3.0 BACKGROUND

Section 3.0 provides an overview of the physical characteristics, land and resource use, history of contamination, initial response actions, and basis for taking action at the site.

3.1 PHYSICAL CHARACTERISTICS

This section briefly describes the Base and its environmental setting. Information was primarily derived from the following site documents:

Final Closeout Report, Luke AFB, Arizona, April 2001, prepared by ARCADIS
Base General Plan, Luke AFB, Arizona, April 2002
Final RI Report, Luke AFB, Arizona, Vol. I and II, October 1997, prepared by ARCADIS
First Five-Year Review Report, Luke AFB, Arizona, January 2002, prepared by ARCADIS

3.1.1 Installation Description

Luke AFB is located in the city of Glendale, Maricopa County, Arizona, approximately 20 miles northwest of downtown Phoenix in south-central Arizona (Figure 3.1). The city of Glendale, Arizona, is located approximately nine miles west of Luke AFB. The Base property encompasses approximately 4,000 acres.

The Maricopa Association of Government describes the area surrounding the AFB as rural (MAG, 1993). Agricultural land and scattered single family homes exist within ½ mile of the Base boundary. Several large residential communities also have been developed near the Base. It is unlikely that residential development will occur near the Base perimeter because land use restrictions imposed by local, city, and county governments are in place. The Base and its easements are illustrated on Figure 3.2.

Physiography

The installation is located in the Basin and Range Physiographic province, which is characterized by mountains that extend in a northwest-southeast direction. The mountain ranges are separated by broad, alluvial valleys. The Base is located in a basin approximately six miles east of the White Tank Mountains in the Lower Colorado River Valley Subdivision of the Sonoran Desert. The White Tank Mountains are remnants of faulted blocks of the earth's crust. Erosion of these mountains has deposited volumes of sand and gravel on the valley floors. The thickness of the deposits is not easily estimated. Gravel-sized fragments of metamorphic gneiss and igneous granite are found at Luke AFB. The fragments are randomly dispersed in the soil matrix, which consists of loam or mixtures of sand, silt, and clay.

Luke AFB is generally flat; however, there is a gentle slope from the north to south. The elevation of the Base ranges from 1,075 to 1,105 to feet above mean sea level (amsl) and there are two naturally-occurring hills at the site (Luke AFB, 2002).

Regional Geology

Eight soils and one soil complex occur at the Base as described below (Luke AFB, 2002). The distribution of the soils and the soil complex is illustrated on Figure 3.3.

Antho Series- permeable sandy loams

Calciorthid Soils- typically sandy loam to clay loam, gravel, and cobble materials

Estrella Series- loam of slow to moderate permeability on broad alluvial fans and low terraces. This series is found on grades of less than 1% at elevations of 800 feet to 1,400 feet AMSL.

Gilman Series- the predominant soil type and consists of loam and sandy loam of moderately permeable soils occurring on valley plains and low terraces at slopes from 0 to 3% at elevations from 800 feet to 1,400 feet AMSL.

Glenbar Series- loam of moderate permeability. This series is found on grades less than 1% at elevations ranging from 700 feet to 1,250 feet AMSL.

Laveen Series- sandy loam, loam and saline-alkali loam of moderate permeability. These soils are found at elevations from 800 feet to 1,400 feet AMSL

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Mohall Series- consists of loam and clay loam of slow to moderate permeability. This series occurs at elevations from 1,000 feet to 1,450 feet AMSL.

Pinal Series- consists of loams of moderate permeability deposited over a silica-lime cemented hard pan that is nearly impermeable. This series is found on grades less than 3% at elevations ranging from 800 feet to 1,400 feet AMSL.

Rillito-Perryville Complex- consists of gravelly and sandy loams formed on remnant stream terraces and alluvial fans. This series occurs at elevations that are 10 feet to 75 feet above surrounding soils.

The soils at Luke AFB are underlain by alluvial and basin fill consisting of sand, silt, gravel, clay, and salt, which are approximately 10,000 feet thick.

Regional Hydrogeology

This section discusses the aquifer units, regional recharge, regional discharge, and historical trends associated with the Luke AFB area. The hydrogeology information summarized below is from the First Five Year Review (ARCADIS, 2002a) and field measurements collected during the most recent round of LTM sampling.

Aquifer Units

The occurrence and movement of groundwater at Luke AFB is affected by hydraulic characteristics of the aquifer units, and the magnitude and distribution of groundwater recharge

and discharge for agriculture and other uses. Aquifer units are the upper alluvial unit, middle fine unit and lower conglomerate unit. Historically, withdrawals in excess of recharge have created declines in groundwater levels in the Luke AFB area of 300 feet. However, recent changes in groundwater use and increased recharge have caused groundwater levels to recover as described below in Section 3.1.1.4. Structural changes associated with the Luke Salt Body significantly affect local groundwater conditions south and east of the Luke AFB.

Interpolation of data from the regional study of Brown and Pool (USGS, 1998) indicates that the upper alluvial aquifer has been completely dewatered in the Luke AFB area, except for localized areas along the Agua Fria River, near the Luke AFB waste water treatment plant. Partial dewatering of the middle fine unit has also occurred in the Luke AFB area. This aquifer is now the uppermost aquifer.

Regional Recharge

Groundwater recharge in the West Salt River Valley is affected by natural as well as artificial sources. Groundwater is naturally recharged by infiltration through the beds of river channels during storm water events or releases from upstream impoundments. Artificial sources of groundwater recharge include infiltration of excess irrigation water applied to fields and seepage losses from irrigation ditches and canals. Infiltration of treated effluent from the Luke AFB wastewater treatment plant (WWTP) may also provide recharge in the immediate area of the releases to the Aqua Fria River floodplain.

Regional Discharge

Groundwater discharge from the regional aquifer in the Luke AFB area occurs primarily from cultural uses. There is no natural discharge due to evapotranspiration or discharge to surface water bodies. Discharge of groundwater occurs principally from pumping numerous wells for irrigation and for municipal, military, and light industrial consumption.

The amount of groundwater discharge for municipal usage is anticipated to increase dramatically in response to the growing population of the area; however, as the population increases in the area it is anticipated that groundwater discharged for agricultural uses will decrease. Comparison of the increased withdrawals for municipal uses and decreased withdrawals for irrigation uses shows that the demand for groundwater in the area will remain generally the same into the foreseeable future.

