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EPA Superfund
Record of Decision:

Langley Air Force Base/
NASA Langley Center OU 50
Hampton, VA
9/27/1999

RECORD OF DECISION

LANGLEY AIR FORCE BASE

OPERABLE UNIT 50

August 1999

RECORD OF DECISION
LANGLEY AIR FORCE BASE
OPERABLE UNIT 50 (Site-61)

DECLARATION

SITE NAME AND LOCATION

Langley Air Force Base
Operable Unit 50 (Installation Restoration Program [IRP] Site 61)
Hampton, Virginia

STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) presents the selected remedial action for IRP Site 61, designated Operable Unit (OU)-50, at Langley Air Force Base in Hampton, Virginia (the "Site"), chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended, 42 U.S.C. 9601 *et seq.* and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations Part 300. This decision is based on the Administrative Record for this OU.

The Virginia Department of Environmental Quality concurs with the selected remedy.

DESCRIPTION OF THE SELECTED REMEDY

OU-50 is part of a comprehensive environmental investigation and cleanup currently being performed at Langley AFB under the CERCLA program. This ROD addresses only OU-50; the other OUs located at Langley AFB are being investigated separately under its installation restoration program and either have been or will be addressed in other RODs. Also, this ROD identifies the final action for soils and an interim action for ground water at the OU. Ground water will be addressed in a final action on an installation-wide basis as a separate OU.

This action addresses the principle threat at the OU by imposing land use restrictions that will prevent any non-industrial activities from taking place at this location. In addition, the interim ground water action will prevent any use, other than monitoring, of the ground water at the OU.

The selected remedy is the implementation of institutional controls and monitoring and includes:

1) Land use restrictions to prevent non-industrial use of the property , with the exception of the non-residential waterfront development plans as discussed in Section VI of this ROD and to maintain the integrity of the current asphalt parking lot;
2) Ground water use restrictions to prohibit use of the ground water for purposes other than monitoring;
3) Within 90 days of ROD signature, the Air Force shall produce a survey plat prepared by a professional land surveyor registered by the Commonwealth of Virginia indicating the location and dimensions of OU-50 and the extent of soil and ground water contamination;
4) The Air Force shall supply a copy of the plat and ensure the incorporation of these restrictions into any real property documents necessary for transferring ownership from the United States, in the unlikely event that the United States sells or transfers the property. The real property document would also include a discussion of the National Priorities List (NPL) status of this Site, as well as a description of the soil and ground water contamination. The Air Force shall submit the survey plat to the City of Hampton recording authority for the limited purpose of providing public notice of the environmental conditions of and limitations on the use of the property. No property right or interest is intended to be nor shall be created by such notice. In addition, the Air Force shall enter a note, in the local land recording office, to the real property document evidencing U.S. ownership of the property on which the OU is located that shall notify interested parties that the site was previously used to manage paint shop substances and waste;
5) Ground water monitoring to ensure contaminated ground water is not impacting the Back River. Specifics of the monitoring program will be developed by the Air Force, the United States Environmental Protection Agency and the Virginia Department of Environmental Quality and presented in a monitoring plan.

DECLARATION OF STATUTORY DETERMINATIONS

The selected final remedy with regard to soils is protective of human health and the environment, complies with Federal and state requirements that are legally applicable or relevant and appropriate requirements (ARARs) to the remedial action and is cost-effective. The soils remedy utilizes permanent solutions and alternative treatment (or resource recovery) technology to the extent practicable for OU-50. With respect to groundwater contamination, the interim measure is protective of human health and the environment and is cost-effective. Because this is an interim measure, ARARs are waived and will be addressed under the final measures presented in the future groundwater ROD. This portion of the action is interim and is not intended to utilize permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable. Because this portion of the action does not constitute a final

remedy for the ground water, the statutory preference for remedies that employ treatment that reduces toxicity, mobility or volume as a principal element will be addressed by the final ground water response.

Because this remedy may result in hazardous substances remaining on-site above health-based levels, a review will be conducted within 5 years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

This 5-year review will also include an evaluation of the status of the ground water remedy to determine if deed restrictions related to groundwater can be removed when ground water response actions are completed.

THOMAS J. KECK
Lieutenant General, USAF
Vice Commander

16 Sep 99
Date

ABRAHAM FERDAS
Director
Hazardous Site Cleanup Division

9/27/99
Date

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APPENDIX C

Glossary

List of Acronyms

AFB	Air Force Base
ARAR	applicable, relevant and appropriate requirements
bgs	below ground surface
CE	Civil Engineering
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPC	chemical(s) of potential concern
°F	degrees Fahrenheit
DOD	U.S. Department of Defense
EEQ	environmental effects quotient
EPA	U.S. Environmental Protection Agency
GMF	granular media filtration
HI	hazard index
IRP	Installation Restoration Program
IT	IT Corporation
LUC	Land Use Control
LUCIP	Land Use Control Implementation Plan
MOALUC	Memorandum of Agreement on Land Use Control
msl	mean sea level
MWR	Morale, Welfare, and Recreation
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O & M	Operations and Maintenance
OU	Operable Unit
PCB	polychlorinated biphenyl
ppm	part(s) per million
RAGS	Risk Assessment Guidance for Superfund
RBC	risk-based concentration
RI	remedial investigation
ROD	Record of Decision
RME	Reasonable Maximum Exposure
TMV	toxicity, mobility and/or volume
UST	Underground Storage Tank

Versar	Versar, Inc.
VDEQ	Virginia Department of Environmental Quality

RECORD OF DECISION

LANGLEY AIR FORCE BASE

OPERABLE UNIT 50 (Site-61)

DECISION SUMMARY

I. Site Name, Location, and Description

Langley Air Force Base (LAFB) is an active U.S. Department of Defense (DOD) installation located approximately 180 miles south of Washington, DC, and is part of the Norfolk metropolitan area (Figure 1). The Base sits on a peninsula bounded by the northwest and southwest branches of the Back River (Figure 2), which is a tributary of the Chesapeake Bay. In addition to the 3,152-acre Base installation, Langley AFB supports the 284-acre Bethel Manor Off-Base Housing Area. Langley AFB was proposed to be included on the National Priorities List (NPL) in 1993 and finalized in 1994. This list includes sites where uncontrolled hazardous substance releases may potentially present serious threats to human health and the environment. Operable Unit 50 (OU-50) was one of the Installation Restoration Program (IRP) sites investigated under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) at Langley AFB and was initially designated IRP Site 61.

OU-50 is located in the southeastern portion of LAFB and is situated on the Southwest Branch of the Back River. As shown in Figure 3, the 2-acre OU is bordered by the Base Marina to the south, buildings to the west and northwest, staff/marina parking to the north and northeast, and the Back River to the east. Current land use at OU-50 is categorized as industrial and is expected to remain industrial in the future.

OU-50 consists of two areas of concern:

- The former Civil Engineering (CE) Paint Shop includes Building 615 and a fenced-in gravel area that had been used for the storage of paint thinner and paint, the mixing of paints, and the cleaning of painting equipment. The CE Paint Shop was in operation from the 1950's to early 1991. The OU is now occupied by Morale, Welfare and Recreation (MWR) for the administration of the Base Marina.

- To the east of the CE Paint Shop is an area where a 2,000 underground storage tank (UST) was removed in 1993. The UST contained unleaded gasoline and was used for fueling boats at the Base Marina.

II. Site History

This section describes the history of OU-50 and regulatory activities conducted to date.

A. OU History

OU-50 was originally identified in June 1992 when, during a discovery inspection for the Morale, Welfare, and Recreation (MWR) office, indications of soil contamination from paints and solvents was uncovered. An area that contained discharge residue from a water-jacketed paint spray booth was also discovered. Evidence of stained soil was visible at the OU. An UST at the marina adjacent to OU-50 leaked gasoline that was suspected to have spread into the area of the site. The UST and some of the surrounding soil was excavated in early 1993.

During the removal of the marina UST, fill material was encountered, including creosote-treated pilings, paint containers, and other refuse. Due to the discovery of this material, the OU was expanded to include buried waste as well as the UST. Analysis of ground water samples obtained from five monitoring wells installed during UST site characterization revealed the presence of petroleum hydrocarbons.

B. CERCLA Investigations

Under CERCLA, a remedial investigation (RI) was conducted from 1995 through 1998. This investigation was performed to characterize the nature, magnitude and extent of contamination at OU-50, determine what risks to human health and the environment existed at OU-50, and determine if further action was necessary for OU-50. Results of the RI are discussed in section V(B).

III. Highlights of Community Participation

In accordance with Sections 113 and 117 of CERCLA, 42 U.S.C. Sections 9613 and 9617, Langley AFB, in conjunction with the EPA and the Virginia Department of Environmental Equality (VDEQ), issued a proposed plan on November 30, 1998, presenting the preferred remedial alternative for OU-50. The Proposed Plan and supporting documentation were made

available for review at that time and are among the documents that comprise the CERCLA Administrative Record for the Site.

