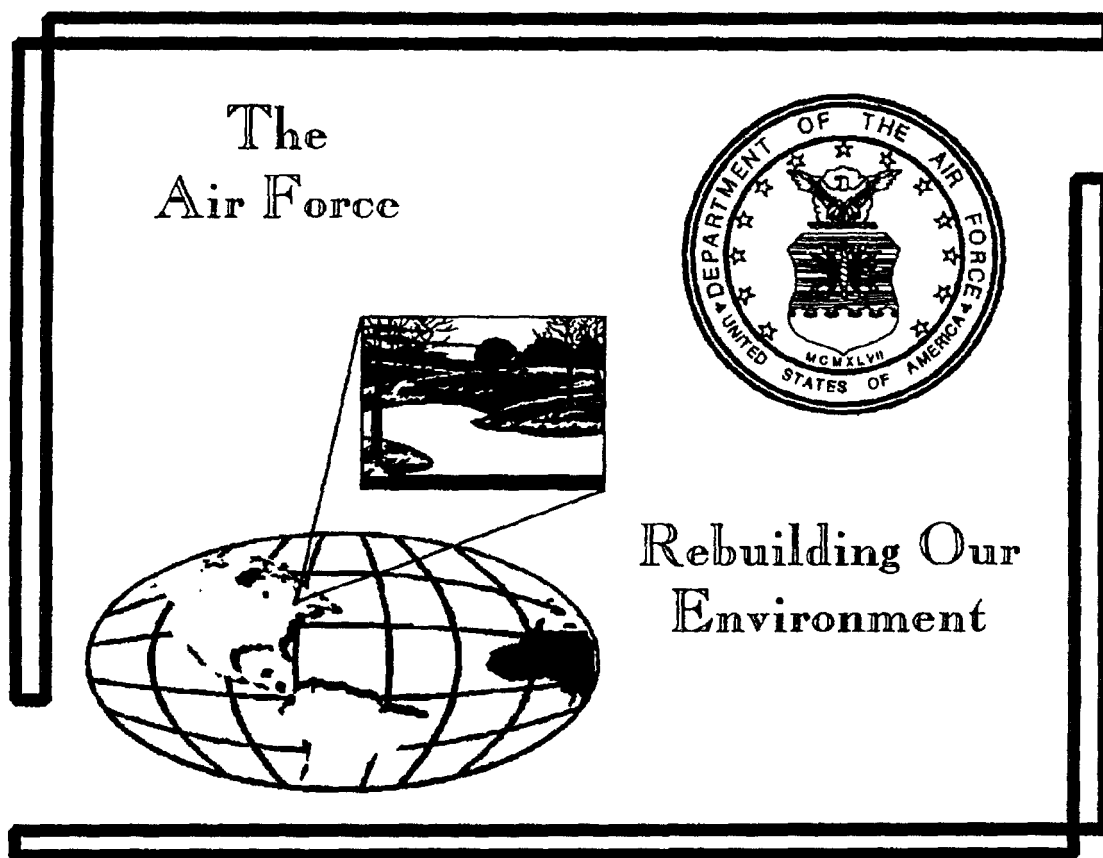


**EPA Superfund
Explanation of Significant Differences:**

**LORING AIR FORCE BASE
EPA ID: ME9570024522
OU 04, 12
LIMESTONE, ME
01/26/2001**

OPERABLE UNIT 4
(LANDFILL 2 AND 3 GROUNDWATER)
& OPERABLE UNIT 12
(QUARRY GROUNDWATER)
EXPLANATION OF SIGNIFICANT DIFFERENCES

JANUARY 2001



**United States Air Force Base Conversion Agency
Installation Restoration Program
Loring Air Force Base, Maine**

**DECLARATION FOR THE
OPERABLE UNITS 4 AND 12
EXPLANATION OF SIGNIFICANT DIFFERENCES
LORING AIR FORCE BASE
LIMESTONE, MAINE**

SITE NAMES AND LOCATION

SITE: Loring Air Force Base (LAFB) National Priorities List Site

SITE NAMES: Operable Unit (OU) 4 (Groundwater Underlying Landfills [LF] 1, 2, and 3; the Coal Ash Pile [CAP]; and the Chapman Pit Debris Area [CPDA])

OU 12 (Basewide Groundwater)

LOCATION: Former Loring Air Force Base
Limestone, Maine

STATEMENT OF PURPOSE

This Explanation of Significant Differences (ESD) sets forth the basis for significant changes to the remedies selected for both the contaminated groundwater associated with LF-2 and LF-3 addressed in the OU 4 Record of Decision (ROD) (ABB-ES, 1996) and the Quarry Contaminated Groundwater Area (Quarry Plume) addressed in the OU 12 ROD (HLA, 1999) at the LAFB National Priorities List (NPL) site (Site) in Limestone, Maine. The need for these changes is based on the detection of contaminant concentrations at (and beyond) compliance boundaries that exceed the action levels and remediation goals set forth in the OU 4 and OU 12 RODs, respectively.

STATUTORY BASIS FOR ISSUANCE OF THE ESD

Under Section 117 (c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), if the lead agency determines that adjustments to the remedial action at a site are necessary and cause the remedial action to differ significantly from the ROD for that site, the lead agency shall publish an explanation of significant differences between the remedial action being undertaken and the remedial action set forth in the ROD and the reasons such changes are being made. The National Contingency Plan (NCP) (40 CFR 300.435 (c) (2)) and EPA guidance (OSWER Directive 9200.1-23P) indicate that an ESD, rather than a ROD amendment, is appropriate where the changes at issue do not fundamentally alter the overall remedy with respect to scope, performance, or cost. The U.S. Department of the Air Force (Air Force), as lead agency, determined the adjustments to the remedial actions proposed for OU 4 and OU 12 do not fundamentally alter the overall remedy for the contaminated groundwater with respect to scope, performance, or cost. It is appropriate to describe these adjustments in an ESD. The adjusted remedies remain protective of human health and the environment and continue to meet applicable or relevant and appropriate requirements (ARARs).

In accordance with the NCP (40 CFR 300.435 (c) (2) (i) (A)), this ESD will become part of the Administrative Record, which is available for public review at the LAFB Base Conversion Agency Office in Limestone, Maine. In addition, a notice that briefly summarizes this ESD will be published in the *Aroostook Republican* and the *Bangor Daily News*.

OVERVIEW OF THE ESD

OU 4 Overview

OU 4 consists of the groundwater associated with LF-1, -2, and -3, the CAP, and the CPDA. LF-2 is located approximately one (1) mile west of the West Gate on Nebraska Road. The landfill occupies approximately nine acres and received waste from 1956 to 1974. LF-3 is located approximately one-half mile southwest of the West Gate on the Sawyer Road. Landfill 3 occupies approximately twenty-nine (29) acres and received waste from 1974 to 1999. The CAP was used as a source of gravel during base construction and later the excavation appeared to have been filled with coal ash and some construction debris. The CAP was eliminated in a removal action conducted in 1994 and 1995. The CPDA was mined for sand and gravel during construction of the base. After mining activities ceased, an earthen dam was built, creating Chapman Pit Pond.

The Air Force documented that no further action is necessary at LF-1 and the CPDA in the OU 4 ROD, which was issued in September 1996 (ABB-ES, 1996). The OU 4 ROD selected the Minimal Action groundwater remedy for the contaminated groundwater associated with LF-2 and LF-3. This ESD relates to the CERCLA remedial action for the contaminated groundwater associated with LF-2 and LF-3. (Although LF-3 and the CAP are typically discussed concurrently, since the CAP was eliminated in a removal action in 1994 and 1995, no further discussion of the CAP is provided in this ESD.) The Minimal Action remedy is being implemented in conjunction with the source control remedy selected for LF-2 and LF-3 in the OU 2 ROD (i.e., low-permeability cover systems, 30-year landfill postclosure monitoring, and deed restrictions), and consists of the following components:

- institutional controls;
- groundwater monitoring;
- five-year site reviews; and
- contingency action, if necessary.