Historical Trends in Water Levels

Groundwater levels declined more than 300 feet in the vicinity of Luke AFB from 1923 to the late 1970s, primarily because of significant depletion in response to pumpage for irrigation requirements. The greatest declines occurred west, north, and south of Luke AFB. A large cone of depression has existed southwest of the Luke AFB since sometime before 1964. The regional groundwater flow direction, which is modified by the cone of depression, is to the south-southwest.

Water levels from selected wells, for which data were adequate, were plotted to show groundwater declines over time at a given location. Analysis of these hydrographs suggests that

water levels have declined substantially over most of the study area through at least 1980. After 1980, many of the hydrographs show a leveling off of the decline trend, or a groundwater rise of up to 40 to 60 feet. Groundwater table elevations in the study area have continued to rise as a result of reduction in agricultural pumpage. The agricultural pumpage has decreased because the farmland near the Base is being converted to residential properties. Also, the availability of Colorado River water via the Central Arizona Project canal (especially for agricultural irrigation) has greatly lessened the demands on groundwater in the Phoenix area.

Water level data for the period from 1991 to 1995 documents a continued rise in the groundwater table throughout the study area. Elevations had increased up to 20 feet, in large part due to above average precipitation for 1992 and 1993. Depth to water readings collected from monitoring wells during the August 2006 investigation documented a rise in static water level of 12.2 feet below ground surface (bgs) from August 2003 and 7.19 feet bgs from April 2005.

3.2 LAND AND RESOURCE USE

The eastern portion of Luke AFB currently consists of a variety of light industrial facilities, office buildings occupied by administrative and community services, base barracks, and outdoor recreation centers. The central and western portions of Luke AFB include the runways, open spaces, and aircraft operations, training and maintenance facilities. Base residential housing and commercial areas are located east of the fenced areas of the main portions Luke AFB. Aircraft maintenance and light industrial operations in support of training missions have been in existence at Luke AFB since its inception in 1941. The results of these activities generated potentially hazardous wastes including, petroleum residues and degreasing solvents (ARCADIS, 2002). The areas where the hazardous waste was stored or used (or suspected to have been used) are known as potential sources of contamination (PSCs). The site layout illustrating the PSCs that required a remedy or long-term monitoring (LTM) is included as Figure 3.4.

3.3 PSC HISTORY OF CONTAMINATION AND INITIAL RESPONSE ACTIONS

This section describes the history of contamination for the 11 sites that required a remedy or are included in the LTM plan. The initial responses for the PSCs also are described in this section. Initial responses were considered to be significant activities (for example: investigations, removals, etc.) completed before the signing of the ROD. The site, which includes the PSCs listed below, was proposed for the NPL on July 14, 1989, and placed on the list on August 30, 1990. The section is sorted by OU then alphabetically by site name.

3.3.1 DP-13: Drainage Ditch Disposal Area

Site Description

PSC DP-13 is located in the northwest corner of the Base. During the 1940s, this site was the location of a drainage ditch that was reportedly used for refuse disposal. The ditch was filled and covered when the Base was deactivated in 1946. Asphalt and concrete rubble stored in the northwest corner of the site was disposed in a burial pit in 1974. No known or suspected industrial-type wastes or hazardous wastes were disposed at this site. Currently, a majority of

the site is covered with bare ground. The northern portion of the site is used as a bivouac area for preparedness training.

History of Contamination

During the OU-1 RI, geophysical and soil gas surveys were conducted to define the landfill boundaries and to select locations for test pits. Fifteen test pits were excavated to characterize the extent and contents of the landfill. Ten soil borings were advanced to further define the vertical and lateral extent of constituents of potential concern detected in the test pit samples. In August 1996, three additional soil borings were advanced to collect supplemental volatile organic compound (VOC) and semivolatile organic compound (SVOC) data for risk assessment purposes.

The test pit located near the side of a maintained road within the bivouac area intercepted an inactive underground utility line. A paint pail and dried paint residue were also observed in this test pit. Wastes collected from that test pit at a depth of 5 feet bgs contained chromium at 15,900 milligrams per kilogram (mg/kg) and lead at 36,000 mg/kg. Because these wastes are buried and the surface area is maintained, direct exposure is not likely under current land use scenarios. However, exposure to these buried wastes could result if excavation were to occur or if the site were developed for residential purposes. For this reason, remedial alternatives were developed for PSC DP-13 as a protective measure (Geraghty & Miller [ARCADIS], 1997).

Initial Response Actions

From 1992 through 1996, investigations were completed to define the contents of the alleged disposal site. One sample collected during the investigation contained levels of metals contamination that would be hazardous to human health or the environment. However, this sample was collected from five feet bgs and because the surface of this area is maintained, direct exposure was not likely considering current land use scenarios. Thus, no time critical removal action (TCRA) was conducted.

3.3.2 FT-07E: Eastern Portion of North Fire Training Area

Site Description

PSC FT-07E is situated in the northern portion of the Luke AFB, west of Fire Department Training Facility 1355. Fire training activities in the eastern portion of PSC FT-07E began in 1973 when the Base constructed three fire-training pits (FTPs). According to Luke AFB records, the three FTPs were active from 1973 until 1989. The two largest FTPs were constructed with sprinkler systems to dispense off-spec petroleum oil lubricant onto mock aircraft or similar structures. The two largest FTPs were designated Fire Training Pit #3 (FTP-3) and Fire Training Pit #4 (FTP-4). The third FTP was identified as Fire Training Pit #6 (FTP-6).

History of Contamination

Luke AFB operated a soil vapor extraction (SVE) system at FTP-3 and FTP-4 from April 1992 through December 1992. Mass calculations indicate that over 14,000 pounds of contaminants were removed from the soil and destroyed by a thermal oxidizer treatment system.

Soil sample results indicated that residual hydrocarbon contamination was effectively reduced at depths greater than 16 feet bgs. Groundwater sample results provide evidence that the underlying groundwater resources have not been impacted and vadose zone transport modeling suggests that residual petroleum hydrocarbon contaminants in the soil will not leach to the underlying groundwater. However, relatively high concentrations (27,000 mg/kg) of total petroleum hydrocarbons (TPHs) remained in the soils near the surface, so remedial alternatives were developed (Geraghty & Miller, 1997). The remedial alternatives evaluated for this site are summarized in Table 3.1.

