ENTERED

DEPARTMENT OF THE AIR FORCE
27TH SPECIAL OPERATIONS CIVIL ENGINEER SQUADRON (AFSOC)
CANNON AIR FORCE BASE NEW MEXICO

DEC 2 7 2010

Ronald A. Lancaster
Chief, Asset Management
506 N DL Ingram Blvd
Cannon AFB NM 88103-5003

Ms Patricia Stewart
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East Bldg 1
Santa Fe NM 87505-6063

Dear Ms Stewart

Attached is the 2010 Biennial Groundwater Monitoring and Annual Landfill Inspection Report for Landfill 3 (SWMU 105), Landfill 4 (SWMU 104), Landfill 25 (SWMU 97), and Sewage Lagoons (SWMU 101) Cannon Air Force Base, New Mexico for your review and approval.

If you have any questions regarding this submittal please contact our office at (575) 784-1146 or 1092.

Sincerely

RONALD A. LANCASTER, GS-13

Attachment:
2010 Biennial Groundwater Monitoring and Annual Landfill Inspection Report (2)

cc:
New Mexico Environment Department, Mr David Cobrain (w/o Attachment)
Environmental Protection Agency, Region VI, Ms Wendy Jacques (w/o Attachment)

2010 iennial Groundwater Monitoring and Annual Landfill Inspection Report Landfill No 3 (LF-03/SWMU 105) Landfill No 4 (LF-04/SWMU 104) Landfill No 25 (LF-25/SWMU 97) and Sewage Lagoons (SWMUI 101) Cannon Air Force ase New Me ico

Final
Decem er 2010

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Prepared for:

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Cannon Air Force Base, New Mexico

U.S. Army Corps of Engineers
Omaha District

Prepared by:

Tetra Tech, Inc.
143 Union Boulevard
Lakewood, Colorado 80228

Trinity Analysis and Development Corp.
90 NW Beal Parkway, Suite A2
Fort Walton Beach, FL 32548

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This report presents the findings of the annual 2009 and 2010 vegetative cover system inspections and analytical results of the 2010 biennial long-term groundwater monitoring event at four Environmental Restoration Program (ERP) sites on Cannon Air Force Base, New Mexico. Annual cover inspection and biennial groundwater sampling were conducted at LF-03 (Solid Waste Management Unit [SWMU] 105), LF-04 (SWMU 104), LF-25 (SWMU 97), and the Sewage Lagoons (SWMU 101). During the 2009 and 2010 inspections, the cover systems at the four sites were observed to be in good to excellent condition with no noted deficiencies or required repair. Slight exceedances of applicable groundwater standards were reported in two wells. Annual cover system inspections will be conducted in 2011 and 2012, and the next biennial groundwater sampling event will be conducted in 2012.

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LIST F ACR N MS AND A REVIATI NS

ACM	asbestos-containing material
AFB	Air Force Base
°F	degrees Fahrenheit
CMS	Corrective Measures Study
DO	dissolved oxygen
EPA	U.S. Environmental Protection Agency
ERP	Environmental Restoration Program
ft	foot/feet
LTM	Long-Term Groundwater Monitoring
M&M Plan	Monitoring and Maintenance Plan
MCL	maximum contaminant level
mg/L	milligrams per liter
MS/MSD	matrix spike/matrix spike duplicate
msl	mean sea level
mV	millivolt
µg/L	micrograms per liter
µmhos/cm	micromhos per centimeter
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NTU	nephelometric turbidity unit
ORP	oxidation-reduction potential
QED	QED Environmental Systems
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SMCL	Secondary Maximum Contaminant Level
SWMU	Solid Waste Management Unit
Tetra Tech	Tetra Tech, Inc.
TOC	top of casing

LIST F ACR N MS AND A REVIATI NS (C NCLUDED)

USGS	U.S. Geological Survey
VOC	volatile organic compound
WQCC	Water Quality Control Commission

E ECUTIVE SUMMAR

Annual vegetative cover inspection and biennial long-term groundwater monitoring (LTM) activities required by the New Mexico Environment Department (NMED) were conducted at four Environmental Restoration Program (ERP) sites on Cannon Air Force Base (AFB). Monitoring, inspection, and reporting activities were completed at LF-03 (Solid Waste Management Unit [SWMU] 105), LF-04 (SWMU 104), LF-25 (SWMU 97), and the former Sewage Lagoons (SWMU 101) in accordance with an approved monitoring and maintenance plan. The inspection and monitoring activities were performed for NMED and the U.S. Army Corps of Engineers, Omaha District, under Contract No. FA4890-04-D-0006, Task Order DK02.