In accordance with the OU 4 ROD Minimal Action remedy, if the results of the groundwater monitoring indicate that landfill-related contaminants are detected in any of the compliance wells comprising the OU 4 compliance boundary at concentrations above the action levels¹ and the remedy is determined not to be protective, a contingency action will be implemented. As discussed in detail below, such detections have occurred, and the remedy has been determined not to be protective. By this ESD, the Air Force is presenting its explanation of the remedial action adjustments arising from the implementation of the contingency action. These adjustments will remedy any threat to human health posed by the presence of contaminated groundwater at LF-2 and LF-3. The contingency action chosen by the Air Force with concurrence from the U.S. Environmental Protection Agency (EPA) and Maine Department of Environmental Protection (MEDEP) is to install new compliance wells and extend the compliance and institutional control boundaries at this site to encompass the LF-2 and LF-3 groundwater contaminant plumes. Institutional controls are being obtained for 177 acres of off base property currently owned by the University of Maine at Presque Isle.

The contingency action described herein does not fundamentally alter the overall remedy for LF-2 and LF-3 with respect to scope, performance, or cost. Groundwater monitoring, five-year reviews, and contingency actions, if necessary, remain components of the remedy.

OU 12 Overview

OU 12 was developed to assess the basewide groundwater conditions at the former LAFB. A number of contaminated groundwater plumes were identified by the OU 12 remedial investigation. One of these plumes originates from the Quarry and is the only area within OU 12 requiring discussion within this ESD. The Quarry is located near the northwestern boundary of the Site and occupies approximately 12 acres. Quarry operations reportedly began with construction of LAFB in 1947 and ceased in 1985. Historically, waste materials from construction projects, industrial and maintenance shops, and other base activities were stored and disposed of at the Quarry.

The OU 12 ROD issued in September 1999 (HLA, 1999) declared the selected remedies for various contaminant plumes within OU 12 to include No Action, No Further Action, Limited Action, and Groundwater Management Zone (GMZ) implementation. The OU 12 ROD selected the GMZ remedy for the Quarry Plume. This ESD relates to the remedial action associated with the Quarry Contaminated Groundwater Area, contained by GMZ 4. The GMZ remedy includes the following major components:

- establishment of GMZs;
- groundwater use restrictions;
- provision of water supply;

¹ Action levels have been established for LF-2 and LF-3 groundwater based on chemical specific ARARs (i.e., federal Maximum Contaminant Levels [MCLs] and Maximum Contaminant Level Goals [MCLGs]) presented in the OU 4 ROD, state Maximum Exposure Guidelines (MEGs), and risk assessment goals (i.e., 1×10^{-6} excess cancer risk level and a hazard quotient of one per compound). If a value described above is not capable of being detected with sufficient precision and value, then the practical quantitation limit or background value is used as appropriate for the groundwater action level. (ABB-ES, 1996).

- long-term monitoring;
- contingency action, if necessary; and
- five-year site reviews.

In accordance with the ROD, if groundwater contaminant concentrations at the GMZ Compliance Boundary exceed federal Maximum Contaminant Levels (MCLs) or the state Maximum Exposure Guidelines (MEGs)², the Air Force will implement a contingency action. In the case of the Quarry Plume, the contingency action consists of expanding the Groundwater-Use Restriction Boundary and the Compliance Boundary and installing a new compliance well. Specifically, the Air Force will extend the Groundwater-Use Restriction and Compliance Boundaries for GMZ 4 westward and southward to provide more conservative boundaries. By this ESD, the Air Force is presenting its explanation of its decision, with concurrence from EPA and MEDEP, to expand the Groundwater-Use Restriction and Compliance Boundaries for GMZ 4 and to install a new compliance monitoring well. The expanded boundaries will encompass the contaminated groundwater at the Quarry and remedy any threat to human health posed by the presence of contaminated groundwater at the Quarry. Institutional controls are being obtained for approximately seven (7) acres of off base property currently owned by Consolidated Rambler Mines of St. John, New Brunswick, Canada.

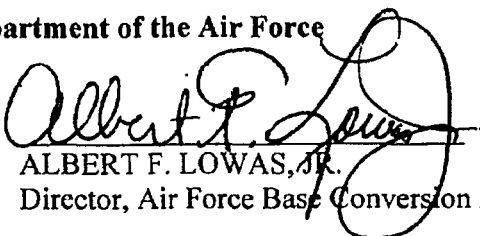
The contingency action described herein does not fundamentally alter the overall remedy for the Quarry Plume with respect to scope, performance, or cost.

DECLARATION

For the foregoing reasons, by my signature below, I concur and recommend the issuance of an Explanation of Significant Differences for OU 4 and OU 12 at LAFB, in Limestone, Maine and the changes stated therein.

Department of the Air Force

By:

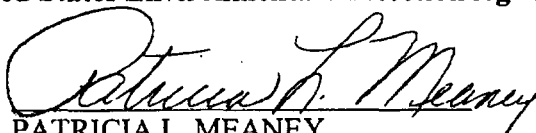

 ALBERT F. LOWAS, JR.
 Director, Air Force Base Conversion Agency

Date:

January 2001

United States Environmental Protection Agency

By:


 PATRICIA L. MEANEY
 Director, Office of Site Remediation and Restoration
 U.S. Environmental Protection Agency, Region 1

Date:

1/26/01

²Remediation goals for OU 12 are based primarily on chemical-specific ARARs (i.e., federal MCLs and state MEGs); however, when these do not exist, the goals are risk-based concentrations (HLA, 1999).

**EXPLANATION OF SIGNIFICANT DIFFERENCES
OPERABLE UNITS 4 and 12
LORING AIR FORCE BASE
LIMESTONE, MAINE**

I. INTRODUCTION

A. Site Names and Location

Site: Loring Air Force Base (LAFB) National Priorities List Site

Site Names: Operable Unit (OU) 4 (Groundwater Underlying Landfills [LF] 1, 2, and 3; the Coal Ash Pile [CAP]; and the Chapman Pit Debris Area [CPDA])

OU 12 (Basewide Groundwater)

Location: Former Loring Air Force Base
Limestone, Maine

B. Lead and Support Agencies

Lead Agency: U.S. Department of the Air Force (Air Force)

Support Agencies: U.S. Environmental Protection Agency (EPA)

Maine Department of Environmental Protection (MEDEP)

Pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) § 120 (e) [42 USC § 9620 (e)], the Air Force, EPA, and MEDEP entered into a Federal Facility Agreement (FFA) (FFA, 1991), dated January 30, 1991, amended December 1993 and January 1995, regarding the cleanup of the LAFB National Priorities List (NPL) site. The FFA sets forth the roles and responsibilities of each of the parties regarding the cleanup.

C. Legal Authority

Under CERCLA § 117 (c) [42 USC § 9617 (c)], the National Contingency Plan (NCP) [40 CFR § 300.435 (c)], and EPA guidance (OSWER Directive 9200.1-23P), if the lead agency determines that differences in the remedial action significantly change, but do not fundamentally alter, the remedy selected in the Record of Decision (ROD) with respect to scope, performance, or cost, then the lead agency shall publish an explanation of the significant differences between the remedial action being undertaken and the remedial action set forth in the ROD and the reasons such changes are being made.

D. Summary of this Explanation of Significant Differences (ESD)

This ESD sets forth the basis for significant changes to the remedies selected for both the contaminated groundwater associated with LF-2 and LF-3 addressed in the OU 4 ROD and the Quarry Contaminated Groundwater Area (Quarry Plume) addressed in the OU 12 ROD at the former LAFB NPL site in Limestone, Maine. Figure 1 presents the location of the OU 4 sites and OU 12 Quarry site addressed by this ESD. The need for these changes is based on the detection of contaminant concentrations at (and beyond) compliance boundaries that exceed the action levels and remediation goals (see Declaration) set forth in the OU 4 and OU 12 RODs, respectively. The conditions and contingency actions at OU 4 and OU 12 that triggered this ESD are further described below in accordance with the guidance provided in EPA's *Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents* (OSWER Directive 9200.1-23P).

The changes to the RODs described herein remain protective of human health and the environment, comply with applicable or relevant and appropriate requirements (ARARs) for this action, and are cost-effective.

E. Availability of Documents

This ESD which will become part of the Administrative Record Files for OU 4 and OU 12. This ESD, along with the supplemental documentation included in the Administrative Record Files, is available for review at the following location:

Air Force Base Conversion Agency
154 Development Drive, Suite G
Limestone, Maine 04750-9743
Phone: (207) 328-7109, Fax: (207) 328-7131
Hours: 7:30 a.m. to 4:30 p.m., Monday through Friday

II. SUMMARY OF SITE HISTORY, CONTAMINATION, RESPONSE ACTIVITIES, AND SELECTED REMEDY

A. Site Description and History

The 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/Canada border and covers approximately 9,000 acres.