Initial Response Actions

Investigations were conducted at the PSC from 1984 to 1996. The investigations documented extensive VOC and TPH contamination. Luke AFB installed an SVE system in early 1992. The system was operated from April of 1992 to December of 1992. Investigations conducted after the SVE system ceased operations provided analytical data for the vadose transport model, which suggested that the overlying contamination would not leach to the groundwater.

3.3.3 LF-03: Outboard Runway Landfill

Site Description

PSC LF-03 consists of a former construction debris landfill located on the western side of the Base near the central part of the outboard runway, south of Taxiway F. The site occupies approximately 21 acres. The outboard runway currently covers 60 percent of the site. The remainder of the site consists of a bare low-lying area with sparse vegetation. The Base reportedly used the site for limited disposal of refuse from 1951 to 1953. Landfilling operations at this site ceased when the outboard runway was constructed.

History of Contamination

During the OU-1 RI, geophysical and soil gas surveys were conducted to define the landfill boundaries and to select locations for test pits. Six test pits were excavated and sampled to characterize its extent and contents. Two additional soil borings were advanced and sampled in August 1996 to collect additional VOC and SVOC data for risk assessment purposes.

Numerous metallic wastes were unearthed at the central portion of this site during test pit excavation. Samples of the wastes collected from test pit TP-5 at depths of 7-8 feet bgs contained chromium at a concentration of 386 mg/kg. Because the metallic wastes containing

elevated chromium concentrations are buried and extend below the outboard runway, direct exposure is not likely under current land use scenarios.

The risk assessment concluded that the site does not present unacceptable health risks given its current land uses. However, long-term exposure and unacceptable health risks could result if the runways were removed and the site was developed for residential purposes. As a result, remedial alternatives were developed for the site (Geraghty & Miller, 1997). The remedial alternatives evaluated for this site are summarized in Table 3.1.

Initial Response Actions

The landfill was characterized from 1992 to 1996. During the investigation, subsurface samples were collected that contained levels of contamination that would be hazardous to human health or the environment. The contaminants did not appear to pose an immediate threat; therefore, no TCRA was conducted.

3.3.4 LF-14: Old Salvage Yard Burial Site

Site Description

PSC LF-14 consists of a former landfill site located in the northeastern corner of the Base. In the 1940s, this site was part of the main drainage canal for the north end of the Base. The canal was abandoned when the drainage was changed in the 1950s. The abandoned canal may have been used as a landfill and was completely filled and covered by 1962. According to interviews with Base personnel, polychlorinated biphenyl (PCB)-containing transformer fluids may have been disposed in the ditch in the northern portion of this site. The site is currently unpaved and covered with bare ground.

History of Contamination

An RI was completed to define the boundaries of the former drainage ditch landfill and to characterize its content. Geophysical and soil gas surveys were conducted to define the landfill boundaries and to select locations for test pits. Phase II activities consisted of excavating 4 test pits and sampling 10 soil borings. Two additional soil borings were advanced in August 1996 to collect supplemental VOC and SVOC data for risk assessment purposes.

Relatively high PCB concentrations (2,300 mg/kg) were detected at the site; however, the depth at which this concentration was detected was greater than 16 feet bgs and exposure is unlikely. Based on the results of the Basewide risk assessment, contaminants identified at PSC LF-14 were not present at areas of potential exposure at concentrations high enough to cause adverse health effects under current land use scenarios. However, the concentrations of PCBs and chromium present in soils 0 to 16 feet bgs could theoretically cause adverse health affects in unlikely event that PSC LF-14 were developed for residential purposes in the future. For

this reason, remedial alternatives were developed for the site (Geraghty & Miller, 1997). The remedial alternatives evaluated for this site are summarized in Table 3.1.

Initial Response Actions

From 1992 through 1996, investigations were completed to define the contents of the former disposal site. The investigations documented PCB and metals contamination at relatively high levels. Based on the results of the Base-wide risk assessment, contaminants identified at PSC LF-14 were not present at areas of potential exposure at concentrations high enough to cause adverse health effects under current land use scenarios. Considering the risk assessment information, it was determined that a TCRA was not warranted.

3.3.5 LF-25: Northwest Landfill

Site Description

PSC LF-25 consists of an area formerly used for landfilling and is located along the southwest boundary of the Base, between the west perimeter and the northwest runway. This narrow site occupies approximately 43 acres. Portions of PSC LF-25 are located immediately downrange of the Base skeet shooting range. Small, localized sections of the site were used as a landfill for construction debris in the past for an undetermined length of time, but it has not been used since 1989.

History of Contamination

An RI was completed to define the boundaries of any former landfills and to characterize their content. During the OU-1 RI investigations, geophysical and soil gas surveys were conducted to define landfill boundaries and to select locations for test pits and soil borings.

Lead and antimony were detected in the surface soils adjacent to the skeet range at concentrations that could cause adverse health effects if prolonged exposure, such as excavation work or residential occupation, were to occur. The lead and antimony were present in the form of metal shot that was fired from the adjacent Base skeet shooting range. As a protective measure, remedial alternatives were developed for the site (Geraghty & Miller, 1997). The remedial alternatives evaluated for this site are summarized in Table 3.1.

Initial Remedial Actions

Investigations were conducted at the PSC from 1990 to 1996. The investigations concluded that metals contamination was present at levels that would pose a threat to human health or the environment in surface soil. Because the site is located in a relatively remote location and because there is no on-site activity that would expose Base personnel to the contamination, a TCRA was not conducted. Instead the contamination was addressed as a remedial action. In

December 1999, shot recovery activities were conducted to reduce the concentrations of antimony and lead below their clean-up goals of 31.0 mg/kg and 400 mg/kg, respectively.

3.3.6 RW-02: Wastewater Treatment Annex Landfill

Site Description

PSC RW-02 was previously a 28-acre landfill at the Luke AFB WWTP annex. The WWTP annex is located north of Glendale Avenue, approximately two miles east of Luke AFB. The landfill is located in the northwestern portion of the WWTP annex adjacent to the western bank of the Agua Fria River. PSC RW-02 served as the primary base landfill for the disposal of refuse from 1953 to 1970. The river bank bordering the landfill was stabilized by the U.S. Army Corps of Engineers in 1990 to prevent erosion.

