EPA/ROD/R01-97/002
1997

EPA Superfund
Record of Decision:

LORING AIR FORCE BASE
EPA ID: ME9570024522
OU 13
LIMESTONE, ME
06/16/1997

<IMG SRC 970020>

FINAL

Loring Air Force Base

Operable Unit 13 (OU 13)
Record of Decision

May 1997

Prepared for:

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

This decision document addresses the findings of the basewide surface water and sediment study, referred to as Operable Unit 13 (OU 13), at the former Loring Air Force Base (LAFB), located in Aroostook County, Maine. Because of the size of the area, and the number of drainage systems involved, OU 13 was subdivided into three primary study areas. The study areas are the three major drainage systems that comprise the terrain occupied by LAFB. These are:

- Wolverton Brook/Brandy Brook Study Area
- Greenlaw Brook Study Area
- Butterfield Brook/Limestone Stream Study Area

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for OU 13. The selected remedy includes Removal and Disposal of contaminated surface soil and sediment that exceed remediation goals from six locations within the OU 13 study areas and No Action at one location. No further action is necessary for the remaining areas in OU 13 because there is no unacceptable risk to human health or the environment.

Although the Remedial Investigation results indicate unacceptable risks associated with surface water in some areas, a Feasibility Study was not recommended because remediating soil and sediment is expected to adequately reduce risks associated with surface water.

Removal and Disposal has been selected for areas that exceed remediation goals. These areas have been identified to include:

Greenlaw Brook Study Area
- Flightline Drainage Ditch (FLDD)
- FLDD Wetland
- East Branch of Greenlaw Brook (EBGB) from Pennsylvania Road to the Ski Chalet
- Nose Dock Area (NDA) Drainageways (north and south drainageways only)
- Drainage Ditch G06

Butterfield Brook/Limestone Stream Study Area
- Underground Transformer Site (UTS) Wetland (northern portion only)

The State Fish Advisory, currently in effect at designated on- and off-base areas, will remain in effect until the fish are determined to be acceptable for consumption.

The No Action alternative has been selected for the little Madawaska River (LMR) because there is no unacceptable risk associated with the LMR due to exposure to soil sediment and surface water. The No Action alternative will include a long-term environmental monitoring program and five-year site reviews to assess whether human health and the environment continue to be adequately protected.

No further action is recommended for the remaining areas within OU 13 because there is no unacceptable risk to human health or the environment.

This decision document was developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan. This decision is based on the Administrative Record for OU 13, which was developed in accordance with Section 113(k) of CERCLA and is available for public review at the Air Force Base Conversion Agency Office, 5100 Texas Road, Limestone, Maine.

The Maine Department of Environmental Protection (MEDEP) concurs with the selected remedy for OU 13.

ASSESSMENT OF OU 13

Actual or potential releases of hazardous substances from the FLDD, FLDD Wetland, EBGB (from Pennsylvania Road to the Ski Chalet), north and south NDA Drainageways, Ditch G06, and UTS Wetland (northern portion), if not addressed, may pose a risk to human health and the environment. This risk will be addressed by implementing the Removal and Disposal remedy selected in this Record of Decision (ROD).

The United States Air Force (USAF) has determined that no further action is necessary for the remaining areas in OU 13 because of anticipated lack of future impacts and/or no unacceptable risks to human and ecological receptors.

DESCRIPTION OF THE SELECTED REMEDY

This Decision Document presents the selected source control remedial action for OU 13, the basewide surface water and sediment operable unit at LAFB. The selected remedy addressed the principal threats posed by contaminated soil and sediment in the drainageways in and around the former LAFB.

The selected remedy for surface soil and sediment that exceed remediation goals in the FLDD, FLDD Wetland, EBGB (from Pennsylvania Road to the Ski Chalet), north and south NDA Drainageways, Ditch G06, and UTS Wetland (northern portion) is Removal and Disposal. The major components of the remedy include:

- pre-design studies to delineate the extent of remediation for design purposes;
- pre-design wetland mitigation studies (i.e., wetland delineations and function-value assessments) to evaluate the impacts resulting from remedial activities;
- site preparation and mobilization;
- cutting and clearing;
- stormwater management;
- sediment excavation;
- sediment disposal at LAFB Landfill 3 (LF-3); some material may require disposal at off-base facilities;
- backfilling the excavations with material that closely matches the excavated material;
- compensatory wetlands mitigation and demobilization; long-term environmental and wetlands mitigation monitoring;
- continued fish advisory, and
- five-year site reviews.

The State Fish Advisory, currently in effect at designated on- and off-base areas, will remain in effect until the fish are determined to be acceptable for consumption. Areas covered by the advisory include Chapman Pit, Green Pond, Greenlaw Brook, and the LMR and its tributaries from the Madawaska Dam Reservoir south to the Aroostook River.

The No Action alternative has been selected for surface soil, sediment, and surface water for the LMR because there is no unacceptable risk associated with these media. The No Action alternative does not include any remedial action components to reduce or control risks. However, the No Action alternative will include a long-term environmental monitoring program and five-year site reviews to evaluate the long-term conditions of the site's ecology and to assess whether human health and the environment continue to be adequately protected.

The USAF has determined that no further action is necessary for the remaining areas within OU 13.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with applicable or relevant and appropriate requirements for the action, and is cost-effective. The remedy uses permanent solutions and alternative treatment technologies to the extent practicable. The selected remedy does not, however, satisfy the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element. Mobility of contaminants is expected to be reduced through the containment features of the landfill cover system to be constructed for LF-3, which will also reduce rainwater infiltration, erosion, and direct contact with the contaminated soil and sediment.

This ROD represents the selection of a remedial action under CERCLA for areas within OU 13, that exceed remediation goals. These areas include the FLDD, FLDD Wetland, EBGB (from Pennsylvania Road to the Ski Chalet), north and south NDA Drainageways, Ditch G06, and UTS Wetland (northern portion). The State Fish Advisory, currently in effect at designated on- and off-base areas, will remain in effect until the fish are determined to be acceptable for consumption. No Action has been selected for the LMR. No further action is necessary for the remaining areas within OU 13. The forgoing represents the selection of a remedial action by the Department of the Air Force and the United States Environmental Protection Agency Region I with the concurrence of the MEDEP.

Concur and recommend for immediate implementation:

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1.0 SITE NAME, LOCATION, AND DESCRIPTION

The former Loring Air Force Base (LAFB), in northeastern Maine, is bordered on the south and east by the Town of Limestone, on the north by the towns of Caswell and Connor, and on the west by the City of Caribou. The base is approximately three miles west of the United States/Canadian border and covers approximately 9,000 acres.

LAFB is a National Priorities List (NPL) site. There are currently several areas of concern under investigation within LAFB, which have been organized into Operable Units (OUs) for investigation and remediation purposes. This Record of Decision (ROD) relates to OU 13, the basewide surface water and sediment operable unit (Figure 1-1).

Because of its primary mission, LAFB personnel were engaged in various operations, a number of which required the use, handling, storage, or disposal of hazardous materials and substances. In the past, these materials entered the environment through accidental spills, leaks in supply piping, landfilling operations, burning of liquid wastes during fire-training exercises, and the cumulative effects of operations conducted at the base's flightline and industrial areas. As part of the Department of Defense's Installation Restoration Program (IRP), the Air Force initiated activities to identify, evaluate, and remediate former disposal or spill sites containing hazardous substances.

Since initiation of the IRP, the base was placed on the United States Environmental Protection Agency's (USEPA's) NPL of sites and is to be remediated according to the Federal Facility Agreement (FFA), an agreement under Section 120 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) signed by the United States Air Force (USAF), the USEPA, and the Maine Department of Environmental Protection (MEDEP) on January 30, 1991, as amended. Following the signing of the FFA LAFB was placed on the U.S. Congress Base Closure List and was closed in September 1994.

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2.0 SITE HISTORY AND RESPONSE ACTIVITIES

This section summarizes the land use, site history, and response activities for OU 13.

2.1 LAND USE AND SITE HISTORY

OU 13 is the basewide surface water and sediment operable unit. OU 13 includes brooks, streams, ditches, lakes, ponds, and wetlands in approximately 30 square miles (19,250 acres) of watershed encompassing the former LAFB. Because of the size of the area, and the number of drainage systems involved, OU 13 was subdivided into three primary study areas (see Figure 1-1). The study areas are the three major watersheds that comprise the terrain in and surrounding LAFB. These are:

- Wolverton Brook/Brandy Brook Study Area (WB/BB)
- Greenlaw Brook Study Area
- Butterfield Brook/Limestone Stream Study Area (BB/LS)

Wolverton Brook/Brandy Brook Study Area. These brooks receive runoff from the western edge of LAFB and off-base areas west of the base, and flow southwesterly into the little Madawaska River (LMR) (Figure 2-1). The LMR flows south approximately 7 miles and merges with the Aroostook River.

The contamination detected in the WB/BB Study Area appears to be unrelated to base activities. Pesticides and fuel-related contaminants have been detected in the WB/BB Study Area at off-site sampling locations upstream of base influences. The most likely source of non-base-related pesticide contamination is runoff from local agricultural fields. Runoff from roads and land where farm machinery is used is a likely source of fuel-related contamination.

Greenlaw Brook Study Area. Greenlaw Brook, the principal on-base drainage, consists of the East Branch and the West Branch, which merge and flow southwesterly into the LMR.

The Flightline Drainage Ditch (FLDD) and the FLDD Wetland (Figures 2-2 and 2-3) constitute a tributary to the East Branch of Greenlaw Brook (EBGB), which receives runoff and storm drain discharge from the primary operations areas of the base. The primary contaminants include polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), pesticides, total petroleum hydrocarbons (TPH), and lead.

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<IMG SRC 97002D1>

The EBGB (Figure 2-4) originates in a wetland south of the Fuels Tank Farm (FTF), and flows westerly approximately 2,500 feet before merging with the FLDD Wetland. The brook continues to flow west and merges with the West Branch of Greenlaw Brook (WBGB). The primary contaminants in the EBGB include PAHs, PCBs, pesticides, TPK and lead. PCBs have also been detected in fish tissue in the EBGB.

The WBGB (Figures 2-5 and 2-6) originates in a wetland north of the Flightline Area (FLA) west of the base boundary. The WBGB flows southward onto base property, passing west of the Nose Dock Area (NDA), and into Malabeam Lake, a distance of approximately 2 miles. The WBGB exits the southern end of Malabeam Lake, continues southward into Chapman Pit, and then merges with the EBGB. Contaminants detected in the WBGB are predominantly the result of base-related activities; however, some potential exists for non-base-related contaminants to also enter the WBGB. The primary contaminants in the WBGB, specifically in the NDA drainageways which originate on the western side of the NDA, include PAHs and inorganics.

Butterfield Brook/Limestone Stream Study Area. The headwaters of Butterfield Brook (Figure 2-7) are north of the base boundary. Butterfield Brook drains roughly the eastern third of the base, flows southeasterly into Durepo Reservoir, and becomes Limestone Stream below the reservoir dam. Limestone Stream flows south approximately 11 miles and merges with the Aroostook River.

Contaminants detected within the study area are a result of a combination of base-and non-base-related activities. Butterfield Brook and its northern tributaries are believed to be impacted by runoff from agricultural field activity north of the base.

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2.2 RESPONSE ACTIVITIES

The response activities for OU 13 are summarized as follows:

- In 1984, a Preliminary Assessment was completed detailing historical material usage and waste disposal practices at LAFB (CH 2 M Hill, 1984).
- The Remedial Investigation (RI) process commenced in 1988 and continued into 1996 (ABB Environmental Services, Inc. [ABB-ES], 1997c).
- LAFB was added to the NPL in February 1990.
- The USAF entered into a FFA in 1991 with the USEPA and MEDEP to address the cleanup of environmental contamination at LAFB (FFA, 1991). The FFA was revised in December 1993 to address base closure related issues, such as real estate property transfer, and to revise the cleanup schedule. The FFA was further modified in January 1995 to allow the Remedial Project Managers to make minor modifications, such as schedule adjustments and removal of petroleum-contaminated sites from the agreement.
- A Feasibility Study (FS) (ABB-ES, 1997a) was completed in 1997 for OU 13 to determine remedial alternatives for remediation of contamination based on the information presented in the RI report.
- The OU 13 Proposed Plan (ABB-ES, 1997b) was submitted for public review in April 1997.
- A public comment period was held from April 14 to May 13, 1997.

Other key activities at LAFB relating to OU 13 are as follows:

- A Fish Advisory was issued by the Maine Department of Human Services in May 1996 warning against ingestion of fish from certain water bodies within and around the former LAFB. These areas include Chapman Pit, Green Pond, Greenlaw Brook, and the LMR and its tributaries from the Madawaska Dam Reservoir south to the Aroostook River.
- A time-critical removal action was completed in 1996 that included removal of contaminated sediment from Ditch G12; removal of soil and sediment from Ditch G11; and cleaning of storm drains and catch basins from the Steam Plant to the head of Ditch G12.
- A removal action to address elevated levels of inorganic compounds in soil/sediment in the vicinity of Chapman Pit is scheduled for the 1997 construction season.

- Construction of Landfill 3 (LF-3) cover system is scheduled for completion in 1998.

- Mitigation of basewide wetlands impacts related to environmental restoration activities is scheduled for 1998.

3.0 COMMUNITY PARTICIPATION

Throughout LAFB's history, the community has been active and involved in base activities. The USAF and USEPA have kept the community and other interested parties apprised of LAFB activities through informational meetings, fact sheets, press releases, public meetings, site tours and open houses, as well as Restoration Advisory Board (RAB) meetings. Membership of the RAB is composed of USAF, USEPA, MEDEP, local officials, and community representatives.

The LAFB Community Relations Plan (CRP) was released in August 1991 and revised in May 1995. The CRP outlined a program to address community concerns and keep citizens informed and involved during remedial activities. The CRP can be found in the Administrative Record.

On June 24, 1992, the USAF made the LAFB Administrative Record available for public review. The Administrative Record is currently available for public review at the Air Force Base Conversion Agency (AFBCA) Office, 5100 Texas Road, Limestone, Maine.

The AFBCA published a notice and brief analysis of the OU 13 Proposed Plan in the Bangor Daily News, the Aroostook Republican, the Star Herald, and the Fort Fairfield Review on April 9, 1997, and made the Proposed Plan available to the public at the AFBCA Office.

From April 14, 1997 through May 13, 1997, the USAF held a 30-day public comment period to accept public input on the alternatives presented in the FS and the Proposed Plan, as well as other documents previously released to the public. On May 8, 1997, AFBCA personnel and regulatory representatives held a public meeting to discuss the Proposed Plan and to accept any oral comments. A transcript of this meeting is included as Appendix A and a Responsiveness Summary is included as Appendix B. Based on public comments, the public is in agreement regarding the preferred remedial alternatives for OU 13 as presented in the Proposed Plan.

4.0 SCOPE AND ROLE OF RESPONSE ACTION

The selected remedy for OU 13 includes two remedial alternatives; 1) Removal and Disposal and 2) No Action. No further action is necessary for much of OU 13 because there is no unacceptable risk to human health or the environment.

The selected remedy for contaminated surface soil and sediment that exceed remediation goals for the FLDD, FLDD Wetland, EBGB (from Pennsylvania Road to the Ski Chalet), north and south NDA Drainageways, Ditch G06, and the Underground Transformer Site (UTS) Wetland (northern portion) is Removal and Disposal. The major components of the remedy include:

- pre-design studies to delineate the extent of remediation for design purposes; pre-design wetland mitigation studies (i.e., wetland delineations and function-value assessments) to evaluate the impacts resulting from remedial activities;

- site preparation and mobilization;

- cutting and clearing;

- stormwater management;

- sediment excavation;

- sediment disposal at LF-3, some material may require disposal at off-base facilities;

- backfilling the excavations with material that closely matches the excavated material;

- compensatory wetlands mitigation and demobilization;

- long-term environmental and wetlands mitigation monitoring;

- continued fish advisory; and

- five-year site reviews.

Although the RI results indicate unacceptable risks associated with surface water in some areas (i.e., FLDD and FLDD Wetland), an FS was not recommended for this medium because remediating soil and sediment is expected to adequately reduce risks associated with surface water.

The State Fish Advisory, currently in effect at designated on- and off-base areas, will remain in effect until the fish are determined to be acceptable for consumption. Areas covered by the advisory include Chapman Pit, Green Pond, Greenlaw Brook, and the LMR and its tributaries from the Madawaska Dam Reservoir south to the Aroostook River.

The No Action alternative has been selected for surface soil sediment, and surface water for the LMR because there is no unacceptable risk associated with these media. The No Action alternative does not include any remedial action components to reduce or control risks. However, the No Action alternative will include a long-term environmental monitoring program and five-year site reviews to evaluate the long-term conditions of the site's ecology and to assess whether human health and the environment continue to be adequately protected.

No further action is necessary at the remaining areas within OU 13 because there is no unacceptable risk to human health or the environment.

These actions will achieve the following remedial response objectives for OU 13:

- prevent or minimize ingestion of and dermal contact with contaminated soil/sediment by human and ecological receptors;

- prevent human ingestion of contaminated fish;

- minimize migration of contaminated soil/sediment; and

- avoid destruction of existing ecological habitat where the risk associated with short-term habitat loss outweighs the reduction in risk potentially realized by site remediation.

5.0 SUMMARY OF SITE CHARACTERISTICS

OU 13 assesses the surface water and sediment conditions at LAFB and the immediate areas surrounding the former LAFB. Because of the size of the area, and the number of drainage systems involved, OU 13 was subdivided into three primary study areas. The study areas consist of the three major watersheds that comprise the terrain in and around the former LAFB. The three study areas consist of: (1) the WB/BB Study Area; (2) the Greenlaw Brook Study Area; and (3) the BB/LS Study Area.

The following paragraphs provide a summary of the site characteristics for each of these study areas. Additional information for these three study areas can be found in the OU 13 FS (ABB-ES, 1997a) and the OU 13 RI Report (ABB-ES, 1997c). Section 2.0 of the OU 13 FS presents an overview of the Greenlaw Brook and BB/LS Study Areas, including discussions on the hydrology and nature and distribution of contaminants. Based on the sporadic nature of the contamination, and no unacceptable risk to human or ecological receptors, the OU 13 RI recommended no further action for the soil and sediment in the WB/BB Study Area. Consequently, the OU 13 FS does not discuss this study area in detail. Section 6.0 of the OU 13 RI Report presents an overview of the WB/BB Study Area, including discussions on the hydrology and nature and distribution of contaminants.