This report summarizes and documents the findings of the 2009 and 2010 annual cover inspections and analytical results of the 2010 biennial LTM sampling event at the four sites. The following activities were conducted:

1. Inspection of the vegetative cover systems to ensure they function as designed and meet operational objectives. Cover inspections were performed on November 9 and 10, 2009, and on October 23, 2010.

2. Groundwater monitoring of wells associated with the sites, including gauging, groundwater sample collection, and analysis, to evaluate potential impacts to groundwater quality. Groundwater sampling activities were conducted from November 1 through 5, 2010.

In 2009 and 2010, the vegetative cover system at each site was observed to be in good to excellent condition with no noted deficiencies or required repair. Groundwater analytical results from the 2010 biennial LTM sampling event indicate slight exceedances of applicable groundwater standards for nitrate nitrogen and nitrate-nitrite nitrogen in one well and lead in one well.

Annual cover inspections will be performed at the sites in 2011 and 2012, and the next biennial LTM sampling event will be conducted in 2012. A summary report of the findings will be submitted to NMED prior to December 31, 2012.

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1 INTR DUCTI N

This report presents the activities and results of annual vegetative cover inspection and biennial long-term groundwater monitoring (LTM) at four Environmental Restoration Program (ERP) sites on Cannon Air Force Base (AFB), located near Clovis, New Mexico (Figure 1). The inspection and monitoring activities were conducted at the named sites in accordance with the approved *Long-Term Monitoring and Maintenance Work Plan, Landfill No. 3 (SWMU 105), Landfill No. 4 (SWMU 104), Landfill No. 25 (SWMU 97), and the Sewage Lagoons (SWMU 101)* (M&M Plan) (Tetra Tech and Brown, Burdine, & Associates, LLC, 2009). The locations of the four sites are shown on Figure 2. Descriptions of the site cover systems and information on site background and history are provided in Section 2.

The vegetative cover systems were established to minimize percolation and leachate production and prevent potential impacts to groundwater beneath each site. The New Mexico Environment Department (NMED) requires annual inspection of the covers to ensure they function as designed and meet operational objectives. A description of the cover system constructed at each of the four sites is provided below:

- Landfill No. 3 (LF-03). A single-layer soil cover was constructed over the former 9-acre landfill. The cover surface is flat to slightly hummocky and has no defined drainage pathways. No evidence of wind or water erosion is present. Limited areas of subsidence are visible that are likely associated with linear waste burial trenches. Established vegetation accounts for approximately 95 percent of the cover surface; the remaining 5 percent is characterized by sparse vegetation or exposed soil. The vegetation consists mostly of summer annuals and a variety of grasses. Perennials typical of prairie grasslands are scattered sparsely among the annuals and grasses and represent approximately 20 percent of the total cover.

- Landfill No. 4 (LF-04). A single-layer soil cover surrounded by an earthen berm was constructed over the 7-acre former landfill. The cover surface is flat to slightly hummocky and has no defined drainage pathways. No significant evidence of wind or water erosion is present. Limited areas of subsidence are visible that are likely associated with linear waste burial trenches. Established vegetation accounts for approximately 95 percent of the cover surface; the remaining 5 percent is characterized by sparse vegetation or exposed soil. The vegetation consists mostly of summer annuals and a variety of grasses. Perennials typical of prairie grasslands are scattered sparsely among the annuals and grasses and represent approximately 20 percent of the total cover.