In 1956, a small quantity of low-level radioactive tubes and dials were buried at the landfill. The radioactive material was reportedly encased in concrete and buried in a 12-foot deep pit with 6 feet of concrete cover and 4 feet of earth cover. The radioactive material burial site is located within the boundaries of the former Defense Reutilization Marketing Office storage yard. This area is surrounded by a fence placarded as a radioactive waste burial site and the burial site is designated with a permanent concrete marker (Geraghty & Miller, 1997).

History of Contamination

Two investigations were completed at this PSC. The investigations indicated that the soil near the alleged buried radioactive waste had not been impacted. Because the human and environmental threats were considered to be minimal, the PSC was addressed as a remedial action.

Initial Response Actions

No response actions have been conducted at RW-02.

3.3.7 SD-20: Oil/Water Separator Canal and Earth Fissure

Site Description

PSC SD-20 consists of a drainage canal located on the southern side of Luke AFB. This unlined canal originates at oil/water separator 912, approximately 100 feet north of Super Sabre Street, and extends southward. The oil/water separator 912 system serves two drainage systems: a 30-inch diameter system for the areas to the northwest, and a 43-inch diameter system for an area to the northeast. During past storm events, stagnant, oily water in the 30-inch diameter system occasionally overflowed into the oil/water separator canal. Upgrades to the Luke AFB sewer system have eliminated the potential for additional discharges to the canal. Two earth fissures, apparently resulting from differential land subsidence, are present at the end of the drainage canal.

History of Contamination

SD-20 was investigated during the RI. During the RI, soil borings were advanced and soil, sediment, and groundwater samples were collected. Studies also targeted the earth fissures and the effect of the nearby Luke Salt Body on contaminant migration and transport. The soils at PSC SD-20 were found to contain total recoverable petroleum hydrocarbons (TRPHs), benzo(a)pyrene, arsenic, and beryllium at low concentrations. Based on the results of the RI, soil contamination was not present at high enough levels to present an unacceptable risk, and would not migrate to groundwater. Based on this conclusion, despite the fact that groundwater samples collected at the site were found to contain trichloroethene (TCE), arsenic, and lead no remedial alternatives for SD-20 were developed in the OU-1 FS (Geraghty & Miller, 1997).

Initial Response Actions

As detailed above, based on the results of the RI, soil contamination was not present at high enough levels to present an unacceptable risk, and would not migrate to groundwater. Based on this conclusion, no remedial alternatives for SD-20 were developed in the OU-1 FS. Based on the recommendation of ADEQ in the First Five-Year Review wells 112S, 112D, and 113 will be sampled at every 5-year review cycle. Site was subsequently added to Luke AFB LTM program.

3.3.8 SD-38: Oil/Water Separator at Auto Body Shop

Site Description

PSC SD-38 is located near the middle of the Base at the northwest corner of "D" Street and 3rd Street. The site consists of the former oil/water separator serving Building 248, the old Base Auto Hobby Shop. In March 1991, the SD-38 oil/water separator was inspected as part of the RCRA Facilities Assessment. It was discovered that this oil/water separator did not have a concrete bottom. This separator has since been removed. The Base submitted samples of the sludge from the bottom of the oil/water separator for laboratory analysis. Other than the sludge sampling, no previous investigations or environmental sampling was performed at this site prior to the OU-1 RI.

History of Contamination

PSC SD-38 was originally assigned to the OU-2 investigation. Because OU-2 data indicated a deep soil impact and thus, a potential threat to groundwater, the site was reclassified as an OU-1 PSC. In May 1992, during the OU-1 investigation, three soil borings were advanced and sampled to further evaluate the nature of any impacts to the site and assess the vertical and horizontal extent of those impacts. A groundwater monitoring well (MW-117) was also installed and sampled at this time to evaluate groundwater quality at the site. In August 1996, one additional boring was advanced and sampled to collect supplemental VOC and SVOC data for use in the risk assessment.

Soil samples collected directly beneath the former oil/water separator at a depth of 8 feet bgs contained TRPH at a concentration of 58,000 mg/kg. Based on the results of the Basewide

risk assessment, prolonged exposure to this concentration of TRPH could potentially cause adverse health affects. Because the soils containing elevated concentrations of TRPH are located at depth, direct exposure is not likely under current land use scenarios. However, prolonged exposure to the TRPH in the subsurface soils could result if the site were developed for residential purposes in the future. For this reason, remedial alternatives were developed for PSC SD-38 (Geraghty & Miller, 1997). The remedial alternatives evaluated for this site are summarized in Table 3.1.

Initial Response Actions

No initial response actions have been conducted at SD-38.

3.3.9 SS-42: Bulk Fuels Storage Area

Site Description

PSC SS-42 consists of a former leaking underground storage tank (LUST) site located within the eastern portion of the bulk fuels storage area of Luke AFB. The LUST was part of an oil/water separator system that received condensate from the two large aboveground fuel tanks.

History of Contamination

Environmental investigations were completed in response to the release from the oil/water separator UST. Seven soil borings were advanced adjacent to the oil/water separator and leaking UST. Several of the borings, advanced to define the horizontal and vertical extent of the impact, contained detections of BTEX and TRPH. Samples collected from as deep as 160 feet bgs reported detections. Because of these unexpected detections, the horizontal extent of the impact was not defined by the seven borings advanced.

A RI was conducted to determine the nature and extent of soil contamination and determine whether there was the potential for soil contaminants to migrate to groundwater. During the RI, TPH and BTEX concentrations were detected in samples collected at depths ranging from 10 feet to 160 feet bgs. The highest detected concentration of TPH was 33,900 mg/kg reported at a depth of 70 feet bgs. BTEX compounds also were detected at their highest concentrations at this depth. Based on the results of the Basewide risk assessment, contaminants identified at PSC SS-42 were not present at areas of potential exposure at concentrations high enough to cause adverse health effects under current land use scenarios, or even under residential land use scenarios. However, results of the vadose zone transport modeling indicated that petroleum related contaminants (TPH and BTEX) detected in the soil could migrate to the underlying groundwater resources. For this reason, remedial alternatives were developed for the site.