The database for OU 13 is very large including nine years of soil, surface water, and sediment data. The data are presented in the OU 13 RI Report primarily in the individual study area contamination assessments, human health risk assessments, and ecological risk assessments. Due to variation in human health exposure scenarios, and the variety of 1AFB ecological habitats and receptors, individual samples within each study area were combined as appropriate for specific receptors. As a result, contaminant concentrations presented for different receptors within the same study area are based on different sample groupings, and consequently can have different maximum and mean contaminant concentrations in the human health and ecological risk assessments. Other complexities are also present in the RI database and data management. As an example, contamination assessments discuss total PAHs to provide an overview of SVOC contamination in a pond or reach of stream, whereas the risk assessment tables present individual PAH compound maximums based on samples in a given receptor-specific sample grouping. Also, due to the transient nature of surface water, the most recent surface water data at a multi-sample location were utilized in risk assessments, although higher analyte values could potentially have been detected in earlier years. Further, at sites where multiple sediment samples were collected in 1993, 1994, and 1995, the mean concentration used in the risk assessments was a "temporal" average of the detected values at

that location over time. Additional information on the use of the OU 13 data is included in the human health and ecological risk assessment methodology discussions in the RI Report.

5.1 WOLVERTON BROOK/BRANDY BROOK STUDY AREA

The WB/BB Study Area is located along the western side of LAFB and is approximately 4,600 acres in size (see Figure 2-1). Base property within this study area covers approximately 700 acres. These brooks receive runoff from the western edge of LAFB and areas west of the base, and flow southwesterly into the LMR. The LMR is a relatively broad but shallow river located approximately 1.5 miles west of the base boundary. The LMR flows south approximately 7 miles and merges with the Aroostook River.

The OU 13 RI recommended no further action for surface water and sediment in the WB/BB Study Area; therefore, this study area was not evaluated in the OU 13 FS and is not discussed in this subsection. Section 6.0 of the OU 13 RI Report presents the site characteristics of the WB/BB Study Area.

5.2 GREENLAW BROOK STUDY AREA

Greenlaw Brook, the principal on-base drainageway, consists of the East Branch and the West Branch, which merge and flow southwesterly into the LMR. The EBGB and WBGB, and their respective drainage areas together are approximately 7,500 acres in size. The FLDD and the FLDD Wetland constitute a tributary to the EBGB and receive runoff and storm drain discharge from the primary operations areas in the central portion of LAFB. A Spill Containment Facility (SCF), designed to remove and contain floating petroleum products caused by spills or releases, is located next to the FLDD south of Weinman Road.

Flightline Drainage Ditch and Corresponding Wetland

The FLDD and FLDD Wetland are located in the south-central portion of LAFB, west of the FLA and Pennsylvania Road (see Figures 2-2 and 2-3). The FLDD receives the majority of stormwater runoff from the NDA, runways, and FLA via an extensive storm drainage system. Several culverts and drainage ditches discharge stormwater into the FLDD. The FLDD is an unlined drainage channel, 20 to 25 feet wide and more than 2,500 feet long. The FLDD extends from the outfall of three 4-foot diameter storm drain culverts southward to the SCF diversion weir at Weinman Road. South of the SCF discharge, flow in the FLDD drainage continues southward through the FLDD Wetland. This wetland is approximately 2,000 feet long, with an average width of about 400 feet. Flow from the FLDD Wetland eventually enters the EBGB.

Surface water, sediment, and surface soil samples were collected from the FLDD and FLDD Wetland. VOCs, including benzene, toluene, ethylbenzene, and xylenes (BTEX) and chlorinated solvents, were detected in surface water with the highest frequency and concentrations near the FLDD headwall. Fuel-related VOCs were
primarily detected in three distinct area: (1) just below the FLDD headwall, (2) just before diversion into the SCF, and (3) just downstream of the SCF discharge confluence with the FLDD. VOCs were detected in only two surface soil samples at low concentrations (close to the CRQL).

SVOCs were sporadically detected in most of the surface water samples but may have been associated with suspended solids in unfiltered samples. Fuel-related SVOCs, including PAHs, were detected in many FLDD and FLDD Wetland sediment and surface soil samples with the highest concentrations occurring in sediment upstream of the SCF. The maximum reported concentration of total PAHs in sediment was 310 milligrams per kilogram (mg/kg). PAH results from surface soils closely resemble the types and concentrations of PAHs detected in sediment.

TPH was detected in the majority of the sediment samples. Detected concentrations of TPH are consistent with overall elevated concentrations of SVOCs in each sediment sample. Surface soil and sediment TPH and SVOC results indicate a modest trend in decreasing concentrations moving away from the main channel into the floodplain.

Pesticide results from one surface water sample near the SCF indicated concentrations greater than off-site concentrations. One PCB (Aroclor-1260) was detected in two surface water samples but is believed to be the result of adsorption on suspended solids in the unfiltered samples. Pesticides in the FLDD and FLDD Wetland sediments were typically at higher concentrations than in other LAFB study areas. PCBs (primarily Aroclor-1260) were detected above off-site concentrations in most of the sediment samples from the FLDD and FLDD Wetland at concentrations ranging from 0.21 to 140 mg/kg, and in only two of the surface soil samples from the FLDD Wetland.

Numerous inorganics were detected above background in surface water, sediment and surface soil. Higher concentrations and greater distribution of inorganics in surface water were generally encountered near the FLDD headwall, approximately halfway down the FLDD, and downstream of the SCF. Detections in

sediment and surface soil are distributed fairly uniformly throughout the FLDD and FLDD Wetland. Lead was reported at a maximum concentration of 474 mg/kg in a sediment sample from the FLDD and 234 mg/kg in a surface soil sample from the FLDD Wetland.

East Branch of Greenlaw Brook

The EBGB originates in the wetlands near the FTF and flows westerly for approximately 2,500 feet before merging with the FLDD Wetland drainage (see Figure 2-4). After the confluence with the FLDD Wetland area, the brook continues to flow westerly, and merges with the WBGB. The EBGB is generally a narrow, shallow stream, except in wetland areas, where it broadens.

VOCs were detected in surface water and sediment samples collected from the EBGB. Detected compounds were primarily BTEX and sporadic low concentrations of some chlorinated solvents. Most of the VOC contaminants reported in surface water occurred in samples from the 1991 sampling event from locations near the FTF. VOC contaminants in sediment were primarily detected in drainage areas from the Refueling Maintenance Shop Area (RMSA), FTF, Vehicle Maintenance Building (VMB), and near the confluence with the FLDD Wetland.

SVOCs constitute a substantial portion of the contaminants reported in EBGB surface water and sediment. The majority of SVOCs were detected in sediment throughout the EBGB. Detected compounds included PAHs and other fuel-related compounds with total PAHs detected at a maximum concentration of 46 mg/kg. The highest concentrations of PAHs were detected in the upper reaches of the EBGB and generally decrease in frequency and concentrations downstream.

TPH was detected in most sediment samples throughout the EBGB but in only one surface water sample. The highest concentrations were detected in drainage area sediments from the RMSA, FTF, and VMB. As with the SVOCs, TPH concentrations in the EBGB generally decrease moving downstream.

In EBGB surface water, pesticides and PCBs were detected infrequently; when they occur, they may be attributable principally to sorbed contaminants in unfiltered samples. Numerous pesticides were detected in sediment throughout the EBGB, in some cases at concentrations an order of magnitude greater than off-site
concentrations. With some exceptions, the highest concentrations were detected in drainage area sediments from the RMSA, FTF, and VMB and generally decrease downstream. Where the exceptions occur, detected concentrations may be partially associated with adjacent agricultural operations. PCBs were detected in many sediment samples with the maximum reported concentration of 110 mg/kg. As with the other contaminants, the greatest concentrations of pesticides and PCBs were detected in the upper reaches of the EBGB.

Reported concentrations of inorganics are typically moderately low for both surface water and associated sediment. Lead was detected above background in the drainage area sediments from the RMSA, FTF, and VMB at concentrations as high as 110 mg/kg.

West Branch of Greenlaw Brook

The WBGB originates northwest of the FLA, west of the base boundary. The WBGB flows southward onto base property, passing west of the Quarry and NDA, and into Malabeam Lake (see Figures 2-5 and 2-6). The WBGB exits the southern end of Malabeam Lake and continues southward into Chapman Pit, and subsequently merges with the EBGB. The total length of the WBGB is approximately 3.4 miles.

Surface water and sediment samples were collected from the WBGB. With few exceptions VOC detections in surface water and sediment, not interpreted to be associated with laboratory contamination, were infrequently detected and generally reported at concentrations below 10 parts per billion.

Fuel-related SVOCs were infrequently detected in surface water samples in the WBGB. The majority of SVOCs detected in sediment were PAHs with the maximum total PAH concentration reported at 1,120 mg/kg. This sample was collected from a drainageway originating from the western side of the NDA and was more than 10 times higher in total PAH concentration than any other sediment sample associated with the WBGB. SVOC results from the WBGB indicate the bulk PAH contamination remains in NDA drainageways with limited transport to the WBGB.

With one exception, surface water TPH results were nondetect. Several positive results were reported for TPH and fuel oil in sediment samples throughout the WBGB, with the highest concentration detected in Chapman Pit sediments. Only four of the downstream sediment samples in the WBGB showed concentrations greater than the upstream background location. TPH data were not available for the NDA drainageways.

Pesticides detected in surface water in the WBGB were generally below observed off-site concentrations. Various pesticides were detected in sediment throughout the WBGB. The majority of detections were less than one order of magnitude above background. The highest concentrations were observed in samples from the Quarry drainage ditch and the adjacent wetland area, and the southernmost NDA drainageway. The number and concentrations of pesticides detected in the WBGB area are generally lower than observed in the EBGB, and are interpreted to be consistent with routine application of pesticides at LAFB. PCBs were detected above concentrations observed in off-site samples at two locations, the wetland area below the Quarry drainage (0.56 mg/kg) and in Green Pond (0.6 and 0.8 mg/kg). One PCB was also detected in one of the surface water samples from the WBGB.

Inorganics were reported above background in surface water and sediment throughout the WBGB. The greatest number of individual metals detected above background concentrations in surface water was from a turbid sample collected just below Chapman Pit. In sediment samples, cadmium was detected with the most regularity at elevated levels (five times background) primarily in sample locations west of the NDA, and manganese was detected at elevated levels in the vicinity of Chapman Pit.

A removal action to address elevated levels of inorganics in soil/sediment in the vicinity of Chapman Pit is scheduled for the 1997 construction season.

5.3 BUTTERFIELD BROOK/LIMESTONE STREAM STUDY AREA

The BB/LS Study Area (see Figure 2-7) includes the northeastern and eastern portions of the base and is approximately 7,150 acres in size. Base property within the study area covers approximately 5,100 acres. The headwaters of Butterfield Brook are north of the base boundary. Principal drainage systems in the study area include Willard and Butterfield Brooks in the north and Limestone Stream in the south. Butterfield Brook drains roughly the eastern third of the Base, flows southeasterly into Durepo Reservoir, and becomes Limestone Stream below the reservoir dam. Limestone Stream flows southerly approximately 11 miles, and then merges with the Aroostook River. Contaminants detected within the study area are likely the result of a combination of base- and non-base-related activities. Butterfield Brook and its northern tributaries appear to be impacted by runoff from agricultural field activity north of the base.

Surface water and sediment samples were collected from the BB/LS Study Area. Analytical results from both Butterfield Brook and Limestone Stream are summarized together in the following paragraphs.

VOCs, including fuel-related compounds and trichloroethylene, were detected sporadically in surface water samples from BB/LS. The only results that consistently indicate the presence of VOCs in surface water and sediment is the wetland area south of the UTS. This wetland area receives stormwater runoff from the UTS, as well as other buildings and former facilities on the north side of Oregon Trail.

SVOCs were detected in surface water sporadically throughout the BB/LS Study Area but were never detected more than once at any location. SVOCs were detected in over 50 percent of the sediment samples. The great majority of SVOCs detected were PAHs, with the maximum reported concentration (7.2 mg/kg) in a sample collected from the wetland downstream of the UTS. SVOCs were detected in the background location for Butterfield Brook upgradient of East Loring Lake but were not detected in background samples from Masters Brook and Willard Brook. PAHs were detected in Durepo Brook where it enters the reservoir from the east, indicating a potential off-base contribution to the reservoir. Upgradient sources along Butterfield Brook and Durepo Brook include roadways and agricultural areas.

TPH was detected in surface water samples from the center of East Loring Lake and downstream of Durepo Reservoir. TPH was detected in sediment throughout the BB/LS Study Area, with the highest concentration detected in the drainage area between the Fire Training Area and East Loring Lake. As with SVOCs, TPH was detected in the upstream background samples for Butterfield Brook and Durepo Brook. Neighboring agricultural operation and road runoff presumably account for fuel-related contaminants entering these areas.

Numerous pesticides were detected in both surface water and sediment throughout this drainage area. The reported concentrations in both media are almost all less than or within an order of magnitude of off-site concentrations for individual pesticides. One exception is the wetland area southeast of the UTS, that also showed the presence of other organic and inorganic contaminants. One PCB (Aroclor-1260) was detected above off-site concentrations in only two samples (1 J and 0.9 mg/kg), collected downstream of the UTS storm drain outfall.

Inorganics above background concentrations in surface water and sediment are widespread and varied across the study area but are generally characterized as low concentrations. With very few exceptions, inorganics were detected at their highest levels in the wetland south of the UTS and in East Loring Lake.

6.0 SUMMARY OF SITE RISKS

A baseline human health risk assessment (HHRA) and baseline ecological risk assessment (ERA) were performed as part of the OU 13 RI. The assessments were performed in accordance with USEPA and MEDEP risk assessment guidance documents and the LAFB Risk Assessment Methodology (Hazardous Waste Remedial Actions Program [HAZWRAP], 1994). The purpose of the HHRA was to characterize the risks associated with potential human exposure to contaminated media, define remediation goals and objectives, and provide information to assist with remedial action decisions. The purpose of the ERA was to evaluate potential risks to aquatic organisms and semi-aquatic wildlife that use aquatic habitat (i.e., stream and palustrine areas) and to terrestrial receptors that may use habitat within the study areas. The baseline FMRA and ERA consisted of a six step process:

1) Data evaluation was conducted to determine the usability of the data and to determine the data sets that would be used for the HHRA and ERA.

2) Contaminant identification identified those hazardous substances that, given the specifics of the site, were determined to be contaminants of potential concern.

3) Exposure assessment identified actual or potential exposure pathways, characterized the potentially exposed populations, and determined the extent of the possible exposure.

4) Toxicity assessment considered the types and magnitude of adverse health effects associated with exposure to hazardous substances.

5) Risk characterization integrated the four previous steps to summarize the potential and actual risks posed by hazardous substances in the study areas, including carcinogenic and non-carcinogenic risks.

6) Uncertainty evaluation considered possibilities that the above process may have over estimated or under estimated the actual risk.

The following paragraphs summarize the results of the HHRA and ERA for each of the study areas. For more detail on the data sets used, data evaluation, contaminant identification, exposure assessment, toxicity assessment, risk characterization, and uncertainty evaluation, see the Final OU 13 RI Report (ABB-ES, 1997c) and the Final OU 13 FS (ABB-ES, 1997a).

The risk assessment process identified the primary risk contributors to both human and ecological receptors. Remediation goals for the individual study areas were then developed for the primary risk contributors. In a few instances, accumulated analytical data and site-specific knowledge about selected inorganics (e.g., frequency of detection, randomness of detection, natural occurrence, lack of base sources, and detections only slightly above background concentrations) indicated that remediation goal development was not warranted. For example, in the FLDD/FLDD Wetland Study Area, selenium was detected above background in less than 10 percent of the sediment samples, whereas lead was detected above background in more than 95 percent of the samples. The widespread detection of lead, its co-location with selenium, selenium detections only slightly above background, and the presence of other significant risk-contributing compounds (i.e., Aroclor-1260 and 4,4-DDT) led to the elimination of selenium as a cleanup indicator compound with a remediation goal. In some cases, manganese was eliminated from remediation goal development primarily due to the fact that it is ubiquitous and naturally occurring in soils and bedrock in the Loring area. Where similar circumstances were identified for aluminum, zinc, and nickel, the decision was made to limit the number of cleanup indicator compounds and remediation goals. This process enables the cleanup to focus on the primary contributors of risk.

6.1 WOLVERTON BROOK/BRANDY BROOK STUDY AREA

The OU 13 RI Report (ABB-ES, 1997c) recommended no further action for surface water and sediment in the WB/BB Study Area. The site risks are not summarized in this subsection; however, the HHRA and ERA for the WB/BB Study Area are presented in the OU 13 RI Report. The OU 13 RI Report recommended an FS to address contamination in fish in the LMR. Therefore, the HHRA and ERA for the LMR are summarized below.

Little Madawaska River

The human health contaminants of concern (COCs) for the LMR are presented in the OU 13 FS (ABB-ES, 1997a). Quantitative estimates of carcinogenic and noncarcinogenic risks associated with exposure to contaminated media, using both the average and RME scenarios, are summarized in Table 6-1.

Total current and future receptor risks do not exceed the USEPA carcinogenic risk range or the MEDEP cancer risk guidance value for the average and RME scenarios. Potential future and current carcinogenic risks for all surface water and sediment data sets are within the USEPA carcinogenic risk range and at or below the MEDEP cancer risk guidance value.

Noncarcinogenic risk for the total receptor does not exceed a Hazard Index (HI) of 1. Current and future noncarcinogenic risks calculated for all surface water and sediment data sets, using both the average and RME exposures for the wading and swimming scenarios, are significantly less than an HI of 1. In addition, the combined surface water and sediment noncarcinogenic risks for the child and adult receptors while wading and swimming are less than an HI of 1. Carcinogenic and noncarcinogenic risks associated with ingestion of fish fillets from the LMR exceed regulatory guidelines. Aroclor-1260 is the primary risk contributor for both carcinogenic and noncarcinogenic risks.

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<IMG SRC 97002D8>
<IMG SRC 97002D9>
<IMG SRC 97002E>

Qualitative evaluation of storm-event and snowmelt data indicate that episodic high-flow conditions do not result in an increased human health risk associated with exposure to surface water and sediment.

Ecological COCs for the different habitats identified in the LMR are presented in the OU 13 FS (ABB-ES, 1997a). The primary risk contributors and the associated risks are summarized in Tables 6-2 through 6-4.

Impacts to aquatic receptors from exposure to COCs in surface water and sediment appear to be minimal. For semi-aquatic receptors, acute and chronic exposure His were slightly above 1 for several indicator species. Selenium and Aroclor-1260 are the primary risk contributors for these receptors. Risk estimates for selenium in sediment are not apparently correlated with base-related contamination because maximum sediment COC concentrations are generally comparable to background concentrations, and background concentrations are generally greater than the RTVs. PCBs were detected at concentrations below those observed off-site but greater than the RTV. Measured fish-tissue PCB residues in trout in the lower LMR may be associated with reproductive and behavioral effects. Qualitative evaluation of data from the 1994 storm-event samples for the primary risk contributors did not indicate an unusual level of risks to ecological receptors.

Acute and chronic risk estimates for semi-aquatic wildlife suggest that substantial risk would not occur from potential exposures to average and maximum detected surface water and sediment concentrations. Incremental risk to aquatic and semi-aquatic receptors associated with exposure to contaminants that may migrate into the LMR in the future appears to be negligible.

6.2 GREENLAW BROOK STUDY AREA

The HHRA and ERA were evaluated separately for several waterways within the Greenlaw Brook Study Area: the FLDD/FLDD Wetland and associated ditches, the EBGB, and the WBGB.