- Landfill No. 25 (LF-25). A 6-inch-thick, graded topsoil cover was installed over the 32-acre former landfill. A 2-foot (ft)-high earthen berm is present along the southern and eastern borders of the cover, and near the northeastern corner concrete slabs (rip-rap) have been placed to control erosion. Minor soil slumping has occurred on a slope near the northern end of the former landfill; however, no exposed waste is present. The cover surface slopes from north to south and encompasses multiple rubble piles that vary in height across the site and reach a maximum of 15 ft in the northern portion of the unit. Most of the rubble piles

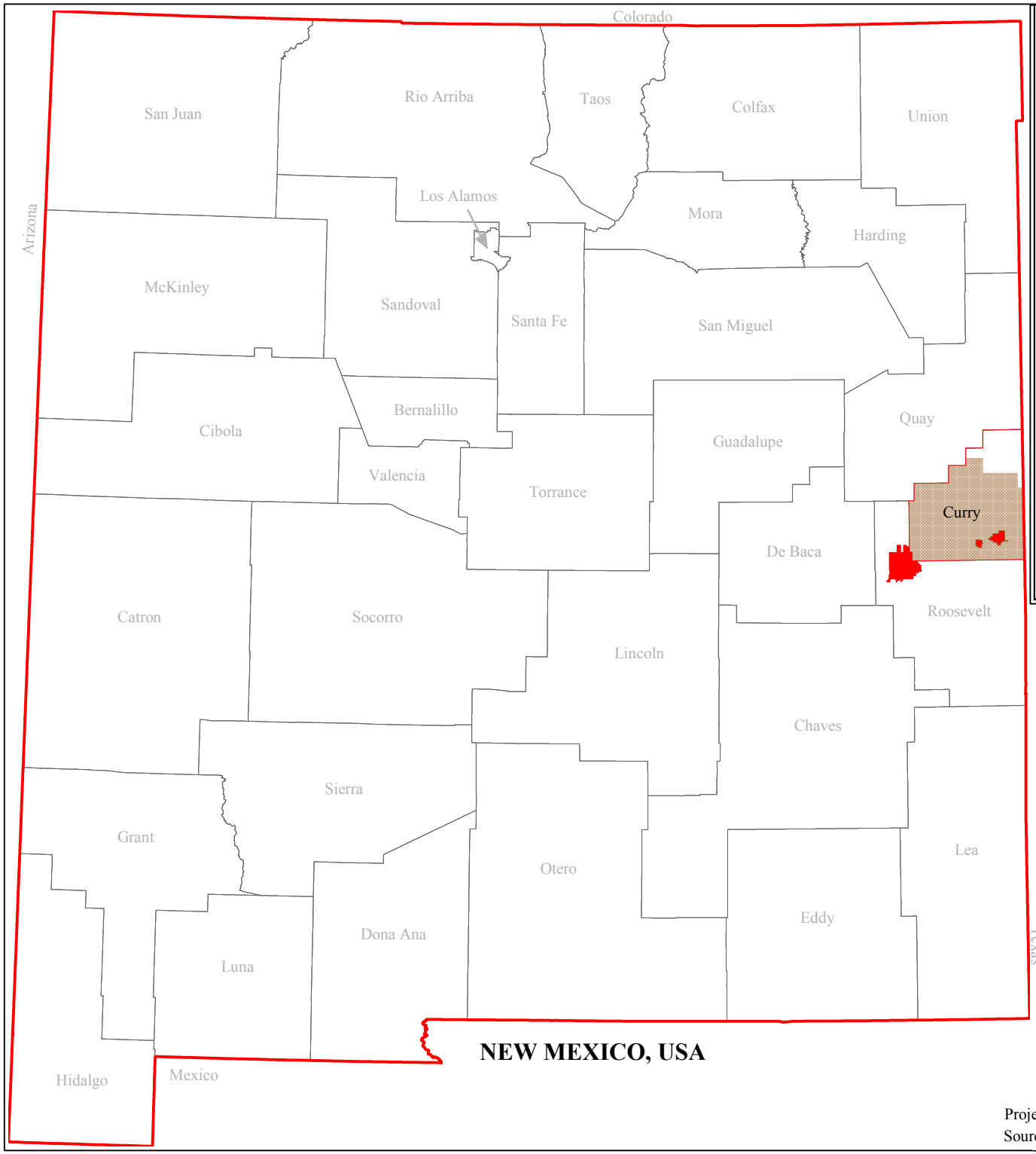
are approximately 3 to 4 ft high. The oldest piles of rubble are present on the northern and western areas of the cover and are covered with grasses, shrubs, and small trees. The northernmost half of the landfill cover supports numerous trees of various sizes in addition to ground cover. Vegetation covers approximately 60 to 70 percent of the surface and is dominated by grasses; small areas containing summer annuals and perennials are scattered throughout. Small amounts of exposed concrete, glass, and gravel lie on the surface but do not appear to be associated with active erosion. A three-strand barbed-wire fence with gates and signage surrounds the site.