LAFB was constructed in the late 1940s. Its primary mission was to support long-range bomber aircraft for the Strategic Air Command. Principal base operations included aircraft maintenance, refueling, munitions storage and maintenance, and flightline operations. These operations required the use, handling, storage, or disposal of materials and compounds containing hazardous substances. In the past, these hazardous substances entered the



Connor

Caswell

Quarry

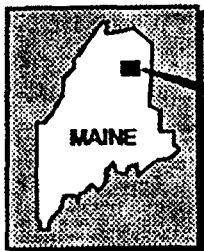
Caribou

Landfill 2

Landfill 3

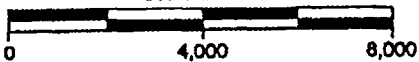
Limestone

Base Boundary



LORING AIR FORCE BASE

Scale in Feet



OU4 AND OU12 EXPLANATION OF SIGNIFICANT DIFFERENCES
FIGURE 1
OU 4 LANDFILLS 2 AND 3 AND OU 12 QUARRY SITE LOCATION MAP
LORING AIR FORCE BASE LIMESTONE, MAINE

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. Under the Department of Defense's Installation Restoration Program (IRP), the Air Force initiated activities to identify, evaluate, and remediate sites contaminated with hazardous substances. The site has been organized into OUs to facilitate investigative and remedial activities. Because of the contamination discovered under the IRP, the LAFB was placed on the NPL in 1990, and the Air Force, EPA, and MEDEP agreed to remediate it in accordance with the FFA signed in 1991 (FFA, 1991). Following the signing of the FFA, LAFB was placed on the Base Closure List by the U.S. Congress and was closed in September 1994.

A site-specific description and history is provided below for each of the OU 4 and OU 12 contamination areas relevant to this ESD.

A.1. Landfill 2

LF-2 is located approximately one mile west of the West Gate on Nebraska Road (Figure 1). The landfill occupies approximately 9 acres and received waste from 1956 to 1974.

The LF-2 area was quarried for gravel during construction of the base. Waste disposal began in 1956 after the gravel supply had been exhausted and continued until 1974. The landfill was covered with approximately 1 foot of clean soil and was closed in 1974. The LF-2 area soils settled over time, leaving a depression in the LF-2 surface. In 1994 and 1995, nonhazardous contaminated soil and debris from various removal actions were placed on LF-2 as subgrade for a cover system, which was designed in accordance with Resource Conservation and Recovery Act (RCRA) Subtitle C and Maine Hazardous Waste Regulations. The cover system construction was completed in 1996.

Wastes buried or burned at the site include domestic garbage, construction rubble, flightline wastes, and sewage sludge. There are no records of waste segregation at the landfill, and waste was reportedly distributed evenly. Flightline wastes disposed of at this site reportedly included oil, hydraulic fluids, solvents, thinners, and paints. Disposal of hazardous substances at this site reportedly ended by 1968. No additional information is available concerning daily operations at LF-2 or the burial locations of different types of waste. Volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, inorganics above background concentrations, total petroleum hydrocarbons, and oil and grease have been detected in groundwater in and around LF-2.

A.2. Landfill 3

LF-3 is located approximately one-half mile southwest of the West Gate on the Sawyer Road (Figure 1). The contiguous areas occupy approximately 17 acres and received waste from 1974 to 1991.

The area occupied by LF-3 was quarried extensively for gravel during construction of the airfield runway and the flightline area. Gravel quarrying continued as late as

1994 in the northwestern portion of the site. The landfill received waste from 1974 to 1991 and eventually was covered with 6 inches of native soil. Waste brought to LF-3 included base refuse such as domestic garbage, contents of dumpsters from the flightline shops, and mess hall wastes. Hazardous wastes are not known to have been placed at LF-3. However, it is suspected that small quantities of hazardous substances such as partially filled solvent cans, oily-water wastes, and fuel-saturated soil are buried at this landfill. Between 1994 and 1999, approximately 350,000 cubic yards (CYs) of nonhazardous contaminated soil and debris from various removal actions were placed on LF-3 as subgrade for the cover system. In 1998, approximately 3,500 CYs of polychlorinated biphenyl (PCB)-contaminated sediment at concentrations above 50 parts per million (ppm) were placed in specially constructed cells at LF-3. VOCs, SVOCs, pesticides, and inorganics above background concentrations were detected in groundwater in and around LF-3. Oil and grease were also detected.

The cover system was designed in accordance with RCRA Subtitle C and Maine Hazardous Waste Regulations. The cover system was completed in 1999.

A.3. Quarry

The Quarry is located near the northwestern boundary of the Site and occupies approximately 12 acres (Figure 1).

Quarry operations reportedly began with construction of LAFB in 1947 and ceased in 1985. The Quarry consists of two levels, the upper and lower tiers. The lower tier is flooded and drains through an excavated ditch to the Greenlaw Brook wetland. The lower tier rises approximately 30 feet to the upper tier, which rises approximately 30 feet to the Quarry rim, which borders the Nose Dock Area. Historically, waste materials from construction projects, industrial and maintenance shops, and other base activities were stored and disposed of at the Quarry. Consistent with the contaminants found in area soils, the primary contaminants detected in the Quarry bedrock groundwater are chlorinated volatile organic compounds (CVOCs) and fuel-related volatile and SVOCs. Dense nonaqueous-phase liquid (DNAPL) has not been directly observed during investigation; however, based on site data, it is likely that residual perchloroethylene DNAPL is present in bedrock at the Quarry site.

B. Investigation History

The investigation history of the sites as documented in the OU 4 and OU 12 RODs is summarized as follows:

- In 1984, a Preliminary Assessment was completed detailing historical hazardous material usage and waste disposal practices at LAFB.
- Initial Site Investigation fieldwork to determine whether contaminants were present at LF-3 was conducted in 1985.
- A Remedial Investigation (RI) process was initiated in 1988 and continued into 1993.

- LAFB was added to the NPL in February 1990.
- The Air Force entered into an FFA in 1991 with the EPA and MEDEP regarding the cleanup of environmental contamination at LAFB. The FFA was revised in December 1993 to address issues related to base closure, such as real property transfer and a revised 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.

The following key milestones relate to OU 4:

- A Focused Feasibility Study for OU 2 was completed in 1994 for LF-2 and LF-3 to determine alternatives for remediation of source area contamination based on information presented in the RI report, and a Proposed Plan was submitted for public review in July 1994.
- The Air Force and the EPA signed the OU 2 ROD on September 30, 1994. MEDEP provided a letter of concurrence on the ROD.
- A Feasibility Study (FS) was completed in 1996 for OU 4 to determine remedial alternatives for LF-2 and LF-3 groundwater based on information presented in the RI report.
- A Proposed Plan was submitted for public review in May 1996.
- The Air Force and the EPA signed the OU 4 ROD on September 30, 1996.
- Groundwater monitoring has been conducted in 1997, 1998, and 1999 for LF-2. Only a portion of the groundwater monitoring was conducted at LF-3 since the final cap was under construction through December 1999 (BEI, 1997).

The following key milestones relate to the Quarry Plume at OU 12:

- Approximately 100 drums were removed from the Quarry site and disposed of in the early 1980s.
- In 1994, a Remedial Action was conducted at the Quarry, which included excavation of soil, sediment, and construction rubble from both the upper and lower tiers of the Quarry. The action was documented in the OU 7 ROD, which was signed in September 1994 (ABB-ES, 1994).
- In 1998, during additional site characterization activities, three (3) primary areas of buried drums were discovered northeast of the Quarry. Subsequently, a removal action was conducted that included excavation and disposal of 348 drums, liquid contents, and associated contaminated soil.

- The OU 12 FS and OU 12 FS Addendum for the Quarry were completed in 1999 to evaluate remedial alternatives to address groundwater contamination based on the information presented in the RI Report.
- The OU 12 Proposed Plan was submitted for public review in May 1999.
- The Air Force and EPA signed the OU 12 ROD on September 19, 1999. MEDEP provided a letter of concurrence on the ROD.

C. Selected Remedies

The following sections describe the selected remedies for the relevant LAFB sites as they were originally described in their respective RODS.