The Administrative Record is available for review by the public at the following information repositories:

- Hampton Public Library
  4207 Victoria Boulevard
  Hampton, Virginia 23669
  (757) 727-1154

- Langley AFB
  Contact: Mr. Vern Bartels
  1CES/CEVR
  37 Sweeney Boulevard
  Building Number 328
  Langley AFB, Virginia 23665-2107.
  (757) 764-1046

An announcement of an availability session, the comment period, and the availability of the Administrative Record for the remedy for OU-50 was published in the *Daily Press,* a newspaper of general circulation in Hampton, VA, on November 29, 1998.

The public comment period for the Proposed Plan was from November 30, 1998 to December 29, 1998. A public availability session was held at the Virginia Air and Space Center in Hampton, Virginia on December 3, 1998 to inform the public of the remedial alternatives and to seek public comments. At this meeting, representatives from EPA, VDEQ, and the Air Force were available to answer questions about conditions at the OU and the remedial alternative under consideration. Responses to the comments received during this period are included in the Responsiveness Summary section of this Record of Decision (ROD).

This ROD presents the selected remedial action for OU-50 determined in accordance with CERCLA, and to the extent practicable, the NCP. All documents considered or relied upon in reaching the remedy selection decision contained in this ROD are included in the Administrative Record for the Site and can be reviewed at the information repositories.

IV. Scope and Role of Operable Unit

Langley AFB was proposed to be included on the NPL in 1993 and finalized in 1994. The NPL includes Sites where uncontrolled hazardous substance releases may potentially present serious threats to human health and the environment. Discrete portions of an NPL site are often managed more effectively as Operable Units. OU-50 is one of the IRP OUs currently being investigated under CERCLA at Langley AFB. This ROD addresses OU-50, which is the IRP Site 61 soil and ground water. The remaining OUs at Langley AFB are currently being independently investigated under CERCLA (Table 1).

V. Summary of OU Characteristics and Extent of Contamination

Summarized below are the relevant findings of the work to date with regard to contaminated media (soil, ground water, surface water and sediment) located within the boundaries of the OU.

A. OU Characteristics

1. Geology

The OU lies within the Atlantic Coastal Plain physiographic province. Ground surface at Langley AFB is predominantly flat lying, with most of the Base lying between 5 and 8 feet above mean sea level (msl). Drainage in the region is poor, with numerous saltwater and freshwater marshes located along the major streams flowing into the Chesapeake Bay. OU-50 is on the Southwest Branch of the Back River.

The geology of the area around Langley AFB consists of a thin layer of topsoil overlying fill materials of varying thickness placed in developed areas and unconsolidated coastal plain sediments.[1] Topsoil is primarily sandy, silty clays or silty, clayey sands deposited within the flood plains during periods of higher sea level stands or deposited in an estuarine or lagoonal environment. Fill material includes gravel, rubble, and construction debris, and is similar to native materials. The coastal plain sediments were deposited when the area was a submerged near-shore marine environment.

2. Hydrogeology

Three major ground water-bearing zones lie beneath Langley AFB. These include the Shallow Water Table Aquifer between 5 and 100 feet bgs, the Upper Artesian Aquifer between 100 and 400 feet bgs, and the Principal Artesian Aquifer between 400 and 700 feet bgs. Recently measured ground water elevations at OU-50 ranged from 2.2 to 4.3 feet above msl. Even though the ground water in the vicinity of Langley AFB, including OU-50, is not used as a source of drinking water, individual homeowners have ground water wells that have been used for watering lawns and washing cars. However, the Shallow Water Table Aquifer provides an important source of drinking water farther to the west in King Williams, Charles City, New Kent, James City, and York Counties. In Newport News and Hampton, there are areas where domestic ground water is obtained from wells that range from 50 to 100 feet in depth. These wells are probably completed in the Shallow Water Table Aquifer, which ranges from 5 to 100 feet below land surface.[2] Ground water in the shallow water table aquifer beneath the Base is not used as a source of drinking water due to high dissolved solids levels and low aquifer yield. Ground water flow in this aquifer is slow and flow direction is towards surface water bodies, including the Back River and its tributaries.

3. Meteorology

Langley AFB has a modified continental-type climate with mild winters.[1] During both winter and summer, temperatures are fairly moderate, with winter temperatures ranging from 40 to 70 degrees Fahrenheit (°F), and summer temperatures ranging from lows of 70°F to highs of mid-80s °F. Relative humidity varies between 67 and 76 percent, depending on the month. Prevailing wind direction is from the north during winter and from the south-southwest during the rest of the year. Precipitation ranges from 24 to 57 inches per year, and is evenly distributed throughout the year. Maximum precipitation is in July and August, with minimums in November and April. Average seasonal snowfall in the area is less than 10 inches per year.

4. Ecology

OU-50 lacks vegetation and is composed of structures, pavement, gravel and concrete slabs.

5. Soils

Soil at OU-50 has generally been paved with 90 percent of the ground surface covered by either asphalt or Building 615. OU-50 is known to be partially underlain by "made land", or fill materials of unknown origin.

B. Nature and Extent of Contamination

In June of 1998 a Remedial Investigation (RI) was completed for OU-50. The following is a summary of the RI.[5]

Ground Water

- As a result of activities at OU-50, a plume of benzene in ground water is present. The plume size is limited in lateral extent, has decreased in size over time, is centered at monitoring well SS61-MW2, and has not migrated beyond the boundaries of the OU.
- Arsenic levels exceed the USEPA Region III tap water risk-based concentration (RBC). The highest concentrations of this inorganic chemical were observed in the northeastern portion of OU-50 (see Table 2, Appendix A).
- Other contaminants detected in ground water at OU-50 above USEPA tap water RBCs or pertinent regulatory levels include volatile organic compounds (acetone, carbon disulfide, chloroform, chloromethane, ethylbenzene and toluene); semi-volatile organic compounds (carbazole and naphthalene, the pesticide dieldrin, PCB-1260); and metals (barium, iron, manganese and thallium) (see Table 2, Appendix A).

Soils

- Benzo(a)pyrene, a semi-volatile organic compound, was detected in surface soils across OU-50. Concentrations in four samples exceeded USEPA's industrial RBC. The widespread presence of this compound may be attributed to the non-native materials and dredge spoils used to fill OU-50 (see Table 3, Appendix A).
- Arsenic was detected in 18 soil samples, 15 of which exceeded USEPA's industrial RBC. In general, concentrations increased east to west across OU-50, and concentrations were generally greater in the subsurface soils than in the surface soils (see Table 3, Appendix A).

- PCB-1260 was detected in surface and subsurface soils in the eastern half of OU-50. Only the easternmost samples exceeded USEPA's industrial RBCs (see Table 3, Appendix A). The limited occurrence of PCB in soils may be related to the presence of non-native fill materials or the result of historical activities at adjacent OU-48 (Site OT-55).
- Lead was detected in all 18 soil samples collected, but only two exceeded USEPA's residential screening level (there is no current industrial screening level for lead) (see Table 3, Appendix A).

Surface Water and Sediment

- Estimated surface water and sediment concentrations for those contaminants of concern detected in the ground water do not pose a risk to aquatic receptors.

Contaminant Fate and Transport

OU-50 is located adjacent to the Base Marina, which represents an active potential source for contamination of sediments and surface water. Therefore, modeling techniques, rather than sampling, were used to evaluate the potential impacts associated with the discharge of contaminated ground water from OU-50 to the Back River. Based on the results of the model results, no impacts to surface water/sediment are likely to be associated with ground water discharge from OU-50.

VI. Current and Potential Future OU and Resource Uses

Current land use at OU-50 is classified as industrial and future land use is expected to remain industrial with the exception of incorporating the waterfront development plans. Details of the Waterfront Development Plans follow.

Waterfront Development Plans

A 10 year shoreline restoration plan has been created to guide the wetlands and shoreline stabilization projects for a mile of shoreline on LAFB between the marina and the end of the mile long building. For the area immediately to the east of the existing marina which includes

OU-50 (Figure 4), the design has called for the following:

- Shoreline Stabilization Improvements
  - Recycling and resizing existing miss-sized hardscape materials
  - Removal of unsuitable materials
  - Proper installation of Filter Cloth
  - Reshaping of shore and installation of Class I rip rap
  - Planting of wetland fringe marsh

- Planting Riparian Forest Buffer
  - Native shrub and tree plantings between shoreline stabilization and parking lot
  - Buffer acts as filtration feature

- Improvement of Pedestrian linkages along the waterfront
  - Pedestrian pathway winds through the native plantings
  - Paving will be pervious paver material or paver block material

- Improving Parking
  - Resurface, restripe and efficiently align parking spaces as shown on the waterfront plans to accommodate additional parking spaces
  - Area along the bulkhead at the gas pumps will remain covered with hardscape material to ensure the exposure pathway from the surface of the hardscape material to the soils beneath remains incomplete

- Fish Cleaning Station
  - Existing station will be replaced with new fish cleaning equipment

There are currently no restrictions regarding use at OU-50, such as fences and signs. Land adjacent to OU-50 is currently industrial, recreational and commercial. Future adjacent land use is expected to remain the same.