- Sewage Lagoons. A 20-acre, 42-inch-thick engineered earthen cover system with a biotic barrier was constructed over the former south lagoon area. The cover consists of an 18- to 21-inch-thick earthen soil-barrier layer; an 18-inch-thick biota barrier of recycled, crushed concrete; and a 6-inch erosion/vegetation layer. The cover is designed to direct stormwater flow off the site into a ditch located to the south of the former lagoon (near well MW-H). No visible signs of erosion are present at any location across this site. The dominant vegetation consists of summer annuals (80 percent) and varieties of grasses (20 percent). Perennial varieties were scattered sparsely among the annuals and grasses. Vegetative cover was estimated to be 95 percent across this site. A few small trees were observed at the western end of this site. A five-strand barbed-wire fence was installed on the northern boundary of the capped area to separate the north and south lagoons and control access. This fence was tied in with the existing fencing that had been installed around the other sides of this site.

The annual cover inspections at LF-03, LF-04, LF-25, and the Sewage Lagoons were performed on November 9 and 10, 2009, and on October 23, 2010, to document the condition of the cover system at each site. The entire cover system was thoroughly examined by field personnel as described in Section 3. Results of the 2010 inspection at each site were documented in Appendix A. Photographs and location coordinates documenting the 2010 cover condition at each site were acquired during the inspections and are presented in Appendix B. The results of the 2009 annual cover inspection are presented in Appendix E.

Depth-to-water was measured at the 12 wells included in this program. A groundwater elevation map and hydrograph were developed based on the 2010 gauging data. Previous investigations indicate that well MW-Oa is downgradient of LF-03, well MW-Na is downgradient of LF-04, wells MW-Ra and MW-Pa are downgradient of LF-25, and wells MW-G and MW-H are downgradient of the Sewage Lagoons. Wells MW-E and MW-F are upgradient of one or more of the sites. Groundwater flow in the vicinity of the landfills and former Sewage Lagoons is discussed in Section 4.

Groundwater samples were collected and analyzed as described in Section 5. The 2010 biennial LTM sampling event was performed at wells MW-Na, -Oa, -Pa, -E, -F, -G, and -H between November 1 and 5, 2010. Groundwater samples were analyzed for volatile organic compounds (VOCs), total Priority Pollutant metals, total mercury, trivalent and hexavalent chromium, nitrate and nitrate-nitrite nitrogen, and perchlorate.



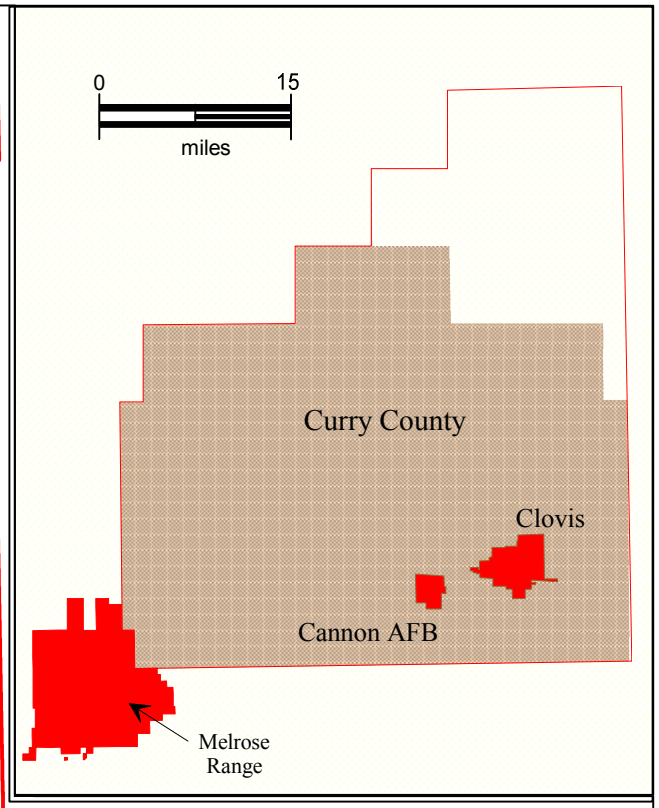
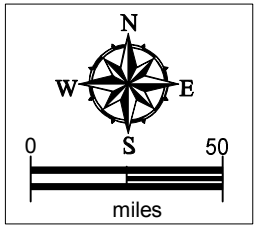