C.1. OU 4 Selected Remedy for Contaminated Groundwater Associated with Landfills 2 and 3

The selected remedial action for contaminated groundwater associated with LF-2 and LF-3 is Minimal Action. In addition to the low-permeability cover systems, 30-year landfill postclosure monitoring, and deed restrictions for LF-2 and LF-3 contained in the OU 2 ROD source control remedy, implementation of the OU 4 Minimal Action remedy includes the following key components:

- institutional controls;
- groundwater monitoring;
- five-year site reviews; and
- contingency action, if necessary.

C.2. OU 12 Selected Remedy Quarry Plume Contaminated Groundwater Area

The selected remedial action for the Quarry Plume is GMZ implementation. This remedy includes the following major components:

- establishment of GMZs;
- groundwater use restrictions;
- provision of water supply;
- long-term monitoring;
- contingency action, if necessary; and
- five-year site reviews.

III. DESCRIPTION OF SIGNIFICANT DIFFERENCES AND BASIS FOR THOSE DIFFERENCES

A. OU 4—Landfill 2 and Landfill 3 Contaminated Groundwater

A.1. Summary and Basis of Significant Differences

The remedy selected in the OU 4 ROD (ABB-ES, 1996) for contaminated groundwater associated with LF-2 and LF-3 is Minimal Action. As part of the remedy, institutional controls were established to restrict human exposure to contaminated groundwater (groundwater-use) in the vicinity and downgradient of the landfills. Compliance Boundaries were established, and compliance wells were installed at the Compliance Boundaries to monitor contaminant levels downgradient of the landfill and serve as compliance points between the groundwater users and the landfills. OU 4 ROD institutional control boundaries, compliance boundaries, and compliance well locations are presented in Figure 2. The Minimal Action remedy for contaminated groundwater at LF-2 and LF-3 selected in the OU 4 ROD requires that a contingency action be implemented if groundwater monitoring reveals landfill-related contaminants at concentrations exceeding the action levels at a compliance point (i.e., compliance well).

Groundwater monitoring conducted in 1997 (Bechtel Environmental [BEI], 1998) and in 1998 (BEI, 1999) detected contaminant concentration exceedances in LF-2 compliance wells (LF-2MW3 and LF-2MW4), LF-3 compliance wells (JMW-0991 and JMW-0992) and in one off-base monitoring well (JMW-0801) downgradient from LF-2. Table 1 presents a summary of contaminant concentrations exceeding action levels in the original LF-2 and LF-3 compliance wells.

In accordance with the OU 4 ROD, when exceedances were detected in the compliance wells, the Air Force:

- notified EPA and MEDEP,
- sampled all potable water supplies downgradient of the landfills that might be affected by contamination originating from the landfills, and
- consulted with the EPA and MEDEP on the requirement for a risk assessment as specified in the ROD. The EPA and MEDEP agreed that since the action levels chosen in the ROD considered the State of Maine MEGs and the action level exceedances trigger a contingency action, a risk assessment was not needed.

After review of this information by EPA and MEDEP, the existing Minimal Action remedy was determined not to be protective, and a contingency action consisting of passive remedial measures was selected and implemented. The contingency action includes expansion of the compliance boundaries and the institutional control boundaries and installation of new compliance wells. As shown in Figure 3 and described in Section III.A.2 below, a substantial adjustment was made to the compliance and institutional control boundaries north of

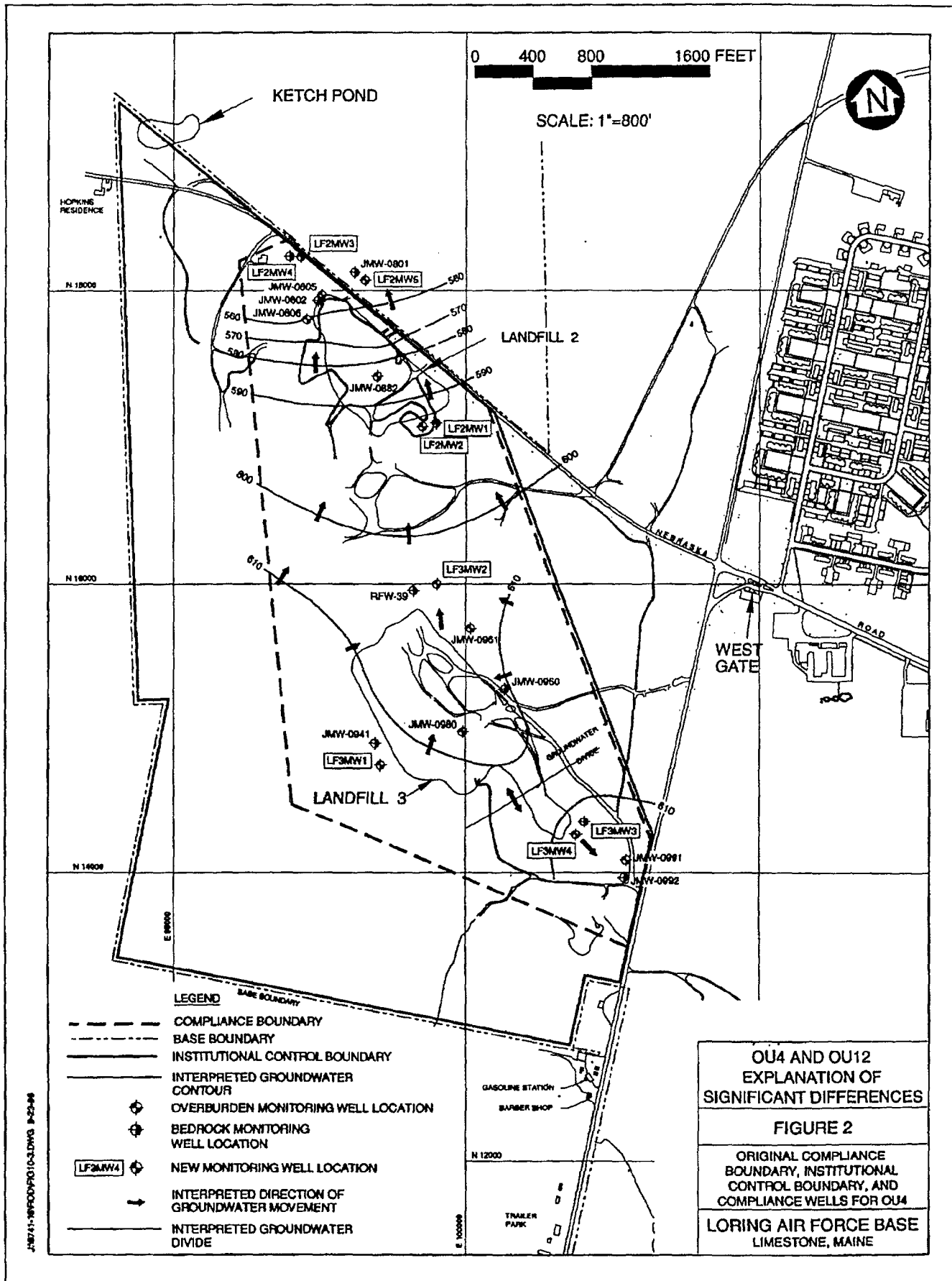


Table 1. Contaminant Concentrations Exceeding Action Levels in Original LF-2 and LF-3 Compliance Wells