Initial Response Actions

Initial investigations conducted in response to the leak from the UST documented extensive VOC and TPH contamination. Luke AFB completed a bioventing treatment study in 1995 and

installed an SVE system in 1996. The system was operated from August of 1996 to November of 1998. Confirmation soil borings were emplaced to determine the effectiveness of the SVE system in mitigating the soil source. Based on analytical results, the SVE system removed nearly 400,000 pounds of volatile hydrocarbons from the soil. Though TPHs and BTEX were detected in at-depth soil samples, levels were substantially reduced. Results of modeling indicated that residual TPHs and BTEX would not impact groundwater at concentrations above Arizona Water Quality Standards (WQSs).

3.3.10 DP-23: Old Surface Impoundment West of Facility 993

Site Description

PSC DP-23 consists of the old surface impoundment and associated drainage swale located west of Building 999 and adjacent to the former south fire training area. The old surface impoundment portion of the site is a rectangular-shaped area that occupies approximately 3.3 acres. Currently, 80 percent of this area is either paved with asphalt, under tarmac, or under concrete, which includes the AGE equipment yard. In the late 1940s, an impoundment dam was constructed along an old natural drainage system, which flowed south off of the Base. This area may have been used for the disposal site for petroleum oil lubricant waste until construction covered the site in 1969. The dam used to create the surface impoundment was buried, but not removed. The swale portion of the site is located to the south of the impoundment area and occupies approximately 19.4 acres. The swale flows south to an area of earth fissures off Base.

History of Contamination

In February 1992, two 150-foot deep borings and four 40-foot deep soil borings were drilled and sampled during the OU-2 investigation. Sediment samples were collected from ten locations in December of 1991 and February of 1992. A total of 26 soil samples and 21 sediment samples were collected and submitted for laboratory analysis.

The highest detected concentration of TRPH was 2,000 mg/kg in the 2 to 4 foot bgs sample collected from a soil boring. The only detected VOC compounds (trace concentrations of toluene and ethyl benzene) were also detected in this sample. TRPH was generally confined to shallow soils. The deepest sample with detectable TRPH concentrations was collected from 8 to 10 feet bgs.

Six soil and five sediment samples collected during the OU-2 investigation contained detectable concentrations of SVOC compounds. Four samples contained concentrations of benzo(a)pyrene in excess of its stated Preliminary Remediation Goal (PRG) of 0.78 mg/kg. These four samples include the two surface samples, a two-to-four-foot bgs sample, and a duplicate sample. None of the other samples contained SVOC compounds at concentrations in excess of their respective PRGs.

The data collected during the OU-2 field investigation were evaluated to determine the appropriate remedial alternative for this site.

Initial Response Actions

In July 1995, the Base constructed an on-site treatment cell in which to compost PAH-contaminated soils by emplacing berms and lining the bermed area with 40-milliliter high density polyethylene (HDPE) liner, topped with 6 inches of native fill. In all 625 cubic yards of soil contaminated with benzo(a)pyrene at levels above the PRG were excavated and placed in the treatment cell for composting. Baseline samples were collected for later comparison to post-treatment samples. Soils were tilled and watered daily and monitored for temperature, oxygen, and moisture levels. After 120 days, interim samples were collected at baseline locations to determine the effectiveness of the composting: 25% remained above the PRG for benzo(a)pyrene. An optimized soil amendment mix was added to the compost and soil composting continued for an additional 60 days. Final sampling was conducted and all samples were stated to be below the PRG for benzo(a)pyrene. The treated soils were used as fill to restore the site to its original grade and the site was hydro-seeded. The high density polyethylene (HDPE) liner was disposed at a local landfill. A site closure report was prepared and approved in 1997.

3.3.11 ST-18: Former Liquid Waste Storage Facility (Facility 993)

Site Description

PSC ST-18 consists of a former liquid waste storage facility (Facility 993) located in the southern part of the Base. Facility 993 originally consisted of a single 5,000-gallon refueling tank truck that was coated and buried in 1968. This UST was used for the temporary storage of all liquid petroleum, oil, lubricant waste, and solvent wastes generated at the Base. Before 1972, liquid wastes stored at this facility were disposed by spraying them on the road during road oiling and dust suppression activities, pouring the waste into narrow trenches, and using the waste as an incendiary during fire training activities. In 1972, two 10,000-gallon USTs were installed at the facility, and the area around all three USTs, approximately 0.2 acres, was enclosed with a fence. Also at this time, the Base began selling the liquid wastes to private contractors for off-base recycling. This facility was classified as an interim status treatment, storage, and disposal facility under the Resource Conservation and Recovery Act (RCRA) in 1979. Part A of a Hazardous Waste Permit application was submitted in 1980. However, closure of this facility began in 1982 to facilitate the construction of a new U.S. Air Force (AF) Reserve maintenance building.

History of Contamination

The three USTs were removed on October 19, 1983. The soil samples collected from directly beneath the 5,000-gallon buried tanker truck and one of the 10,000-gallon USTs showed signs of impact from past waste releases. The tank pit was excavated to a depth of 16 feet bgs in an attempt to assess the extent of contamination. Based on field observations, highly impacted soils were manifested to a hazardous waste landfill. The moderately contaminated soils were

aired for several weeks and replaced in the pit, and the minimally contaminated soils were placed directly back into the pit.

Because this site was an active facility in 1981, it was not identified during the Installation Restoration Program (IRP) Phase I investigation, which focused on historic waste disposal activities. However, the Base decided to include this site in the IRP Phase II investigation because of the sampling results of the UST closure activities. Between November 4, 1985, and February 6, 1986, the activities at the site continued during the IRP, Phase II, Stage 1 investigation. During this investigation, five soil borings were advanced in and around Facility 993. The depths of the soil borings ranged from 100 to 145 feet bgs. In addition, five groundwater monitoring wells were installed. The results indicated that the soil beneath the former USTs had been impacted by fuel and organic solvents, and that the impacted soil extended to 56.5 feet bgs.

Initial Response Actions

The site was capped with concrete in 1987 as part of the RCRA post-closure requirements for the site. In a letter dated May 13, 1988, the ADEQ stated that they had inspected the concrete cap covering the facility and it was satisfactory. Currently, the Base continues to inspect and maintain the cap to ensure the integrity of the concrete and sealed joints. Also, the groundwater beneath ST-18 is monitored in accordance with the LTM plan (Geraghty & Miller, 1997).