FIGURE 1.
Site Location

Cannon Air Force Base

Curry County, New Mexico



Projection: UTM meters, NAD 83
Source files: New Mexico Resource Geographic Information System Program

Trinity Analysis and Development Corp.

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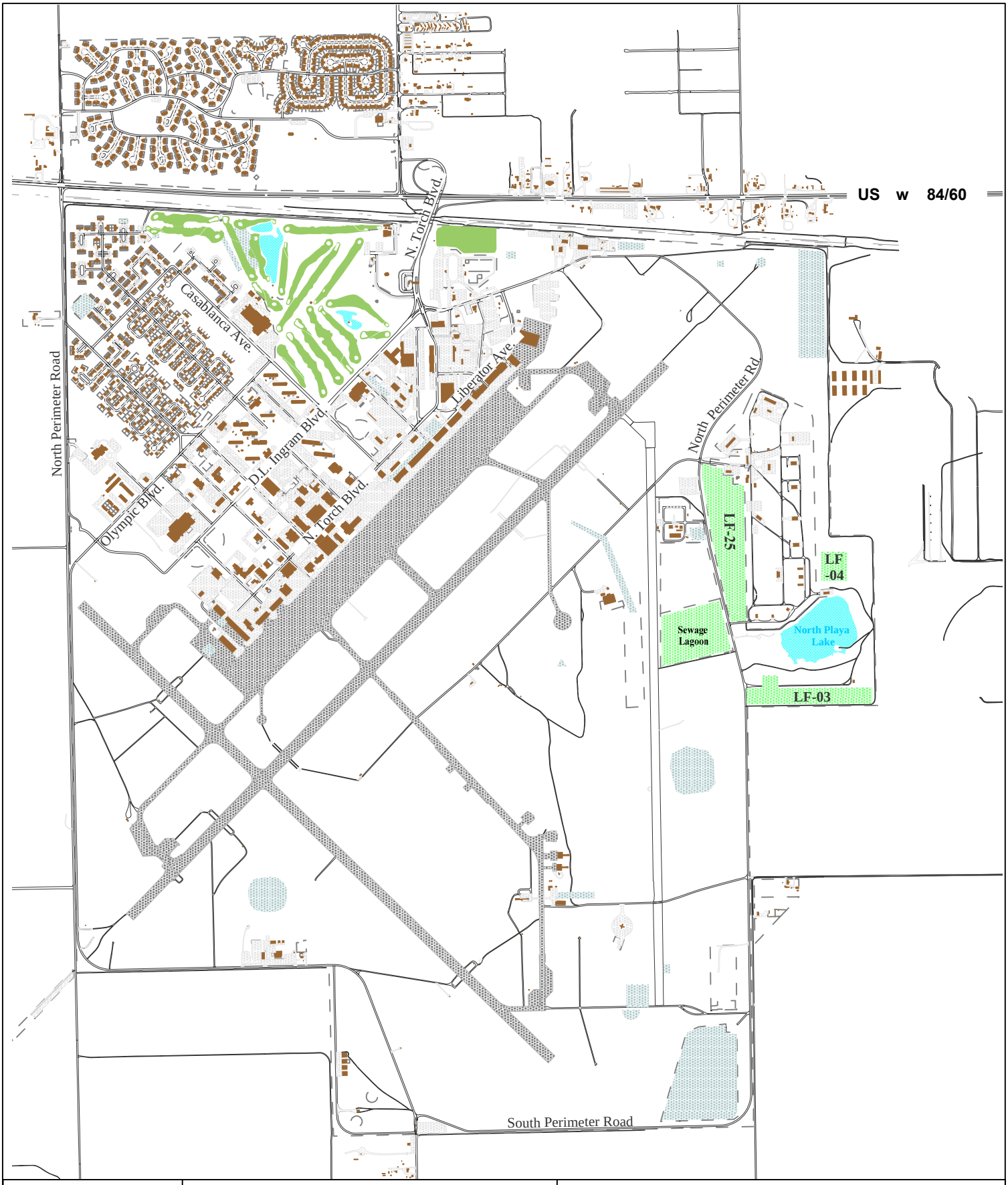