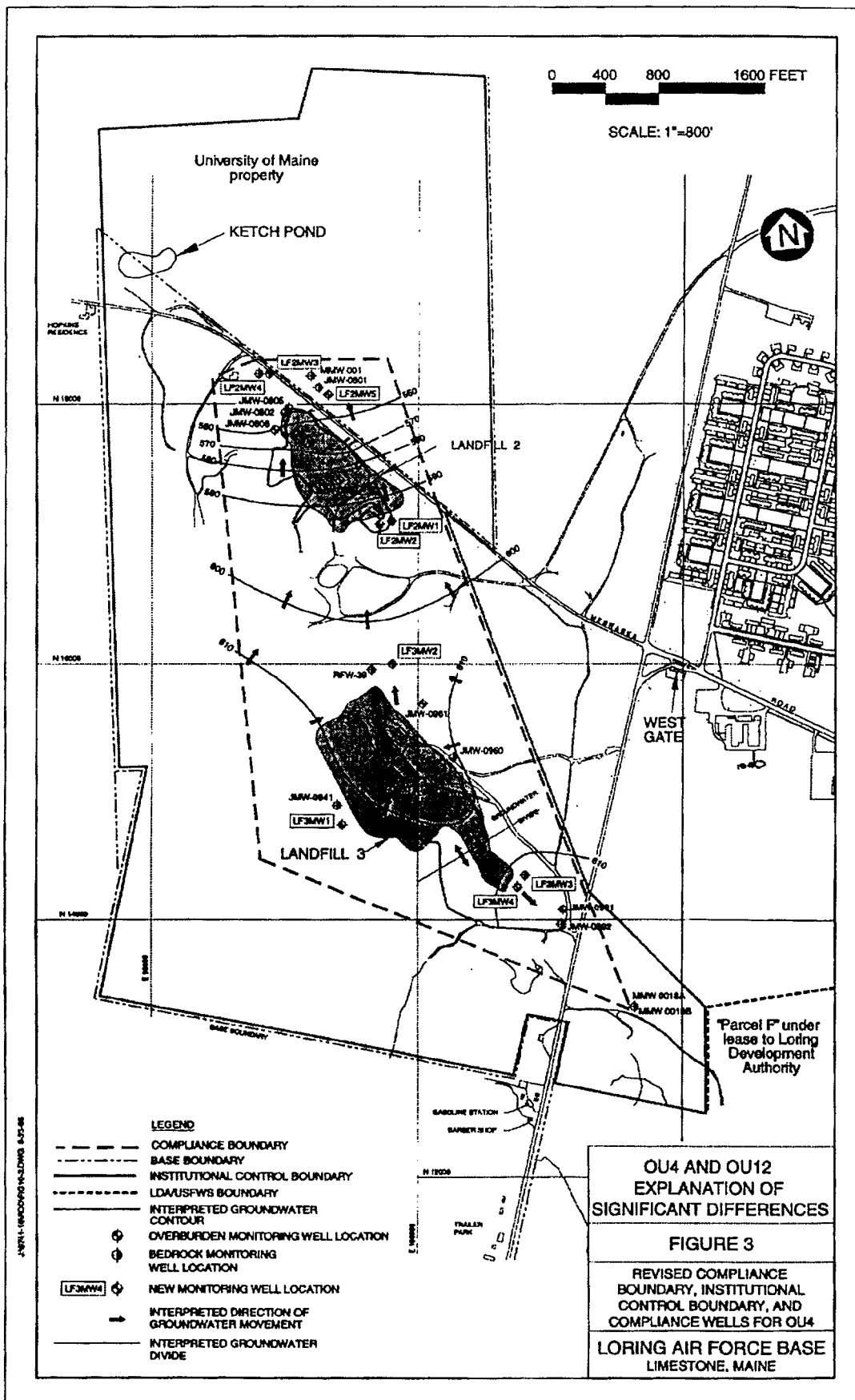
	Action Levels (µg/L)	LF-2 Wells			LF-3 Wells		REMARKS
		LF-2 MW-3 (µg/L)	LF-2 MW-4 (µg/L)	JMW-0801B ^a (µg/L)	JMW-0991 (µg/L)	JMW-0992 (µg/L)	
Jan 97	Iron 8,400	Iron 13,700					High turbidity; detection limit for VC and VOCs too high
Apr 97	VC 0.15			VC 0.32			Iron and turbidity dropped in LF-2 MW-3
Jul 97	VC 0.15 Iron 8,400 Manganese 1,300			VC 0.45	VC 0.58 Iron 20,700 Manganese 2,310	VC 0.17	
Oct 97	VC 0.15 PCE 3			VC 0.43 (0.36 dup) PCE 6	VC 0.45		
Apr 98	VC 0.15			VC 0.4 (0.43 dup)			
Jul 98	VC 0.15			VC 0.43	VC 0.55		
Oct 98	Bis (2-ethylhexyl) Phthalate 10		Bis (2-ethylhexyl) phthalate 17				Exceedance likely a sampling or lab contaminant
Apr 99	VC 0.15			VC 0.2			
Oct 99	Bis (2-ethylhexyl) Phthalate 10			VC 0.3 Bis (2-ethylhexyl) phthalate 73	Not sampled. Replaced by MMW-0018A/B	Not sampled. Replaced by MMW-0018A/	

^aAlthough JMW-0801B was downgradient from LF-2, it was inadvertently located outside the original Compliance Boundary; therefore, it was not a compliance well, although reported as such in the 1997 and 1998 *Annual Report Monitoring and Maintenance of landfills* (BEI, 1998 and 1999). Exceedances in this well were evidence that the Compliance Boundary north of LF-2 was not protective.

VC = vinyl chloride.

VOC = volatile organic compound.

PCE = perchloroethylene.



LF-2 and Southeast of LF-3 to ensure that they remain protective of human health, and new compliance wells were installed at the new compliance boundaries.

Since the changes to these components of the remedy do not fundamentally alter the overall cleanup approach described in the OU 4 ROD, it was determined that an ESD was an appropriate documentation of the changes.

A.2. Description of Significant Differences

The following sections describe the significant changes undertaken as part of the contingency actions at LF-2 and LF-3.

A.2.a. LF-2: As indicated on Figure 3, the original northern Compliance Boundary of LF-2 was extended further north. As a result, the new Compliance Boundary incorporates a triangular parcel of land to the northeast of Nebraska Road. The original institutional control boundary was adjusted as shown in Figure 3 to enclose all of the University of Maine property north of Nebraska Road as well as the new Compliance Boundary. The property newly enclosed by the adjusted and compliance wells were installed at the compliance boundaries to monitor contaminant levels downgradient of the landfills and serve as compliance points between the groundwater users and the landfills. OU 4 ROD institutional control boundaries, compliance boundaries, and compliance well locations are presented in Figure 2. The Minimal Action remedy for contaminated groundwater at LF-2 and LF-3 selected in the OU 4 ROD requires that a contingency action be implemented if groundwater monitoring institutional control boundary will be subject to the same controls that exist on the property enclosed within the original boundary configuration. The boundary adjustments encompass all down gradient LF-2 monitoring wells.

A new compliance well MMW-0001 has been constructed on the adjusted Compliance Boundary north of LF-2 and northwest of JMW-0801B, as shown on Figure 3. LF-2MW3 and LF-2MW4 remain as compliance wells. No groundwater contaminant detections have been reported in the new compliance well MMW-0001 (Montgomery Watson, 2000a).

An institutional control will be implemented for property owned by the University of Maine north of LF-2. The Air Force is currently finalizing a Deed of Easement and Declaration of Covenant with the University of Maine. The groundwater-use restriction will run with the property until remediation is complete and agreed upon between the USAF, the USEPA, and MDEP. This "Deed" is expected to be finalized by December 2000. A copy of the Draft Deed was provided to the EPA and the MDEP.

A.2.b. LF-3: As indicated on Figure 3, the Compliance Boundary southeast of LF-3 was adjusted by extending the east and south segments of the original Compliance Boundary to the south and east, respectively, until they intersected.

Compliance wells MMW-0018A and MMW-0018B were installed at the most southeast point of the adjusted institutional control boundary, as shown on Figure 3,

to replace original compliance wells JMW-0991 and JMW-0992. No groundwater contaminant detections have been reported in the new compliance wells (Montgomery Watson, 2000a). The institutional control boundary south of LF-3 was adjusted by extending the south segment of the original boundary eastward to the U.S. Fish and Wildlife Service (USFWS)/Loring Development Authority (LDA) property boundary, then north along that same boundary to the corner and then northwest to intersect at the same point at which the original east segment intersected with Sawyer Road (Figure 3). The property newly enclosed by the adjusted institutional control boundary is wholly within the USFWS property and is subject to the same controls that exist on the property enclosed within the original boundary configuration. The USFWS will be notified of the change in the compliance and institutional control boundary.

The boundary adjustments and compliance well installations described herein, while constituting a significant difference in the remedy selected in the OU 4 ROD for LF-2 and LF-3, do not fundamentally alter the overall remedy for LF-2 and LF-3 with respect to scope, performance, or cost.

The total installation cost for the new compliance wells is approximately \$85,000, and the additional long-term monitoring cost (present worth) until groundwater ARARs are estimated to be attained (30 years) is approximately \$116,400 (three sampling events a year at three wells for 30 years). This present worth estimate is based on a 7 percent discount rate.