Flightline Drainage Ditch and Corresponding Wetland

The human health COCs for the FLDD/FLDD Wetland and associated ditches are presented in the OU 13 FS (ABB-ES, 1997a). Quantitative estimates of carcinogenic and noncarcinogenic risks associated with exposure to contaminated media, using both the average and RME scenarios, are summarized in Table 6-5.

Total current and future receptor risk exceeds the USEPA carcinogenic risk range and the MEDEP cancer risk guidance value for both average and RME scenarios. Potential carcinogenic risks for a surface soil and sediment data sets are within the USEPA carcinogenic risk range. Potential risk for surface water exceeds the USEPA carcinogenic risk range. The surface water risk, and the RME surface soil and sediment risk exceed the MEDEP cancer risk guidance value. Total noncarcinogenic risk exceeds an HI of 1 for average and RME scenarios. Estimated noncarcinogenic risks exceed the HI of 1 for RME sediment and RME and average surface water scenarios. The primary carcinogenic and noncarcinogenic risk contributor for surface soil, sediment, and surface water, is Aroclor-1260. Qualitative evaluation of storm-event data indicate that episodic high-flow conditions do not result in an increased human health risk associated with exposure to surface water and sediment.

Ecological COCs for the different habitats identified in the FLDD/FLDD Wetland and associated ditches are presented in the OU 13 FS (ABB-ES, 1997a). The primary risk contributors and the associated risks for the different habitats are summarized in Tables 6-6 through 6-11.

TABLE 6-4
SUMMARY OF ECOLOGICAL RISK ASSESSMENT FOR SEDIMENT AND SURFACE WATER
LITTLE MADAWASKA RIVER - RIVERINE HABITAT

OPERABLE UNIT 13 RECORD OF DECISION
LORING AIR FORCE BASE

ECOLOGICAL RECEPTORS EVALUATED

PRIMARY RISK CONTRIBUTORS (a)	ACUTE EXPOSURES	CHRONIC EXPOSURES	RIVER HOT SPOT
SEMI-AQUATIC WILDLIFE(b)			
Muskrat			
Hazard Index	0.23	0.11	0.25
Belted Kingfisher			
4,4-DDE	--	0.49[c]	--
4,4-DDT	--	0.13[c]	--
Selenium	1.1[d]	0.17[d]	--
Hazard Index	1.3	1.1	0.014
Maritime Garter Snake			
Hazard Index	0.0062	0.013	0.0021
Mink			
4,4-DDE	--	0.37[e]	--
Aroclor-1260	--	01.6[f]	--
Selenium	--	0.95[g]	--
Hazard Index	0.79	3.3	0.013
Osprey			
Selenium	1.2[h]	--	--
Hazard Index	1.4	0.065	0.00087

NOTES:
[a] The analytes that contribute to risk are identified for those wildlife receptors that have a hazard index greater than 1. Hazard quotients are listed for these analytes.
[b] The information listed below is a summary of Tables Y10-5 through Y10-7 in Appendix Y of the RI report (ABB-ES, 1997c).
[c] Risk based on the following effects: LOAEL for decreased eggshell thickness in barn owls; chronic ingestion study.
[d] Risk based on the following effects: NOAEL for teratogenic effects in mallard ducks; 3-month ingestion study.
[e] Risk based on the following effects: LOAEL for reproductive productivity in rats; 3-generation ingestion study.
[f] Risk based on the following effects: LOAEL for multiple effects in beagle dogs; chronic ingestion study.
[g] Risk based on the following effects: LOAEL for decreased breeding in rats; chronic ingestion study.
[h] Risk based on the following effects: LOAEL for mortality in rats; acute ingestion study.
--: Analyte not a substantial risk contributor for this exposure scenario.

TABLE 6-7
SUMMARY OF ECOLOGICAL RISK ASSESSMENT FOR SEDIMENT AND SURFACE WATER
FLIGHTLINE DRAINAGE DITCH STUDY AREA - STREAM HABITAT

OPERABLE UNIT 13 RECORD OF DECISION
LORING AIR FORCE BASE

ECOLOGICAL RECEPTORS EVALUATED

PRIMARY RISK CONTRIBUTORS	ACUTE EXPOSURES[a]	CHRONIC EXPOSURES [a]
SEMI-AQUATIC WILDLIFE[b]		
Muskrat		
4,4'-DDD	0.42[c]	0.77[d]
Aroclor-1260	0.33[c]	0.11[e]
gamma-Chlordane	-	0.54[f]
Lead	0.30[g]	0.47[h]
Hazard Index	3.0	2.9
Great Blue Heron		
gamma-Chlordane	0.38[i]	0.79[f]
Endosulfan sulfate	0.11[j]	0.3[k]
4,4-DDT	-	0.99[l]
Hazard Index	1.4	3.4
Maritime Garter Snake		
Hazard Index	0.18	0.23
Mink		
Hazard Index	0.038	0.024
Belted Kingfisher		
Hazard Index	0.071	0.073

NOTES:
[a] The analytes that contribute to risk are identified for those wildlife receptors that have a hazard index greater than 1. Hazard quotients are listed for these analytes.
[b] The information listed below is a summary of Tables Y7-12 and Y7-13 in Appendix Y of the RI report (ABB-ES, 1997c).
[c] Risk estimated based on the following effects: mortality in rats; single oral dose.
[d] Risk estimated based on the following effects: LOAEL for reproductive effects in rats; multi-generation ingestion study.
[e] Risk estimated based on the following effects: reduced litter size in rats; multi-generation ingestion study.
[f] Risk estimated based on the following effects: LOAEL for regional liver hypertrophy in mice; chronic ingestion study.
[g] Risk estimated based on the following effects: mortality in rats; single oral dose.
[h] Risk estimated based on the following effects: NOAEL for developmental effects in mortality in rats; single oral dose.
[i] Risk estimated based on the following effects: LOAEL for mortality in pheasant; single oral dose.
[j] Risk estimated based on the following effects: LOAEL for mortality in mallard; single oral dose.
[k] Risk estimated based on the following effects: LOAEL for ovarian cyst development in mice; chronic ingestion study.
[l] Risk estimated based on the following effects: LOAEL for reduced eggshell thickness in black duck; chronic ingestion study.
-: Analyte is not a substantial risk contributor for this exposure scenario.

TABLE 6-8
SUMMARY OF ECOLOGICAL RISK ASSESSMENT FOR SEDIMENT AND SURFACE SOIL
FLIGHTLINE DRAINAGE DITCH STUDY AREA - FLOODPLAIN HABITAT
OPERABLE UNIT 13 RECORD OF DECISION
LORING AIR FORCE BASE

ECOLOGICAL RECEPTORS EVALUATED

CONTRIBUTORS	PRIMARY RISK	ACUTE EXPOSURES[a]	CHRONIC EXPOSURES [a]
TERRESTRIAL WILDLIFE (b]			
Short-tail Shrew			
	Benzo(b,k)fluoranthene	2.2[c]	-
	Chrysene	1.0[c]	-
	Endrin aldehyde	1.7[d]	-
	Lead	1.3[e]	5.2[f]
	Manganese	3.2[g]	3.8[h]
	Selenium	12[d]	7.5[i]
	Hazard Index	27	22
American Woodcock			
	Benzo(a)pyrene	1.0[c]	-
	Benzo(b,k)fluoranthene	2.7[c]	-
	Chrysene	1.2[c]	-
	Endrin aldehyde	2.6[l]	-
	Lead	1.5[j]	2.2[k]
	Manganese	3.6[g]	1.6[h]
	Selenium	15[d]	-
	Hazard Index	34	7.4
Garter Snake			
	Hazard Index	0.51	0.19
Red Fox			
	Selenium	1.8[d]	-
	Hazard Index	6.9	0.75
Barred Owl			
	Benzo(b,k)fluoranthene	1.0[c]	-
	Benzo(g,h,i)perylene	1.2[c]	-
	Indeno(1,2,3-cd)pyrene	1.0[c]	-
	Endrin aldehyde	1.3[j]	-
	Selenium	2.1[d]	-
	Hazard Index	9.2	0.26

NOTES:
[a] The analytes that contribute to risk are identified for those wildlife receptors that have a hazard index greater than 1. Hazard quotients are listed for these analytes.
[b] The information listed below is a summary of Tables Y7-8 and Y7-9 in Appendix Y of the RI report (ABB-ES, 1997c).
[c] Risk estimate based on the following effects: decreased fertility and litter size in mice.
[d] Risk estimate based on the following effects: mortality in rats.
[e] Risk estimate based on the following effects: mortality in guinea pigs.
[f] Risk estimate based on the following effects: NOAEL for developmental effects in rats.
[g] Risk estimate based on the following effects: NOAEL for mortality in mice.
[h] Risk estimate based on the following effects: decreased growth rates in rodents and livestock.
[i] Risk estimate based on the following effects: decreased breeding in rats.
[j] Risk estimate based on the following effects: mortality in rock doves.
[k] Risk estimate based on the following effects: kidney pathology and learning deficiencies in rock doves.
[l] Risk estimate based on the following effects: mortality in birds.
-: Analyte not a substantial risk contributor for this exposure scenario.
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TABLE 6-10
SUMMARY OF ECOLOGICAL RISK ASSESSMENT FOR SEDIMENT
FLIGHTLINE DRAINAGE DITCH STUDY AREA - AQUATIC DITCH HABITAT

OPERABLE UNIT 13 RECORD OF DECISION
LORING AIR FORCE BASE

ECOLOGICAL RECEPTORS EVALUATED

PRIMARY RISK CONTRIBUTORS	ACUTE EXPOSURES[a]	CHRONIC EXPOSURES [a]
TERRESTRIAL WILDLIFE [b]		
Short-tail Shrew		
Benzo(b,k)fluoranthene	1.0[c]	-
Selenium	49[d]	1.9[e]
Hazard Index	53	2.0
American Woodcock		
Benzo(b,k)fluoranthene	1.3[c]	-
Selenium	64[d]	-
Hazard Index	68	0.012
Garter Snake		
Selenium	1.1[d]	-
Hazard index	1.1	0.0015
Red Fox		
Selenium	3.0[d]	-
Hazard Index	3.3	0.00051
Barred Owl		
Hazard Index	0.91	0.000029

NOTES:

[a] The analytes that contribute to risk are identified for those wildlife receptors that have a hazard index greater than 1. Hazard quotients are listed for these analytes.
[b] The information listed below is a summary of Tables Y7-16 and Y7-17 in Appendix Y of the RI report (ABB-ES 1997c).
[c] Risk estimate based on the following effects: decreased fertility and litter size in mice.
[d] Risk estimate based on the following effects: mortality in rats.
[e] Risk estimate based on the following effects: decreased breeding in rats.
-: Analyte not a substantial risk contributor for this exposure scenario.

TABLE 6-11
SUMMARY OF ECOLOGICAL RISK ASSESSMENT FOR SURFACE SOIL
FLIGHTLINE DRAINAGE DITCH STUDY AREA - TERRESTRIAL DITCH HABITAT

OPERABLE UNIT 13 RECORD OF DECISION
LORING AIR FORCE BASE

ECOLOGICAL RECEPTORS EVALUATED

PRIMARY RISK CONTRIBUTORS	ACUTE EXPOSURES[a]	CHRONIC EXPOSURES [a]
TERRESTRIAL WILDLIFE [b]		
Short-tail shrew		
Selenium	29[c]	2.9[d]
Hazard Index	34	4.0
American Woodcock		
Benzo(b,k)fluoranthene	1.0[e]	-
Selenium	38[c]	-
Hazard Index	44	0.039
Garter Snake		
Hazard Index	0.64	0.0047
Red Fox		
Selenium	1.9[c]	-
Hazard Index	2.3	0.0014
Barred Owl		
Selenium	0.89[c]	-
Hazard Index	1.3	0.00021

NOTES:

[a] The analytes that contribute to risk are identified for those wildlife receptors that have a hazard index greater than 1. Hazard quotients are listed for these analytes.
[b] The information listed below is a summary of Tables Y7-18 and Y7-19 in Appendix Y of the RI report (ABB-ES 1997c).
[c] Risk estimate based on the following effects: mortality in rats.
[d] Risk estimate based on the following effects: decreased breeding in rats.
[e] Risk estimate based on the following effects: decreased fertility and litter size in mice.
-: Analyte not a substantial risk contributor for this exposure scenario.

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<IMG SRC 97002E2>

It is likely that aquatic organisms that occur in the FLDD Study Area, including Ditch G06, are being adversely affected by existing contaminant levels in sediment. The majority of the risk is associated with exposures to SVOCs, Aroclor-1260, and many different pesticides. HIs for some semi-aquatic wildlife receptors were estimated to exceed 1, but because of the small magnitude of risk and the number of conservative assumptions used, it is unlikely that most semi-aquatic wildlife receptors would be adversely affected in the FLDD habitat. Based on risk evaluations for terrestrial wildlife receptors that occur in the FLDD floodplain habitat, receptors may be adversely affected as a result of contaminant exposure. Potential effects would be limited based on the magnitude of risk estimates.

Inorganic analyte concentrations detected in the aquatic and terrestrial ditches associated with the FLDD and the floodplain, exceed the toxicological benchmarks used to screen risks to terrestrial plants and soil invertebrates. However, maximum concentrations of the risk-contributing analytes are not substantially higher than background concentrations.

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<IMG SRC 97002E5>
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The inhalation exposure pathway appears to be insignificant for ecological receptors. The incremental risk to wildlife receptors associated with discharge of groundwater to the FLDD stream habitat was also evaluated and determined to be insignificant. The evaluation of wide-ranging wildlife exposures indicates that risks to these receptors are similar to those limited to the FLDD stream habitat.

East Branch of Greenlaw Brook

The human health COCs for the EBGB are presented in the OU 13 FS (ABB-ES, 1997a). Quantitative estimates of carcinogenic and noncarcinogenic risks associated with exposure to contaminated media, using both the average and RME scenarios, are summarized in Table 6-12.

Total current and future receptor risk are within the USEPA carcinogenic risk range for average and RME scenarios. Total receptor risk for the RME scenario exceeds the MEDEP cancer risk guidance value. It is not appropriate to sum the noncarcinogenic risks for the child and adult components of the total receptor; however, the hazard index for the child under the RME scenario exceeds an HI of 1. Potential current and future carcinogenic risks for all surface soil, sediment and surface water data sets are within or below the USEPA carcinogenic risk range. Only potential carcinogenic risks for adult RME exposure to sediment, and child RME exposure to the PCB sediment hot spot, exceed the MEDEP cancer risk guidance value. Noncarcinogenic risk associated with childhood exposure to sediment at the PCB hot spot under the RME scenario exceeds an HI of 1. Carcinogenic and noncarcinogenic risks associated with the ingestion of fish fillets from the EBGB exceed regulatory guidelines. Aroclor-1260 is the primary risk contributor for both carcinogenic and noncarcinogenic effects. Qualitative evaluation of storm-event and snowmelt data indicate that high-flow conditions do not result in an increased human health risk associated with exposure to surface water and sediment.

Ecological COCs for the different habitats identified in the EBGB are presented in the OU 13 FS (ABB-ES, 1997a). The primary risk contributors and the associated risks for the different habitats are summarized in Tables 6-13 through 6-18.

Stream Habitat. Aquatic receptors may be at risk as a result of exposure to stream surface water and sediment. HIs based on maximum surface water and sediment concentrations are 650 and 3,100, respectively. Aroclor-1260 contributes more than 95 percent of the calculated risk to the stream sediment at the PCB hot spot, with a maximum HI of 23,000. Adverse population-level impacts are unlikely to occur to semi-aquatic wildlife in the stream habitat, although risks to receptors sensitive to PCB exposures are possible in the PCB hot spot.

Palustrine Habitat. Sensitive aquatic receptors may be at risk from potential exposure to areas of PCB and pesticide contaminants in stream sediments; however, population-level effects are unlikely. Some inorganic analytes exceed plant reference toxicity values (RTVs) but phytotoxicity is unlikely to occur at near background concentrations and plants are not considered at risk from exposure to palustrine sediments. Based on the slight RTV exceedances and the conservative nature of the screening process, it is unlikely that adverse population-level impacts would occur to invertebrates and semi-aquatic receptors inhabiting the palustrine habitat in the vicinity of the EBGB.

TABLE 6-12
QUANTITATIVE RISK SUMMARY
GREENLAW BROOK (EAST BRANCH) STUDY AREA

OPERABLE UNIT 13 RECORD OF DECISION
LORING AIR FORCE BASE

	MEAN EPC		MAXIMUM EPC	
	Total a Cancer Risk	Total a Hazard Index	Total a Cancer Risk	Total a Hazard Index
CURRENT USE				
DITCH SURFACE SOIL				
Incidental Ingestion of Soil: Child (6-16 Years)	3E-07	0.01	1E-06	0.05
Dermal Contact with Soil: Child (6 - 16 Years)	7E-08	0.005	3E-06	0.1
Inhalation Exposure to particulates and volatiles: Child (6 - 16 Years)	2E-10	0.0000004	4E-10	0.000001
TOTAL: CHILD	3E-07	0.02	4E-06	0.2
DITCH SURFACE SOIL (HOT SPOT)				
Incidental Ingestion of Soil: Child (6 - 16 Years)	3E-06	0.09	4E-06	0.1
Dermal Contact with Soil: Child (6 - 16 Years)	8E-07	0.03	8E-06	0.3
Inhalation Exposure to particulates and Volatiles: Child (6-10 Years)	4E-10	ND	4E-10	ND
TOTAL: CHILD	3E-06	0.1	1E-05	0.4
DITCH AND STREAM SEDIMENT				
Incidental Ingestion of Sediment Child (6 - 16 Years) Wading	6E-07	0.03	3E-06	0.2
Dermal Contact of Sediment Child (6 - 16 Years) Wading	7E-04	0.005	5E-06	0.3
TOTAL: CHILD WADING	7E-07	0.04	9E-04	0.5
SEDIMENT (EAST BRANCH)				
Incidental Ingestion of Sediment Adult Wading	1E-06	0.02	5E-06	0.1
Dermal contact of Sediment Adult Wading	2E-07	0.003	1E-05	0.2
TOTAL: ADULT WADIN6	1E-06	0.03	2E-05	0.3
COMPOSITE RECEPTOR (CHILD PLUS ADULT) RISKS WADING: SEDIMENT	2E-06	NC	3E-05	NC