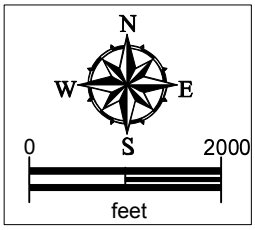

NOTES

ERP Site/SWMU

ERP LTM Sites

Existing building

Airfield surface

Digital data files provided by GeoBase/CAFB

Projection: UTM Zone 13N, NAD 83

FIGURE 2.
Plan View

Cannon Air Force Base

Curry County, New Mexico

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Data tables summarizing the analytical results are presented Section 5. Water quality field data forms and laboratory analytical data as reported and submitted by TestAmerica, Inc. are contained in Appendix C. A data validation summary report for the 2010 biennial sampling event is presented in Appendix D.

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2 SITE DESCRIPTI N AND IST R

Cannon AFB is located in Curry County, New Mexico, approximately 7 miles west of the city of Clovis (Figure 1). Cannon AFB occupies 4,320 acres that consist primarily of the airfield and associated operations, maintenance, and support facilities that are located northwest of the airfield. Housing facilities are located in the former northwestern portion of the Base, west of U.S. Highway 277 and north of U.S. Highway 60. Additional Base support facilities, such as the munitions storage area and current fire department training area, are located south and east of the airfield.

The following sections describe the operational history of the sites and associated cover systems.

2 1 LF-03 istor and Site Description

This section provides a brief background and history of LF-03 based on the results of Resource Conservation and Recovery Act (RCRA) Facility Investigations (RFIs) conducted at the site. This site was investigated along with LF-04 during the Appendix I, Phase I RFI (Radian, 1994a). A detailed summary of the site's background and history, results of previous investigations, corrective measures, and status is presented in the *RCRA Facility Investigation Report for Landfill No. 3 (LF-03/SWMU 105), Landfill No.4 (LF-04/SWMU 104), and Landfill No. 25 (LF-25/SWMU 97)* (HGL, 2006).

LF-03 is an inactive landfill formerly used for burn and disposal trenching operations. The 9-acre site is an open field located in the east-central portion of Cannon AFB and is bounded to the north by a road leading to the transmitter tower, to the south and east by barbed-wire fences and agricultural fields, and on the west by Perimeter Road. The ground surface of the soil cover is slightly hummocky and is covered with prairie grasses. Limited shallow areas of subsidence are visible and associated with the waste burial trenches at the landfill. Playa Lake, which lies approximately 450 ft north of LF-03, is the closest surface water body to the former landfill. The location of the site with respect to the surrounding facility is shown in Figure 2.

The landfill was operated from 1959 to 1967 and was reported to have received domestic and industrial wastes including solvents, paints, thinners, waste oils, and peroxide containers. Disposal activities consisted of placing collected waste material into a trench, burning the accumulated waste, and then covering the burned material with soil the following day. The disposal trench excavations were reported to be up to 16.5 ft deep and over 250 ft in length. The amount of waste material disposed within the landfill trenches has not been determined. No waste disposal activities are known to have occurred for over 40 years. Subsurface investigations documented waste material such as soda and beer bottles, plastic sheeting and bags, clothing, a synthetic rubber machinery belt, Styrofoam, scrap metal, insulated and non-insulated wiring, and a crushed 5-gallon can with no lid. Consistent with historical waste disposal operations, both burned and unburned materials have been encountered in the burial trenches during site investigations.