Ground water in the shallow water table aquifer at Langley AFB is not currently used as a source of drinking water at or within ½ mile of the Base.[3] Ground water near the coast is brackish to saline, and therefore not potable.

VII. Summary of OU Risks

A risk assessment was conducted during the RI in accordance with the latest EPA policy on risk assessments.[6] The results are summarized below.[5]

A. Human Health Risk Assessment

The baseline risk assessment provides the basis for taking action and indicates the exposure pathways that need to be addressed by this remedial action. It serves as the baseline indicating what risks could exist if no action was taken at OU-50. This section of the ROD reports the results of the baseline risk assessment conducted for this OU.

Health risks are based on a conservative estimate of the potential carcinogenic risk or the potential to cause other health effects not related to cancer. Carcinogenic risks and noncarcinogenic risks were evaluated. Three factors were considered:

- Nature and extent of contaminants at OU-50
- Pathways through which human and ecological receptors are or may be exposed to those contaminants at OU-50
- Potential toxic effects of those contaminants.

For this OU, the human health risk assessment was based on exposure to soil under industrial land use scenarios and exposure to groundwater under the potential future residential receptor as a conservative estimate in the unlikely event that OU-50 might be developed for residential use. The industrial land use was assumed to be exposure through construction activities limited to ten days a year. Exposure would result from construction activities that require exposure to soils beneath the current asphalt cover. Surface water and sediment exposure as a result of marina activities was considered in a qualitative manner.

Cancer risks are expressed as numbers reflecting the increased chance that a person will develop cancer, if he/she is directly exposed (i.e., through working at the OU) to the contaminants found in the ground water and soil at the OU over a period of time. For example, EPA's acceptable risk range for Superfund OUs is 1×10^{-4} to 1×10^{-6}, meaning there is one additional chance in ten thousand (1×10^{-4}) to one additional chance in one million (1×10^{-6}) that a person will develop

cancer if exposed to contaminants at a Superfund OU. The risk associated with developing other health effects is expressed as a hazard index (HI), which is the ratio of the existing level of exposure to contaminants at a OU to an acceptable level of exposure. Below an HI of 1, adverse effects are not expected.

The human health risk assessment evaluated the results of:

- Direct contact with the contaminated soil
- Incidental ingestion of contaminated soil
- Inhalation of fugitive dust
- Ingestion of contaminated ground water
- Inhalation of vapor phase chemicals via ground water use
- Dermal contact with contaminated ground water

Concentrations of chemicals detected in the soil, ground water, sediment and surface water during the focused RI were compared to risk-based screening levels and background levels. The chemicals of potential concern (COPC) identified in soil at OU-50 were metals (arsenic) and volatile and semi-volatile organic (benzo(a)pyrene) compounds and PCB-1260. COPCs identified in groundwater were acetone, arsenic, barium, benzene, carbazole, carbon disulfide, chloroform, chloromethane, dieldrin, ethylbenzene, iron, manganese, napthalene, PCB-1260, toluene and thallium. The COPCs for soil and groundwater were then evaluated in the human health risk assessment. Estimated sediment and surface water concentrations were compared to RBCs. No exceedences were identified, concluding that a risk assessment for exposure to these media was unnecessary.

Health risk levels, determined using EPA guidance to ensure that conservative estimates of potential health effects are determined, differ depending on the assumed land use because human exposures differ with land use. A conservative estimate of risk was developed incorporating the potential exposure pathways including direct skin contact with contaminated soil and ground water, accidental ingestion of soil and ground water, and inhalation of contaminated soil particles and ground water. Plausible receptors that may be exposed to soil at the OU and which were evaluated in the risk assessment included a construction worker, and future adult and child resident (ground water only).

The lifetime cancer risk from exposure to contaminated soil for the construction worker at OU-50 is calculated as 4.3×10^{-6}. This lifetime risk is within the EPA's acceptable risk range of 1×10^{-6} to 1×10^{-4}. The HI for the non-carcinogenic risk due to exposure to contaminated soil for the construction worker was estimated to be 0.012, which is below the target level of 1.0.

For a theoretical future residential user, ground water use risk was determined to be 7×10^{-3}, which exceeds EPA's acceptable risk range. The calculated HI for the adult ground water consumer is 123 and for the child, 131, levels at which adverse health effects may occur.

B. Ecological Risk Assessment

OU-50 lacks vegetation and is composed of structures, pavement, gravel and concrete slabs. As a result, no complete exposure pathways for ecological receptors are associated with OU-50 soils, and potential ecological risks associated with exposure to soil constituents were not quantified.

The only potential exposure pathway to which ecological receptors could be exposed is the discharge of ground water to the Back River. Potential risks to ecological receptors were quantified for this pathway through the development of environmental effects quotients (EEQs). EEQs for ecological risk are similar to the hazard indices prepared for human health risk. They are determined by dividing the site-specific concentrations by a conservative screening level.

The results of the EEQ calculations indicated that none of the constituents for which surface water and sediment concentrations were estimated had calculated EEQs greater than 1. These results indicate that estimated surface water and sediment concentrations in the Back River do not represent levels of concern from an ecological standpoint with respect to direct contact (i.e., ingestion via gills and ingestion of sediment).

C. Conclusions

The remedial objective for OU-50 is to protect human health and the environment. Because the current and anticipated future land use is non-residential, soils were evaluated only for construction worker exposure. As indicated, the risk posed to the construction worker is within EPA's acceptable risk range; however, actual or threatened releases from hazardous substances

may present an imminent and substantial endangerment to public health or welfare under a non-industrial scenario. In addition, the risk from ground water to the theoretical resident exceeds EPA's acceptable risk range. Ecological risk assessment determined that there is minimal risk to terrestrial receptors at OU-50. The specific remedial objectives for this operable unit, therefore, are to assure that non-industrial use of the property, with the exception of the non-industrial waterfront development plans outlined in Section VI, and to prevent access to ground water other than for monitoring purposes.

VIII. Description of Alternatives

The Feasibility Study for OU-50 presents five alternatives that address risks posed by contaminated ground water and soils. A summary of the remedial alternatives evaluated for OU-50 is presented below.

Alternative 1- No Action

The NCP requires that a "no action" alternative be considered to provide a baseline for comparison with action alternatives. Under this alternative, no remedial action would be undertaken to address contaminated soil and ground water at OU-50.

- Capital Cost: $0
- Operations and maintenance (O&M) cost: $0
- Net present worth: $0

Alternative 2 - Limited Action and Institutional Controls

This alternative includes institutional controls: land use restrictions to limit future uses of the OU and require permits, qualified supervision, and health and safety precautions for activities conducted on and near the OU. Because soils were evaluated for worker exposure (and not a residential receptor), the use of this property would be restricted to industrial use under this alternative. Ground water was not evaluated for construction worker exposure. These restrictions include: 1) land use restrictions to prevent non- industrial use of the property, with the exception of the non-residential waterfront development plans outlined in Section VI, and to maintain the integrity of the current asphalt parking lot; 2) ground water use restrictions to

prohibit the use of ground water for purposes other than monitoring; 3) within 90 days of ROD signature, the Air Force shall produce a survey plat prepared by a professional land surveyor registered by the Commonwealth of Virginia indicating the location and dimensions of OU-50 and the extent of soil and ground water contamination; and; 4) the Air Force shall incorporate these restrictions and supply a copy of the plat into any real property documents necessary for transferring ownership from the United States, in the unlikely event that the United States sells or transfers the property. The real property document would also include a discussion of the National Priorities List (NPL) status of this OU, as well as a description of the soil and ground water contamination. The Air Force shall submit the survey plat to the City of Hampton recording authority for the limited purpose of providing public notice of the environmental conditions of and limitations on the use of the property. No property right or interest is intended to be nor shall be created by such notice. In addition, the Air Force shall enter a note, in the local land recording office, to the real property document evidencing U.S. ownership of the property on which the OU is located that shall notify interested parties that the site was previously used to manage paint shop substances and waste.

In addition, public awareness training would be developed and implemented to keep potentially affected individuals aware of possible hazards at the OU. Planning for emergency procedures would also be developed to deal with accidental exposures or sudden risk increases in affected areas.