TABLE 6-12
QUANTITATIVE RISK SUMMARY
GREENLAW BROOK (EAST BRANCH) STUDY AREA

OPERABLE UNIT 13 RECORD OF DECISION
LORING AIR FORCE BASE

	MEAN EPC		MAXIMUM EPC	
	Total a Cancer Risk	Total a Hazard Index	Total a Cancer Risk	Total a Hazard Index
SEDIMENT(PCB HOT SPOT)				
Incidental Ingestion of Sediment: Child (6-16 Years) Wading	1E-05	0.4	2E-05	1
Dermal contact of Sediment: Child (6-16 Years) Wading	4E-06	0.2	6E-05	3
TOTAL: CHILD WADING	1E-05	0.5	8E-05	3
SEDIMENT (PAH/DDD HOT SPOT)				
Incidental Ingestion of Sediment: Child (6-16 Years) Wading	7E-07	0.0007	7E-07	0.0007
Dermal Contact of Sediment: Child (6-16 Years) Wading	ND	0.0008	ND	0.005
TOTAL: CHILD WADING	7E-07	0.001	7E-07	0.006
TOTAL SEDIMENT RISK				
Child Wading (Sediment plus Sediment [PCB Hot Spot] plus Sediment [PAH/DDD Hot Spot])	1E-05	0.5	9E-05	4
Adult Wading (Sediment [East Branch])	1E-06	0.03	2E-05	0.3
COMPOSITE RECEPTOR (CHILD PLUS ADULT) RISKS WADING: SEDIMENT	1E-05	NC	1E-04	NC
SURFACE WATER				
Incidental Ingestion of Surface Water: Child (6-16 Years) Wading	8E-10	0.001	9E-10	0.01
Dermal Contact of Surface Water: Child (6-16 Years) Wading	1E-08	0.002	2E-08	0.02
TOTAL: CHILD WADING	1E-08	0.003	2E-08	0.03
SURFACE WATER (EAST BRANCH)				
Incidental Ingestion of Surface Water: Adult Wading	1E-09	0.0007	1E-09	0.006
Dermal Contact of Surface Water: Adult Wading	3E-08	0.002	4E-08	0.02
TOTAL: ADULT WADING	3E-08	0.003	4E-08	0.02

TABLE 6-12
QUANTITATIVE RISK SUMMARY
GREENLAW BROOK (EAST BRANCH STUDY AREA)

OPERABLE UNIT 12 RECORD OF DECISION
LORING AIR FORCE BASE

	MEAN EPC		MAXIMUM EPC	
	Total a Cancer Risk	Total a Hazard Index	Total a Cancer Risk	Total a Hazard Index
TOTAL RISK SURFACE WATER				
Child Wading (Surface Water)	1E-08	0.003	2E-08	0.03
Adult Wading (Surface Water [East Branch])	3E-08	0.003	4E-08	0.02
COMPOSITE RECEPTOR (CHILD PLUS ADULT) RISKS WADING: SURFACE WATER	4E-08	NC	6E-08	NC
TOTAL RECEPTOR RISK (SURFACE SOIL, SEDIMENT, AND SURFACE WATER)				
Child (6-16 Years) Exposure to Surface Soil, Sediment, and Surface Water	1E-05	0.7	1E-04	4
Adult Exposure to Sediment and Surface Water	1E-06	0.03	2E-05	0.3
COMPOSITE RECEPTOR (CHILD PLUS ADULT) RISKS PLAYING AND WADING	1E-05	NC	1E-04	NC
FISH FILLETS EGGS				
Incidental Ingestion of Fish Fillets: Child	7E-04	53	1E-03	78
Incidental Ingestion of Fish Fillets: Adult	2E-03	30	2E-03	45
COMPOSITE RECEPTOR (CHILD PLUS ADULT) RISKS EATING FISH	2E-03	NC	3E-03	NC
FUTURE USE				
DITCH SURFACE SOIL				
Incidental Ingestion of Soil: Child (6-16 Years)	3E-07	0.01	1E-06	0.05
Dermal Contact with Soil: Child (6-16 Years)	7E-08	0.005	3E-06	0.1
Inhalation Exposure to Particulates and Volatiles: Child (6-16 Years)	2E-10	0.0000004	4E-10	0.000001
TOTAL: CHILD	3E-07	0.02	4E-06	0.2

TABLE 6-12
QUANTITATIVE RISK SUMMARY
GREENLAW BROOK (EAST BRANCH STUDY AREA)

OPERABLE UNIT 12 RECORD OF DECISION
LORING AIR FORCE BASE

			MEAN EPC		MAXIMUM EPC	
			Total a Cancer Risk	Total a Hazard Index	Total a Cancer Risk	Total a Hazard Index
DITCH SURFACE SOIL (HOT SPOT)						
Incidental Ingestion of Soil: Child (6-16 Years)			3E-06	0.09	4E-06	0.1
Dermal Contact with Soil: Child (6-16 Years			8E-07	0.03	8E-06	0.3
Inhalation Exposure to Particulates and volatiles: Child (6-16 Years)			4E-10	ND	4E-10	ND
	TOTAL:	CHILD	3E-06	0.1	1E-05	0.4
DITCH AND STREAM SEDIMENT						
Incidental Ingestion of Sediment: Child (6-16 Years) Wading			6E-07	0.03	3E-06	0.2
Dermal Contact of Sediment: Child (6-16 Years) Wading			7E-06	0.005	5E-06	0.3
	TOTAL:	CHILD WADING	7E-07	0.04	9E-06	0.5
SEDIMENT (EAST BRANCH)						
Incidental Ingestion of Sediment: Adult Wading			1E-06	0.02	5E-06	0.1
Dermal Contact of Sediment: Adult Wading			2E-07	0.003	1E-05	0.2
	TOTAL:	ADULT WADING	1E-06	0.03	2E-05	0.3
COMPOSITE RECEPTOR (CHILD PLUS ADULT) RISKS WADING: SEDIMENT			2E-06	NC	3E-05	NC
SEDIMENT (PCB HOT SPOT)						
Incidental Ingestion of Sediment: Child (6-16 Years) Wading			1E-05	0.4	2E-05	1
Dermal Contact of Sediment: Child (6-16 Years) Wading			4E-06	0.2	6E-05	3
	TOTAL:	CHILD WADING	1E-05	0.5	8E-05	3
SEDIMENT (PAH/DDD HOT SPOT)						
Incidental Ingestion of Sediment: Child (6-16 Years) Wading			7E-07	0.0007	7E-07	0.0007
Dermal Contact of Sediment: Child (6-16 Years) Wading			ND	0.0008	ND	0.005
	TOTAL:	CHILD WADING	7E-07	0.001	7E-07	0.006

TABLE 6-12
QUANTITATIVE RISK SUMMARY
GREENLAW BROOK (EAST BRANCH STUDY AREA)

OPERABLE UNIT 12 RECORD OF DECISION
LORING AIR FORCE BASE

	MEAN EPC		MAXIMUM EPC	
	Total a Cancer Risk	Total a Hazard Index	Total a Cancer Risk	Total a Hazard Index
TOTAL SEDIMENT RISK				
Child Wading (Sediment plus Sediment [PCB Hot Spot] plus Sediment [PAH/DDD Hot Spot])	1E-05	0.5	9E-05	4
Adult Wading (Sediment [East Branch])	1E-06	0.03	2E-05	0.3
COMPOSITE RECEPTOR (CHILD PLUS ADULT) RISKS WADING: SEDIMENT	1E-05	NC	1E-04	NC
SURFACE WATER				
Incidental Ingestion of Surface Water: Child (6-16 Years) Wading	2E-08	0.002	2E-08	0.01
Dermal Contact of Surface Water: Child (6-16 Years) Wading	2E-07	0.01	2E-07	0.03
TOTAL: CHILD WADING	2E-07	0.01	2E-07	0.04
SURFACE WATER (EAST BRANCH)				
Incidental Ingestion of Surface Water: Adult Wading	3E-08	0.002	3E-08	0.007
Dermal Contact of Surface Water: Adult Wading	4E-07	0.01	4E-07	0.03
TOTAL: ADULT WADING	4E-07	0.01	4E-07	0.03
TOTAL RISK SURFACE WATER				
Child Wading (Surface Water)	2E-07	0.01	2E-07	0.04
Adult Wading (Surface Water [East Branch])	4E-07	0.01	4E-07	0.03
COMP0SITE RECEPTOR (CHILD PLUS ADULT) RISKS WADING: SURFACE WATER	6E-07	NC	6E-07	NC
TOTAL RECEPTOR RISKS (SURFACE SOIL, SEDIMENT, AND SURFACE WATER)				
Child (6-16 Years) Exposure to Surface Soil, Sediment, and Surface Water	1E-05	0.7	1E-04	4
Adult Exposure to Sediment and Surface Water	1E-06	0.04	2E-05	0.3
COMPOSITE RECEPTOR (CHILD PLUS ADULT) RISKS PLAYING AND WADING	1E-05	NC	1E-04	NC

TABLE 6-12
QUANTITATIVE RISK SUMMARY
GREENLAW BROOK (EAST BRANCH STUDY AREA)

OPERABLE UNIT 12 RECORD OF DECISION
LORING AIR FORCE BASE

	MEAN EPC		MAXIMUM EPC	
	Total a Cancer Risk	Total a Hazard Index	Total a Cancer Risk	Total a Hazard Index
FISH FILLETS EGGS				
Incidental Ingestion of Fish Fillets: Child	7E-04	53	1E-03	78
Incidental Ingestion of Fish Fillets: Adult	2E-03	30	2E-03	45
COMPOSITE RECEPTOR (CHILD PLUS ADULT) RISKS EATING FISH	2E-03	NC	3E-03	NC

NOTES:
a Totals may not appear accurate due to the rounding; but, in fact, are based on addition of individual cancer risks and hazard indices prior to rounding.
EPC = Exposure Point Concentration
NC = Not calculated because noncancer risks are not additive between the child and adult receptors.
ND = Toxicity data not available for quantitative evaluation.
NE = not evaluated.
NA = No carcinogenic CPCs detected.

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TABLE 6-17
SUMMARY OF ESTIMATED RISK TO SEMI-AQUATIC WILDLIFE FROM SEDIMENT
GREENLAW BROOK (EAST BRANCH) STUDY AREA - PALUSTRINE HABITAT

OPERABLE UNIT 13 RECORD OF DECISION
LORING AIR FORCE BASE

ECOLOGICAL RECEPTORS EVALUATED

PRIMARY RISK CONTRIBUTORS	ACUTE EXPOSURES[a]	CHRONIC EXPOSURES [a]
SEMI-AQUATIC WILDLIFE[b]		
Muskrat		
Lead	-	0.32[c]
Selenium	2.0[d]	1.7[e]
Hazard Index	2.5	2.3
Great Blue Heron		
Lead	-	0.18[f]
Nickel	-	0.11[g]
Selenium	9.3[d]	0.71[h]
Hazard Index	9.6	1.3
Maritime Garter Snake		
Hazard Index	0.42	0.075
Short-tailed Shrew		
Lead	-	1.1[c]
Nickel	0.76[i]	-
Selenium	20[d]	17[e]
Hazard Index	22	19

NOTES:
[a] The analytes that contribute to risk are identified for those wildlife receptors that have a hazard index greater than 1. Hazard quotients are listed for these analytes.
[b] The information listed below is a summary of Tables Y9-14 and Y9-15 in Appendix Y of the RI report (ABB-ES, 1997c).
[c] Risk estimate based on the following effects: NOAEL for reproductive effects in rats; multi-generation feeding study.
[d] Risk estimate based on the following effects: LOAEL for mortality in rats; single oral dose.
[e] Risk estimate based on the following effects: LOAEL for reproductive effects in rats; chronic study.
[f] Risk estimate based on the following effects: LOAEL for kidney pathology and learning deficiencies in rock dove.
[g] Risk estimate based on the following effects: LOAEL for survivorship effects in Japanese quail; acute ingestion study.
[h] Risk estimate based on the following effects: NOAEL for teratogenic effects in mallards; subchronic study.
[i] Risk estimate based on the following effects: LOAEL for mortality in rats; single oral dose.
-: Analyte is not a substantial risk contributor for this exposure scenario.
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Ditch Habitat. Maximum concentrations of some inorganics exceed plant and invertebrate RTVs. However, because background concentrations are generally comparable to maximum detected site concentrations, and average site concentrations are generally below RTVs, the spatial extent of potential phytotoxicity likely would be limited. Lethal and sublethal effects to terrestrial wildlife receptors are possible but population-level effects are not likely.

West Branch of Greenlaw Brook

The human health COCs for the WBGB are presented in the OU 13 FS (ABB-ES, 1997a). Quantitative estimates of carcinogenic and noncarcinogenic risks associated with exposure to contaminated media, using both the average and RME scenarios, are summarized in Table 6-19.

Total current and future receptor risks are within the USEPA carcinogenic risk range for the average and the RME scenarios. Total receptor risk under the RME scenario slightly exceeds the MEDEP cancer risk guidance value. Potential current and future carcinogenic risks for all surface soil, sediment, and surface water data sets are within or below the USEPA carcinogenic risk range, and at or below the MEDEP cancer risk guidance value.

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<IMG SRC 97002G>

It is not appropriate to sum the noncarcinogenic risk for the child and adult components of the total receptor; however, the hazard index for the child under the RME scenarios exceeds an HI of 1. Current and future noncarcinogenic risks for all surface soil and sediment data sets are less than an HI of 1. For surface water data sets, HIs are less than or equal to 1, except for the RME child-wading scenario. Inorganic analytes in surface water were the primary risk contributors.

Carcinogenic risks associated with ingestion of fish fillets from Malabeam Lake, Chapman Pit, and Green Pond exceeded regulatory guidelines. Noncarcinogenic risks for fish ingested from Chapman Pit and Green Pond exceed an HI of 1, and risks associated with Malabeam Lake are less than an HI of 1. PCBs are the primary risk contributors for both carcinogenic and noncarcinogenic effects at Chapman Pit and Green Pond.

Ecological COCs for the different habitats identified in the WBGB are presented in the OU 13 FS (ABB-ES, 1997a). The primary risk contributors and the associated risks for the different habitats are summarized in Tables 6-20 through 6-27.

Stream Habitat. Exposures to surface water COCs could result in adverse effects to aquatic receptors, although the majority of risk contributors were detected at concentrations only somewhat elevated above background conditions. Some semi-aquatic wildlife receptors may be at risk from acute exposures to some inorganics although adverse population-level impacts are unlikely to occur considering the magnitude of the risk and the conservative approach used in the EPA. The evaluation of snowmelt and storm-event data indicate that episodic events do not represent an unusual level of risks to ecological receptors. Future exposures from groundwater contaminants predicted to discharge into the stream habitat are estimated to have limited incremental effect on risk calculated in this ERA.

Palustrine Habitat. Aquatic receptors are likely to suffer adverse effects from exposure to palustrine surface water and sediment. Inorganic analytes are the primary risk contributors in surface water. Pesticides, Aroclor-1260, and inorganics are the primary risk contributors in sediment. An evaluation of risk for plants indicates that exposure to inorganic analytes is likely to cause adverse affects. Risk estimates for soil invertebrates indicate that exposure to some inorganic analytes may cause negligible adverse effects.

Exposure modeling results indicate that adverse population-level impacts may occur to some semi-aquatic wildlife receptors. Inorganic analytes are the primary risk contributors. The evaluation of snowmelt and storm-event samples for the palustrine habitat found no indication that these episodic exposure events represent an unusual level of risks to ecological receptors. With one exception (tetrachloroethylene in pore water in the WBGB wetland west of the quarry), incremental risks attributed to future groundwater discharge are anticipated to be negligible.

Lacustrine Habitat. Aquatic receptors may suffer adverse effects from exposure to lacustrine surface water and sediment. Surface water risks are attributed to inorganic analytes. For lacustrine sediment,

population level effects may occur from exposure to Aroclor-1260 and endosulfan II, particularly within Green Pond, where maximum concentrations of these compounds were detected.

Population-level effects for most semi-aquatic wildlife receptors from exposure to lacustrine surface-water and sediment COCs are not likely to occur. The evaluation of snowmelt and storm-event samples for the palustrine habitat found no indication that these episodic exposure events represent an unusual level of risk to ecological receptors. Incremental risks attributed to future groundwater discharge are anticipated to be negligible.

Aquatic Ditch Habitat. Aquatic receptors may suffer adverse effects from exposure to aquatic ditch surface water and sediment. Surface water risks are primarily attributed to two inorganic analytes, however, these analytes only slightly exceed observed background levels. For aquatic ditch sediment, it is likely that exposure to PAHs may cause adverse effect to aquatic organisms.

Risk for plants from exposure to sediment in the aquatic ditches indicates that phytotoxic effects may occur within the three ditches adjacent to the NDA and would most likely be associated with exposure to chromium and zinc. Background levels of these inorganic analytes exceed their RTVs, suggesting that risk may be overestimated. Risk estimates for soil invertebrates exposed to sediment indicate that minimal adverse effects are possible but unlikely. Exposure to sediment may cause limited adverse population-level effects to some semi-aquatic wildlife.

Terrestrial Ditch Habitat. An evaluation of risk for plants exposed to surface soil and sediment in terrestrial ditches indicates that inorganic analytes may cause slight adverse effects. Negligible adverse effects may occur for soil invertebrates potentially exposed to surface soil and sediment in the ditches. Exposure modeling results suggest that no adverse effects from ingestion of soil or sediment, from food chain exposures, are anticipated for most of the wildlife receptors in the terrestrial ditch habitat.

6.3 BUTTERFIELD BROOK/LIMESTONE STREAM STUDY AREA

The HHRA and ERA for the BB/LS Study Area are summarized below. The human health COCs for the BB/LS are presented in the OU 13 FS (ABB-ES, 1997a). Quantitative estimates of carcinogenic and noncarcinogenic risks associated with exposure to contaminated media, using both the average and RME scenarios, are summarized in Table 6-28.

Total current and future receptor risks do not exceed the USEPA carcinogenic risk range or the MEDEP cancer risk guidance value for the average and RME scenarios. Potential current and future carcinogenic risks for a surface soil, sediment, and surface water data sets are within or below the USEPA carcinogenic risk range and at or below the MEDEP cancer risk guidance value. Noncarcinogenic risk for the total receptor does not exceed an HI of 1. Current and future noncarcinogenic risks for all surface soil, sediment, and surface water data sets are significantly less than an HI of 1.

Carcinogenic and noncarcinogenic risks associated with the ingestion of fish fillets from Butterfield Brook and East Loring Lake exceed regulatory guidelines. The pesticide, 4,4'-dichlorodiphenyldichloroethylene (4,4'-DDE) is the primary risk contributor for carcinogenic effects at Butterfield Brook and the primary risk contributor for carcinogenic and noncarcinogenic effects East Loring Lake. The pesticide, 4,4'-dichlorodiphenyltrichloroethylene (4,4'-DDT) is the primary risk contributor for noncarcinogenic effects at Butterfield Brook.

Qualitative evaluation of storm-event data indicate that episodic high-flow conditions do not result in an increased human health risk associated with exposure to surface water and sediment.

Ecological COCs for the different habitats identified in the BB/LS Study Area are presented in the OU 13 FS (ABB-ES, 1997a). The primary risk contributors and the associated risks for the different habitats are summarized in Tables 6-29 through 6-38 and discussed in the following paragraphs.

