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SECTION 3.6

OPERABLE UNIT 12
BASEWIDE GROUNDWATER

3.6.1 SCOPE AND NATURE OF FIVE-YEAR REVIEW

The USAF, in coordination with the USEPA, conducted this review of OU-12 pursuant to CERCLA § 121(c), NCP § 300.400(f)(4)(ii), and OSWER Directives 9355.7-02 (May 23. 1991) and 9355.7-02A (June 26, 1994). It is a policy review. The OU-12 ROD was signed in September 1999. The remedial action at OU-12 includes the establishment of Groundwater Management Zones (GMZs) and long-term monitoring (LTM). The OU-12 Long-Term Monitoring Plan was completed in November 1999. The purpose of the review of OU-12 is to assess the effectiveness of the completed activities at achieving the remedial action objective. This document has been prepared within the scope of a level Ia review.

3.6.2 SUMMARY OF SITE CONDITIONS

3.6.2.1 Site Location and Description

OU-12 was developed to assess the basewide groundwater regime at LAFB. Groundwater associated with OU-2 (i.e., LF-2 and LF-3) and OU-2A (i.e., LF-1, the Coal Ash Pile, Drum Disposal Area, and Paint Can Disposal Area) was not included as part of OU-12 in accordance with the FFA. Groundwater associated with these areas is being addressed in accordance with the OU-4 ROD, signed in September 1996 (ABB-ES, 1996c).

LAFB lies in the lower Aroostook River Basin. Topography of the basin is typified by a succession of gently rolling to steeply sloping ridges separated by narrow valleys. Narrow swamps and bogs extend between the ridges. Most of LAFB is located on a relatively flat plateau, with average elevations between 700 and 750 feet National Geodetic Vertical Datum (NGVD). Approximately 200 feet of relief occurs between the area of the runway, in the central portion of LAFB, and the southwestern corner of LAFB (i.e., 750 to 550 feet NGVD). Significant changes in relief occur primarily in the western portions of LAFB, where westerly flowing drainage to the Little Madawaska River (LMR) has created incised valleys and swales. Although most of the runoff flows to the west of LAFB, some drainage occurs to the east, which flows to Butterfield Brook and ultimately into Limestone Stream.

Prior to construction of LAFB, the land was mostly undeveloped; portions were used for farming and large tracts were blueberry bogs. Substantial areas were disturbed during construction of LAFB. Land use in communities surrounding the Site is primarily rural/agricultural. A more detailed description can be found in Section 2.0 of the Final OU-12 RI Report (ABB-ES, 1997c).

Because of the large area and number of source areas involved (i.e., groundwater associated with the majority of source areas within OUs 1 through 11), OU-12 was subdivided into ten

primary study areas or flow fields (i.e., Flow Fields 1 through 10) for the RI (ABB-ES, 1997c). These flow fields, shown on figure 3.6-1, provided the RI with initial hydrologic regions in which to evaluate collective downgradient impacts and the relationships between source areas. The flow fields overlapped to ensure adequate understanding of their interaction.

3.6.2.2 Site History

The following subsections summarize the history of investigations and removal actions conducted at each source area within each of the ten flow fields.

Flow Field 1

Flow Field 1 includes one contaminant source area identified in OU-11, the RMSA site. The site was originally studied in the OU-11 RI (ABB-ES, 1996a).

The RMSA site consists of Building 7600 and a parking area located in the southern portion of the base. The building has several garage bays that were used for maintenance operations for fuel bowser trucks. Building floor drains historically discharged to an oil interceptor on the eastern side of the building. The oil interceptor would conceptually allow only water to exit the structure but was dependent on the periodic pumping of oil from the structure to function correctly. Interceptor effluent was piped to a dry well consisting of rock fragments and cobbles constructed directly on top of the bedrock surface. The dry well was replaced with an OWS in the late 1980s. Oil from the separator was piped to an UST located north of the separator. Water from the separator was routed to the drainageway east and north of the RMSA building until 1992, when it was piped to the sanitary sewer.

A removal action, consisting of the removal of contaminated soil and removal of the oil interceptor, former dry well, OWS, UST, and the discharge pipe, was conducted in 1995. Soil was also removed from the drainageway north of the RMSA building. A No Further CERCLA Action decision for source area soil at the site was documented in the No Further CERCLA Action for Sites Within OUs 3, 5, 10, and 11 ROD, signed in August 1998 (ABB-ES, 1998d). A non-CERCLA corrective action was conducted in 1998, which included excavation and disposal of fuel-contaminated soil from an area northeast of the RMSA building.

Chlorinated solvent contamination, including PCE, TCE, and vinyl chloride (VC), was identified in bedrock groundwater samples collected from groundwater monitoring wells in the area of the RMSA. The distribution of contaminants indicates the RMSA is the source area of this contamination. The RMSA chlorinated volatile organic compounds (CVOC) bedrock groundwater plume (i.e., RMSA Plume) discharges to the East Branch of Greenlaw Brook (EBGB) drainage system (i.e., FLDD South Plume).

Flow Field 2

Flow Field 2 includes four OU-11 sites; the VMB site, the Fuels Tank Farm (FTF) site, the BL site, and the Coal Storage Pile (CSP)/Fly Ash Disposal (FAD) site. Two OU-13 drainage ditches (G-11 and G-12) were also evaluated as potential source areas within Flow Field 2 (ABB-ES, 1997b).