- Capital Cost: $27,000
- Operations and maintenance (O&M) cost: $14,000
- Net present worth: $242,000

Alternative 3 - Monitoring and Institutional Controls

This alternative contains all the provisions of Alternative 2, Limited Action and Institutional Controls, plus ground water monitoring at OU-50. Samples would be collected from monitoring wells and would be analyzed for the risk drivers and any other contaminants of concern or parameters deemed necessary.

The frequency and duration of sampling will be determined in a subsequent remedial design.

- Capital Cost: $27,000
- Operations and maintenance (O&M) cost: $24,000
- Net present worth: $396,000

Alternative 4 - Ground Water Extraction/GMF/Air Stripping/Discharge to Surface Water and Institutional Controls

This alternative includes ground water extraction through an extraction well or recovery trench system. Extracted ground water will pass through a granular media filtration (GMF) system to remove suspended solids. Filtered water will be treated in a low-profile air stripper to remove the volatile organic compounds. Treated ground water would be discharged to the Back River. Sludges resulting from the filtration system would be characterized and properly disposed. This alternative would also require future institutional controls. Ground water use restrictions would be implemented until completion of the remedy.

- Capital Cost: $325,000
- Operations and maintenance (O&M) cost: $71,200
- Net present worth: $1,419,200

Alternative 5 - Ground Water Extraction/Chemical Precipitation/Air Stripping/Discharge to Surface Water and Institutional Controls

This alternative is identical to Alternative 4, except that a chemical precipitation process (vertical sludge blanket clarifier) would be used to remove metals and suspended solids. Since chemicals must be added to the extracted ground water, a step would be added to the treatment process to mix the chemicals and ground water to form a slurry. This alternative would also require future institutional controls. Ground water use restrictions would be implemented until completion of the remedy.

- Capital Cost: $325,200
- Annual O&M Cost: $84,400
- Present Worth: $1,622,200

IX. Summary of Comparative Analysis of Alternatives

During the detailed evaluation of remedial alternatives, each alternative is assessed against the following nine evaluation criteria: overall protection of human health and the environment; compliance with applicable and relevant and appropriate requirements (ARARs); long-term effectiveness and permanence; reduction of toxicity, mobility and/or volume (TMV); short-term effectiveness; implementability; cost; state acceptance; and community acceptance.

A comparative analysis for the five alternatives based on these evaluation criteria is presented in the following sections.

A. Overall Protection of Human Health and the Environment

Under Alternative 1, no remedial action would be implemented. The current site conditions and property use present no risk to human health because ground water is not used and constituents in soils do not pose an unacceptable risk under the industrial use scenario. This alternative, however, is not protective of an unrestricted use scenario. Furthermore, since soils were evaluated only for industrial use scenarios, there may be potential risk under different types of scenarios. Under Alternatives 2 and 3, institutional controls would be implemented. The enforcement of the institutional controls, specifically the requirement for industrial use only and the prohibition of contact with, and consumption of, ground water would eliminate exposure pathways that could present significant risk to future users. The institutional controls would mitigate both the carcinogenic and non-carcinogenic risks described in Section VII. Alternatives 4 and 5 protect both human health and the environment through treatment of contaminated ground water thereby controlling the mobility of contaminants and reducing contaminant concentrations. Ground water use restrictions would be implemented until treatment of the ground water is complete. Also, institutional controls would prohibit use of the property for purposes other than industrial. These alternatives would be protective of human health and the environment under current and future use scenarios. No significant risk to terrestrial or aquatic life was identified for OU-50 due to both a lack of sustainable habitat and insignificant levels of bioaccumulating contaminants.

B. Compliance with ARARs

Since this ROD involves an interim measure with respect to ground water contamination, final remediation goals and hence, ARARs, are not identified here. This ROD, however, does present a final action for soils. The soils under all five alternatives would be in compliance with all ARARs. (Specific ARARs for the remedy in this case are identified in Section XI of this ROD).

C. Long-term Effectiveness and Permanence

Implementation of Alternative 1 could be effective and permanent in the long-term if considering soil alone because no significant contamination is present, assuming continued industrial use. However, in the long-term, individuals could be exposed to contamination through contact with ground water, and the property could be used for nonindustrial purposes, possibly increasing the risk to human health. Therefore, Alternative 1 does not meet the requirements for long-term effectiveness and permanence.

For Alternatives 2 and 3 The long-term effectiveness of the institutional controls will be contingent upon enforcement of the use restrictions by the Air Force through the Land Use Control Assurance Plan (LUCAP) as described in Section X. Implementation of Alternatives 2 and 3 would maintain the industrial use of OU-50 and reduce the risk the future risk of exposure to ground water by the development and enforcement of restrictions. Because these restrictions would become a permanent part of the real estate documentation, through the submittal of the survey plat as described in Section X, and because the restrictions would be required to be included in any sales, transfers and/or lease agreements, this alternative would be a long-term and permanent remedial action.

In addition to land use and ground water use restrictions described in Alternatives 2 and 3, Alternatives 4 and 5 include technologies that provide effective, permanent removal of contaminants from OU-50. Alternatives 4 and 5 include a system of pumping wells for ground water extraction. The effectiveness of the extraction system can be evaluated based on pump tests conducted in the proposed location. The effectiveness of these alternatives can be evaluated through monitoring of the system performance.

Alternative 4 includes GMF, an effective technology for the removal of suspended material and associated inorganic contaminants from the extracted ground water. Metals are removed less effectively unless some form of pretreatment is utilized. Solids removed in this process must be dewatered and disposed. These solids are not expected to be hazardous because of the low metal concentrations found in the ground water, but testing would be necessary to properly characterize the solids for disposal.

Alternative 5 includes chemical precipitation, an effective technology for removal of metals and suspended solids. This process would be more effective than GMF if low metals concentrations are required for discharge to surface water or if metals could cause fouling of the air stripper. Precipitates generated in this process would require characterization prior to disposal, but because metals present in OU-50 are at relatively low levels, the residuals are not expected to be hazardous.

Alternatives 4 and 5 propose an air stripping process for removal of organics in the ground water. The effectiveness of this process is dependent on influent VOC concentrations, air-water ratio, and proper design and sizing of the stripper. This technology does not destroy the VOC compounds but rather eliminates them from the water stream.

Alternatives 4 and 5 are expected to provide long-term effectiveness and permanence under both current and future use scenarios.

D. Reduction of Toxicity, Mobility, or Volume through Treatment

The No Action, Limited Action, and Monitoring alternatives (Alternatives 1, 2 and 3) would not reduce the toxicity, mobility, or volume of contaminants at the OU since the alternatives do not involve physical remedial actions. Because ground water contamination is being addressed as a separate OU, the statutory preference for remedies that employ treatment that reduces the toxicity, mobility, and/or volume a s a principle element will be addressed by the final ground water response.

Alternatives 4 and 5 would reduce toxicity, mobility, and volume of contamination at Site 61. Toxicity would be reduced by removal of organic and inorganic contaminants by the various treatment processes. Mobility would be reduced through extracting contaminated ground water

in Alternatives 4 and 5, thereby controlling the rate and extent of migration. Volume would be reduced through the removal and/or destruction of contaminants in ground water.

E. Short-term Effectiveness

No impact to short-term effectiveness would be expected from the No Action, Limited Action, or Monitoring alternatives, Alternatives 1, 2, and 3, respectively.

Conventional construction equipment would be used to complete the ground water extraction system, treatment facilities, and outfall system in Alternatives 4 and 5; site workers would not face risks beyond those inherent in any construction project. Langley AFB employees and surrounding residents would be unaffected by construction activities.

Design and construction of the remediation systems will require approximately 12-24 months, including detailed design and review, bid package preparation, contractor and equipment supplier selection, construction and installation of equipment, and start-up and shakedown.

Under the RAGS Part C, the risks associated with the operation of an on-site air stripper should be considered short-term risks. Although the operation may occur over a period of many years, exposure to emissions is viewed as a short-term risk. The site and access restrictions that are included as part of this alternative will control and limit any potential exposure from the air stripper emissions in Alternatives 4 and 5.

F. Implementability

The unit processes assembled in Alternatives 4 and 5 are all commonly used in water treatment and are commercially available. Electricity and a potable water supply are the only necessary utilities and are currently available at the OU.

The No Action alternative would be the easiest to implement followed by the Limited Action alternative and the Monitoring alternative (Alternatives 1, 2, and 3).

Alternative 4 would be the next easiest to implement but still will not require any extraordinary effort since all treatment technologies are common and readily available. The chemical

precipitation process makes Alternative 5 less desirable than Alternative 4 unless lower metal discharge limits are needed than can be achieved by GMF.

The proposed discharge system, common to Alternatives 4 and 5, is implementable. However, coordination with VDEQ would be required to determine the effluent discharge limits to the Back River.

Administrative oversight would be necessary for all alternatives to ensure proper operation and maintenance of the chosen alternative. Monitoring of effluent contaminant concentrations, flow rates, residual testing, and effectiveness evaluations would be required for Alternatives 4 and 5. Duties associated with performing, coordinating, and managing these tasks are feasible and implementable.