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TABLE 6-21
SUMMARY OF ESTIMATED RISK TO SEMI-AQUATIC WILDLIFE FROM SEDIMENT AND SURFACE WATER
GREENLAW BROOK (WEST BRANCH) STUDY AREA - STREAM HABITAT

OPERABLE UNIT 13 RECORD OF DECISION
LORING AIR FORCE BASE

ECOLOGICAL RECEPTORS EVALUATED

PRIMARY RISK CONTRIBUTORS	ACUTE EXPOSURES[a]	CHRONIC EXPOSURES [a]
SEMI-AQUATIC WILDLIFE[b]		
Muskrat		
Aluminum	1.5[c]	3.3[d]
Manganese	-	1.8[e]
Hazard Index	2.9	5.7
Great Blue Heron		
Aluminum	1.46[c]	0.71[d]
Manganese	0.23[f]	0.53[e]
Selenium	0.59[g]	0.11[h]
Hazard Index	1.5	1.8
Maritime Garter Snake		
Hazard Index	0.079	0.16
Mink		
Hazard Index	0.62	0.18
Belted Kingfisher		
Selenium	0.89[g]	-
Hazard Index	1.1	0.32

NOTES:
[a] The analytes that contribute to risk are identified for those wildlife receptors that have a hazard index greater than 1. Hazard quotients are listed for these analytes.
[b] The information listed below is a summary of Tables Y9-34 and Y9-35 in Appendix Y of the RI report (ABB-ES, 1997c).
[c] Risk estimate based on the following effects: LOAEL for reduced growth in rats; subchronic ingestion study.
[d] Risk estimate based on the following effects: LOAEL for reduced weight gain in newborn mice; multi-generation feeding study.
[e] Risk estimate based on the following effects: LOAEL for decreased growth rate in rodents/livestock; subchronic ingestion study.
[f] Risk estimate based on the following effects: NOAEL for mortality in mice; chronic ingestion study.
[g] Risk estimate based on the following effects: LOAEL for mortality in rats; single oral dose.
[h] Risk estimate based on the following effects: NOAEL for teratogenic effects in mallards; subchronic ingestion study.
-: Analyte is not a substantial risk contributor for this exposure scenario.

<IMG SRC 97002G2>
<IMG SRC 97002G3>
<IMG SRC 97002G4>
<IMG SRC 97002G5>

TABLE 6-25
SUMMARY OF ESTIMATED RISK TO SEMI-AQUATIC WILDLIFE FROM SEDIMENT AND SURFACE WATER
GREENLAW BROOK (WEST BRANCH) STUDY AREA - LACUSTRINE HABITAT

OPERABLE UNIT 13 RECORD OF DECISION
LORING AIR FORCE BASE

ECOLOGICAL RECEPTORS EVALUATED	PRIMARY RISK CONTRIBUTORS	ACUTE EXPOSURES [a]	CHRONIC EXPOSURES [a]
SEMI-AQUATIC WILDLIFE [b]			
Muskrat			
	Aluminum	1.3(c)	4.3(d)
	Hazard Index	1.8	4.9
Great Blue Heron			
	Aluminum	-	0.67(d)
	Hazard Index	0.59	1.0
Maritime Garter Snake			
	Hazard Index	0.035	0.08
Mink			
	Hazard Index	0.074	0.41
Osprey			
	Hazard Index	0.12	0.047

NOTES:
[a] The analytes that contribute to risk are identified for those wildlife receptors that have a hazard index greater than 1. Hazard quotients we listed for these analytes.
[b] The information listed below is a summary of information listed in Tables Y9-38 and Y9-39 in Appendix Y of the RI report (ABB-ES, 1996).
[c] Risk estimate based on the following effects: LOAEL for reduced growth in rats: subchronic ingestion study.
[d] Risk estimate based on the following effects: LOAEL for reduced weight gain in newborn mice; multi-generational feeding study.
-: Analyte is not a substantial risk contributor for this exposure scenario.

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TABLE 6-38
SUMMARY OF ESTIMATED RISK TO TERRESTRIAL WILDLIFE FROM SEDIMENT AND SURFACE SOIL
BUTTERFIELD BROOK/LIMESTONE STREAM STUDY AREA - DITCH HABITAT

OPERABLE UNIT 13 RECORD OF DECISION
LORING AIR FORCE BASE

ECOLOGICAL RECEPTORS EVALUATED

PRIMARY RISK CONTRIBUTORS		ACUTE EXPOSURES [a]	CHRONIC EXPOSURES [a]
TERRESTRIAL WILDLIFE [b]			
Short-tailed shrew			
	Aluminum	6.8[c]	6.4[d]
	Nickel	1.1[e]	-
	Selenium	23[e]	6.2[f]
	Hazard Index	32	13
American Woodcock			
	Aluminum	7.9[c]	-
	Selenium	30[e]	-
	Hazard Index	40	0.20
Garter Snake			
	Hazard Index	0.58	0.023
Red Fox			
	Selenium	1.8[e]	-
	Hazard Index	2.4	0.005
Barred Owl			
	Selenium	1.4[e]	-
	Hazard Index	2.0	0.0013

NOTES:
[a] The analytes that contribute to risk are identified for those wildlife receptors that have a hazard index greater than 1. Hazard quotients are listed for these analytes.
[b] The information listed below is a summery of Tables Y11-21 and Y11-22 in Appendix Y of the RI report (ABB-ES, 1997c).
[c] Risk estimate based on the following effects: LOAEL for reduced growth in rats; oral subchronic.
[d] Risk estimate based an the following effects: reduced body weight gain of newborn rats; oral chronic.
[e] Risk estimate based on the following effects: mortality in rats; single oral dose.
[f] Risk estimate based on the following effects: decreased breeding in rats; oral chronic.
-: Analyte is not a substantial risk contributor for this exposures scenario.

Stream Habitat. Aquatic receptors may be at risk as a result of exposure to stream surface water and sediment. Two inorganic COCs account for the majority of estimated risk. A food chain exposure model was used to estimate exposure doses to five semi-aquatic wildlife species; those dose estimates were compared to RTVs. Some RTV exceedances occurred, but based on their magnitude and the conservative approach used in the ERA, adverse population-level impacts are unlikely to occur in the stream habitat.

Palustrine Habitat. Aquatic receptors may be at risk as a result of exposure to surface water and sediment. Three surface water inorganic COCs account for the majority of estimated risk. With sediments, several pesticides and inorganics were the primary risk contributors for aquatic receptors. Sediment invertebrates and wetland plants growing in the palustrine habitat also may be affected from exposure to inorganic COCs. However, toxicological benchmarks for both plants and invertebrates are often considerably lower than LAFB background inorganic concentrations, indicating they are very conservative and tend to overestimate ecological impacts. Based on slight RTV exceedances for representative semi-aquatic wildlife species, and the conservative nature of the screening process, it is unlikely that adverse population-level impacts would occur to semi-aquatic receptors in the palustrine habitat.

Lacustrine Habitat. Aquatic receptors may be at risk as a result of exposure to surface water and sediment. For surface water, inorganic COCs account for the majority of estimated risk. With sediments, several pesticides and inorganics were the primary risk contributors for aquatic receptors. Based on slight RTV exceedances for representative semi-aquatic wildlife species, and the conservative nature of the screening process, it is unlikely that adverse population-level impacts would occur to semi-aquatic receptors in the lacustrine habitat with the BB/LS Study Area.

Ditch Habitat. Risks to aquatic receptors is unlikely to be substantial in nature due to the magnitude of the risk and the maximum COC concentrations being only one or two times greater than background. Impacts to terrestrial plants and soil invertebrates are not expected from exposure to ditch sediment and surface soil. Potential effects were predicted for most semi-aquatic representative species; however, the maximum concentrations of inorganic analytes driving the risk were only slightly elevated above background, indicating that risks were overestimated and probably unlikely to occur. The evaluation of snowmelt and storm-event data indicate that episodic events do not represent an unusual level of risks to ecological receptors. Future exposures from groundwater contaminants predicted to discharge into the stream habitat are estimated to have limited incremental effect on risk calculated in this ERA.

7.0 DEVELOPMENT AND SCREENING OF ALTERNATIVES

Seven alternatives were developed and screened in the OU 13 FS (ABB-ES, 1997a). This section describes the response objectives and the development and screening of alternatives.

The USAF has determined that no further action is necessary for surface water and sediment in the WB/BB Study Area based on the anticipated lack of future impacts (ABB-ES, 1997c). Therefore, no remedial alternatives were developed for the WB/BB Study Area.

7.1 STATUTORY REQUIREMENTS/RESPONSE OBJECTIVES

Under its legal authorities, the USAF's primary responsibility at NPL sites is to undertake remedial actions that are protective of human health and the environment In addition, Section 121 of CERCLA establishes several other statutory requirements and preferences, including: a requirement that the USAF'S remedial action, when complete, must comply with all federal and more stringent state environmental standards, requirements, criteria, or limitations, unless a waiver is granted; a requirement that the USAF select a remedial action that is cost-effective and that utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and a preference for remedies in which treatment that permanently and significantly reduces the volume, toxicity, or mobility of the hazardous substances is a principal element over remedies not involving such treatment. Response alternatives were developed to be consistent with these Congressional mandates.

Based on preliminary information relating to types of contaminants, environmental media of concern, and potential exposure pathways, remedial action objectives were developed to aid in the development and screening of alternatives. These remedial action objective were developed to mitigate existing and future potential threats to public health and the environment. These response objectives are:

- to prevent or minimize ingestion of and dermal contact with contaminated soil/sediment by human and ecological receptors;
- to prevent human ingestion of contaminated fish;

- to minimize migration of contaminated soil/sediment; and

- avoid destruction of existing ecological habitat where the risk associated with short-term habitat loss outweighs the reduction in risk potentially realized by site remediation.

7.2 TECHNOLOGY AND ALTERNATIVE DEVELOPMENT AND SCREENING

CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) have set forth the process by which remedial actions are evaluated and selected. In accordance with these requirements, a range of alternatives were developed for OU 13 that consider the specific drainage-system features that make each site unique, including soil type, affected acreage, and hydrologic features.

With respect to source control, the OU 13 FS (ABB-ES, 1997a) developed a range of alternatives considering the CERCLA STATUTORY preference for a treatment that reduces the toxicity, mobility, or volume of the hazardous substances to the maximum extent feasible, eliminating or minimizing to the degree possible the need for long-term management. This range also included alternatives that treat the principal threats posed by the site but vary in the degree of treatment employed and the quantities and characteristics of the treatment residuals and untreated waste that must be managed; alternative(s) that involve little or no treatment but provide protection through engineering or institutional controls; and a no action alternative.

Although the RI results indicate unacceptable risks associated with surface water in some areas (i.e., FLDD and FLDD Wetland), an FS was not recommended for this medium because remediating soil and sediment is expected to adequately reduce risks associated with surface water.

Seven remedial alternatives were developed and screened in Section 5 of the OF 13 FS for each site where there are potential risks from soil and sediment exposure. Tables 5-8 through 5-13 in the FS identify the alternatives that were retained through the screening process for each area, as well as those that were eliminated from further consideration. The alternatives retained for each site are as follows:

<u>FLDD</u>

- No Action
- Capping - Land Use Restrictions
- Removal - Volume Reduction - Disposal
- Removal - Disposal

<u>FLDD Wetland</u>

- No Action
- Land Use Restrictions
- Sediment Traps - Land Use Restrictions
- Removal - Volume Reduction - Treatment
- Removal - Disposal

<u>EBGB</u>

- No Action
- Land Use Restrictions
- Sediment Traps - Land Use Restrictions
- Removal - Disposal

<u>WBGB (including NDA drainageways)</u>

- No Action
- Land Use Restrictions
- Removal - Volume Reduction - Treatment
- Removal - Disposal

<u>LMR</u>

- No Action

UTS Wetland

- No Action
- Land Use Restrictions
- Removal - Volume Reduction - Treatment
- Removal - Disposal

Ditch G06

- No Action
- Removal - Volume Reduction - Treatment
- Removal - Disposal

8.0 DESCRIPTION OF ALTERNATIVES

This section provides a narrative summary of each alternative evaluated in the FS. A detailed assessment of each alternative can be found in Sections 7 through 13 of the OF 13 FS (ABB-ES, 1997a). The alternatives developed in the FS include:

- No Action
- Land Use Restrictions
- Sediment Traps - Land Use Restrictions
- Capping - Land Use Restrictions
- Removal - Volume Reduction - Disposal
- Removal - Volume Reduction - Treatment
- Removal - Disposal

8.1 NO ACTION

The No Action alternative was evaluated for each area within OU 13, as required by the NCP, to provide a baseline against which other alternatives could be compared during detailed analysis. The No Action alternative does not include any remedial action components to reduce or control risks. However, the No Action alternative would implement an environmental monitoring program to assess the long-term conditions of the site's ecology. The ecological effects would be assessed by comparing these monitoring results to baseline conditions established during the baseline ecological risk assessment conducted as part of the OU 13 RI.

The environmental monitoring program would include chemical physical, and biological testing. Data collected during the environmental monitoring program would be evaluated during the five-year site reviews. Five-year site reviews are performed to assess whether human health and the environment are adequately protected.

8.2 LAND USE RESTRICTIONS

The Land Use Restrictions alternative would include the following components:

- pre-design wetland mitigation studies
- site preparation
- fence construction
- institutional controls
- wetlands mitigation
- long-term environmental and wetlands mitigation monitoring
- continued fish advisory
- five-year site reviews

8.3 SEDIMENT TRAPS - LAND USE RESTRICTIONS

The Sediment Traps - Land Use Restrictions alternative would include construction of barriers at select locations within the drainageways; to trap contaminated sediment which would be removed and disposed at a landfill on a regular basis. The alternative would include the following components:

- pre-design studies
- pre-design wetland mitigation studies
- site preparation
- fence construction
- institutional controls
- sediment excavation/dredging and disposal

- sediment barrier construction
- wetlands mitigation
- annual sediment removal
- long-term environmental and wetlands mitigation monitoring
- continued fish advisory
- five-year site reviews

8.4 CAPPING - LAND USE RESTRICTIONS

The Capping - Land Use Restrictions alternative would include diverting stormwater from the drainageway as necessary, and constructing a cap over the contaminated soil and sediment in the drainageway channel. The alternative would include the following components:

- pre-design studies
- pre-design wetland mitigation studies
- site preparation
- institutional controls
- stormwater management
- soil/sediment consolidation
- cap construction
- wetlands mitigation
- long-term environmental and wetlands mitigation monitoring
- five-year site reviews

8.5 REMOVAL - VOLUME REDUCTION - DISPOSAL

The Removal - Volume Reduction - Disposal alternative would include excavating and dredging the contaminated soil and sediment from the drainageway, screening the excavated material to reduce the volume, and disposal of the soil and sediment in a landfill. The alternative would include the following components:

- pre-design studies
- pre-design wetland mitigation studies
- site preparation
- stormwater management
- soil/sediment excavation
- soil/sediment screening and washing of removed rocks
- soil/sediment disposal
- backfilling with clean borrow
- wetlands mitigation
- long-term environmental and wetlands mitigation monitoring
- five-year site reviews

The volume reduction component of the alternative would remove the oversized material from the soil and sediment, and reduce the quantity of material requiring disposal at a landfill. The oversized material would be washed and used with clean borrow to backfill the drainageway to its original grade. Backfill materials would be selected to closely match existing soils in terms of soil type, particle size gradation, organic content, and stream structural components (e.g., logs and branches).

Contaminated soil and sediment would be disposed of at the on-base LF-3 as subgrade material prior to construction of the landfill cover system which has been designed to comply with requirements of the Resource Conservation and Recovery Act (RCRA). Some contaminated material may also be disposed of at an off-base licensed treatment or disposal facility approved by the USEPA and MEDEP. Only non-hazardous material can be disposed of at LF-3. If any of the soil and sediment is determined to be characteristic hazardous waste, as defined by RCRA, it will be subject to RCRA Land Disposal Restrictions (LDRs). Additionally, soil and sediment containing concentrations of PCBs greater than 50 parts per million is subject to the requirements of the Toxic Substances Control Act.

8.6 REMOVAL - VOLUME REDUCTION - TREATMENT

The Removal - Volume Reduction - Treatment alternative would be similar to the Removal - Volume Reduction - disposal alternative, except that the soil and sediment would be treated instead of disposed in a landfill. Ile alternative would include the following components:

- pre-design studies
- pre-design wetland mitigation studies

- site preparation
- stormwater management
- soil/sediment excavation or dredging
- soil/sediment screening, washing of removed rocks, and dewatering of soil/sediment
- on-site soil/sediment treatment
- backfilling with clean borrow
- disposal/reuse of treated soil/sediment
- wetlands mitigation
- long-term environmental and wetlands mitigation monitoring
- continued fish advisory
- five-year site reviews

Treatment of the excavated soil and sediment would likely be performed at one centralized treatment area on-base. Technologies evaluated in the FS for treatment of organic contaminants included incineration, thermal desorption, and solvent extraction. The stabilization and solidification technology was evaluated for immobilization of inorganic contaminants. Because treatment of the excavated soil and sediment from the OU 13 areas would require one or more construction seasons to complete; clean borrow and screened/washed oversized material would be used to backfill the drainageways, and the treated material would be disposed or reused at an approved area on-base.

8.7 REMOVAL - DISPOSAL

The Removal - Disposal alternative would be similar to the Removal - Volume Reduction - Disposal alternative, except that the soil and sediment would not be reduced in volume prior to disposal. Where practical, boulders and large cobbles would be removed; however, screening of soil/sediment and washing of removed rocks would not be performed. The alternative would include the following components:

- pre-design studies
- pre-design wetland mitigation studies
- site preparation
- stormwater management
- soil/sediment excavation or dredging
- removal of boulders and large cobbles
- soil/sediment disposal at a landfill
- backfilling with clean borrow
- wetlands mitigation
- long-term environmental and wetlands mitigation monitoring
- continued fish advisory
- five-year site reviews

9.0 SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

Section 121(b)(1) of CERCLA presents several factors that, at a minimum, the USAF is required to consider in its assessment of alternatives. Building upon these specific statutory mandates, the NCP articulates nine criteria to be used in assessing the individual remedial alternatives.

9.1 EVALUATION CRITERIA USED FOR DETAILED ANALYSIS

A detailed analysis was performed on the alternatives using the NCP's nine evaluation criteria in order to select a site remedy. Subsection 9.2 contains a summary of the comparison of each alternative's strengths and weaknesses with respect to the nine evaluation criteria. The evaluation criteria are summarized in Subsections 9.1.1 through 9.13.

9.1.1 Threshold Criteria

The two threshold criteria described below must be met in order for the alternatives to be eligible for selection in accordance with the NCP.

- Overall protection of human health and the environment addresses whether or not the remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

- Compliance with applicable or relevant and appropriate requirements (ARARs) addresses whether or not the remedy will meet all of the ARARs of other federal and state environmental laws and/or provide grounds for invoking a waiver.

9.1.2 Primary Balancing Criteria

The following five criteria are utilized to compare and evaluate the elements of one alternative to another that meet the threshold criteria.

- Long-term effectiveness and permanence addresses the criteria that are utilized to assess alternatives for long-term effectiveness and permanence they afford, along with the degree of certainty that they will prove successful.
- Reduction of toxicity, mobility, or volume through treatment addresses the degree to which alternatives employ recycling or treatment that reduces to)toxicity, mobility, or volume, including how treatment is used to address the principal threats posed by the site.

- Short-term effectiveness addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until cleanup goals are achieved.

