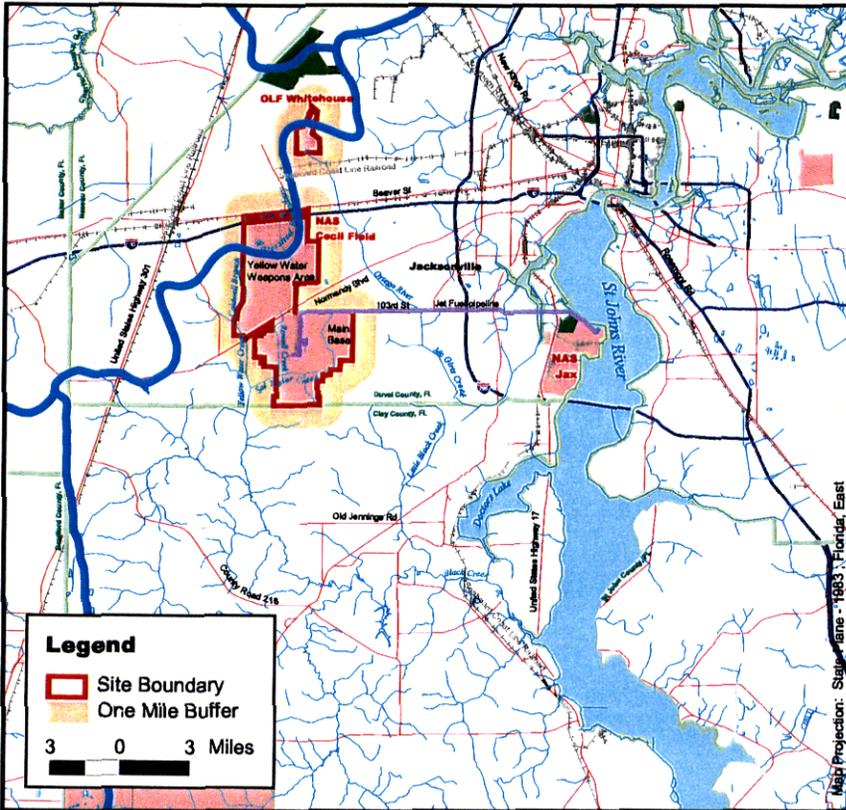


## Duval County, Florida

### Demographic Statistics Within One Mile of Site\*

Total Population	6344
White	5344
Black	759
American Indian, Eskimo, Aleut	29
Asian or Pacific Islander	81
Other Race	135
Hispanic Origin	284
Children Aged 6 and Younger	845
Adults Aged 65 and Older	178
Females Aged 15 - 44	1230
Total Housing Units	1582

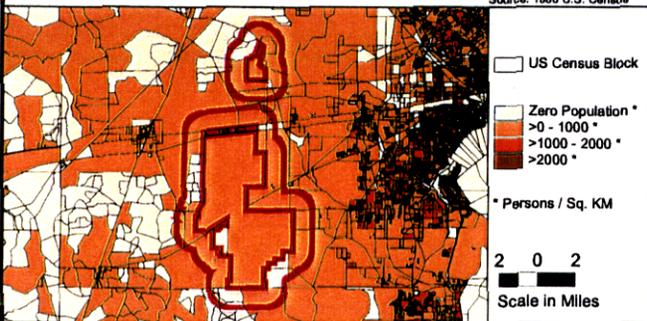
Demographics Statistics Source: 1990 US Census  
\*Calculated using an area-proportion spatial analysis technique



Base Map Source: 1995 TIGER/Line Files

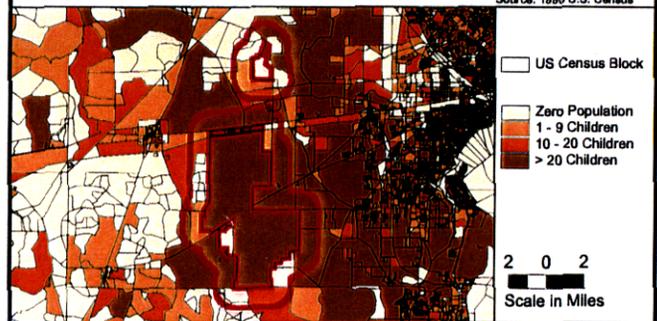
### Population Density

Source: 1990 U.S. Census



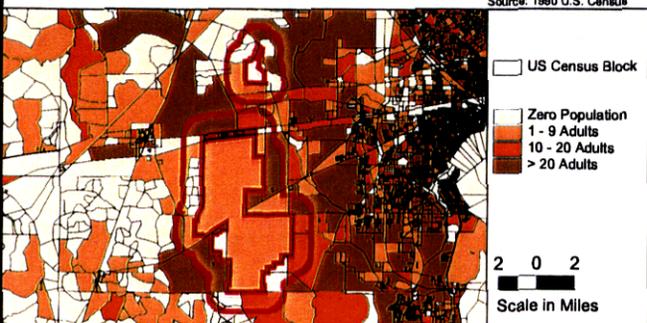
### Children 6 Years and Younger

Source: 1990 U.S. Census



### Adults 65 Years and Older

Source: 1990 U.S. Census



### Females Aged 15 - 44

Source: 1990 U.S. Census

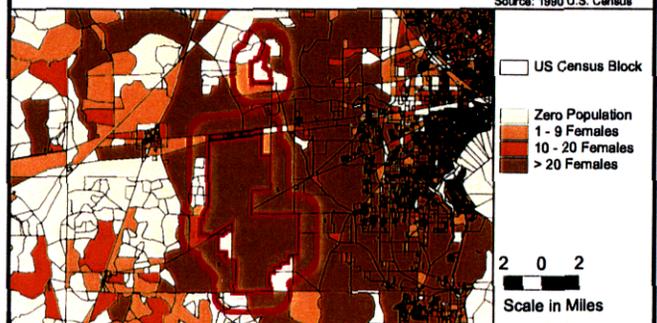


Figure 10