VMB

The VMB, originally studied in the OU-11 RI (ABB-ES, 1996a), is located southeast of the intersection of Pennsylvania and South Carolina Roads. The site consists of Buildings 7500 and 7501. Building 7500 was used for maintenance of USAF vehicles until base closure in 1994. Building 7501, located north of Building 7500, was a vehicle parking building. Waste generated at the facility included waste oil, antifreeze, solvents, Speedi-Dry, and battery electrolyte. These waste fluids were collected indoors and combined and stored at the site from 1954 until 1989. After 1989, waste fluids were sent to the DRMO. Floor drains in the buildings lead through a sand and gas trap to an underground storm drain pipe that discharged to a ponded area south of Building 7500 until 1972. At that time, the existing storm drainpipe was sealed and abandoned, and a new line was installed connecting the sand and gas trap to the sanitary sewer system. An OWS and waste oil UST replaced the sand and gas trap in 1991. Surface drainage from paved areas of the site is into a drainage ditch that runs northeast to southwest across the site.

In 1995, contaminated soil was removed from the VMB site and a bioventing system was installed to address fuel-related contamination in shallow soil west of the buildings. Removal actions conducted in 1996 included the removal of the grease trap associated with the OWS and removal of soil contaminated with chlorinated solvents, PCBs, and TPH. In 1997, the OWS and associated contaminated soil were removed and additional soil was removed from the "hot-spot" area located southeast of the buildings. Soil excavated in 1996 and 1997 containing chlorinated solvent contamination was treated ex-situ with a SVE system. Due to the limited effectiveness of the bioventing system, in 1998, the system was removed and the contaminated soil was excavated. A No Further CERCLA Action decision for source area soil at the site was documented in the No Further CERCLA Action for Sites Within OUs 3, 5, 10, and 11 ROD, signed in August 1998 (ABB-ES, 1998d).

Contaminants identified in bedrock groundwater in the area of the VMB (i.e., VMB Plume) include the CVOCs PCE, TCE, dichloroethene (DCE), and VC. The highest concentration of PCE was detected in the shallowest zone sampled directly downgradient from the "hot-spot" area. In addition, a number of fuel-related VOCs and SVOCs were observed in the area downgradient of the former UST at the VMB. Plumes from both the VMB and BL are interpreted to intermingle and are both likely sources of the contaminants detected in the discharge area (i.e., FLDD South Plume).

FTF

The FTF, originally studied in the OU-11 RI (ABB-ES, 1996a), is located south of the FLA and west of the former East Gate Waste Storage Tank (EGWST) site. The FTF was constructed in the early 1950s for the storage of bulk fuels. Originally, three ASTs were located at the site; however, increased fuel needs prompted the construction of two additional tanks in the late 1950s. Besides storage and transfer of jet propellant fuel, motor gasoline, and No. 2 fuel oil, tank sandblasting and repainting periodically occurred at the site. Numerous unquantified fuel spills have occurred at the FTF over the past 40 years. Additionally, leaks in underground fuel lines have been a source of soil and groundwater contamination.

In 1980, a product recovery well was installed in an attempt to collect free product (i.e., jet fuel) from the perched water table. Approximately 7,000 gallons of free product were removed during the first year following installation of the recovery well. Free product collection continued through 1984; however, the quantities of fuel recovered are unknown. During 1995, lead-contaminated soil was removed from areas around the ASTs. In 1996, a bioventing/bioslurping system was installed and is currently being operated. Removal actions in 1997 included removal of drainage ditch soil and installation of additional bioventing wells. Removal of AST fueling and defueling lines was also conducted. A No Further CERCLA Action decision for source area soil at the site was documented in the OUs 9 and 11 ROD, signed in September 1996 (ABB-ES, 1996b).

Both CVOCs and fuel-related compounds have been identified in groundwater beneath the FTF; however, the fuel-related compounds are addressed in accordance with state law, pursuant to a state-authorized CAP (ABB-ES, 1997d) and were not considered during development of the OU-12 Feasibility Study (FS). Concentrations of PCE and TCE have been detected sporadically in two wells just at or above action levels. These two wells constitute the extent of the FTF South Plume evaluated in the FS.

BL

The BL, originally studied in the OU-11 RI (ABB-ES, 1996a), is located northeast of the intersection of South Carolina and Pennsylvania Roads. The site consists of Building 7330 and the surrounding area. Prior to 1970, the building was used as a bakery. The laundry became operational in 1971. As part of laundry operations, dry cleaning was performed in the building. PCE was originally delivered to the laundry in drums, then later by a tank truck that pumped into an AST north of the building. Used PCE was originally containerized in drums and was later sent to a second AST. Spills or releases may have occurred on or surrounding the pavement near the building. Floor drains in the area of the dry cleaning operations emptied into the storm sewer, which discharged into an open drainage ditch west of the VMB.

An in-situ SVE system was installed at the BL in 1996 and continues to operate.

Groundwater sampling conducted as part of the OU-12 RI identified PCE in bedrock groundwater in the area of the BL (i.e., BL Plume). Contaminant distributions show a chlorinated solvent plume extending from the BL to the discharge area at the confluence of the FLDD wetland and the EBGB. Plumes from both the VMB and BL are interpreted to intermingle and are both likely sources of the contaminants detected in the discharge area (i.e., FLDD South Plume).