- Implementability addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

- Cost includes estimated capital costs (indirect and direct) and annual operation and maintenance (O&M) costs, as well as present-worth costs.

9.1.3 Modifying Criteria

The modifying criteria are used on the final evaluation of remedial alternatives generally after the USAF has received public comment on the RI Report, FS, and Proposed Plan.

- State acceptance addresses the state's position and key concerns related to the preferred alternative and other alternatives, and the state's comments on ARARs and to be considered information or the proposed use of waivers.

- Community acceptance addresses the public's general response to the alternatives described in the FS and Proposed Plan.

9.2 SUMMARY OF COMPARATIVE ANALYSIS

Remedial alternatives were evaluated for each area within OU 13. During the detailed analysis of each individual alternative, a comparative analysis was conducted, focusing on the relative performance of each alternative against the nine criteria. The complete comparative analysis is presented in Sections 7 through 13 of the OU 13 FS, (ABB-ES, 1997a). A tabular assessment of each alternative according to the first seven criteria can be found in Tables 9-1 through 9-6 of this ROD. The remaining two criteria are summarized in the following paragraphs.

State Acceptance. The MEDEP, as a party of the FFA, has provided comments on the FS and Proposed Plan, and has documented its concurrence with the remedial action as stated in Section 13 of this ROD. A copy of the MEDEP's letter of concurrence is presented in Appendix C of this ROD.

Community Acceptance. The Proposed Plan presents the preferred alternatives for OU 13, Removal - Disposal of contaminated surface soil and sediment that exceeds remediation goals for six locations and the No Action alternative for the LMR. From April 14, 1997 through May 13, 1997, the USAF held a public comment period to accept public input. A public meeting was held on May 8, 1997 to discuss the Proposed Plan and to accept any oral comments.

Community acceptance of the Proposed Plan was evaluated based on comments received at the public meeting and during the public comment period. This is documented in the transcript of the public meeting in Appendix A, and in the Responsiveness Summary in Appendix B of this ROD.
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10.0 THE SELECTED REMEDY

The selected remedy for OU 13 includes two remedial alternatives; Removal - Disposal and No Action. No further action is necessary for much of OU 13 because there is no unacceptable risk to human health or the environment.

Removal - Disposal is the selected remedy for areas within OU 13 that exceed remediation goals. These areas have been identified to include:

- FLDD
- FLDD Wetland
- EBGB (from Pennsylvania Road to the Ski Chalet)
- NDA Drainageways (north and south)
- Ditch G06
- UTS Wetland (northern portion)

The State Fish Advisory, currently in effect, will continue to be enforced until the fish are determined to be acceptable for consumption. Areas covered by the advisory include Chapman Pit Green Pond, Greenlaw Brook, and the LMR and its tributaries from the Madawaska Dam Reservoir south to the Aroostook River.

The No Action alternative has been selected for the LMR because there is no unacceptable risk associated with surface soil, sediment, and surface water. The No Action alternative will include an environmental monitoring program and five-year site reviews to assess whether human health and the environment continue to be adequately protected.

No further action is necessary at the other areas within OU 13 because there is no unacceptable risk to human health or the environment.

10.1 REMEDIATION GOALS

The USAF has established, with concurrence of the regulatory agencies, site-specific remediation goals (RGs) that will be protective of human health and the environment. RGs were established based on USEPA Risk Assessment Guidance for Superfund (USEPA, 1991), LAFB Risk Assessment Methodology (HAZWRAP,1994), and MEDEP Risk Assessment Guidance (MEDEP, 1994). Rgs and the compounds for which they have been established are listed in Tables 10-1 through 10-7.

10.2 DESCRIPTION OF REMEDIAL COMPONENTS

The following subsections describe the Removal - Disposal and No Action alternatives developed by the USAF for OU 13.

10.2.1 Removal - Disposal

The following paragraphs describe the Removal - Disposal alternative the USAF developed for areas that exceed remediation goals. These areas have been identified to include the FLDD, FLDD Wetland, EBGB (from Pennsylvania Road to the Ski Chalet), north and south NDA Drainageways, Ditch G06, and UTS Wetland (northern portion). Implementation of the selected alternative will include the following activities:

- pre-design studies to delineate the extent of remediation for design purposes;
- pre-design wetland mitigation studies (i.e., wetland delineations and function-value assessments) to evaluate the impacts resulting from remedial activities;
- site preparation and mobilization;
- cutting and clearing;
- stormwater management;
- sediment excavation;
- sediment disposal at LF-3; some material may require disposal at off-base facilities;
- backfilling the excavations with material that closely matches the excavated material;
- compensatory wetlands mitigation and demobilization;
- long-term environmental and wetlands mitigation monitoring;
- continued fish advisory for Chapman Pit, Green Pond, Greenlaw Brook, and the LMR and its tributaries from the Madawaska Dam Reservoir south to the Aroostook River; and
- five-year site reviews.

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TABLE 10-5
FISH TISSUE REMEDIATION GOALS
EAST BRANCH GREENLAW BROOK, CHAPMAN PIT, GREEN POND, AND LITTLE MADAWASKA RIVER

OPERABLE UNIT 13 RECORD OF DECISION
LORING AIR FORCE BASE

CONTAMINANT OF CONCERN 1	MAXIMUM DETECTED CONCENTRATION 2 (mg/kg)	PROTECTION OF HUMAN HEALTH 3 (mg/kg)	ACTION LEVEL 4 (mg/kg)
4,4'-DDD	0.076	0.018	NA
4,4'-DDE	0.044	0.013	5 (Total DDT, DDE, and TDE)
4,4'-DDT	0.14	0.013	5 (Total DDT, DDE, and TDE)
Aroclor-1242	0.074	0.0022	NA
Aroclor-1260	2.1	0.0022	NA
Heptaclor	0.0031	0.00098	0.3
Chlordane, Alpha	0.042	0.0034	0.3 (Total Chlordane)
Chlordane, Gamma	0.014	0.0034	0.3 (Total Chlordane)

Notes:

1 Contaminants of concern identified in fish tissue at one or more of the affected areas.
2 Maximum detected concentration out of all the affected areas.
3 The lesser value of a carcinogenic risk-based concentration calculated with the target cancer risk set at 1x10 -6 and a noncarcinogenic risk-based concentration with the hazard quotient set at 1. Development of human health risk-based concentrations is documented in Appendix A.1 of the OU 13 FS (ABB-ES, 1997a).
4 Action Levels for Poisonous or Deleterious Substances in Human Food and Animal Feed (DHHS, 1992).

mg/kg = milligrams per kilogram
DDE = dichlorodiphenyldichloroethylene
DDD = dichlorodiphenyldichloroethane
DDT = dichlorodiphenyltrichloroethylene
NA = Not available

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<IMG SRC 97002J7>

The components are described in the following paragraphs.

Pre-design Studies. Pre-design studies are required to delineate the areas requiring remediation, for refining the sediment transport models, for collecting and interpreting hydrologic data that can be used in the design of stormwater diversion structures, and for identifying suitable backfill material. The details of the pre-design studies will be presented in the Remedial Action Work Plan (RAWP) to be prepared by the Remedial Action Contractor (RAC). The RAWP will be submitted to the USEPA and MEDEP for review and approval prior to implementation.

Upon completion of the pre-design delineation, the risk management process provided in the RAWP will be followed for weighing the reduction in risk to receptors versus the adverse affects to wetland communities impacted by remedial activities. Based on the results of the risk management process, the limits of the excavation may potentially be refined.

Pre-design Wetland Mitigation Studies. The pre-design wetland mitigation studies will include wetland delineations and function-value assessments. Pre-design wetland mitigation studies are required for evaluating the impacts to the areas that would occur as a result of remedial activities. The process used for evaluating impacts to the areas, and for developing a plan to mitigate the impacts, will be consistent with the process presented in the OU 13 Mitigation Process Plan (MPP), developed for the Wetlands Management Program (ABB-ES and Woodlot Alternatives, 1995).

Impacts to the areas from remedial activities will be monitored by number of acres impacted, wetland type and class, and function. This information will be used to identify the compensatory mitigation required for damage done to the existing areas. A mitigation plan will be prepared for regulatory review and approval during the remedial design process.

Site Preparation and Mobilization. Site preparation will include construction of access roads, stockpile areas, decontamination pads, staging areas for construction equipment, a mobile laboratory, and construction-support trailers. Equipment mobilized to the site will include earth-moving equipment (e.g., excavators, front-end loaders, and bulldozers), dumptrucks, and construction-support trailers.

Cutting and Clearing. Cutting and clearing of trees and brush will be required for construction of access roads and within the areas of excavation. To reduce the impact of cutting and clearing on areas downgradient of the excavation areas, erosion-control measures will be installed and maintained throughout the construction period.

Stormwater Management. Stormwater management will be required to prevent erosion and migration of potentially contaminated sediments into non-contaminated areas, and to minimize impacts to existing wetlands. Stormwater management may include stormwater diversion ditches, stormwater retention basins, or temporary bypass piping. Sampling and analysis of the stormwater will be conducted and treatment or disposal may be necessary for some of the water. A Stormwater Management Plan will be included in the RAWP prepared by the RAC. The plan will be reviewed and approved by the USEPA and MEDEP prior to implementation.

Sediment Excavation. Figures 10-1 through 10-6 show the proposed excavation limits for each area as presented in the FS. Actual excavation limits for each area will be established based on the pre-design studies. Following cutting and clearing activities, the soil and sediment exceeding the established RGs will be removed by excavating and/or dredging. Where practical, boulders and large cobbles will be removed during excavation, stockpiled, and reused along with clean soil as backfill material. Confirmation sampling will be conducted to verify that RGs have been achieved.

Some of the excavated material may require dewatering prior to disposal. Dewatering procedures will be included in the RAWP prepared by the RAC.

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Based on the OU 13 RI surface soil and sediment data, and in order to be protective of ecological receptors, RG exceedances are limited to a depth of approximately 2 feet below ground surface. The FS estimated a total volume of approximately 93,000 cubic yards (cy) of contaminated soil and sediment. However, the actual limits of excavation will be based on the additional data collected during the pre-design studies. The estimated volumes presented in the FS for each area are as follows:

FLDD	8,520 cy
FLDD Wetland	36,100 cy
EBGB	38,300 cy
NDA Drainageways	5,370 cy
Ditch G06	200 cy
UTS Wetland	4,600 cy
TOTAL VOLUME APPROXIMATELY	93,090 cy

Sediment Disposal. Soil and sediment removed from the areas will be loaded into dumptrucks and transported to LF-3 for disposal as subgrade material prior to construction of the LF-3 landfill cover system. In accordance with the OU 2 ROD, subgrade material may not be used if it is determined to be hazardous and subject to RCRA LDRs; therefore, some excavated material may require disposal at an off-base licensed facility.

Backfilling Excavations. The excavations will be backfilled and regraded to the approximate configuration of the original areas. As part of the pre-design activities, a borrow study will be conducted to identify suitable backfill. Backfill materials will be selected to closely match the existing soils in terms of soil type, particle size gradation, organic content, and stream structural components (e.g., logs and branches).

Compensatory Wetlands Mitigation and Demobilization. Compensatory wetlands mitigation will be implemented according to the final mitigation plan. A wetlands scientist will monitor implementation of the final mitigation plan. To comply with MPP criteria for restoration of wetlands, the following ratios of restored to impacted wetland will be included in the final mitigation plan:

- 1.15:1 for restoration in Class II or Class III wetlands
- 2:1 for restoration in Class I wetlands

The actual extent of wetlands requiring mitigation will be presented in the mitigation plan. The FS estimated approximately 29 acres of wetlands would be impacted as a result of remedial activities. The estimated acreage presented in the FS for each area is as follows:

FLDD	4.8 acres
FLDD Wetland	10.0 acres
EBGB	10.0 acres
NDA Drainageways	1.7 acres
Ditch G06	0.5 acres
UTS Wetland	2.0 acres
TOTAL PROJECTED IMPACTED WETLANDS APPROXIMATELY	29 acres

Long-Term Environmental and Wetlands Mitigation Monitoring. Environmental monitoring will be conducted to assess the effectiveness of the implemented remedy. Environmental monitoring will include chemical, physical, and biological testing. The actual monitoring program will be submitted to the USEPA and MEDEP for review and approval prior to implementation.

In accordance with the MPP, a mitigation monitoring plan will be prepared prior to implementing wetlands restoration. A wetlands scientist will monitor wetlands restoration for a minimum of five years as defined in the MPP, beginning the first year after restoration. An annual evaluation report that presents the results of vegetation, soil, and hydrology measurements will be prepared and submitted to the USEPA and MEDEP.

Continued Fish Advisory. A State Fish advisory is currently in effect warning against the ingestion of fish contaminated with PCBs. The Fish Advisory is in effect at designated areas on-base, including Chapman Pit, Green Pond, and Greenlaw Brook. Fish Advisory is also in effect for the LMR and its tributaries from the Madawaska Dam Reservoir south to the Aroostook River. The Fish Advisory will continue until the fish are determined to be acceptable for consumption, based on the environmental monitoring data.

Five-year Site Reviews. The USAF will review the environmental monitoring data at least once every five years in accordance with applicable USEPA guidance. The five-year site reviews are intended to evaluate whether the response action continues to protect human health and the environment, assess site conditions, and propose further actions, if necessary.

10.2.2 No Action

The No Action alternative has been selected for surface soil, sediment, and surface water for the LMR because there is no unacceptable risk associated with these media. The No Action alternative does not include any remedial action components to reduce or control risks. However, the No Action alternative will include an environmental monitoring program (see Subsection 10.2.1) to assess the long-term conditions of the site's ecology. The ecological effects will be assessed by comparing the long-term monitoring results to baseline conditions established during the baseline ecological risk assessment conducted as part of the OU 13 RI.

The No Action alternative will also include five-year site reviews. The long-term environmental monitoring data will be evaluated during the five-year site reviews to assess whether human health and the environment are adequately protected.

No further action is necessary for the remaining areas in OU 13 because of limited and sporadic contamination, anticipated lack of future impacts, and/or no unacceptable risk to human and ecological receptors.

10.2.3 Future Action - Chapman Pit

A removal action to address elevated levels of inorganics in soil/sediment in the vicinity of Chapman Pit is scheduled for the 1997 construction season. The removal action is not part of this ROD, but will be addressed in a future ROD.

11.0 STATUTORY DETERMINATIONS

This section discusses how the selected remedy meets the statutory requirements of CERCLA and the NCP.

11.1 THE SELECTED REMEDY IS PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT

The Removal - Disposal alternative would be protective of human health and the environment because removal of the contaminated soil and sediment from the site and disposing of the material at a landfill minimizes direct contact, incidental ingestion of soil and sediment by humans and animals, and further stream transport and windborne migration.

Continuation of the Fish Advisory for the LMR, Chapman Pit, Green Pond, and Greenlaw Brook will continue to minimize human health exposure to PCBs from fish consumption.

11.2 THE SELECTED REMEDY ATTAINS ARARs

The selected remedy will attain all federal and state ARARs that apply to OU 13. Tables 11-1 through 11-3 present a tabular summary of the chemical, location, and action-specific ARARs for the selected remedy, including the regulatory citation, a brief summary of the requirement, and how it will be attained.

11.3 THE SELECTED REMEDIAL ACTION IS COST-EFFECTIVE

In the USAF's judgment, the selected remedy is cost-effective, that is the remedy affords overall effectiveness proportional to its cost. In selecting the remedy, once the USAF identified alternatives that were protective of human health and the environment and that attain ARARs, the USAF evaluated the overall effectiveness of each alternative by assessing the relevant three criteria in combination: long-term effectiveness and permanence; reduction in toxicity, mobility, or volume through treatment; and short-term effectiveness. The relationship of the overall effectiveness of the remedial alternatives was determined to be proportional to its cost.

TABLE 11-1
CHEMICAL-SPECIFIC ARARs, CRITERIA, ADVISORIES, AND GUIDANCE

OPERABLE UNIT 13 RECORD OF DECISION
LORING AIR FORCE BASE

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARAR
SOIL/SEDIMENT/WASTE MATERIAL				
Federal	CWA AWQC (33 USC 1251 et seq.)	Relevant and Appropriate	CWA AWQC are health-based criteria developed for carcinogenic and noncarcinogenic compounds and water quality parameters. AWQC are set at levels protective of human health for two routes of exposure: (1) drinking water and consuming fish, and (2) only consuming fish. Remedial actions involving contaminated surface water must consider the uses of the water and the circumstances of the release of threatened release; this determines whether AWQC are relevant and appropriate.	AWQC were used to develop sediment remediation goals and will be used to develop discharge limits for wastewater discharged to surface waters during remedial activities, either directly or indirectly through the LAFB WWTP. Surface water currently meets these standards and is expected to continue to do so after the action is completed.
Federal Guidance and Criteria To Be Considered	USEPA Interim Sediment Criteria Values for Nonpolar Hydrophobic Organic Contaminants; (SCD No. 17; May 1988)	To Be Considered	These criteria were developed by USEPA for 16 organic compounds and represent contaminant levels in sediments that are currently considered protective of aquatic life.	These criteria are used to evaluate sediment quality and to develop sediment clean-up values.
	Overview at Sediment Quality in the United States (1987)	To Be Considered	These criteria represent non-polluted threshold values for inorganics in sediments.	These criteria are used to evaluate sediment quality and develop sediment clean-up criteria.
	USEPA Sediment Quality Criteria for the Protection of Benthic Organisms for Endrin, Dieldrin, Fluoranthene, Acenaphthrene, and Phenanthene (USEPA-822-R-93-011 through -017)	To Be Considered	These criteria were developed by USEPA for several substances that may be present in sediment.	These criteria are used to evaluate sediment quality and develop sediment clean-up values.
	NOAA, Incidence of Adverse Biological Effects within Ranges of Chemical Concentrations in Marine and Estuarine Sediments (1994)	To Be Considered	These criteria represent toxic effect levels resulting from exposure of aquatic organisms to selected organics and inorganics.	These criteria are used to evaluate sediment quality and develop sediment clean-up values.
	Ontario MOE, Guidelines for Protection and Management of Aquatic Sediment Quality in Ontario (1993)	To Be Considered	These criteria represent toxic effects levels resulting from exposure of aquatic organisms to selected organics and inorganics.	These criteria are used to evaluate sediment quality and develop sediment clean-up values.

TABLE 11-1
CHEMICAL-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE

OPERABLE UNIT 13 RECORD OF DECISION
LORING AIR FORCE BASE

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARAR
State	Maine Regulations Relating to Water Quality Criteria for Toxic Pollutants (06-096 CMR, Chapter 584)	Relevant and Appropriate	This rule limits the concentrations of certain materials allowed in Maine waters to prevent the occurrence of pollutants in toxic amounts as required by state and federal law. Except if naturally occurring, ambient levels of toxic pollutants shall not exceed the CWA AWQC. Where AWQC do not exist, the Board of Environmental Protection shall adopt site-specific numerical criteria.	AWQC will be used to develop discharge limits for wastewater discharged to surface waters during remedial activities, either directly or indirectly through the LAFB WWTP.
State Guidance and Criteria To Be Considered	Maine Procedural Guidelines for Establishing Standards for the Remediation of Oil-Contaminated Soil and Ground Water in Maine (February 1, 1995)	To Be Considered	This policy sets forth soil and groundwater clean-up levels for hydrocarbon-contaminated soils and is based on MEDEP's Hydrocarbon Spill Decision Tree with three levels of clean-up goals; stringent, intermediate, and baseline.	These standards are considered during clean-up level development along with site-specific risk assessment data.