3.4 BASIS FOR TAKING ACTION

The contaminants of concern (COCs) that were identified during the RI/FS for the 11 PSCs discussed in this Five-Year Review are summarized in Table 3.2 by PSC and by sample media.

Remedial actions taken focused on eliminating exposures to soil associated with significant human health risks, which are defined as those sites where EPA or ADEQ risk management criteria had been exceeded.

Table 3.1
Remedial Alternative Matrix
for
Potential Sources of Contamination
Sites: FT-07E, LF-03, LF-14, LF-25, and SD-23
Luke AFB, Arizona

Remedial Alternative ROD ID	Remedial Alternative Description	Potential Source of Contamination				
		FT-07E	LF-03	LF-14	LF-25	SD-38
S-1	No action	X	X	X		X
S-2	Institutional Controls	X^R	X^R	X^R		X^R
S-3	Asphalt Cap and Institutional Controls					
S-4	Institutional Controls and Ex Situ Physical Treatment/Metals Recovery				X^R	
S-5	Excavation and Off-Site Disposal	X	X	X		X
S-6	Excavation, Off-Site Incineration, and Disposal			X		
S-7	Excavation, Off-Site Thermal/Chemical Treatment, and Disposal	X	X		X	X
S-8	Excavation, On-Site Thermal/Chemical Treatment, and Disposal	X	X	X	X	X
S-9	Excavation, On-Site Biological Treatment, and Disposal	X				X
S-10	Excavation, On-Site Thermoplastic Solidification, and Reuse			X		
S-11	In-Situ Soil Vapor Extraction		X			
S-12	In-Situ Aerobic Biodegradation		X			

Notes
R Recommended Alternative
ID identification
ROD Record of Decision

Table 3.2
Basis for Taking Action
Luke AFB, Arizona

Potential Source of Contamination		Contaminants of Concern
Operable Unit 1	DP-13	acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate, carbazole, chrysene, dibenz(a,h)anthracene, dibenzofuran, fluoranthene, fluorine, indeno(1,2,3-cd)pyrene, phenanthrene, pyrene, TRPH, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, zinc, and cyanide
	FT-07E	acetone, ethylbenzene, toluene, xylenes, TRPH, arsenic, barium chromium, copper, lead, nickel, and zinc
	LF-03	TRPH, arsenic, barium, beryllium, cadmium, chromium, copper, lead, nickel, silver, and zinc
	LF-14	xylenes, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, butyl benzyl phthalate, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, pyrene, PCBs, TRPH, arsenic, barium, beryllium, cadmium, chromium, copper, lead, nickel, silver, zinc, and cyanide
	LF-25	xylenes, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, pyrene, TRPH, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, nickel, silver, zinc, and cyanide
	RW-02	2-methylnaphthalene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate, chrysene, di-n-butyl phthalate, di-n-octyl phthalate, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, pyrene, TRPH, arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, silver, uranium, zinc, gross alpha, gross beta, radium-226, and radium-228
	SD-20	toluene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, bis(2-ethylhexyl)phthalate, chrysene, di-n-octylphthalate, fluoranthene, indeno(1,2,3-c,d)pyrene, phenanthrene, pyrene, TRPH, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, nickel, and zinc
	SD-38	TRPH, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, nickel, and zinc
	SS-42	benzo(a)anthracene, benzo(b)fluoranthene, bis(2-ethylhexyl)phthalate, chrysene, di-n-butylphalate, fluoranthene, pyrene, TPH, and lead
Operable Unit 2	DP-23	ethylbenzene, toluene, anthracene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, benzo(a)pyrene, bis(2-ethylhexyl)phthalate, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, pyrene, TRPH, copper, and lead
	ST-18	benzene, 1,1 dichloroethene, ethylbenzene, 1,1,2,2-tetrachlorethane, tetrachloroethene, toluene, trichloroethene, xylenes, benzo(a)anthracene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(a)pyrene, benzyl alcohol, bis(2-ethylhexyl)phthalate, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, 2-methylnaphthalene, naphthalene, phenanthrene, pyrene, TRPH, copper, and lead

Notes:
No elevated levels of radionuclides were detected in any samples, but the alleged buried waste qualifies the radionuclides as contaminants of concern.
TRPH total recoverable petroleum hydrocarbons