CSP/FAD

The CSP/FAD, originally studied in the OU-11 RI (ABB-ES, 1996a), is one site with two areas, one that was utilized for the storage of coal and another for the disposal of the residual fly ash from the base heating plant's coal-fired boiler. The sites are located south of the FLA and west of the FTF. Coal was stored, uncovered, on the ground from 1953 until 1985, at which time two concrete pads with an integrated storm water runoff collection system were constructed. From 1985 to 1996, coal was stored on the pads. Stormwater runoff from the pile was collected by a drainage system that emptied into a settling pond and into the sanitary sewer system. Operation of the base heating plant ceased in 1995. The FAD area is southwest of the coal piles and has had minimal erosion controls over its period of use.

A cover was constructed over the FAD in 1994 and additional closure activities were conducted to comply with state regulations. This site was included in the OUs 9 and 11 ROD, signed in September 1996 (ABB-ES, 1996b).

Overburden and bedrock wells sampled during the RI in the area of the CSP/FAD were free of contaminants above action levels.

Drainage Ditches G-11 and G-12

The OU-13 (i.e., basewide surface water and sediment study) drainage ditches G-11 and G-12, originally studied in the OU-13 RI (ABB-ES, 1997b), were considered potential source areas within Flow Field 2 during the OU-12 RI. Ditch G-11 is located north and west of the BL. Ditch G-12 is located southwest of the VMB, west of Pennsylvania Road.

A removal action was conducted in 1996 that included excavation of contaminated soil and sediment from these ditches. These ditches were included in the OU-13 ROD, signed in June 1997 (ABB-ES, 1997b).

Groundwater sampling completed during the RI did not identify these ditches as likely groundwater contaminant source areas in Flow Field 2.

Flow Field 3

Flow Field 3 includes four OU-9 sites, five OU-10 sites, and three OU -3 sites. The OU-9 sites include the Snow Barn (SB) site, the Power Plant Drainage Pipe (PPDP) site, the Former Vehicle Motor Pool (FVMP) site, and the AHS site. The OU-10 sites include the FSSB site, the PH 8210 site, the PH 8270 site, the ES site, and the JEBS site. The OU-3 sites include the Solvent Paint Dock Area (SPDA) site, the CSSA site, and the Demineralization Plant (DP) site.

SB

The SB, originally studied in the OU-9 RI (ABB-ES, 1995a), is located at the southeastern edge of the runway near the DC hangar. The SB was formerly used to house and maintain snow removal equipment that was used on the base. Prior to 1992, a paved area south of the SB building was used as an area to wash snow removal equipment. The wash area formerly drained to a ditch located immediately to the southwest where stained soil has been observed. The primary sources of contaminants are washwater and surface water runoff from the maintenance and parking areas.

A removal action, consisting of the removal of soil from three separate areas, was conducted in 1995. A No Further CERCLA Action decision for source area soil at the site was documented in the OUs 9 and 11 ROD, signed in September 1996 (ABB-ES, 1996b).

Groundwater sampling completed during the RI did not identify the SB as a likely groundwater contaminant source area in Flow Field 3.

PPDP

The PPDP, originally studied in the OU-9 RI (ABB-ES, 1995a), is located north and east of the AHS and south of Hawaii Road. It is a buried 12-inch inside diameter concrete storm sewer pipe that was formerly connected to an underdrain system that drained the area for five diesel fuel USTs located east of the Power Plant. The pipe also connected to the floor drain system within the Power Plant. The pipe discharges into a surface impoundment known as the Pipeline Drainage Area, which drains to an unlined drainage way and ultimately flows to the FLDD. Several releases occurred to the PPDP as a result of an explosion of circuit breakers in the Power Plant and overflowing of the USTs during filling. In 1993, an investigation was undertaken to evaluate potential leaks in the PPDP. The pipe did not appear to be leaking and the bedding soils did not appear to have been affected by releases from the pipe. However, investigations identified contaminated soils in the vicinity of the pipe and in the discharge area west of Pennsylvania Road.

A removal action, conducted in 1995, included excavation of petroleum- and PCB-contaminated soil and installation of a bioventing system. Additionally, all sections of the drainage pipe were cleaned using a hydrovac system. A No Further CERCLA Action decision for source area soil at the site was documented in the OUs 9 and 11 ROD, signed in September 1996 (ABB-ES, 1996b). Soil confirmation samples collected in 1998 indicate that site RGs have been met and the bioventing system has been shut down.

Groundwater in the vicinity of the PPDP is considered part of the FLDD North Plume (i.e., discharge plume).

FVMP

The FVMP, originally studied in the OU-9 RI (ABB-ES, 1995a), was located east of Pennsylvania Road, just south of the intersection with Hawaii Road. It was used for maintenance of snow removal and construction equipment. Maintenance activities generated wastes including waste oils, hydraulic fluid, antifreeze, and spent Speedi-dry. Waste fluids were stored in drums and may have been disposed on the ground northeast of the building. Use of the facility was discontinued in 1963 and the primary structure was demolished in 1972. The remaining structure was the location of the Self-Help Store, which is currently unoccupied.

A bioventing system was installed to the north and west of the former Self-Help Store in 1995. A No Further CERCLA Action decision for source area soil at the site was documented in the OUs 9 and 11 ROD, signed in September 1996 (ABB-ES, 1996b). Soil confirmation samples collected in 1998 indicate site RGs have been met and the bioventing system has been shut down.

Groundwater in the vicinity of the FVMP is considered part of the FLDD North Plume (i.e., discharge plume).