Notes:

ARAR = Applicable or Relevant and Appropriate Requirement
AWQC = Ambient Water Quality Criteria
CMR = Code of Maine Regulations
CWA = Clean Water Act
LAFB = Loring Air Force Base
MEDEP = Maine Department of Environmental Protection
MOE = Ministry of the Environment
NOAA = National Oceanic and Atmospheric Administration
SCD = Standards Criteria Division
USC = United States Code
USEPA = U.S. Environmental Protection Agency
WWTP = Wastewater Treatment Plant

TABLE 11-2
LOCATION-SPECIFIC ARARS CRITERIA, ADVISORIES, AND GUIDANCE

OPERABLE UNIT 13 RECORD OF DECISION
LORING AIR FORCE BASE

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARAR
WETLAND/FLOODPLAINS				
Federal	Protection of Wetlands and Floodplains, Executive Order (EO) 11990 and EO 11998 (40 CFR 6, Appendix A)	Applicable	Sets forth USEPA policy for carrying out the provisions of the Wetland Executive Order (EO 11990) and Floodplains Executive Order (EO 11988). Under this order, federal agencies are required to minimize the destruction, loss, or degradation of wetlands; preserve and enhance natural and beneficial values of wetlands, and minimize potential harm to or within floodplains and to avoid the long- and short-term adverse impact with modifications to floodplains.	This requirement will be used during the development of alternatives. If no practical alternative exists, potential harm must be minimized and action taken to restore the natural and beneficial values of the wetland. Alternatives that involve excavating wetland soil or sediment will be designed to minimize impacts on the wetlands.
	CWA Section 404(b)(l) Guidelines for Specification of Disposal Sites for Dredged or Fill Material (40 CFR 230)	Relevant and Appropriate	Section 404 of the CWA regulates the discharge of dredged or fill material into U.S. waters, including wetlands. The purpose of Section 404 is to ensure that proposed discharges are evaluated with respect to impact on the aquatic ecosystem.	If the alternative involves dredged or fill material discharge to a wetland during construction of access roads, the substantive requirements of this Act will be met.
	Rivers and Harbors Act of 1899 (33 USC 403)	Relevant and Appropriate	Section 10 of the Rivers and Harbors Act of 1899 requires authorization from the Secretary of the Army, acting through the USACE, for the construction of any structure in or over any "navigable water of the U.S.," the excavation from or deposition of material in such waters, or any obstruction or alteration in such waters.	Permits are not required for CERCLA on-site actions. The substantive requirements will be met.
State	Wetlands Protection (06-096 CMR, Chapter 310, Section 1)	Applicable	These regulations outline requirements for certain activities adjacent to any freshwater wetland greater than 10 acres or with an associated stream, brook, or pond. The activities must not unreasonably interfere with certain natural features, such as natural flow or quality of any waters, not harm significant aquatic habitat, freshwater fisheries, or other aquatic life.	Remedial activities will meet activity standards. Substantive requirements of these regulations must be met for actions taken within 100 feet of a wetland or stream.

TABLE 11-2
LOCATION-SPECIFIC ARARs CRITERIA, ADVISORIES, AND GUIDANCE

OPERABLE UNIT 13 RECORD OF DECISION
LORING AIR FORCE BASE

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARAR
	Maine Standards for Classification of Fresh Surface Waters (38 MRSA º 465)	Applicable	This statute established a water quality classification system which allowed for management of surface waters so as to protect the quality of those waters and, where water quality standards were not being achieved, to enhance water quality. This classification system is based on water quality standards which designated the uses and related characteristics of those uses for each class of water and which also establish water quality criteria necessary to protect those uses and related characteristics. The State assigned water quality classification to each surface water body which designate the intended minimum level of quality for the body of water.	These requirements will be met if an alternative involves discharging water to a surface water body.
	Maine Natural Resources Protection Act, Permit-by-Rule Standards (06-096 CMR, Chapter 305)	Relevant and Appropriate	This rule prescribes standards for specific activities that may take place in or adjacent to wetlands and water bodies. The standards are designed to ensure that the disturbed soil material is stabilized to prevent erosion and siltation of the water.	Proposed activities involving disturbance of soil material and discharge of treatment water within 100 feet of the normal high-water line will be designed to incorporate applicable standards.
	Maine Site Location Development Law and Regulations (38 MRSA Sections 481-490; 06-096 CMR, Chapter 375)	Relevant and Appropriate	This act and these regulations govern development and includes hazardous activities that consume, generate, or handle hazardous wastes and oil. Activities cannot adversely affect existing uses, scenic character, or natural resources in the municipality or neighboring municipality. The regulation provide that there shall be no unreasonable adverse effects on specified items (including air quality, runoff/infiltration relationships and surface-water quality), no unreasonable alteration of climate or natural drainageways, and provisions for erosion and sedimentation control and noise control.	Remedial action will meet requirements that are relevant and appropriate to OU 13.
OTHER NATURAL RESOURCE				
Federal	Fish and Wildlife Coordination Act (16 USC 661)	Relevant and Appropriate	This act requires that any federal agency proposing to modify a body of water must consult with the U.S. Fish and Wildlife Service, National Marine Fisheries Service, and other related state agencies.	Notification is not required for actions taken on-site at a CERCLA site. However, actions will be taken to minimize impacts to wetlands.

TABLE 11-2
LOCATION-SPECIFIC ARARs CRITERIA, ADVISORIES, AND GUIDANCE

OPERABLE UNIT 13 RECORD OF DECISION
LORING AIR FORCE BASE

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARAR
	Migratory Bird Treaty Act (16 USC 703-712)	Applicable	This act prohibits the hunting, possessing, killing, or capturing of the listed migratory birds, birds in danger of extinction, and those birds' eggs of nests.	Long-term impacts will not result. Remedial activities will be delayed until after the ground-nesting migratory bird breeding season is over.
state	Maine Inland Fisheries and Wildlife Laws and Regulations 12 MRSA Chapter 713, Section 7751)	Relevant and Appropriate	The state of Maine has authority to research, list, and protect any species deemed endangered or threatened These species are listed as either endangered or threatened in the state regulations. The Maine Department of Inland Fisheries and Wildlife also has developed the following administrative categories for species not considered endangered or threatened but considered important for research and further evaluation: Maine Watch list, Special Concern List, and Indeterminate Category. The Department determines appropriate use(s) of various habitats on a case-by-case basis. The Maine lists may differ from the federal lists of endangered species.	No currently listed endangered or threatened species in the site area have been identified. However, new species may be added to the list. Activities must not impact an endangered or threatened species.
State Guidance and Criteria be Considered	Maine Natural Areas Program	To Be Considered	These state programs govern special habitats or communities.	Where such special areas exist, these state programs will become involved in the project and/or permit review process.

Notes:

ARAR = Applicable of Relevant and Appropriate Requirement
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CMR = Code of Maine Regulations
CWA = Clean Water Act
EO = Executive Order
MRSA = Maine Revised Statutes Annotate
OU = Operable Unit
USACE = U.S. Army Corp of Engineers
USC = United States Code
USEPA = U.S. Environmental Protection Agency

TABLE 11-3
ACTION-SPECIFIC ARARs FOR REMOVAL-DISPOSAL ALTERNATIVE

OPERABLE UNIT 13 RECORD OF DECISION
LORING AIR FORCE BASE

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARAR
AIR				
State	Maine Ambient Air Quality Standards (38 MRSA 584; 06-096 CMR, Chapter 110)	Relevant and Appropriate	This chapter establishes ambient air quality standards that are maximum levels of a particular pollutant permitted in the ambient air.	Standards for particulate matter-150 Ig/m 3, 24-hour average concentration. This standard would apply to excavation or construction activities with the potential of generating significant dust.
SOIL/SEDIMENT/ WASTE/MATERIAL				
Federal	RCRA - Identification and Listing of Hazardous Wastes; Toxicity Characteristics (40 CFA 261.24)	Relevant and Appropriate	Defines those wastes that are subject to regulations as hazardous wastes under 40 CFR Parts 124 and 264.	Analytical results will be evaluated against the criteria and definitions of hazardous waste. The criteria and definition of hazardous waste will be referred to and utilized in development of remedial alternatives and during remedial actions.
	RCRA LDRs (40 CFR Part 268)	Applicable	Land disposal of RCRA hazardous waste is restricted without specified treatment. For the LDRs to be applicable, it must be determined that the waste meets the definition of one of the specified restricted wastes and remedial action constitutes placement. For each hazardous waste, the LDRs specify that the waste must be treated either by a treatment technology of to a concentration level prior to disposal in a RCRA Subtitle C permitted facility,	Waste materials from OU 13 will be evaluated to determine whether the waste is hazardous. If so, the materials will not be disposed of on-base, but will be treated in accordance with LDRs prior to disposal at an off-bass facility.
	TSCA (40 CFR Part 761 Subpart D)	Applicable	This regulation governs the storage and final disposal of PCBs by incineration of in a chemical waste landfill. The regulation also specifies procedures to be followed in decontaminating containers and moveable equipment used in storage areas.	Storage, disposal and decontamination requirements specified in this regulation will be applied if soil or sediment with PCB concentrations greater than of equal to 50 ppm are encountered.
	TSCA (40 CFR Part 761 Subpart G)	To Be Considered	This policy governs the cleanup of PCB spills occurring after May 4, 1987. Because this policy is not a regulation and only applies to recent spills (reported within 24 hours of occurrence), these requirements are not applicable, but will be considered.	This policy will be considered during the development of remedial alternatives for areas with detected PCBs at concentrations greater than or equal to 50 ppm.

TABLE 11-3
ACTION-SPECIFIC ARARs FOR REMOVAL-DISPOSAL ALTERNATIVE

OPERABLE UNIT 13 RECORD OF DECISION
LORING AIR FORCE BASE

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARAR
	Hazardous Waste Management Systems; (40 CFR 260)	Relevant and Appropriate	USEPA procedures for making information available to the public; rules for claims of business confidentiality.	Does not address cleanup requirements. However, these procedures will be followed when dealing with hazardous waste.
	Requirements for Miscellaneous Units (40 CFR 264.600 - 264.999)	Relevant and Appropriate	Requirements for owners and operations of facilities that treat, store, or dispose of hazardous waste in miscellaneous units.	Treatment alternatives not specifically regulated under other sections of RCRA must be met to prevent the release of hazardous constituents into the environment.
	RCRA Subtitle C. Subpart B - General Standards (40 CFR 264.10-264.30 - 264.18)	Relevant and Appropriate	Requirements regarding waste analysis, security, training, inspections, and location applicable to a facility which stores, treats, or disposes of hazardous waste (e.g., a TSD facility)	These requirements will be met if handling hazardous waste.
	RCRA Subtitle C, Subpart C - Preparedness and Preparation (40 CFR 264.30 - 264.37)	Relevant and Appropriate	Requirements to design and operation, equipment, And communications associated with a TSD facility, and to arrangements with local response departments.	These requirements will be met if handling hazardous waste.
	RCRA Subtitle C, Subpart D - Contingency Plan and Emergency Procedures (40 CFR 264.50 - 264.56)	Relevant and Appropriate	Emergency Planning procedures for a TSD facility.	These requirements will be met if handling hazardous waste.
	Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal facilities (40 CFR 264)	Relevant and Appropriate	Define requirements for RCRA facility operations and management including impoundments, wastepiles, land treatment, landfills, incinerators, storage, closure and post closure.	Operations, management and safety requirements in effect for all portions of remedial process, if hazardous waste is being handled.

TABLE 11-3
ACTION-SPECIFIC ARARs FOR REMOVAL-DISPOSAL ALTERNATIVE

OPERABLE UNIT 13 RECORD OF DECISION
LORING AIR FORCE BASE

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARAR
	Standards Applicable to Generators of Hazardous Waste (40 CFR 262)	Relevant and Appropriate	RCRA Subtitle C established standards applicable to treatment, storage, and disposal of hazardous waste and closure, of hazardous waste facilities.	Sediments will be tested to determine whether they contain characteristic hazardous waste. If so, treatment of disposal of the sediment would occur at an off-site facility complying with the requirements of these regulations.
State	Maine Hazardous Waste Management Rules (06-096 CMR, Chapters 800-802, 850, 851, and 853-857; MRSA 1319)	Relevant and Appropriate	These rules set forth Maine's definitions and criteria for establishing whether waste materials are hazardous and subject to associated hazardous waste regulations.	These regulations supplement RCRA requirements. Those criteria and definitions more stringent than RCRA take precedence over federal requirements.
	Maine Solid Waste Management Rules (06-096 CMR, Chapters 400-409; 38 MRSA 1306 and 1310-N)	Relevant and Appropriate	These rules regulate the operation of solid waste facilities and define the types of wastes that are acceptable under the facility's license. They also outline how to characterize the waste prior to disposal in the landfill.	These rules would apply to the on-base disposal of nonhazardous waste.

Notes:

ARAR = Applicable or Relevant and Appropriate Requirement
CFR = Code of Federal Regulations
CMR = Code of Maine Regulations
LDRs = Land Disposal Restrictions
MRSA = Maine Revised Statutes Annotated
OU = Operable Unit
PCB = polychlorinated biphenyl
ppm = parts per million
RCRA = Resource Conservation and Recovery Act
TSCA = Toxic Substances Control Act
TSD = treatment, storage, disposal
USEPA = U.S. Environmental Protection Agency
Ig/m 3 = micrograms per cubic meter

The costs of the remedial alternatives (i.e., Removal - Disposal for six locations and No Action for the LMR) are:

FLDD	$1,824,000
FLDD Wetland	$5,037,000
EBGB	$4,812,000
NDA Drainageways	$1,281,000
Ditch G06	$ 290,000
UTS Wetland	$ 929,000
LMR	$ 82,000
ESTIMATED TOTAL COST (NET PRESENT WORTH)	$14,255,000

The selection of these alternatives represents a reasonable value with regard to the other alternatives. Compared to the other alternatives that provide overall protection to human health and the environment and comply with ARARs, the selected remedy is less expensive.

11.4 THE SELECTED REMEDY UTILIZES PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT OR RESOURCE RECOVERY TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

Once the USAF identified those alternatives that attain or, as appropriate, waive ARARs, and that are protective of human health and the environment, the USAF identified the alternative that utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. This determination was made by identifying the alternative that provides the best balance of trade-offs among alternatives, in terms of: 1) long-term effectiveness and permanence; 2) reduction in toxicity, mobility, or volume through treatment; 3) short-term effectiveness; 4) implementability; and 5) cost. The balancing test emphasized long-term effectiveness and permanence and the reduction of toxicity, mobility, or volume through treatment, and considered the preference for treatment as a principal element, the bias against off-site land disposal of untreated waste, and community and state acceptance.

The selected remedy, in conjunction with the LF-3 cover system, provides the best balance of trade-offs among the alternatives. The selected remedy provides long-term protection of human health and the environment because contaminated soil and sediment will be removed from the site and contained below a well-maintained landfill cover system. Once the cover system construction is complete, migration of contaminants and access to the soil and sediment will be reduced. Potential for migration and erosion of contaminated soil and sediment from the OU 13 areas will be greatly reduced with the conclusion of excavation activities.

The selected remedy will not reduce the toxicity, mobility, or volume through treatment of the source area contaminants. However, the selected remedy will reduce mobility through containment and will reduce rainwater infiltration, erosion, and direct contact with the contaminated soil and sediment.

The selected remedy would require health and safety training for workers who operate the excavation equipment and conduct monitoring. Adverse effects on workers are not anticipated as long as safe working practices are followed. Adverse effects on the community would not be expected as a result of implementation of the selected remedy. The selected remedy will impact ecological receptors during excavation activities and destruction of wetlands. The wetlands will be restored in accordance with state and federal regulations and an approved mitigation plan.

Installation of the selected remedy involves easily implementable, reliable, and available technologies. Construction activities for the Removal-Disposal alternative can be initiated and completed during the 1997 construction season; which will expedite remediation of OU 13, and allow the LF-3 cover system to be constructed in 1998 as currently scheduled.

The selected remedy is cost-effective because it provides a reasonable value with regard to the other alternatives. It provides overall protection to human health and the environment, complies with ARARs, meets the response objectives, and is the least expensive.

11.5 THE SELECTED REMEDY DOES NOT SATISFY THE PREFERENCE FOR TREATMENT WHICH PERMANENTLY AND SIGNIFICANTLY REDUCES THE TOXICITY, MOBILITY, OR VOLUME OF THE HAZARDOUS SUBSTANCES AS A PRINCIPAL ELEMENT

The selected remedy will not reduce toxicity, mobility, or volume through treatment of source area contaminants as a principal element. However, the selected remedy, in combination with the LF-3 cover system, will reduce mobility through containment and will reduce rainwater infiltration, erosion, and

direct contact with the contaminated soil and sediment. In view of the large volume of soil and sediments that would require treatment and the high cost of such treatment relative to use of the material as necessary subgrade fill for the LF-3 cover system, it is not practicable to treat the excavated material.

12.0 DOCUMENTATION OF NO SIGNIFICANT CHANGES

The USAF presented a Proposed Plan (ABB-ES, 1997b) outlining the proposed alternative of Removal and Disposal for areas that exceed remediation goals. These areas include the FLDD, FLDD Wetland, EBGB (from Pennsylvania Road to the Ski Chalet), north and south NDA Drainageways, Ditch G06, and the UTS Wetland (northern portion). The USAF recommended continuation of the State Fish Advisory currently in effect at designated on- and off-base areas. The No Action alternative was selected for the LMR because there is no unacceptable risk associated with surface soil, sediment, and surface water. No further action was proposed for the remaining areas within OU 13. A removal action to address elevated levels of inorganics in soil/sediment in the vicinity of Chapman Pit is scheduled for the 1997 construction season.

The Proposed Plan was presented to the public, and public comments have been considered prior to the selection of the preferred alternatives.

No significant changes have been made to the preferred alternatives described in the Proposed Plan.

13.0 STATE ROLE

The MEDEP, as a party of the FFA, has reviewed the various alternatives. The MEDEP has also reviewed the RI Report, Risk Assessment, and FS to determine if the selected remedy is in compliance with applicable or relevant and appropriate state environmental laws and regulations.

The MEDEP concurs with the selected remedy for OU 13. A copy of the letter of concurrence is presented in Appendix C of this ROD.