B. OU 12—Quarry Contaminated Groundwater Area

B.1. Summary and Basis of Significant Differences

The Groundwater Management Zone remedy was selected for the Quarry Plume in the OU 12 ROD (HLA, 1999). As part of this remedy, the Air Force established a GMZ that encompasses the Quarry Plume. This GMZ has been designated GMZ 4. GMZ 4 includes the Contaminated Groundwater Area that makes up the Quarry Plume; outside of the Contaminated Groundwater Area are the Compliance Boundary and the Groundwater-Use Restriction Boundary. The Groundwater-Use Restriction Boundary encompasses not only the area within the Compliance Boundary but also a buffer zone between the Groundwater-Use Restriction Boundary and the Compliance Boundary. Compliance well (MMW-0009) was installed in 1999 at the Compliance Boundary to monitor contaminant levels downgradient of the plume to ensure that contaminated groundwater exceeding remediation goals is not migrating toward receptors outside the Groundwater-Use Restriction Boundary. Figure 4 presents these groundwater-use restriction boundaries, compliance boundaries, and the compliance well location for the Quarry Contaminated Groundwater Area, which are established by the selected remedy described in the OU 12 ROD.

Institutional controls are in place and enforced at the Groundwater-Use Restriction Boundary to eliminate the potential for human receptor exposure to the Quarry Plume groundwater. These controls prohibit the use of groundwater as a water supply and any installation of future water supply wells within the Groundwater-Use Restriction Boundary until contaminant concentrations are reduced to less than the established remediation goals and Air Force, EPA, and MEDEP approval is obtained.

The GMZ remedy requires that a contingency action be implemented if groundwater monitoring detects contaminants at concentrations exceeding the remediation goals at any compliance point (i.e., compliance well). Groundwater monitoring conducted in December 1999 (Montgomery Watson, 2000b) detected perchloroethylene (PCE) (CAS Number 127-18-4) in the groundwater at a concentration of 52.7 µg/L, in the GMZ 4 Compliance Boundary well (MMW-0009). The MEG for PCE is 3 µg/L. The MCL for PCE is 5 µg/L. No other chemical concentrations exceeded the remediation goal.

In accordance with the ROD, if groundwater contaminant concentrations at the compliance boundaries exceed federal MCLs or the state MEGs, the Air Force will implement a contingency action. The contingency action implemented by the Air Force consists of expanding the compliance and groundwater-use restriction boundaries and installing a new compliance well (MMW-0421) downgradient of MMW-0009.

The justification for the contingency action implemented by the Air Force is based upon current information regarding bedrock groundwater flow at the Quarry. A recent review by the Air Force of groundwater data indicates that regional bedrock groundwater flows generally to the southwest from the main base towards Greenlaw Brook. This interpretation is consistent with the groundwater flow maps presented in the OU 12 RI Report (ABB, 1997). Local bedrock groundwater also has been interpreted to flow southwest from the Quarry toward the West Branch of Greenlaw Brook (WBGB). Additionally, fracture trace analysis, downhole geophysics, and two-dimensional resistivity surveys indicate that water-bearing fracture zones (see Transects 1, 2, 3, and 4 on Figure 4) in the bedrock may result in localized zones of preferential flow that may deviate from the regional groundwater flow direction. Photolineament analysis, downhole geophysics, and fracture trace analysis indicate the majority of the bedrock fractures are aligned along a northeast to southwest axis. The Air Force believes most groundwater in the bedrock at GMZ 4 will move to the south, along the WBGB. Under certain seasonally affected conditions, a minor portion of the groundwater in the bedrock at GMZ 4 will move to the southwest, past the WBGB along the preferential flow zones caused by the fractures (Montgomery Watson, 2000c).

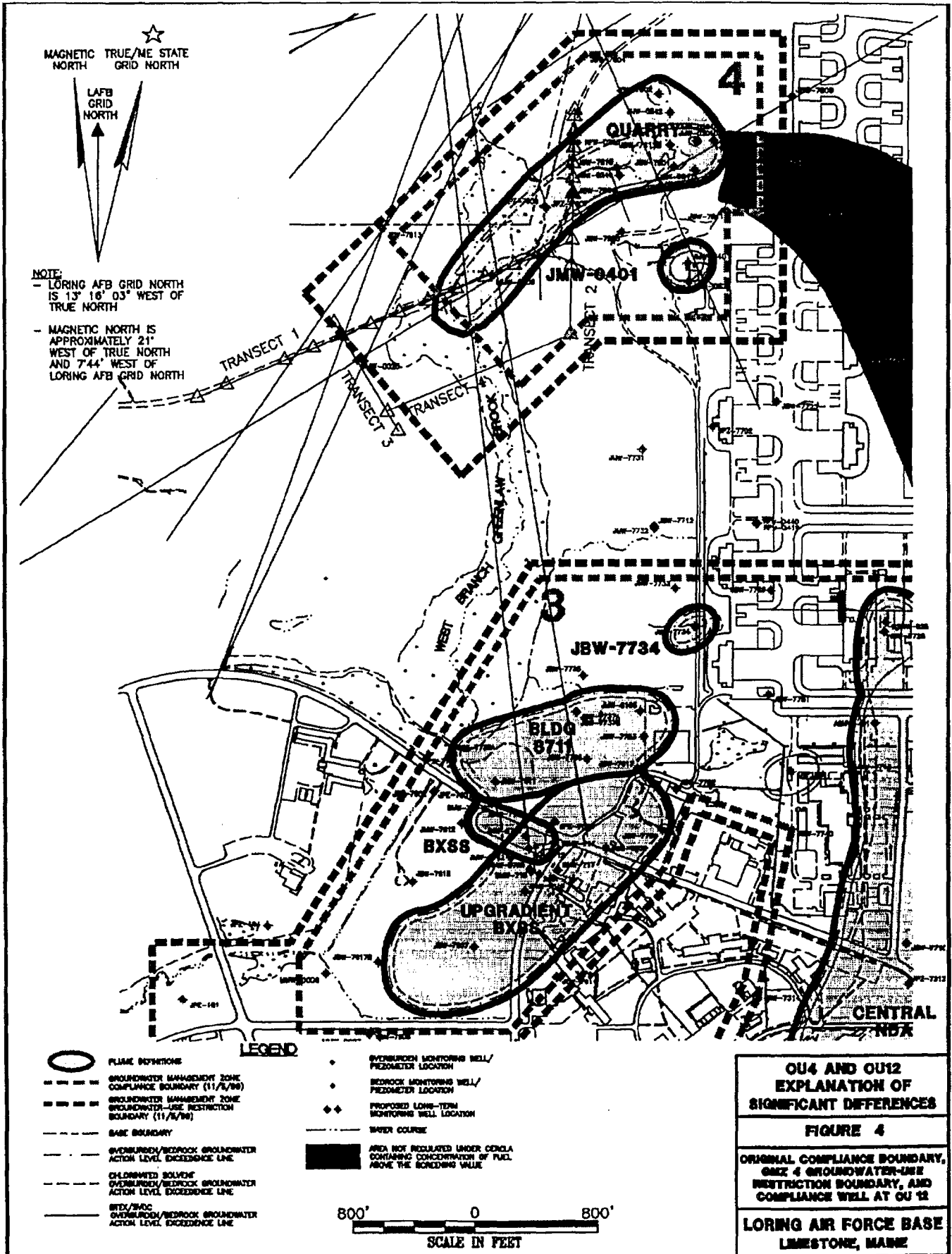
Consistent with this information regarding groundwater flow provided above, MMW-0421 (new compliance well) was installed in August 2000 directly downgradient of MMW-0009 (old compliance well) along a water-bearing fracture zone (Transect 1) (Figure 4). The initial packer tests (sampling and analysis) in August 2000 shown in Table 2 indicate that the Quarry Plume does not extend beyond MMW-0421.

Additionally, as part of the basewide groundwater monitoring program at the Site, the Air Force conducted gas diffusion sampling to identify wetland or surface water body locations where VOCs could potentially be discharging from groundwater to the surface water. The results of the GMZ 4 vapor diffusion sampling conducted along the WBGB reported VOC detections at only two sample locations. These were located near long-term monitoring wells JPZ-7807 and MMW-0009. The Air Force believes this suggests that the VOC plume in the overburden is limited in extent and is not adversely affecting the WBGB (Montgomery Watson, 1999).