AHS

The AHS, originally studied in the OU-9 RI (ABB-ES, 1995a), is located at the intersection of Weinman and Pennsylvania roads. The AHS was a garage used by base personnel for personal vehicle maintenance activities. Past activities at the AHS included routine car maintenance, oil changes, parts cleaning, car painting, and car cleaning. Floor drains within the building were connected to the sanitary sewer system. Two USTs were located in the area of the AHS. The first collected waste oils/products and the second stored heating oil.

Both tanks, and contaminated soil associated with the heating oil UST, were removed in 1992 and the heating oil tank was replaced. A bioventing system was installed west of the AHS in 1996 and continues to operate to address fuel-related contamination in subsurface soil.

Groundwater in the vicinity of the AHS is considered part of the FLDD North Plume (i.e., discharge plume).

FSSB

The FSSB, originally studied in the OU10 RI (ABB-ES, 1994c), was located near the northeastern corner of the Arch Hangar. The building used to store paint thinner and solvents for aircraft maintenance, was demolished in 1986. No documented spills or releases have occurred at the site; however, small quantities of thinners or solvent may have been released via spillage or cleaning activities at the building.

A removal action conducted in 1995 consisted of excavation of contaminated soil from an area northeast of the Arch Hangar. An additional removal action conducted in 1996 focused on removing TPH-contaminated soil remaining following the 1995 removal action. A NFA decision for source area soil at the site was documented in the No Further CERCLA Action for Sites Within OUs 3, 5, 10, and 11 ROD, signed in August 1998 (ABB-ES, 1998d).

Contaminants identified in groundwater in the area of the FSSB (i.e., FSSB Plume) during OU-12 RI activities include trichloroethane (TCA) and dichloroethane (DCA). The concentrations of these contaminants were slightly in excess of action levels in shallow bedrock groundwater in a single well. The soil source area removal actions at the FSSB appear to have caused a considerable decline in the concentrations of these compounds in groundwater. In addition, PCE, TCE, and VC have historically been detected in single wells at concentrations above action levels. The wells are located in close proximity to the source area.

PH 8210

PH 8210, originally studied in the OU10 RI (ABB-ES, 1994c), was located adjacent to the runway, approximately 100 feet west of the Kilo Ramp and 500 feet south of the Crash Fire Station. The facility was used in the early to mid-1950s for fueling and defueling aircraft. The pumphouse facility consisted of a reinforced concrete building, six USTs, a defueling tank, a collection tank, and associated piping (i.e., transfer, refueling, defueling, and drain lines). In 1963, the facility was decommissioned, which included filling the USTs and associated piping with a sodium chromate solution to prevent corrosion and collapse of the system. A transfer line to the NDA remained active until 1994.

A 1992 removal action included demolition of the building, removal of PCB-contaminated materials, removal of the eight USTs, associated inactive piping and valve pits, and treatment and disposal of generated fluids. Removal of jet fuel-contaminated soils around the former pumphouse was completed in 1997. A NFA decision for source area soil at the site was documented in the No Further CERCLA Action for Sites Within OUs 3, 5, 10, and 11 ROD, signed in August 1998 (ABB-ES, 1998d).

Both VOCs and SVOCs are present at concentrations above action levels in the fuel hydrocarbon groundwater plume identified in the area of PH 8210. This plume (i.e., PH 8210 Plume) is in both overburden and bedrock groundwater, with the highest concentrations of VOCs in the source area of the bedrock plume.

PH 8270

PH 8270, originally studied in the OU-10 RI (ABB-ES, 1994c), was located approximately 1,500 feet south of the Arch Hangar. The facility was used in the early to mid-1950s for fueling and defueling aircraft. The pumphouse facility consisted of a reinforced concrete building, six USTs, a defueling tank, a collection tank, and associated piping (i.e., transfer, refueling, defueling, and drain lines). In 1963, the facility was decommissioned, which included filling the USTs and associated piping with a sodium chromate solution to prevent corrosion and collapse of the system. A transfer line to the NDA remained active until 1994.

A 1992 removal action included demolition of the building, removal of the eight USTs, associated inactive piping and valve pits, and treatment and disposal of generated fluids. Removal of jet fuel-contaminated soils around the former pumphouse was completed in 1997. A NFA decision for source area soil at the site was documented in the No Further CERCLA Action for Sites Within OUs 3, 5, 10, and 11 ROD, signed in August 1998 (ABB-ES, 1998d).

Fuel-related contaminants were identified during groundwater sampling conducted during the OU-12 RI. Because the fuel-related contamination is not regulated under CERCLA, actions to address the groundwater contamination at this site are being performed in accordance with state law, pursuant to a state-authorized CAP (ABB-ES, 1998a).

ES

The ES, originally studied in the OU-10 RI (ABB-ES, 1994c), was located east of Arizona Road and consisted of a small two-story building, a drainage ditch north of the building, an AST, and pipes connecting the ES to the JEBS, the DC and Arch Hangars, and to the sewer system. The ES was originally used as a treatment facility for wastewater from the JEBS, the DC Hangar, and the SB. In the early 1970s, the building was converted for use as the ES. Operations involved the storage and preparation of pesticides and herbicides for routine application at the base. No spills were recorded at the site. During the 1991 SI, the basement of the ES contained approximately 3 feet of an oil/water mixture with a layer of oily sludge approximately 4 inches thick floating on the surface. It is likely that this mixture was residual wastewater from the hangars and the JEBS. In 1992, pesticide mixing operations were moved to another facility.