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

ABB-ES	ABB Environmental Services, Inc.
AFBCA	Air Force Base Conversion Agency
ARAR	Applicable or Relevant and Appropriate Requirements
BB/LS	Butterfield Brook/Limestone Stream
BTEX	benzene, toluene, ethylbenzene, and xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	contaminant of concern
CRP	Community Relations Plan
CRQL	Contract Required Quantitation Limit
cy	cubic yards
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethylene
EBGB	East Branch of Greenlaw Brook
ERA	ecological risk assessment
FFA	Federal Facility Agreement
FLA	Flightline Area
FLDD	Flightline Drainage Ditch
FS	Feasibility Study
FTF	Fuels Tank Farm
HAZWRAP	Hazardous Waste Remedial Actions Program
HHRA	human health risk assessment
HI	hazard index
IRP	Installation Restoration Program
LAFB	Loring Air Force Base
LDR	Land Disposal Restrictions
LF	Landfill
LMR	Little Madawaska River
MEDEP	Maine Department of Environmental Protection
mg/kg	milligram per kilogram
MPP	Mitigation Process Plan
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NDA	Nose Dock Area
NPL	National Priorities List
O&M	operation and maintenance
OU	Operable Unit
PAH	polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyls
RAB	Restoration Advisory Board
RAC	Remedial Action Contractor
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RG	Remediation Goals
RI	Remedial Investigation
RME	reasonable maximum exposure
RMSA	Refueling Maintenance Shop Area
ROD	Record of Decision
RTV	reference toxicity value
SCF	Spill Containment Facility
SVOC	semivolatile organic compound
TPH	total petroleum hydrocarbons
USAF	U.S. Air Force
USEPA	U.S. Environmental Protection Agency
UTS	Underground Transformer Site
VMB	Vehicle Maintenance Building
VOC	volatile organic compound
WB/BB	Wolverton Brook/Brandy Brook
WBGB	West Branch of Greenlaw Brook

REFERENCES

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APPENDIX A

TRANSCRIPT OF THE PUBLIC MEETING (MAY 8, 1997)

STATE OF MAINE AROOSTOOK, ss.

PUBLIC HEARING

PROPOSED PLAN FOR: OPERABLE UNIT 13

COPY

MAY 8, 1997
8:00 PM
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T A B L E O F C O N T E N T S

E X H I B I T S

MAY 8, 1997

MR. FORBES: Good evening. Welcome to the public hearing to receive comments on the proposed plan for Operable Unit 13 at Loring Air Force Base. Today's date is May 8th, 1997. My name is Peter Forbes, the Remedial Project Manager for the Installation, Restoration Program at Loring. Seated with me is Naji Akladiss, the Remedial Project Manager for the Maine DEP. Also in the audience is Michael Nalipinski, the Remedial Project Manager from the US Environmental Protection Agency. They will assist me in receiving your comments.

This hearing is being held in accordance with provisions of the Comprehensive Environmental Response Compensation & Liability Act or CERCLA, as amended in 1986. Also known as Superfund.

This act requires federal facilities on the National Priorities List to present clean up proposals to the local community for comment and consideration before the final clean up decisions are made. The purpose of this hearing is to receive comments on the proposed plan for Operable Unit 13.

Mr. Philip Bennett from Aroostook Legal Reporters will serve as the court reporter tonight, preparing a verbatim record of the proceedings. The verbatim record

will become a part of the final clean up plan. The court reporter will be able to make a complete record only if he's able to hear and understand what you say. With that in mind, please follow these ground rules. Speak only after I recognize you and please address your remarks to me. State your name and the organization that you represent and present your statement. Do not begin speaking until you've reached the microphone and speak slowly and clearly into the microphone.

If you've prepared your statement beforehand, you may read it aloud or you way paraphrase it and place it on this table.

Are there any individuals wishing to make a comment or a statement at this time? Yes, Maynard.

MAYNARD ST. PETER: I have a copy here for you, Peter.

MR. FORBES: Thank you.

MAYNARD ST. PETER: I'd like to read this into the record, please.

MR. STRAINGE: Can you state your name, please, for the record.

MAYNARD ST. PETER: Maynard St. Peter, member of the RAB Board. Peter, I have read the proposed plan for Operable Unit 13 and I am in agreement with the base clean up teams in that the

contaminated soil must be removed to an acceptable level.

I do have a major problem with this proposal's continued use of the term wetlands in regard to the Greenlaw Brooks and its tributaries. Both branches of the Greenlaw Brook did and still do have wetlands as their headwaters. But the length of the brooks themselves were a continual series of beaver dams connected by fast running water with very little wetlands. This is how it was.

It was a creation of Loring that created the wetlands. The destruction of the beaver dams and the continual effort by the Department of Defense in not allowing the beavers to reclaim Loring has produced those areas now defined as wetlands. Before Loring this area was one of Aroostook's greatest fisheries, supporting more than 20 beaver dams. It was also a primary recharge area for the Cary Mill aquifer located beneath Loring.

Had the environmental laws of today been in effect in the late forties, Loring could not nor would it have ever been built here. Had the national government invoked the right of domain, you can rest assured that the State of Maine would have had a clause mandating that on their departure they would have had to put things back the way they were.

Although we cannot undo the past, any effort at

restoration today must emphasize and look at this area as what it was, not what it is.

I am recommending that the base clean up team revise the document, acknowledging this fact. That all references to the Greenlaw Brook and its tributary wetlands, except for those directly related to the headwaters, be changed to reflect what they really are--destroyed fish habitat.

I am also requesting that all restoration efforts in association with the Greenlaw Brook be directed toward the recovery of the fishery that once existed here.

As a Citizen of Maine we deserve no less, the people of Aroostook expect no less, the residents of Limestone and Caribou are asking for no less.

The Maine Department of Environmental Protection and the US Environmental Protection Agency must support us in our effort to reclaim this inland fisheries.

MR. FORBES: Thank you, Maynard.

MR. ST. PETER: Okay.

MR. FORBES: Okay, are there any other comments? Anyone else wishing to make a statement or a comment? Well, seeing that there are no other people stepping forward with a comment tonight, it is 8:10 p.m., May 8th, 1997, and I declare the public

hearing to receive comments on the proposed plan for Operable Unit 13 at Loring Air Force Base closed.

C E R T I F I C A T I O N

I HEREBY CERTIFY THAT the foregoing is a true and correct transcript of the public hearing taken on the aforementioned date.

<IMG SRC 97002O>

STATE OF MAINE AROOSTOOK, ss.

APPENDIX B

RESPONSIVENESS SUMMARY

FINAL

LORING AIR FORCE BASE

OPERABLE UNIT (OU) 13

May 1997

Prepared for:

Air Force Base Conversion Agency
Loring Air Force Base, Maine
(207) 328-7109

Prepared by:

Service Center: Hazardous Waste Remedial Actions Program
Oak Ridge, Tennessee 37831-7606

Contractor: ABB Environmental Services, Inc.
Portland, Maine 04112

Project No. 9975-16

TABLE OF CONTENTS

PREFACE

The United States Air Force (USAF) held a 30-day comment period from April 14 to May 13, 1997, to provide an opportunity for the public to comment on the Proposed Plan and other documents developed for Operable Unit 13 (OU 13) at the former Loring Air Force Base (LAFB). OU 13 is the basewide surface water and sediment operable unit. The Proposed Plan is the document that identifies remedial action objectives, evaluates remedial alternatives, and recommends the alternative that best meets the evaluation criteria for OU 13.

The USAF made a recommendation of its preferred alternative in the OU 13 Proposed Plan. Removal and Disposal of contaminated soil and sediment was recommended for areas that exceed remediation goals. These areas include the Flightline Drainage Ditch (FLDD), FLDD Wetland, East Branch of Greenlaw Brook (EBGB) from Pennsylvania Road to the Ski Chalet, north and south Nose Dock Area (NDA) Drainageways, Ditch G06, and the northern portion of the Underground Transformer Site (UTS) Wetland. The USAF recommended continuation of the State Fish Advisory Currently in effect at designated on- and off-base areas. The No Action alternative was recommended for the Little Madawaska River (LMR) because there is no unacceptable risk associated with surface soil, sediment and surface water. The USAF has determined that no further action is necessary for the remaining areas within OU 13.

The Proposed Plan was issued April 10, 1997. All documents on which the preferred alternative was based were placed in the Administrative Record for review. The Administrative Record is a collection of documents considered by the USAF when selecting the remedial action for OU 13.

The purpose of this Responsiveness Summary is to document USAF responses to the questions and comments raised during the public comment period regarding the proposed alternative for OU 13. The USAF considered all comments in this document before selecting a final remedial alternative to address soil and sediment contamination from OU 13.

This Responsiveness Summary is organized into the following sections:

1.0 Overview of the Remedial Alternative Recommended in the Proposed Plan.

2.0 Background on Community Involvement and Concerns.

3.0 Summary of Comments Received During the Public Comment Period and USAF Responses.

1.0 OVERVIEW OF THE REMEDIAL ALTERNATIVE RECOMMENDED IN THE PROPOSED PLAN

The selected remedy for OU 13 includes two remedial alternatives; 1) Removal and Disposal and 2) No Action. No further action is necessary for much of OU 13 because there is no unacceptable risk to human health or the environment. The selected remedy for contaminated surface soil and sediment that exceed remediation goals in the FLDD, FLDD Wetland, BBGB (from Pennsylvania Road to the Ski Chalet), north and south NDA Drainageways, Ditch G06, and the UTS Wetland (northern portion) is Removal and Disposal. The major components of the remedy include:

- pre-design studies to delineate the extent of remediation for design purposes;
- pre-design wetland mitigation studies (i.e., wetland delineations and function-value assessments) to evaluate the impacts resulting from remedial activities;
- site preparation and mobilization;
- cutting and clearing;
- stormwater management;
- sediment excavation;
- sediment disposal at LF-3, some material may require disposal at off-base facilities;
- backfilling the excavations with material that closely matches the excavated material;
- compensatory wetlands mitigation and demobilization;
- long-term environmental and wetlands mitigation monitoring;
- continued fish advisory; and
- five-year site reviews.

The State Fish Advisory, currently in effect at designated on- and off-base areas, will remain in effect until the fish are determined to be acceptable for consumption.

The No Action alternative has been selected for the LMR because there is no unacceptable risk associated with surface soil, sediment, and surface water. The components of the alternative include environmental monitoring and five-year site reviews to evaluate the long-term conditions of the site's ecology and to assess whether human health and the environmental continue to be adequately protected.

The USAF has determined that no further action is necessary for the remaining areas within OU 13 because there is no unacceptable risk to human health or the environment.

These actions will achieve the following remedial response objectives developed for OU 13:

- prevent or minimize ingestion of and dermal contact with contaminated soil/sediment by human and ecological receptors;
- prevent human ingestion of contaminated fish;
- minimize migration of contaminated soil/sediment; and
- avoid destruction of existing ecological habitat where risk associated with short-term habitat loss outweighs the reduction in risk potentially realized by site remediation.

2.0 BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

Throughout LAFB's history, the community has been active and involved in base activities. The USAF and US Environmental Protection Agency (USEPA) have kept the community and other interested parties apprised of LAFB activities through informational meetings, fact sheets, press releases, public meetings, site tours and open houses, as well as Restoration Advisory Board (RAB) meetings. Membership of the RAB is composed of USAF, USEPA, Maine Department of Environmental Protection (MEDEP), local officials, and community representatives.

The LAFB Community Relations Plan (CRP) was released in August 1991 and revised in May 1995. The CRP outlined a program to address community concerns and keep citizens informed and involved during remedial activities. The CRP can be found in the Administrative Record.

On June 24, 1992, the USAF made the LAFB Administrative Record available for public review. The Administrative Record is currently available for public review at the Air Force Base Conversion Agency (AFBCA) Office, 5100 Texas Road, Limestone, Maine.

From April 14 through May 13, 1997, the USAF held a public comment period to accept public input on the alternatives presented in the OU 13 Feasibility Study and Proposed Plan, as well as other documents previously released to the public. On May 8, 1997, AFBCA personnel and regulatory representatives held a public meeting to discuss the Proposed Plan and to accept any oral comments. Based on the public comments, the public is in agreement regarding the preferred alternatives for OU 13 presented in the Proposed Plan.

3.0 SUMMARY OF COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND USAF RESPONSES

This Responsiveness Summary addresses comments received by the USAF during the public comment period from April 14 to May 13, 1997, relative to the Proposed Plan for OU 13 at the former LAFB. Comments include those received verbally during the public hearing and letters received during the public comment period. The comments and corresponding responses are included in the following paragraphs.

1. Comment: One commenter stated that he is pleased with the cleanup activities being conducted at LAFB. The commenter also stated that he hopes the USAF will be able to restore Greenlaw Brook to its condition 40 years ago, and that the Greenlaw Brook will become a high quality fishery again.

USAF Response: The selected remedial alternative consists of excavation and removal of contaminated surface soil and sediments from streams, wetlands, and drainage ditches in numerous areas, and restoration of the wetlands affected during the removal process. The removal activities will be disruptive to the habitats being remediated, however the regulatory agencies, ecological specialists, wetland scientists, the U.S. Fish and Wildlife Service (USFWS), and the USAF are in agreement that the removals are necessary to facilitate recovery of the ecosystem. By removing the sources (contaminated soil and sediments), water quality will improve, the food chain will be able to re-establish in formerly contaminated areas, and the fishery will undoubtedly recover. The rate of recovery will be greatly increased with the removal of contaminants; however, restoration to conditions prior to base construction will require time. Full restoration of the habitats and fishery will also require continued vigilance by future owners and tenants of base property.

The USAF intends to conduct long-term monitoring of the recovery of the ecological communities impacted by former base activities, including periodic analysis of contaminants in fish tissue. The State Fish Advisory currently in effect for portions of the Little Madawaska River watershed near the base will be able to be lifted at some point in the future when the "catch-and-release" policy is no longer necessary. The local community will also be kept informed as to the status of the recovery of the fishery.

2. Comment: One commenter agreed that contaminated soil and sediment must be removed to acceptable levels. The commenter stated that both branches of the Greenlaw Brook have wetlands at their headwaters, but that the brooks themselves used to be a series of beaver dams connected by fast running waters, with very little wetlands present. Before the creation of Loring Air Force Base, the area used to be one of Aroostook County's greatest fisheries. With the creation of Loring and destruction of the beaver dams, the fast running waters are gone and wetlands have developed.

The commenter requested that the document be revised to reflect that the "wetlands" that have been created are really "destroyed fish habitat". The commenter also requested that all restoration efforts associated with Greenlaw Brook be directed towards the recovery of the fishery that once existed before the development of Loring; restoration should focus on the way the area was, not what it is now.

USAF Response: The USAF understands the concerns raised by the commenter; that wetlands now exist in some areas that once were fish habitat. However, these wetlands provide a diverse habitat for a wide range of aquatic wildlife that form the foundation of the fishery and are very valuable to the area's overall ecology, both for aquatic and terrestrial wildlife.

As stated in the USAF's Response to Comment 1, by removing the sources of contamination, water quality and the food chain will recover, and the fishery will improve correspondingly. Due to the creation of LAFB and other development in the area over the years, it is not feasible to restore the area to the conditions of 40 or 50 years ago. However, now that LAFB is no longer active, and significant areas of contamination will be removed, the ecosystem will recover and beaver activity will eventually increase. Beaver dams will have a positive effect on the streams and brooks, helping to return the areas to pre-Loring conditions, although there will be a significant and inevitable recovery period after the removals are completed. Wetland restoration specialists have been retained by the USAF specifically to design and supervise the wetland restorations to be conducted in the removal areas. USEPA, USFWS, and MEDEP wetland scientists will also be contributing to the planning and supervision of the restorations.

Additionally, in accordance with the Record of Decision for the Disposal of Loring Air Force Base, Maine (April 1996), approximately 4,500 acres of LAFB property will be transferred to the USFWS. The acreage has been designated for three uses. Approximately 3,900 acres will be used as part of the National Wildlife Refuge System. Included in these parcels are the East Branch of Greenlaw Brook and a large portion of the West Branch of Greenlaw Brook. Approximately 20 acres will be used for wildlife habitat conservation and approximately 560 acres of vacant land on the shores of the Little Madawaska River, will be used for fishery, wildlife, and wetlands protection.

3. Comment: One commenter agreed with the preferred alternative that the USAF is proposing. However, the commenter is concerned with the ecological restoration activities. The area used to be an important fishery utilized by Native Americans. However, the construction of LAFB altered the watershed drainage patterns, changing the flow of water through the area, resulting in deterioration of the fish habitat. The commenter requested the USAF consider restoring the ecosystem to conditions that preceded occupation of the area by the Department of Defense, including measures to enhance the fish habitat. Suggested measures include returning non-contaminated organic and inorganics debris to the stream and only partially backfilling excavated areas to increase the depth of pools within the stream bed. Additionally, to enhance diversity in the affected wetland and riparian ecosystems, the commenter requested the USAF consider restoring suitable portions of the de-vegetated areas with the brown ash species.

USAF Response: Please see the responses to the preceding comments for a partial response to this comment. The suggestion of returning non-contaminated organic and inorganic debris to the remediated areas will be part of the restoration thought process, and the creation of deeper pools will also be considered. Additionally, brown ash will be included in the selection of vegetation to be used in the restoration process. As mentioned, wetland restoration scientists have been retained by the USAF specifically to aid in the restoration efforts, and specialists from the regulatory agencies and USFWS are fully involved at this time in the process as well.

APPENDIX C
LETTER OF CONCURRENCE

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- stormwater management,
- sediment excavation;
- sediment disposal at Landfill 3, some material may require disposal at off-base facilities;
- backfilling the excavations with material that closely matches the excavated material;
- compensatory wetlands mitigation and demobilization;
- long-term environmental and wetlands mitigation monitoring;
- continued fish advisory; and
- five-year site reviews.

The State Fish Advisory, currently in effect at designated on- and off-base areas, will remain in effect until the fish are determined to be acceptable for consumption.

The No action alternative has been selected for the Little Madawaska River because there is no unacceptable risk associated with surface soil, sediment, and surface water. The components of the alternative include environmental monitoring and five-year site reviews to evaluate the long-term conditions of the site's ecology and to assess whether human health and the environmental continue to be adequately protected.

The above actions will achieve the following remedial response objectives developed for OU 13:

- prevent or minimize ingestion of and dermal contact with contaminated
- soil/sediment by human and ecological receptors;
- prevent human ingestion of contaminated fish;
- minimize migration of contaminated soil/sediment; and
- avoid destruction of existing ecological habitat where risk associated with short-term habitat loss outweighs the reductions in risk potentially realized by site remediation.

The USAF Will review the environmental monitoring data at least once every five years in accordance with applicable USEPA guidance. The five-year site reviews are intended to evaluate whether the response action continues to protect human health and the environment, assess site conditions, and propose further actions, if necessary.

The MEDEP's concurrence in the selected remedy, as described above, should not be construed as the State's concurrence with any conclusions of law or findings of fact which may he set forth in the Record of Decision. The State reserves any and all rights to challenge any such finding of fact or conclusion of law in any other context. This concurrence is bused upon the State's understanding that the MEDEP will continue to participate in the Federal Facilities Agreement and in the review and approval of operational, design, and monitoring plans.

The MEDEP looks forward to working with the Department of the Air Force and the USEPA to resolve the environmental problems posed by this site. If you need additional information, do not hesitate to contact myself or members of my staff.

Sincerely,

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