MAGNETIC TRUE/ME STATE
NORTH GRID NORTH



NOTE:
- LORING AFB GRID NORTH IS 13° 16' 03" WEST OF TRUE NORTH
- MAGNETIC NORTH IS APPROXIMATELY 21° WEST OF TRUE NORTH AND 7° 44' WEST OF LORING AFB GRID NORTH



- LEGEND**
- PLUME DEFINITIONS
 - GROUNDWATER MANAGEMENT ZONE COMPLIANCE BOUNDARY (11/8/90)
 - GROUNDWATER MANAGEMENT ZONE GROUNDWATER-USE RESTRICTION BOUNDARY (11/8/90)
 - GAGE BOUNDARY
 - OVERBURDEN/BEDROCK GROUNDWATER ACTION LEVEL EXCEEDED LINE
 - CHLORINATED SOLVENT OVERBURDEN/BEDROCK GROUNDWATER ACTION LEVEL EXCEEDED LINE
 - BED/300 OVERBURDEN/BEDROCK GROUNDWATER ACTION LEVEL EXCEEDED LINE
 - OVERBURDEN MONITORING WELL/ PIZOMETER LOCATION
 - BEDROCK MONITORING WELL/ PIZOMETER LOCATION
 - PROPOSED LONG-TERM MONITORING WELL LOCATION
 - WATER COURSE
 - AREA NOT REGULATED UNDER CERCLA CONTAINING CONCENTRATION OF FUEL ABOVE THE SCREENING VALUE



**OU4 AND OU12
EXPLANATION OF
SIGNIFICANT DIFFERENCES**

FIGURE 4

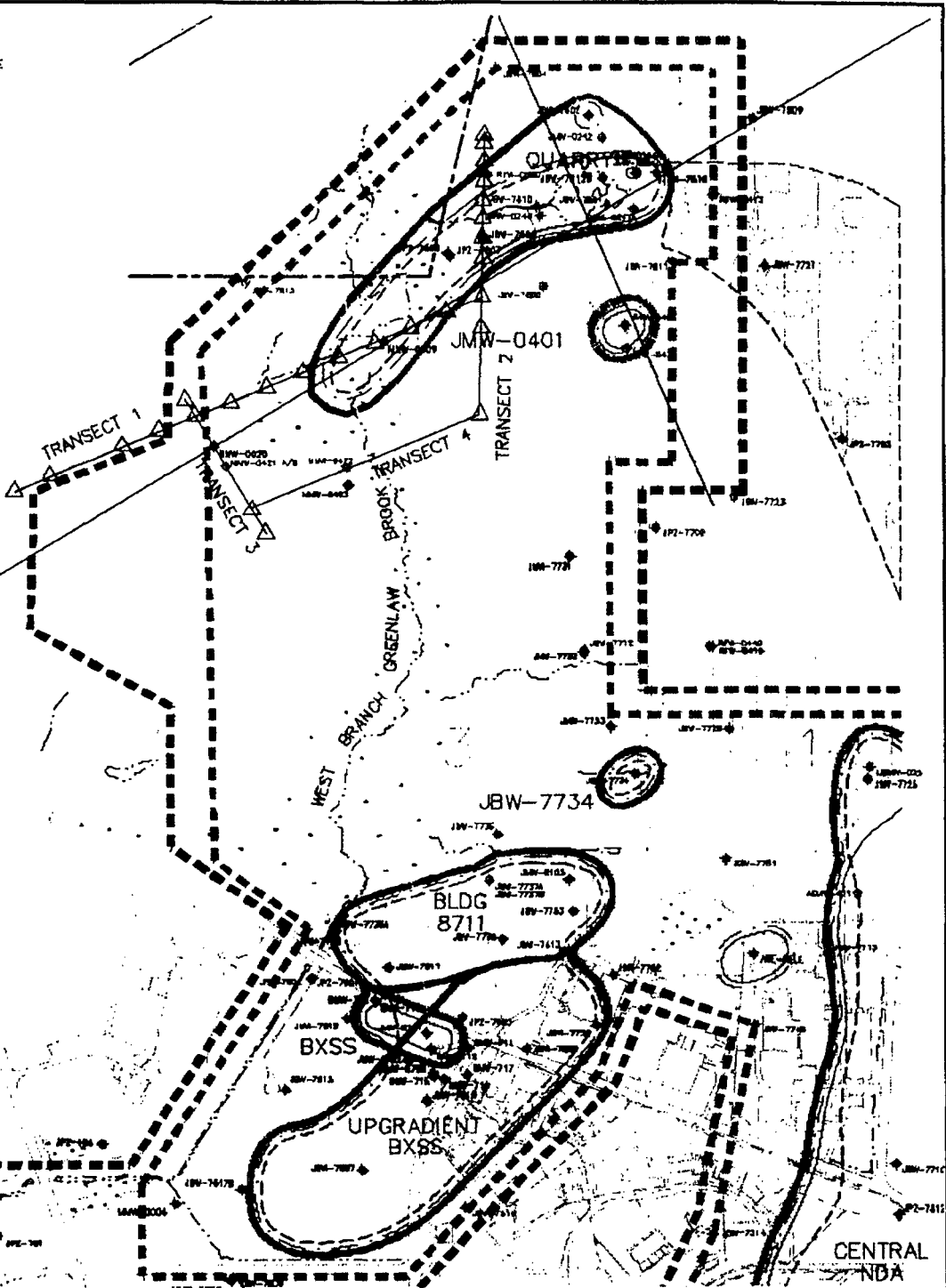
ORIGINAL COMPLIANCE BOUNDARY,
GMZ 4 GROUNDWATER-USE
RESTRICTION BOUNDARY, AND
COMPLIANCE WELL AT OU 12

**LORING AIR FORCE BASE
LIMESTONE, MAINE**

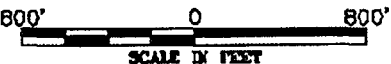
MAGNETIC TRUE/ME STATE
NORTH GRID NORTH



NOTE:
- LORING AFB GRID NORTH IS 13° 16' 03" WEST OF TRUE NORTH
- MAGNETIC NORTH IS APPROXIMATELY 21° WEST OF TRUE NORTH AND 7'44" WEST OF LORING AFB GRID NORTH



- LEGEND**
- PLUME DEFINITIONS
 - GROUNDWATER MANAGEMENT ZONE COMPLIANCE BOUNDARY PERMITS 4/15/00
 - GROUNDWATER MANAGEMENT ZONE GROUNDWATER-USE RESTRICTION BOUNDARY PERMITS 4/15/00
 - BME BOUNDARY
 - GROUNDWATER/BROOK GROUNDWATER ACTION LEVEL EXCESSANCE LINE
 - CHLORINATED SOLVENT GROUNDWATER/BROOK GROUNDWATER ACTION LEVEL EXCESSANCE LINE
 - PFOA/PFOA GROUNDWATER/BROOK GROUNDWATER ACTION LEVEL EXCESSANCE LINE
 - UPGRADIENT MONITORING WELL/ PIZEMETER LOCATION
 - BROOK MONITORING WELL/ PIZEMETER LOCATION
 - WATER COURSE
 - AREA NOT REGULATED UNDER CERCLA BECAUSE CONCENTRATION OF PFOA ABOVE THE SCREENING VALUE



OU4 AND OU12
EXPLANATION OF
SIGNIFICANT DIFFERENCES

FIGURE 5

REVISED COMPLIANCE BOUNDARY,
GMZ 4 GROUNDWATER-USE
RESTRICTION BOUNDARY, AND
COMPLIANCE WELL AT OU 12

LORING AIR FORCE BASE
LIMESTONE, MAINE

Table 2
Summary of Analytical Results of GMZ-4 Packer Test Groundwater Samples
Loring Air Force Base
Limestone, Maine

Parameter/Analyte	MCLs (1)	MEGs (2)	Compliance Boundary RG (3)	MMW-0421 (36.8-48.8 ft bgs)	MMW-0421 (47.85-59.8 ft bgs)	MMW-0421 (85.8-97.8 ft bgs)	MMW-0421 (101-113 ft bgs)
Specific Capacity (gpm/ft)	-	-	-	15	9.90	17.14	0.13
Selected Ion Monitoring (µg/L)							
Vinyl Chloride	2.0	0.15	0.15	0.10 U	0.10 U	0.10 U	0.10 U
Volatile Organic Compounds (µg/L)							
Tetrachloroethylene (PCE)	5	7	3	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	1000	1400	1000	1.0 U	1.0 U	1.0 U	1.0 U
Total Petroleum Hydrocarbons (µg/L)							
Diesel Range Organics (5)	NS	NS	NS	25 U	25 U	25 U	25 U
Gasoline Range Organics	NS	NS	NS	5 U	5 U	5 U	5 U
Total Petroleum Hydrocarbons (6)	NS	NS	361 (4)	25 U	25 U	25 U	25 U