G. Cost

Estimated costs for the alternatives are summarized in Section VIII. These are preliminary estimates and are subject to change as the alternatives are refined (through pilot tests, etc.).

The No Action alternative (Alternative 1) has no cost and the Limited Action alternative (Alternative 2) only a minimal cost consideration. The Monitoring alternative (Alternative 3) is the next least expensive alternative followed by Alternatives 4 and 5, respectively.

Competitive bidding and/or vendor discounts may significantly reduce capital costs for the unit processes.

O&M costs for the other alternatives is also uncertain since influent concentrations, both organic and inorganic, are not defined at this time.

H. State Acceptance

The Virginia Department of Environmental Quality concurs with the selection of Alternative 3, Monitoring and Institutional Controls as the selected remedy for this OU.

I. Community Acceptance

A public meeting on the Proposed Plan, which described Alternative 3 as the preferred alternative, was held on December 3, 1998 in Hampton, Virginia. Comments received orally and/or in writing at the availability session are referenced in the Responsiveness Summary (Section XIII of this ROD).

X. Selected Remedy

Following review and consideration of the information in the Administrative Record file, requirements of CERCLA and the NCP, and the review of public comments on the Proposed Remedial Action Plan, the Air Force and EPA, in consultation with VDEQ, have selected Alternative 3: Monitoring and Institutional Controls as the remedy for OU-50. This remedy will prevent unacceptable exposure to soil and groundwater. The total present worth costs of the selected remedy are estimated at $396,000.00

Based on available information, the Air Force and EPA believe that the selected remedy would be protective of human health and the environment, would be cost-effective, and would provide the best balance of trade-offs among the alternatives with respect to the evaluation criteria.

The selected remedy for OU-50 includes the following major components:

1) Land use restrictions to prevent non-industrial use of the property, with the exception of the non-residential waterfront development plans discussed in Section VI and to maintain the integrity of the current asphalt parking lot;;
2) Ground water use restrictions to prohibit use of the ground water for purposes other than monitoring;
3) Within 90 days of ROD signature, the Air Force shall produce a survey plat prepared by a professional land surveyor registered by the Commonwealth of Virginia indicating the location and dimensions of OU-50 and the extent of soil and ground water contamination;
4) The Air Force shall supply a copy of the plat and ensure incorporation of these restrictions into any real property documents necessary for transferring ownership from the United States, in the unlikely event that the United States sells or transfers the

property. The real property document would also include a discussion of the National Priorities List (NPL) status of this Site, as well as a description of the soil and ground water contamination. The precise boundaries of the areas in which residential use is prohibited shall be fixed during the development of the Land Use Control Implementation Plan described later in this section. The Air Force shall submit the survey plat to the City of Hampton recording authority for the limited purpose of providing public notice of the environmental conditions of and limitations on the use of the property. No property right or interest is intended to be nor shall be created by such notice. In addition, the Air Force shall enter a note, in the local land recording office, to the real property document evidencing U.S. ownership of the property on which the OU is located that shall notify interested parties that the site was previously used to manage paint shop substances and waste;

5) Ground water monitoring to ensure contaminated ground water is not impacting the Back River, but this is not the final remedy for ground water. Ground water will be addressed in a final action on an installation-wide basis as a separate OU. Specifics of the monitoring program will be developed by the Air Force, the United States Environmental Protection Agency and the Virginia Department of Environmental Quality and presented in a monitoring plan.

Within 90 days of the execution of this ROD, the LAFB shall develop a Land Use Control Implementation Plan (LUCIP) for OU-50 with the concurrence of EPA Region III and in consultation with the Commonwealth of Virginia. The LUCIP shall include:

(1) a description and the location of OU-50, including a map, a description of the OU's approximate size and a description of the COCs;
(2) the land use control objectives (LUCs) selected above;
(3) the particular controls and mechanisms to achieve these goals;
(4) a reference to this ROD; and;
(5) any other pertinent information.

Within 180 days following the execution of this ROD, the Air Force, with the concurrence of EPA Region III and in consultation with the Commonwealth of Virginia, shall develop a Memorandum of Agreement on Land Use Control (MOALUC) for LAFB. The MOALUC shall contain Base-wide periodic inspection, condition certification and agency notification

procedures designed to ensure the maintenance by LAFB personnel of any site specific LUCs deemed necessary for future protection of human health and the environment, including LUCs selected in this ROD. A fundamental premise underlying execution of the MOALUC is that, through the Air Force's substantial good-faith compliance with procedures called for therein, reasonable assurances will be provided to USEPA and the Commonwealth of Virginia as to the permanency of those remedies which include the use of specific LUCs.

Although the terms and conditions of the MOALUC will not be specifically incorporated or made enforceable as to this or any other ROD, it is understood and agreed by the Air Force, USEPA and the Commonwealth of Virginia that the contemplated permanence of the remedy reflected herein shall be dependent upon LAFB's good-faith compliance with the MOALUC. Should such compliance not occur or should the MOALUC be terminated it is understood that the protectiveness of the remedy concurred in may be reconsidered and that additional measures may need to be taken to ensure necessary future protection of human health and the environment.

XI. Statutory Determinations

Under CERCLA Section 121, EPA must select remedies that are protective of human health and the environment, comply with applicable or relevant and appropriate requirements (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous waste as their principle element. The following sections discuss the remedy in light of these statutory requirements.

A. Protection of Human Health and the Environment

The selected remedy, Alternative 3, would protect human health and the environment. The institutional controls will mitigate both the carcinogenic and non-carcinogenic risk described in Section VII.

B. Compliance with ARARs

Since the remedy regarding ground water is an interim measure, final cleanup objectives and

ARARs will be addressed in a subsequent basewide ground water ROD. This ROD, however does present a final action for soils. The selected remedy will comply with all ARARs (there are no chemical-, location-, or action- specific ARARs).

C. Cost Effectiveness

The selected remedy, Monitoring and Institutional Controls, was chosen because it provides the best balance among criteria used to evaluate the alternatives considered in Section IX. The alternative was found to achieve both adequate protection of human health and the environment and to meet statutory requirements of Section 121 of CERCLA. The selected remedy was found to be cost-effective. The cost of Alternative 3 has been established to be $396,000.00.

D. Utilization of Permanent Solutions and Alternate Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

The Air Force, EPA and VDEQ have determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for OU-50. The ground water portion of this action, however, is interim and is not intended to utilize permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable.

E. Preference for Treatment as a Principle Element

The selected remedy for OU-50, Monitoring and Institutional Controls, does not satisfy the statutory preference for treatment as a principal element of the remedy. With respect to the soils, as long as the property is not used for non-industrial purposes, a treatment remedy is not required. As for the ground water, since the selected action does not constitute a final remedy, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element will be addressed by the final ground water response action.

XII. Significant Changes from Proposed Plan

The proposed plan for OU-50 was released for public comment on November 30, 1998. The proposed remedial alternative identified in the proposed plan was Monitoring and Institutional

Controls. The Air Force, EPA and VDEQ reviewed and considered all comments received during the public meeting and during the public comment period. Since the public comment period ended, the Air Force has developed waterfront beautification plans which include changes to the use of the waterfront property at OU-50, specifically, the inclusion of a walkway along the shoreline. These plans are discussed in detail in Section VI. EPA independently assessed the potential future recreational use of OU-50 and found that although the recreational user would have a higher risk than a construction worker, neither a hazard index greater than 1 nor a cancer risk greater than 1×10^{-4} is expected.[7,8] Therefore, the limitations of the institutional controls, as presented in the Proposed Plan, have been slightly altered to allow for walkway installation.

XIII. Responsiveness Summary

A. Overview

In a proposed plan released for public comment on November 29, 1998, Langley AFB, with the support of EPA and VDEQ, identified Monitoring and Institutional Controls as the preferred remedial alternative for OU-50.[4] There were no written comments received as a result of the public comment period. There were no written comments submitted during the December 3, 1998 availability session held in Hampton, Virginia. There were four questions presented orally at the availability session concerning OU-50. After evaluating and addressing these comments, Langley AFB and EPA, with the support of VDEQ, have selected Monitoring and Institutional Controls as the remedy for OU-50. Comments and the associated responses of Langley AFB, EPA, and VDEQ are described below after a brief discussion of community involvement to date.

B. Community Involvement to Date

The Langley AFB Partnership established a public comment period from November 29, 1998 to December 29, 1998 for interested parties to comment on the proposed plan for OU-50. These and all other documents considered or relied upon during the remedy selection process for OU-50 are included in the Administrative Record, which has been established in two information repositories accessible to the public since the beginning of the public comment period for OU-50. An availability session was held at the Virginia Air and Space Center, Hampton, Virginia, on December 3, 1998 to present the proposed plan, answer questions, and accept both oral and

written comments on the OU-50 remedial alternative. Four persons attended this session.