The ES building walls and foundation were demolished in 1995 and the waste drainline from the JEBS was removed. Contaminated soil was also removed from the area of the building. Further soil and drainline excavation was completed in 1996 and a bioventing system was installed to address the remaining TPH contamination beneath and adjacent to the building foundation. In 1998, the bioventing system was converted to an SVE system and connected to the JEBS SVE system.

The CVOC groundwater plumes originate from several sources in the ES/JEBS area and commingle as they approach the FLDD. The drainlines at the ES provided a source of TCE and other contaminants in soil above the bedrock groundwater. The contaminant plume

associated with the ES includes contamination from a source area near the southern end of the JEBS. This plume is known as the ES/JEBS South Plume. In general, the highest concentrations of TCE and its degradation product DCE are close to the former source areas, in shallow bedrock zones. Additional degradation has appeared to have occurred farther downgradient in this plume. The discharge area of this plume and other plumes in this general area is called the FLDD North Plume.

JEBS

The JEBS, originally studied in the JEBS SI (HLA, 1998a), is located west of the FLA in the central industrial area of the base. Activities associated with site included draining, maintenance, repair, teardown, and modification of jet engines. Facilities at the JEBS included a small washrack room in the northwest corner of the building. Wash water was collected in a floor drain, piped to an oil and grease trap/oil water separator just outside the building, then to the ES for treatment. The period of operations at the building was from 1952 to 1991. The types of wastes stored include paint waste, chemical waste, and mixed petroleum waste.

An in-situ SVE system was installed at the JEBS in 1998 and continues to operate. The system was installed to remediate areas of soil contaminated with CVOCs north, south, and southwest of the JEBS building.

The CVOC groundwater plumes originate from several sources in the ES/JEBS area and commingle as they approach the FLDD. Two sources of CVOC contamination are present at the northern and southern ends of the JEBS. These plumes are known as the JEBS North and ES/JEBS South Plumes, respectively. In general the highest concentrations of CVOCs are close to the former source areas, in shallow bedrock zones. The discharge area of this plume and other plumes in this general area is called the FLDD North Plume.

SPDA

The SPDA, originally studied in the OU3 RI (Law, 1996a), is located adjacent to the eastside of Building 7220. The SPDA is a large warehouse where varnish and paint was periodically removed from the floor of the building using solvents. An area of soil contamination was detected outside the loading dock doors where the varnish and paint waste was disposed in dumpsters.

In 1996, contaminated soil was excavated from the drainage ditch along the railroad tracks directly east of Building 7220. A NFA decision for source area soil at the site was documented in the OU-3 ROD, signed in September 1996 (Law, 1996b).

Groundwater in the vicinity of the SPDA is considered part of the FLDD North Plume (i.e., discharge plume).

CSSA

The CSSA, originally studied in the OU3 RI (Law, 1996a), is located in the northeast quadrant of the intersection of Weinman and Kansas Roads, west of the railroad tracks. The shed, now demolished, was used for the storage of waste oil, waste chemical drums, and electrical transformers. Reportedly, there also may have been pesticide mixing performed in the area. The site has recently been used as a parking lot and storage area for grounds-keeping equipment.

A CERCLA remedial action was performed at the CSSA during 1997 in accordance with the OU-3 ROD (Law, 1996b). This action included removal and disposal of surface and subsurface soil contaminated with fuel oil, chlorinated PAHs, pesticides, inorganics, and PCBs and removal and disposal of steam lines with asbestos-containing insulation.

OU-12 RI activities identified both a xylene plume and a chlorinated solvent plume at the CSSA site (i.e., CSSA Plume). The source of the fuel plume, which is very limited in extent, is likely a former UST. DCE and VC were detected in overburden groundwater above action levels in samples collected in 1996. Concentrations of CVOCs immediately downgradient did not suggest a large source of contamination in this area. The contaminant concentrations and distributions indicate the contaminants have been degrading primarily within the source area.

DP

The DP, originally studied in the OU3 RI (Law, 1996a), is located west of the south end of the FLA in an industrial area. The plant demineralized water for the base potable water supply from the early 1980s to 1990s. Backwash from the demineralization process was reportedly discharged into a low swale area, forming a pond southwest of the building. The backwash wastewater contained heavy metals. A former fuel oil UST was located adjacent to the building.

Miscellaneous trash and debris were removed from the site in 1992 and 1996. A NFA decision for source area soil at the site was documented in the OU-3 ROD, signed in September 1996 (Law, 1996b).

Fuel-related contaminants were identified during groundwater sampling conducted during the OU-12 RI. Because the fuel-related contamination is not regulated under CERCLA, actions to address the groundwater contamination at this site are being performed in accordance with state law, pursuant to a state-authorized CAP (ABB-ES, 1998a).

Flow Field 4

Flow Field 4 consists of the former EGWST site, which was investigated as part of OU-6 and the Old Post Exchange (PX) Gas Station site investigated as part of OU-3.

EGWST

The former EGWST site, originally studied in the OU6 RI (ABB-ES, 1993a), is located in the southeast portion of the base along Maine Road, approximately 300 feet north of the east gate entrance. Until 1968, the site was a motor gasoline pumping station for base personnel. Two USTs were used for gasoline storage. After closure of the station, the USTs were used as holding tanks for hazardous liquid wastes such as fuels, crankcase oils, gear oils, brake fluid, hydraulic fluids, solvents, and strippers. Use of the tanks was discontinued in 1980.