2 2 LF-04 istor and Site Description

This section provides a brief background and history of LF-04 based on the results of RFIs conducted at the site. This site was investigated along with LF-03 during the Appendix I, Phase I

RFI (Radian, 1994b). A detailed summary of the site's background and history, results of previous investigations, corrective measures, and status is presented in the *RCRA Facility Investigation Report for Landfill No. 3 (LF-03/SWMU 105), Landfill No.4 (LF-04/SWMU 104), and Landfill No. 25 (LF-25/SWMU 97)* (HGL, 2006).

LF-04 is an inactive landfill formerly used for burn and disposal trenching operations. The 7-acre site is located in the east-central portion of Cannon AFB and lies approximately 800 ft west of the Munitions Storage Area and is bounded to the north by Perimeter Road, to the west by a barbed-wire fence, and to the east and south by vacant fields. The site is an open field covered with prairie grasses. Limited shallow areas of subsidence are visible and are associated with the waste burial trenches at the former landfill. A constructed earthen berm surrounds the landfill site, providing additional erosion control and containment. Playa Lake, which lies approximately 1,000 ft south of LF-04, is the closest surface water body to the former landfill. The location of the site with respect to the surrounding facility is shown in Figure 2.

The 7-acre landfill was operated for one year from 1967 to 1968. The landfill reportedly received domestic and industrial wastes including solvents, paints, thinners, waste oils, and peroxide containers. Disposal activities consisted of placing collected waste material into a trench, burning the accumulated waste, and then covering the burned material with soil the following day. The disposal trench excavations were reported to be up to 16.5 ft deep and over 250 ft in length.

The amount of waste material disposed within the landfill trenches has not been determined. No waste disposal activities are known to have occurred for over 40 years. Subsurface investigation activities encountered waste materials such as glass, soda and beer cans, clothing, plastic sheeting and bags, scrap metal, insulated and non-insulated wiring, and one crushed 5-gallon can.

2 3 LF-25 istor and Site Description

This section provides a brief background and history of LF-25 based on the results of RFIs conducted at the site. This site was investigated during the Appendix I, Phase I RFI (Radian, 1994c). A detailed summary of the site's background and history, results of previous investigations, corrective measures, and status is presented in the *RCRA Facility Investigation Report for Landfill No. 3 (LF-03/SWMU 105), Landfill No.4 (LF-04/SWMU 104), and Landfill No. 25 (LF-25/SWMU 97)* (HGL, 2006).

LF-25 is an inactive construction and demolition debris landfill located in the east-central portion of Cannon AFB. The former landfill covers a 32-acre area roughly trapezoidal in shape, located east of Perimeter Road and approximately 500 ft northwest of Playa Lake. The topography of the LF-25 area slopes from north to south. The site encompasses multiple rubble piles that vary in height and reach a maximum of 15 ft in the northern portion of the unit. Most of the rubble piles are approximately 3 to 4 ft high. The oldest piles of rubble are present on the northern and western portions of the unit and are covered with grasses, shrubs, and small trees. A 2-ft-high permanent earthen berm is present adjacent to the southern and eastern borders of the unit to prevent stormwater runoff from leaving the site. Near the northeastern corner of the site, Base personnel have placed concrete slabs (rip-rap) to control erosion. The landfill location with respect to the surrounding facility is shown in Figure 2.

The landfill was used as a waste disposal site from approximately 1945 through the 1980s, but the exact period of operation is unknown. After World War II, construction demolition debris was disposed at the former landfill. The accumulation of debris within the former concrete rubble pile is unknown but is believed to have begun around 1961. The debris consisted of concrete, wood, asbestos tiles, metal, transite and cement pipe, and asphalt mixed with soil. Trenches excavated during a 1990 environmental assessment revealed the majority of material was airfield pavement and subgrade material, followed by building demolition rubble. Glass, metal, cinders, ash, and other burned material were encountered in what appeared to be burn trenches.

In 2001 exposed non-friable asbestos-containing material (ACM) was observed at the site. Remediation activities associated with asbestos removal were conducted in 2000 as documented in the Construction Completion Report (Foster Wheeler Environmental, 2001a). Approximately 56 cubic yards of ACM and 16,000 cubic yards of concrete rubble waste were removed from LF-25. Other remedial activities conducted at the site included tree trimming, tree removal, recycling of concrete debris, and site grading. A permanent earthen berm was constructed to a height of 2 ft above the ground surface along the former landfill's southern and eastern edges to prevent stormwater runoff from leaving the site. Final site contours act to retain and control stormwater runoff.