This Responsiveness Summary, required by CERCLA, provides a summary of citizens' comments received during the public meeting and the responses of the Air Force, EPA, and VDEQ. Responses to these comments are included in the section below.

C. Summary of Comments Received During Public Comment Period and Comment Responses

Comment #1:

Even though contamination has been found at the OU, the plan is only to monitor, not remove anything from the OU? Will the contamination dissipate over time?

Response #1:

Yes, the groundwater contamination will dissipate over time and because there is no impact on human health or the environment under the current land use, no removal is warranted. Groundwater monitoring is important so that we can ensure that there is no future impact on the Back River. Initially, more comprehensive monitoring would be conducted. After two quarters of monitoring results are reviewed, some chemicals may fall out or a decision may be made to monitor less frequently. If something shows up that is of potential concern then appropriate steps would be taken. The ground water monitoring data also would be evaluated as part of the five-year review. In addition, there is a base-wide ground water monitoring effort underway. The Air Force, EPA and VDEQ, however, decided not to delay progress on this OU, allowing this remedy to move forward apart from the base-wide effort.

Comment #2:

Who would be the contractor for this work?

Response #2:

For the ground water monitoring at OU-50 (Site OT-61) IT Corporation would do the work.

Comment #3:

I was aware of the removal of an underground storage tank from this OU in the past, but I did not know of the other aspects associated with remediation of the OU.

Response #3:

The underground storage tank was removed in 1993. The existing contamination is probably associated with the paint shop operations that were conducted at the OU.

Comment #4:

Is there any natural attenuation involved too, or is just dissipation that will occur?

Response #4:

Both natural attenuation (where there is an actual breakdown of the chemicals) and dissipation (where the contamination spreads out and is found in even lower concentrations) of the groundwater will occur at the OU.

X. References

[1]Versar, Inc., 1996, *Langley Air Force Base Basewide Standard Operating Procedures: Background Information Document*, January 19.

[2]Radian Corporation, 1996, *OU Inspection and Screening Risk Assessment Report for 33 Installation Restoration Program OUs, Draft, Langley Air Force Base, Virginia*, February.

[3]Radian International, 1998, *Final Installation Restoration Program (IRP) Conceptual Hydrogeological Model Report for Langley Air Force Base*, May.

[4]Langley Air Force Base, 1998, *Final Proposed Plan for Remedial Action at Operable Unit 50, Langley Air Force Base, Virginia*, November.

[5]PMC, 1998, *Final Remedial Investigation and Feasibility Report for IRP Site SS-61, Langley Air Force Base, Virginia*, 10 July.

[6]U.S. Environmental Protection Agency, 1989, *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part A), Interim Final*, Office of Emergency and Remedial Response, Washington, DC, EPA/540/1-89/002.

[7]Driscoll, Stacie, 1999. Personal communication: Letter from Stacie Driscoll, U.S. EPA Region III. 6 May.

[8]Driscoll, Stacie, 1999. Personal communication: Letter from Stacie Driscoll, U.S. EPA Region III. 17 June.

APPENDIX A
Tables

Table 1

Summary of Operable Units Under CERCLA Investigation
Langley Air Force Base, Virginia

OU Name/IRP OU Name	Findings	Current Status
OU-21/LF-01 Former Landfill, End of 08/26 Runway	Contaminants of Potential Concern (COPCs) - pesticides and metals in the ground water and soil.	In the remedial investigation (RI) phase. A draft RI report has been submitted and reviewed. A separate basewide ecological risk assessment is currently underway.
OU-22/WP-02 Former Waste Water Treatment Plant, Bldg 724	COPCs - pesticides and metals in the ground water and soil.	In the RI phase. A draft RI report will be submitted by mid-1999.
OU-23/LF-05 Former Landfill in the Shellbank Area	COPCs - pesticides, volatile organic compounds (VOCs), and metals in the ground water; pesticides and metals in the surface water; and semivolatile organic compounds (SVOCs) and metals in the soil.	In the RI phase. A draft RI report has been submitted and reviewed. A separate basewide ecological risk assessment is currently underway.
OU-24/OT-06 Former Entomology OU, Shellbank Area	COPCs - pesticides, VOCs, SVOC, and some metals in the ground water; SVOCs, pesticides and some metals in the soil.	In the RI phase. A draft RI report has been submitted and reviewed. A separate basewide ecological risk assessment is currently underway.
OU-25/LF-07 Former Landfill, Shellbank Area	COPCs - pesticides and some metals in the ground water; dieldrin in the soil.	In the RI phase. A draft RI report has been submitted and reviewed. A separate basewide ecological risk assessment is currently underway.
OU-26/WP-08 Former Waste Water Treatment Plant, Lighter Than Air (LTA) Area	COPCs - some pesticides and metals in the ground water; dieldrin in the soil.	In the RI phase. A draft RI report has been submitted and reviewed.
OU-28/LF-10 Former Landfill, Golf Course	COPCs - VOCs, metals and some pesticides in the ground water; VOCs and polychlorinated biphenyls (PCBs) in surface water; some metals in the soil.	In the RI phase. A draft RI report has been submitted and reviewed. A separate basewide ecological risk assessment is currently underway.

OU Name/IRP OU Name	Findings	Current Status
OU-29, LF-11 Former Landfill, Tabbs Creek Area	COPCs - VOCs, pesticides, metals and PCBs in the ground water; some metals in the surface water; SVOCs, metals, and PCBs in the soil.	In the RI phase. A draft RI report has been submitted and reviewed. A separate basewide ecological risk assessment is currently underway.
OU-30/LF-12 Former Landfill, Munitions Storage area, Northwest Area of Base	COPCs - VOCs and metals in the ground water; metals and 2,4 DB in the surface water; SVOCs and nickel in the soil.	In the RI phase. A draft RI report has been submitted and reviewed. A separate basewide ecological risk assessment is currently underway.
OU-31/LF-13 Former Landfill Munitions Storage Area, Northwest Area of Base	COPCs - Aldrin, alpha-BHC and some metals in the ground water; VOCs, SVOCs, metals and PCBs in the surface water.	In the RI phase. A draft RI report has been submitted and reviewed. A separate basewide ecological risk assessment is currently underway.
OU-32/WP-14 Former Chemical Leach Pit, Firing-In Abutment, Building 1303	COPCs - pesticides, SVOCs, and some metals in the ground water; arsenic and dieldrin in the soil.	In the RI phase. A draft RI report has been submitted and reviewed. A separate basewide ecological risk assessment is currently underway.
OU-33/LF-15 Former Landfill, Willoughby Point	COPCs - VOCs, SVOCs, pesticides and metals in the ground water; pesticides and metals in the surface water.	In the RI phase. A draft RI report has been submitted and reviewed. A separate basewide ecological risk assessment is currently underway.
OU-34/LF-17 Former Landfill, LTA Area	COPCs - VOCs, pesticides and some metals in the ground water; dieldrin and some metals (mainly lead) in the soil.	In the RI phase/ A draft RI report will be submitted by mid-1999.
OU-35/LF-18 Former Landfill, Northwest corner of Base	COPCs - pesticides in the ground water; pesticides and metals in the surface water; SVOCs and manganese in the surface soil; delta-BHC, and metals in the sediment.	In the RI phase. A draft RI report has been submitted and reviewed. A separate basewide ecological risk assessment is currently underway.
OU-37/LF-22 Former Landfill, Willoughby Point	COPCs - pesticides and metals in the ground water; alpha-BHC, delta-BHC and metals in the surface water.	In the RI phase. A draft RI report has been submitted and reviewed. A separate basewide ecological risk assessment is currently underway.
OU-40/OT-25 Old Entomology Building and Former Storage Area, Bldg 965	COPCs - pesticides in the ground water and soil.	In the RI phase. A separate basewide ecological risk assessment is currently underway.
OU-42/OT-38A and B Four Waste Oil and Trash Burn Areas, Basewide	Risk assessments showed no significant risk to human health or the environment from soils	The Record of Decision (ROD) for soils was signed on January 14, 1999. Ground water ROD will follow at a later date. The final RI report was submitted in September 1998.