The two USTs and associated contaminated soil were removed during two separate removal actions in 1989 and 1990. A non-CERCLA remedial action was conducted in 1994. Fuel-contaminated soil was excavated and disposed of in the on-base LF-2 as subgrade material prior to the construction of the landfill cover system. The non-CERCLA action was documented in the OU-6 ROD, signed in March 1994 (ABB-ES, 1994a).

Groundwater sampling conducted during the OU-12 RI did not identify concentrations of fuel-related VOCs previously detected in groundwater. Their absence suggests that natural degradation of the contaminant may be occurring. No further action was recommended for groundwater in the area of the former EGWST site due to the lack of contaminants.

Old PX Gas Station

The Old PX Gas Station, originally studied in the OU3 RI (Law, 1996a), is located near the southeast corner of the base at the intersection of Maine and South Carolina roads. The gas station was demolished in the late 1950s to early 1960s and the site is currently covered by asphalt pavement. The type of fuel dispensed at the site is unknown; however, based on the years of operation, it is assumed to have been leaded gasoline. It is unknown whether there was more than one UST at the site. Field investigation activities conducted at the site in 1993 confirmed that any USTs used at the site had been removed. A NFA decision for source area soil at the site was documented in the OU-3 ROD, signed in September 1996 (Law, 1996b).

A non-CERCLA corrective action was conducted in 1997, which included excavation and disposal of fuel-contaminated soil.

No further action was recommended for groundwater in the area of the Old PX Gas Station due to the lack of contaminants.

Flow Field 5

Flow Field 5 consists of the Railroad Maintenance Site (RRMS), which was originally studied in the OU6 RI (ABB-ES, 1993a),

The RRMS is located in the southeastern corner of the Site, approximately 800 feet from the eastern base boundary. The area was used as a maintenance yard for railroad equipment. In 1984, the Preliminary Assessment investigators observed 19 drums stored at the site. Three areas of stained soil were also observed. Some of the drums were empty, while others contained materials formerly used in maintenance operations. The drum contents were analyzed, determined to be heavy oil and antifreeze, and properly disposed of.

Contaminated soil was removed as part of the OU-6 Remedial Actions in 1994. These actions were documented in the OU-6 ROD, signed in March 1994 (ABB-ES, 1994a).

Groundwater sampling conducted as part of the OU-12 RI did not identify site-related contaminants; therefore, this site was recommended for NFA in the OU-12 RI Report.

Flow Field 6

Flow Field 6 consists of the BXSS site, which was investigated in the OU5 RI (CDM, 1996). Flow field 6 encompasses two groundwater plumes, the BXSS Plume (i.e., petroleum) and the Upgradient BXSS Plume (i.e., chlorinated solvents).

The BXSS is located in the central portion of the Site at the intersection of Texas and Cupp Roads. The BXSS is approximately 2.5 acres in size and includes a single building and a large paved area where leaded and unleaded gasoline were dispensed. Materials handled at the BXSS included fluids associated with vehicle maintenance such as engine oils, coolants and lubricants. Several USTs were present at the BXSS for storage of the various materials. Various small spills and leakage from the tanks are likely sources of contamination at the BXSS.

In 1992, a bioventing pilot study was initiated at the BXSS. The bioventing system was expanded in 1996 to encompass a larger area of contaminated soil. The bioventing system continues to operate to address the fuel-contaminated soil north and west of the BXSS building. This area of subsurface soil contamination is considered a low-level threat waste. A 1997 removal action removed TPH- and lead-contaminated sediment and soil from the drainage ditch located west of the BXSS. No principal threat waste (e.g., NAPL, buried non-liquid wastes in drums or tanks, and highly toxic or highly mobile COCs) is present at the BXSS site. A No Further CERCLA Action decision for the source area soil at the BXSS site was documented in the *No Further Action for Sites Within OUs 3, 5, 10 and 11 ROD* (ABB-ES, 1998d).

Petroleum-related contaminants with concentrations exceeding action levels are present in the overburden groundwater in an area west of the former gasoline UST locations. This area of groundwater contamination is known as the BXSS Plume. The data indicate that VOCs have migrated up to 500 feet west/northwest from the BXSS site. Fuel-related contamination is not regulated under CERCLA. However, because CERCLA contaminants (e.g., TCE) are present in groundwater in the vicinity of the BXSS, the BXSS Plume was included in the OU 12 FS.

TCE identified in bedrock groundwater in the vicinity of the BXSS site is believed to be originating from an upgradient source. This area of contamination is known as the Upgradient BXSS Plume.

The limited extent of fuel-related contaminants in overburden groundwater and the observed decreases in contaminant concentrations suggest biodegradation is actively occurring at the BXSS site. Groundwater data collected at the sites also suggest the concentrations of benzene are reducing with distance downgradient in the plume.

Flow Field 7

Flow Field 7 includes two OU-5 sites, the NDA site and the Support Services Area (SSA) site.

NDA

The NDA, originally studied in the OU-5 RI (CDM, 1996), occupies approximately 300 acres in the central portion of the base and was used for storage, maintenance, and refueling and defueling of aircraft. Facilities in the NDA included subsurface fuel lines, pumphouses, USTs, ASTs, and subsurface utilities. Storage tanks stored jet engine fuel, diesel fuel, gasoline, hydraulic oil, waste oil, heating oil, and anhydrous ammonia. USTs and ASTs were decommissioned and/or removed in the fall of 1994.