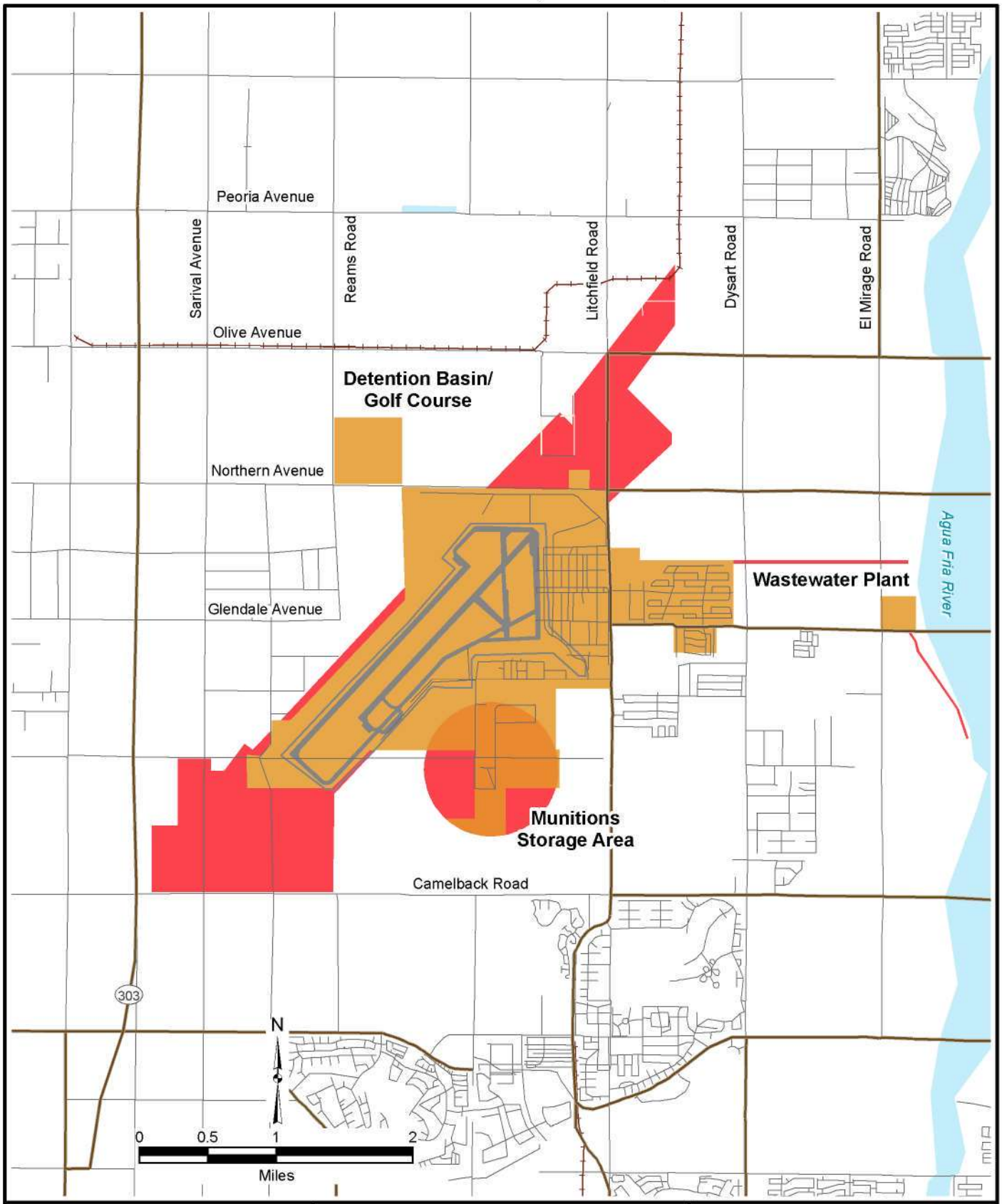
FIGURES

Filename: X:/AFC002/Luke_AFB/TO_57/MAPS/2nd 5 Year Review/Site_Location_Map.mxd
Project: AFC002-057-02-05
Created: 10/26/06 CV
Source: HGL GIS Database, 2006

0 20 40 80
Miles

N

Figure 3.1
Site Location Map



Filename: X:/AFC002/Luke_AFB/TO_57/MAPS/
2nd 5 Year Review/Land_Ownership_Easement.mxd
Project: AFC002-057-02-05
Revised: 02/15/07 CV
Source: HGL GIS Database, 2006
ESRI StreetMap USA