OU Name/IRP OU Name	Findings	Current Status
OU-44/FT-41 Former Fire Training Area, Firing-In Abutment, Bldg 1303	COPCs - VOCs, pesticides, dioxins, and some metals in the ground water; SVOCs, dioxins and some metals in the surface water.	In the RI phase. A draft RI report has been submitted and reviewed. A separate basewide ecological risk assessment is currently underway.
OU-47/OT-51 Former Electrical Substation, Shellbank Area, Bldg 82	COPCs - pesticides, PCBs and lead in the soil.	The ROD for soil was signed on January 14, 1999. Ground water ROD will follow at a later date.
OU-48/OT-55 Civil Engineering Yard, Underground Petroleum Contamination	COPCs - pesticides and dieldrin in the ground water; pesticides and PCBs in the soil.	In the RI phase. A draft RI report is due to be submitted by mid-1999.
OU-49/OT-56 Silver Contamination in Storm Sewers, Basewide	COPCs - metals and VOCs in surface water and metals, SVOCs and pesticides in sediment.	In the feasibility study (FS) phase. The FS is due to be finalized by mid-1999.
OU-50/SS-61 Old Civil Engineering Paint Shop/Marina	COPCs - VOCs in the ground water and soil.	This OU is currently in the Record of Decision Phase.
OU-51/SS-63 Back River Sediments	COPCs - pesticides, metals, and PCTs in the sediment.	In the preliminary assessment/OU inspection (PA/SI) phase. The draft PA/SI report is due to be submitted by the end of 1998.
OU-52/OT-64 Ground water Contamination, Basewide	COPCs - pesticides and metals in the ground water.	In the scoping phase. The long-term monitoring project is due to be awarded by mid-1999.

Table 2

Maximum Groundwater Concentrations Exceeding Residential Tap water Levels

Analyte	Value (ug/l)	Screening Level (ug/l)
Acetone	440.00	370.00
Arsenic	252.00	0.045
Barium	1030.00	260.00
Benzene	2400.00	0.3600
Carbazole	7.00	3.400
Carbon Disulfide	130.00	100.00
Chloroform	2.00	0.1500
Chloromethane	54.00	1.400
Dieldrin	0.0200	0.0042
Ethylbenzene	880.00	130.00
Iron	11700.00	1100.00
Manganese	2370.00	18.00
Napthalene	190.00	150.00
PCB-1260 (Arochlor 1260)	0.500	0.0087
Thallium	14.90	0.290
Toluene	150.00	75.00

Table 3

Maximum Soil Concentrations Exceeding Industrial Screening Levels

Analyte	Value (mg/kg)	Screening Level (mg/kg)
Arsenic	17.30	3.80
Benzo(a)Pyrene	4400.00	780.00
PCB-1260	1200.00	740.00

APPENDIX B
Figures

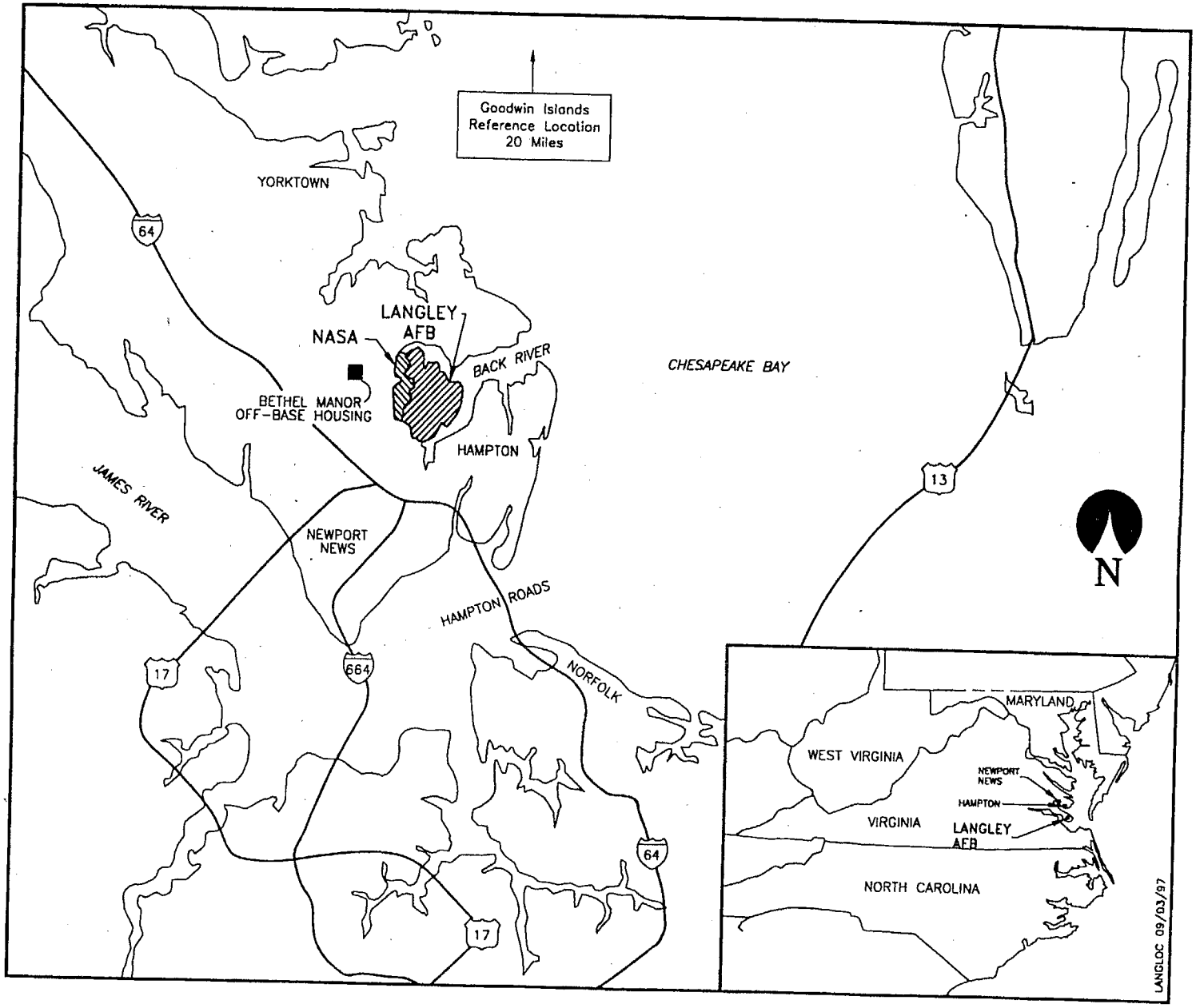

Figure 1. Location Map, Langley Air Force Base, Virginia

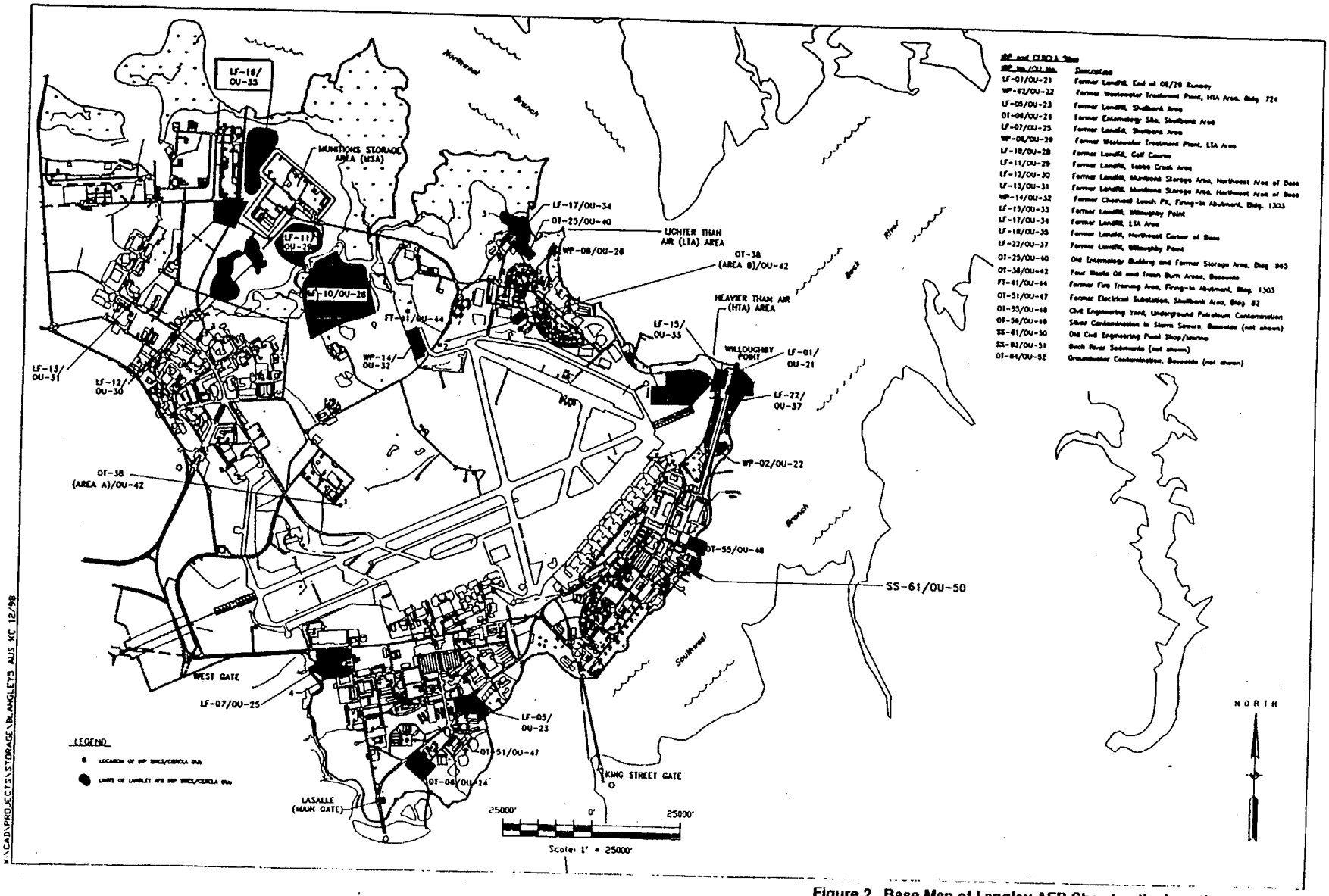

Figure 2. Base Map of Langley AFB Showing the Location of the Site (SS-61/OU-50)