A 1995 removal action was conducted at two areas of shallow soil contamination at the NDA. An additional 1996 removal action excavated soil contaminated from the fuel transfer lines. A bioventing system was installed along areas of the former fuel transfer line during the 1996 removal action. The bioventing effort at the NDA is ongoing; however, based on the soil confirmation data collected in 1998, some areas have met the site RGs. The bioventing system has been shut down for these specific areas. Other areas have been recommended for continued operation of the bioventing system until RGs are met. Some areas have also been recommended for excavation of fuel-contaminated soil. Non-CERCLA corrective actions were also conducted at the NDA in 1998.

Contaminants with concentrations exceeding action levels exist in overburden and bedrock groundwater in the NDA. Overburden fuel-related contamination is present along the eastern edge of the NDA. This area of groundwater contaminated with only fuel-related compounds is being addressed in accordance with state law, pursuant to a state-authorized CAP (ABB-ES, 1998a). Fuel-related and CVOC contamination is present in groundwater in the central area of the NDA. This Central NDA Plume, consisting primarily of TCE and VC, is the only plume addressed in the OU-12 FS. This plume extends north to south within the south central portion of the NDA.

SSA

The SSA, originally studied in the SSA SI (ABB-ES, 1997a), consists of six buildings located south and southwest of the NDA. The SSA includes Buildings 8710, 8711, 8713, 8800, 8810, and 8840. These buildings were grouped together due to their use and storage of chlorinated solvents. An SI was conducted at the SSA in 1996. Specific source areas (Source Area No. 1 through Source Area No. 5 and Buildings 8710, 8711, and 8800) were identified as areas for further investigation due to the identification of CVOC contamination in areas upgradient of the Base Exchange Service Station (BXSS). Source Area No. 1 is associated with the OWS located along the western side of the NDA. Source Area No. 2 is the pumphouse located in the north-central portion of the site. Source Areas Nos. 3, 4, and 5 are associated with leaking fuel lines along the east side of the NDA. Building 8710 has historically been an accumulation point for hazardous materials and has been used for equipment maintenance, weapon loading, and weapon storage. Building 8711 has a former drum storage area/engine degreasing area, a former jet/missile engine testing area, and a fuel bowser storage area. Building 8800 has a former waste slop tank and OWS, a former drum storage area, and a loading area.

A 1996 removal action addressed soil from an area west of the parking lot at Building 8711. Three separate areas were also excavated north of Building 8800. In 1998, contaminated soil on the north side of Building 8710 was excavated.

TCE and PCE were identified in bedrock groundwater in the vicinity of Building 8711 above action levels during OU-12 RI sampling. VC was also detected in bedrock groundwater upgradient of Building 8711 at one monitoring well location, JBW-7734. Together, these areas of groundwater contamination are known as the Building 8711/JBW-7734 Plume.

Flow Field 8

Flow Field 8 consists of the Quarry site, which was originally studied in the OU-7 RI (ABB-ES, 1993b).

The Quarry is located near the northwestern boundary of the Site, adjacent to the NDA. Site topography reflects past rock quarrying activities, which reportedly began with construction of LAFB in 1947. Quarry operations 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 NDA. Historically, waste materials from construction projects, industrial and maintenance shops, and other base activities were stored and disposed of at the Quarry.

Approximately 100 drums were removed from the 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. This action was documented in the Quarry Site OU-7 ROD, signed in September 1994 (ABB-ES, 1994b). In 1998, during additional site characterization activities, three primary areas of buried drums were discovered northeast of the Quarry. A removal action was conducted that included

excavation and disposal of 348 drums, liquid contents, and associated contaminated soil. Bedrock groundwater contamination (i.e., Quarry Plume) is primarily due to CVOCs; however, some fuel-related compounds have also been detected.

Several contaminants are present in bedrock groundwater at the Quarry site (i.e., Quarry Plume). These contaminants include both chlorinated and fuel-related compounds. The CVOCs include PCE, TCE, cis-1,2-DCE, VC, 1,1-DCE, 1,2-DCA, carbon tetrachloride, chlorobenzene, and chloroform. The fuel-related compounds include benzene, ethylbenzene, toluene, and naphthalene.

The OU-12 RI Report recommended the Quarry be included in the FS; however, because of the geologic and hydrogeologic site conditions and the potential presence of dense non-aqueous phase liquid (DNAPL), the Quarry was subsequently recommended for a DNAPL pilot study. A phased approach to the pilot study was presented in the "Preliminary Alternative Analysis Report" (ABB-ES, 1998b) and "Field Work Notification for Additional Site Characterization" (ABB-ES, 1998c). The Preliminary Alternative Analysis Report (PAAR) identified and evaluated innovative remedial technologies that might be appropriate for removal or destruction of DNAPL in the fractured bedrock aquifer at the Quarry. The Field Work Notification identified additional site characterization activities to be conducted to further evaluate the potential for and distribution of DNAPL. The additional site characterization activities would then be used to support the decision of whether or not to proceed with the actual pilot study. The results of the additional site characterization activities are presented in the Phase I and Phase II Data Reports (HLA, 1998a and 1999a).

Based on the additional site characterization activities, the Phase II Data Report recommended that the pilot study not be conducted at the Quarry. This recommendation was based on the following reasons:

Several significant technical uncertainties associated with the effectiveness and implementability of the innovative technology (i.e., in-situ chemical oxidation) being considered;

The potential risk to ecological receptors in surface water may increase as a result of conducting the pilot study; and

The significant cost of implementing the innovative technology resulting in negligible benefits.