Table 2
Summary of Analytical Results of GMZ-4 Packer Test Groundwater Samples
Loring Air Force Base
Limestone, Maine

Parameter/Analyte	MCLs (1)	MEGs (2)	Compliance Boundary RG (3)	MMW-0422 (35-47 ft bgs)	MMW-0422 (50-62 ft bgs)	MMW-0422 (62-74 ft bgs)	MMW-0422 (91-103 ft bgs)
Specific Capacity (gpm/ft)	-	-	-	0.10	0.19	0.48	0.03
Selected Ion Monitoring (µg/L)							
Vinyl Chloride	2.0	0.15	0.15	0.10 U	0.10 U	0.10 U	0.10 U
Volatile Organic Compounds (µg/L)							
Tetrachloroethylene (PCE)	5	7	3	2.5 J	2.6 J	2.9 J	2.3 J
Toluene	1000	1400	1000	1.0 U	1.0 U	1.0 U	1.0 U
Total Petroleum Hydrocarbons (µg/L)							
Diesel Range Organics (5)	NS	NS	NS	49 Z	25 U	25 U	25 U
Gasoline Range Organics	NS	NS	NS	5 U	5 U	5 U	5 U
Total Petroleum Hydrocarbons (6)	NS	NS	361 (4)	49 Z	25 U	25 U	25 U

Table 2
Summary of Analytical Results of OU 12 GMZ 4 Packer Test Groundwater Samples
Loring Air Force Base
Limestone, Maine

- (1) MCL = Maximum Contaminant Level (*USEPA, Water Regulations and Health Advisories, October 1996*)
- (2) MEG = Maximum Exposure Guideline (*State of Maine, Summary of State and Federal Drinking Water Guidelines, 1992*)
the risk-based screening value for monitoring at the GMZ Compliance Boundary
- (3) Developed by comparison of PQL, Background Concentration, MCL, and RBCs. MCL takes precedence.
State of Maine Department of Human Services October 23, 1992 Letter regarding revised MEGs
- (4) The petroleum hydrocarbon (PHC) level listed is not an action level but is a risk-based screening value for monitoring
at the compliance boundary wells only (OU 12 ROD, Table 11-2).
- (5) Diesel Range Organics (DRO) is calculated as the sum of the peaks between naphthalene and C-28 (n-octacosane), inclusive.
- (6) Total Petroleum Hydrocarbons (TPH) is calculated by adding DRO and GRO together and subtracting overlapping peaks from the result.

Bold result indicates analyte was detected in the sample.

Exceedances of MCLs or MEGs are shaded

Exceedances of Action Levels at a compliance boundary are boxed

U = Compound or analyte was analyzed for but not detected at or above the statement limit.

Z = Associated field equipment blank contained 37 µg/L of DRO in the sample; final results for this sample are pending a data usability assessment.

R = Quality control indicates data is not usable.

J = Estimated value

NS = No standard

NA = Not analyzed

(µg/L) = micrograms per Liter

This component of the ESD was considered necessary to document the contingency action implemented since it involved changes to components of a remedy that do not fundamentally alter the overall cleanup approach described in the OU 12 ROD.

This ESD also addresses a minor change to the OU 12 ROD that is necessary to clarify the construction activity review process at the Site. The remedy selected in the OU 12 ROD (HLA, 1999), Sections 11.2.3 & 11.2.4 states:

“In addition to restricting the use of groundwater, any activities associated with maintenance of existing utilities, subsurface excavation, exploration, construction, or subsurface injection or discharge of water within the Groundwater-Use Restriction Boundaries will be prohibited without the prior approval of the USAF, USEPA, and MEDEP.”

The OU 12 requirement to obtain regulatory approval for any activity associated with maintenance of existing utilities or routine construction within an OU 12 GMZ is more restrictive than necessary and does not reflect the current practice of the Air Force and lessees. The Air Force currently reviews and approves all requests for subsurface excavations and explorations within the OU 12 GMZs. The review process, which is accomplished with the use of a “Dig Permit Request Form”, includes information regarding the location and purpose for the subsurface excavation or exploration. The proposed activity is reviewed to ensure there will be no impact to any CERCLA remedy currently implemented on the property. Activities that have no impact on any of the CERCLA remedial actions, including utility maintenance, are routinely approved without consultation with the regulatory agencies. The Air Force proposes minor changes to the OU 12 ROD in order to clarify the construction activity review process.

B.2. Description of Significant Differences

The difference between the remedy selected in the OU 12 ROD and the remedy undertaken as part of the contingency action at the Quarry Plume consists of a westward and southward expansion of the existing Compliance and Groundwater-Use Restriction Boundaries and the installation and monitoring of a new compliance well (Figure 5). These changes increase the size of the property protected by groundwater-use restrictions and provide a more conservative approach to protecting human health from exposure to the Quarry groundwater contaminants.

MMW-0421 was installed southwest of the toe of the plume as the new compliance well to ensure that contaminants are not migrating outside the Groundwater-Use Restriction Boundary. No groundwater contaminant detections have been reported in the new compliance well. As indicated on Figure 5, the Compliance Boundary and Groundwater-Use Restriction Boundary will be extended westward to MMW-0421 and southward towards the GMZ 3 boundary to reflect the exceedance of remediation goals in MMW-0009. The additional property subject to the expanded groundwater-use restrictions consists primarily of wetlands and will not be developed. Therefore, changes to the Compliance Boundary and Groundwater-Use Restriction Boundary will not have an impact on future development at the former LAFB.

The boundary adjustments and compliance well installations described herein, while constituting a significant difference in the remedy selected in the OU 12 ROD for the Quarry contaminated groundwater, do not fundamentally alter the overall remedy for the Quarry bedrock groundwater with respect to scope, performance, or cost.

The total installation cost for the new compliance well is approximately \$40,000 and the additional long-term monitoring cost (present worth) until groundwater ARARs are estimated to be attained (168 years) is approximately \$20,400 (three sampling events a year for first three years and one sampling event a year for years 4 through 168). This present worth estimate is based on a 7 percent discount rate.

Minor changes to the OU 12 ROD are also included in this ESD to clarify the construction activity review process. The following text will be deleted from the OU 12 ROD (HLA, 1999), Sections 11.2.3 & 11.2.4.

“In addition to restricting the use of groundwater, any activities associated with maintenance of existing utilities, subsurface excavation, exploration, construction, or subsurface injection or discharge of water within the Groundwater-Use Restriction Boundaries will be prohibited without the prior approval of the USAF, USEPA, and MEDEP.”

The deleted text from each section will be replaced with the following text.

“In addition to restricting the use of groundwater, any activities that could jeopardize the protectiveness of the remedial action will be prohibited without the prior approval of the USAF, USEPA, and MEDEP. The USAF will screen and approve proposed activities that are determined to have no impact to the protectiveness of the remedial action. Examples of restricted activities that could impact the migration of contaminated groundwater beyond the compliance boundaries include (1) subsurface application or injection of water or (2) surface application of water.”

The minor textual changes do not fundamentally alter the overall OU 12 remedy with respect to scope, performance, or cost.

IV. SUPPORT AGENCY COMMENTS

EPA and MEDEP have participated with the Air Force as lead agency in developing the significant differences (changes) to both the 1996 OU 4 ROD and the 1999 OU 12 ROD and support the changes described in this ESD. The changes enable the Air Force to address contamination at the Site in a manner that addresses the concerns of the community and protects human health and the environment.

V. AFFIRMATION OF THE STATUTORY DETERMINATIONS

Considering the above-described adjustments to the selected remedies set forth in the 1996 ROD for OU 2 and 1999 ROD for OU 12, the Air Force believes the remedies remain protective of human health and the environment, comply with federal and state requirements identified in the RODs as applicable or relevant and appropriate to the remedial actions, and are cost-effective.

VI. PUBLIC PARTICIPATION

This ESD, as well as other material relating to the investigations and remedy selection, is available for public review at the location listed in Section I above.

The Air Force will publish a public notice of availability and a brief description of this ESD in the *Aroostook Republican* and the *Bangor Daily News*.

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