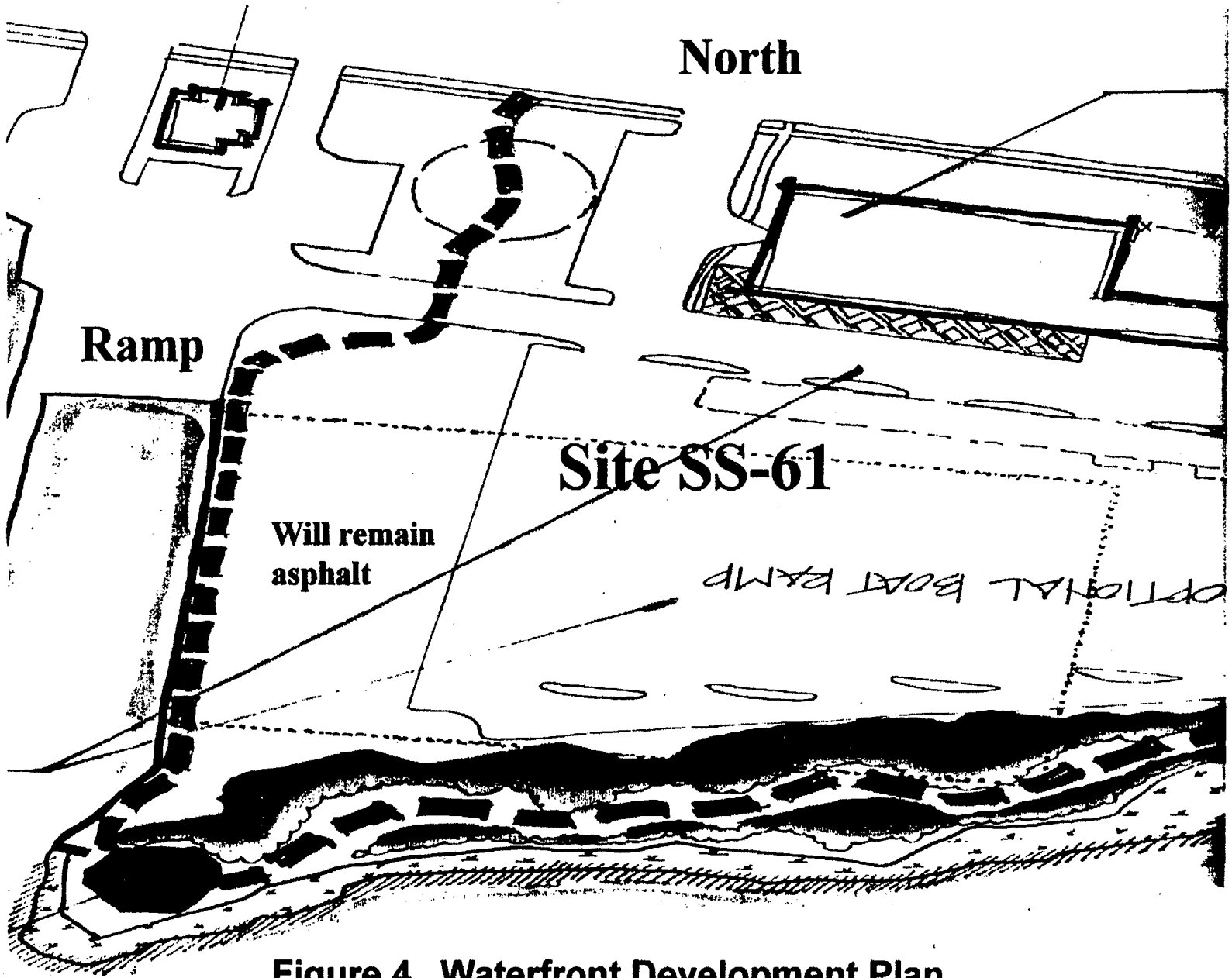

Figure 4. Waterfront Development Plan

APPENDIX C
Glossary

Administrative Record: A collection of documents containing all the information and reports generated during the entire phase of investigation and cleanup at the OU and used to make a decision on the selection of the preferred alternative under CERCLA.

Carcinogenic Risk: Cancer risks are expressed as numbers reflecting the increased chance that a person will develop cancer if exposed to chemicals or substances. For example, EPA's acceptable risk range for Superfund OUs is 1×10^{-4} to 1×10^{-6}. This means that the probability of cancer should not be greater than 1 in 10,000 chance to a 1 in 1,000,000 chance above background.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA): A federal law, commonly referred to as the Superfund Program, passed in 1980 that provides for the cleanup and emergency response in connection with numerous existing inactive hazardous waste disposal OUs that endanger public health and safety of the environment.

Chemicals of Potential of Concern (COPCs): Chemicals, either present at the OU as a result of historical activities or of likely concern to human health and the environment, which are evaluated in the risk assessment.

Ecological Risk Assessment: An evaluation of the risk posed to the environment if remedial activities are not performed at the OU.

Exposure Pathways: Describes the course a chemical or physical agent takes from the source to the exposed individual. Elements of the exposure pathway are: (1) the source of the released chemical; (2) the contaminated medium (e.g., soil); (3) a point of contact with the contaminated medium; and (4) an exposure route (e.g., ingestion, inhalation) at a contact point.

Hazard Index (HI): A number indicative of non-carcinogenic health effects which is the ratio of the existing level of exposure to an acceptable level of exposure. A value equal to or less than one indicates that the human population is not likely to experience adverse effects.

Human Health Risk Assessment: An evaluation of the risk posed to human health should remedial activities not be implemented.

Installation Restoration Program (IRP): Program established by the United States Air Force to systematically identify and remediate contaminated OUs. The IRP was designed to be consistent with EPA rules and guidelines.

Lowest-Observed-Adverse-Effect Level (LOAEL): The lowest exposure level at which there are statistically or biologically significant increases in frequency or severity of adverse effects between the exposed population and its appropriate control group.

No-Observed-Adverse-Effect Level (NOAEL): An exposure level at which there are no statistically or biologically significant increases in the frequency or severity of adverse effects between the exposed population and its appropriate control; some effects may be produced at this level, but they are not considered as adverse, nor as precursors to adverse effects. In any experiment with several NOAELs, the regulatory focus is primarily on the highest one, leading to the common usage of the term NOAEL as the highest exposure without adverse effect.

Operable Unit (OU): A discrete portion of a OU or a discrete action representing an incremental step in the investigation and remediation of hazardous substances at a facility.

Proposed Plan: A document that presents a proposed cleanup alternative and requests public input regarding the

proposed alternative.

Record of Decision (ROD): A legal document that describes the cleanup action or remedy selected for a OU, the basis for the choice of that remedy, and public comment on alternative remedies.

Remedial Action: Implementation of plans and specifications, developed as part of the design, to remediate a OU.

Remedial Investigation (RI): Part of a study of a facility that supports the selection of a remedy for a OU where hazardous substances have been disposed. The RI identifies the nature and extent of contamination at the facility.

OU: The facility and any other areas in close proximity to the facility where a hazardous substance, hazardous waste, hazardous constituent, pollutant, or contaminant from the facility has been deposited, stored, disposed of, or placed or has migrated or otherwise come to be located.

OU Inspection (SI): The SI determines if the OU presents an immediate threat that requires prompt response action because the OU may pose a threat to human health and/or the environment.

OU-Related Risk: Cancer and non-cancer risk estimates that are based on contaminants present in environmental media due to OU-specific human activities at Langley AFB, but that exclude the contribution of background contaminant concentrations.

Superfund Amendments and Reauthorization Act (SARA): An amendment to CERCLA enacted in 1986.

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