As a result of the recommendation not to proceed with the pilot study, an OU-12 FS Addendum was prepared for the Quarry site and is appended to the Final OU-12 FS (HLA, 1999b).

Subsequently, the USAF has agreed to make available funding of $250,000 (two hundred fifty thousand dollars) for limited scale implementation of DNAPL mass reduction technologies at the Quarry site, and has included a request for this funding in the Fiscal Year

2000 budget. The USAF will coordinate with USEPA Region I and the MEDEP to establish a program whereby the Quarry site could be used to integrate USAF funded mass reduction efforts with State- and USEPA-supported research. The USAF developed a consensus statement mutually with the MEDEP and USEPA Region I, which established a process to coordinate and approve projects at the Quarry site as well as administer the distribution of USAF remedial funds. Any dispute regarding the established process will be resolved pursuant to the procedures set forth in the FFA. The objective of this program is to reduce contaminant mass at the Quarry site while developing an improved understanding of the mechanisms controlling DNAPL and dissolved phase contaminant behavior in fractured bedrock systems.

Flow Field 9

Flow Field 9 consists of the FJETC site, which was originally studied in the OU-5 RI (CDM, 1996).

The FJETC is located on the west side of the runway, north of the NDA. The site once consisted of two small buildings and a concrete pad that was used for stationary tests of aircraft engines upon concrete pedestals. The buildings were decommissioned in 1976 and demolished in 1986. A 2,500-gallon aboveground fuel tank was also present at the site, located on the concrete slab adjacent to the former test cell building. The site currently consists of a 40-foot by 50-foot concrete pad, asphalt pavement, and the cobble-lined blast zone. Operations at the FJETC generated JP-4, lubrication oils, hydraulic fluids, wash water, and engine coolants as liquid waste streams. Waste fluids, except for wash water, were drummed and sent to the DRMO for disposal.

A bioventing system was installed at the FJETC in 1995. Seasonal groundwater levels at the site have hampered the air injection process; however, the system continues to operate.

Groundwater occurs in both overburden and bedrock in the FJETC area, although the overburden is dry a large portion of the year. Only during times of high rainfall and/or snowmelt does the water table rise to saturate the lower portion of the overburden. Contaminants identified in the upper perched overburden groundwater (i.e., FJETC Plume) at the site include primarily fuel-related compounds and CVOCs.

Flow Field 10

Flow Field 10 includes two OU-8 sites, the FTA site and the Underground Transformer Site (UTS).

FTA

Click here to go to Section 3.6.3

The FTA, originally studied in the OU-8 RI (ABB-ES, 1995b), is located along the northeastern side of the Site, south/southwest of Oklahoma Road. The FTA was used from 1952 to 1988 for firefighter training activities. The site consisted of a mock aircraft located in a circular pit. During training exercises, waste fluids consisting of fuels, oils, and solvents, were released into the FTA pit, ignited, and extinguished. As a result of these activities, a layer of weathered fuel product is present on the bedrock groundwater surface at the FTA site. In 1981, a bentonite liner was installed in the pit, a berm was constructed around the pit, and a UST and OWS were installed. Unburned fluids were piped to the OWS, with fuel product diverted to the UST and water diverted to a ditch on the north side of the FTA Access Road. A UST, located west of the pit, was reportedly used to store flammable liquids prior to use in the fire training pit. The USTs and associated piping were removed in 1994.

Removal actions have been conducted at the FTA between 1995 and 1999. In 1995, the OWS and areas of shallow soil contamination were excavated. Additionally, a bioventing system was installed in the area of the pit and discharge pipeline. In 1998, the bioventing system was decommissioned and contaminated soil was excavated. The remaining contaminated soil was excavated in 1999.

In 1995, a product recovery pilot test was initiated. The pilot test includes a bedrock recovery trench downgradient of the free product, constructed by blast enhanced fracturing, extraction wells, and a groundwater treatment facility. Treated groundwater is discharged to surface drainage. The recovery trench and extraction wells have created a capture zone for product; however, an insufficient quantity of product has accumulated to facilitate recovery from the bedrock trench. Beginning in 1999, the Air Force began conducting passive product recovery (e.g., skimming or bailing) from individual wells at the FTA. Specific recommendations are provided in the "Fire Training Area Pilot Study Report (URS, 1999).

Fuel-related VOCs and SVOCs have been detected in both overburden and bedrock groundwater at the FTA (i.e., FTA Plume). CVOCs have also been detected in bedrock groundwater.

UTS

The UTS, originally studied in the OU-8 RI (ABB-ES, 1995b), was located within a military housing complex that consisted of 10 buildings. All of the buildings, except two, were connected by an underground tunnel system. Two underground vaults could also be accessed by the tunnel system. According to USAF records, each vault contained one transformer; a third transformer was located in the Mess Hall building basement. USTs associated with each transformer were connected to floor drains located within the curbed vault area.

In the early 1970s, the UTS buildings were demolished. During demolition, the contractor drained each transformer into its associated floor drain. It is suspected, although not documented, that the transformers were filled with PCB-containing oils. The transformers were removed in 1983. In 1992, a removal action was completed at the UTS that included purging liquid from the USTs, removing the USTs and associated piping, cleaning the USTs,