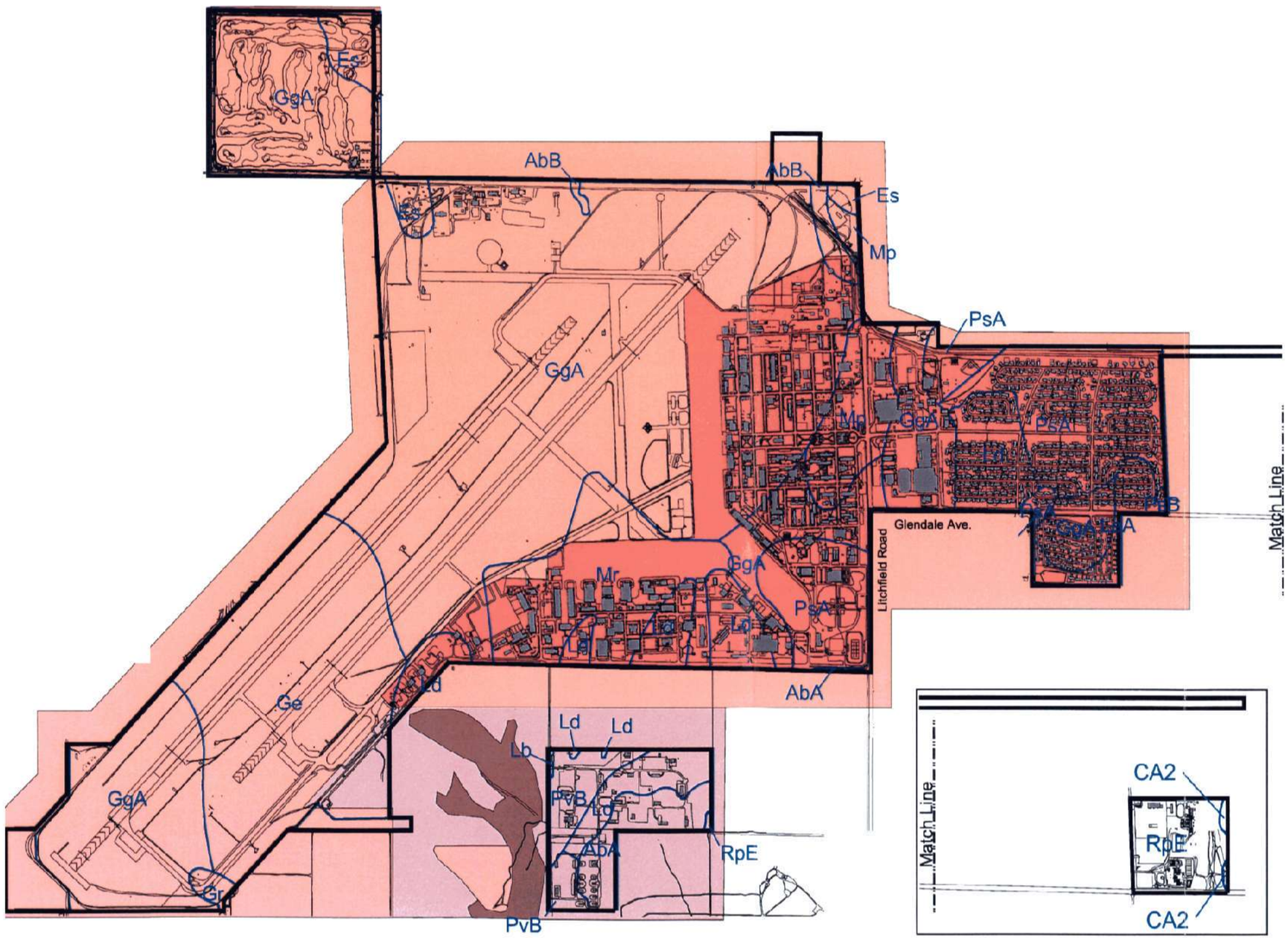
Land Owned

Easement

Figure 3.2
Land Ownerships and Easements

Figure 3.3
Soils and Vegetation

U.S. Air Force Center for Environmental Excellence



Base Boundary
Soil Boundry

Soil Types

AbA	Antho Sandy Loam 0-1 Percent Slopes
AbB	Antho Sandy Loam 1-3 Percent Slopes
CA2	Calciorthids
Es	Estrella Loam
Ge	Gilman Fine Sandy Loam
GgA	Gilman Loam 0-1 Percent Slopes
Gr	Glenbar Loam
Lb	Laveen Sandy Loam
Ld	Laveen Loam, Saline-Alkali
LeA	Laveen Loam 0-1 Percent Slopes
Mp	Mohall Loam
Mr	Mohall Clay Loam
PsA	Pinal Loam 0-1 Percent Slopes
PsB	Pinal Loam 1-3 Percent Slopes
PvB	Pinal-LaPalma Loams 1-3 Percent Slopes
RpE	Rillito-Perryville Complex

Vegetation Areas

- Microphyllous Desert Scrub Area
- Microphyll Woodlands
- Disturbed Sites
- Landscape Vegetation Areas

Date: 02/13/2002

N W E S

1000 0 1000 2000 Feet

Filename: X:/AFC002/Luke_AFB/TO_57/MAPS/
2nd 5 Year Review/Land_Ownership_Easement.mxd
Project: AFC002-057-02-05 Created: 10/26/06 CV
Source: Luke AFB Base General Plan
K:\81321001\Luke General Plan\gis
General Plan Phase II\gp_phase2.apr

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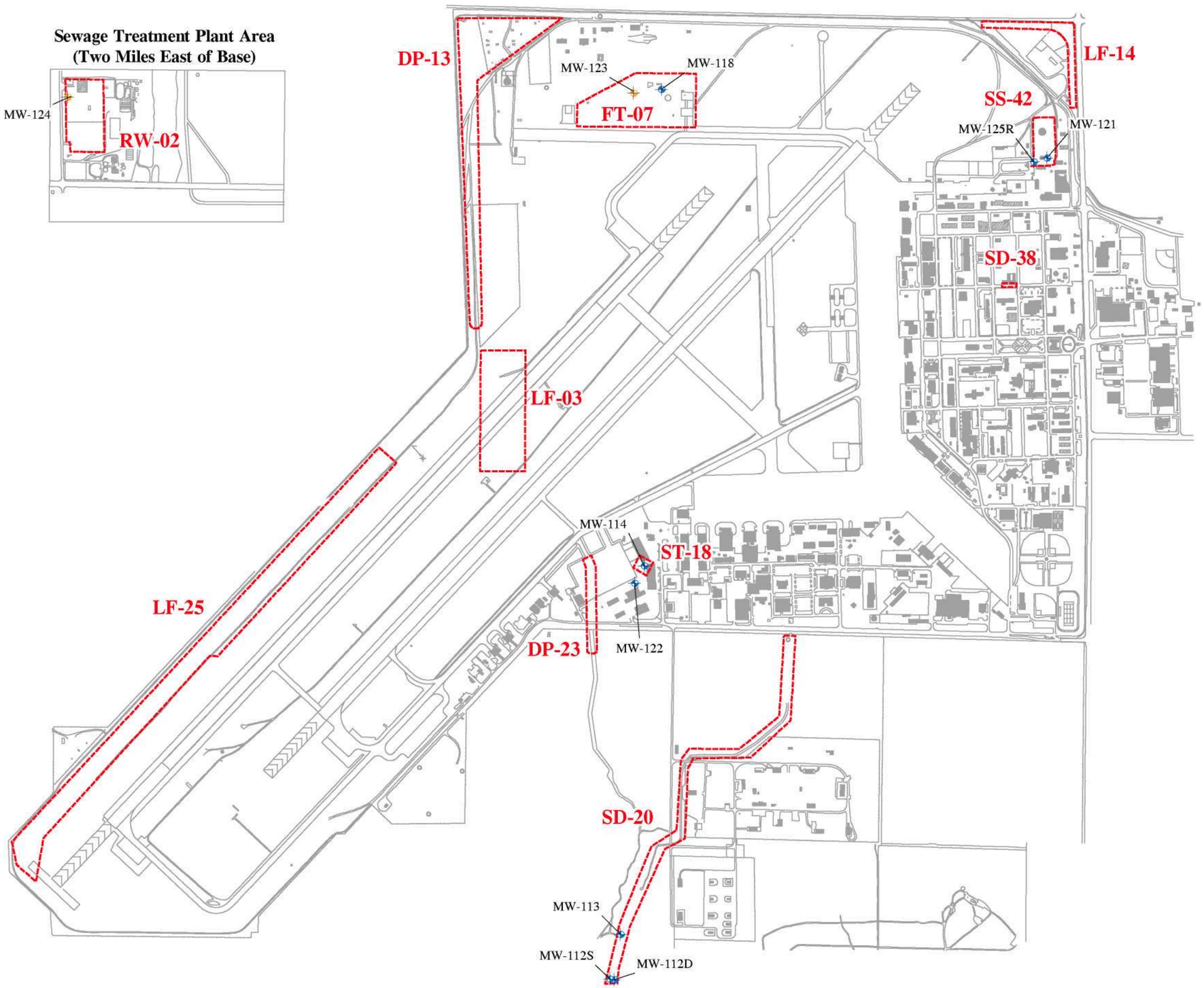
Figure 3.4
Site Layout Map

U.S. Air Force Center for Environmental Excellence



Legend

- Existing Structure
- Fence Line
- Miscellaneous Basemap Feature
- Monitoring Well
- Collapsed Well
- Project Potential Sources of Contamination (PSCs)

N

0 650 1,300 2,600
Feet

Filename: X:/AFC002/Luke_AFB/TO_57/MAPS/
2nd 5 Year Review/Site_Layout_Map.mxd
Project: AFC002-057-02-05
Revised: 02/15/07 CV
Source: Luke AFB Base General Plan

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