A 6-inch-thick topsoil cover was installed using clean fill generated from site grading to minimize percolation through the landfill, leachate production, and potential impacts to groundwater. The cover system was revegetated by seeding and mulching with native grasses using an approved seed mix. A three-strand barbed-wire fence with gates and signage was installed around the site boundary. Cover construction was completed in June 2001. Cover construction activities are documented in the Construction Completion Report (Foster Wheeler Environmental, 2001a).

2 4 Sewage Lagoons istor and Site Description

The former Sewage Lagoons were constructed in 1966. The location of the former Sewage Lagoons site with respect to the surrounding facility is shown in Figure 2. The lagoons consisted of two unlined surface impoundments that received combined sanitary and industrial wastewater from Base facilities. The north and south lagoons had concrete-lined banks and unlined earthen bottoms, operated in series, and had a combined surface area of approximately 39 acres. In 1998, a new wastewater treatment plant was put in operation at Cannon AFB. Although sewage discharge to the lagoons stopped in 1998, the Base continued to discharge treated wastewater to the lagoons in order to prevent direct exposure to the underlying sludge. In early 1998 the Base stopped discharging treated wastewater to the lagoons and allowed them to dry.

SWMU 101 was investigated in 1992 during the Appendix I RFI (Woodward-Clyde, 1992). Based on the results the lagoons were recommended for continued annual groundwater monitoring. A Corrective Measures Study (CMS) for closure identified potential corrective actions (Foster Wheeler Environmental, 2001b). Human health and ecological risk assessments were conducted as part of the CMS to determine the requirements for contaminant containment and source control. The CMS recommended sludge removal from the former north lagoon, in-place consolidation in the former south lagoon, and closure using an engineered cover with a biotic barrier as voluntary corrective actions for closing the lagoons. The same economical solution to close the lagoons permanently was identified in two reports, *Sludge Management, Compliance Evaluation, and Requirements Identification Phase*

III (E&E, 1998) and *Sewage Lagoons Closure Final Specifications* (USACE, 2002). The solution involved dewatering, consolidation, and compaction of the contaminated material, followed by installation of a protective cover. The cover design assumed that the contaminated medium at the site consisted of approximately 2 ft of sludge overlying a 1-ft-thick layer of soil.

In 2003, a voluntary corrective measure was implemented at SWMU 101 to construct an engineered earthen cover to minimize any potential threat to human health and the environment from contaminated material within the lagoons. Sludge and the underlying contaminated soil from the north lagoon were excavated and consolidated into the south lagoon. The south lagoon area was then graded and compacted to prepare a substrate. Finally, a 20-acre engineered earthen cover system with a biotic barrier was installed over the south lagoon area to reduce infiltration of moisture into the underlying layer of contaminated material.

The Construction Completion Report (Foster Wheeler Environmental, 2006) documents the activities conducted to complete the voluntary remedial action at the former Sewage Lagoons. The preliminary construction activities included grading and drainage construction and demolition and removal of concrete and piping. Contaminated media were then excavated from the former north lagoon area followed by in-place consolidation of excavated material, random fill, and grading in the south lagoon area. The cover consists of an 18- to 21-inch-thick earthen soil-barrier layer; an 18-inch-thick biota barrier of recycled, crushed concrete; and a 6-inch-thick erosion/vegetation layer. A drainage ditch surrounds the cover to prevent stormwater runoff from leaving the site. In April 2004, the cover was revegetated by seeding with native species. A five-strand barbed-wire fence was installed on the northern boundary of the capped area to separate the north and south lagoon areas and control access. This fence was tied in with the existing fencing that had been installed around the other sides of the site.

3 LANDFILL C VER INSPECTI N

This section presents the results of the 2009 and 2010 annual vegetative cover systems inspections. The 2009 inspection was conducted on November 9 and 10, 2009, and the 2010 inspection was performed on October 23, 2010.

The annual vegetative cover inspections consisted of physically walking, observing, and documenting the current condition of the cover systems at each of the three landfills and the south lagoon area. The review included descriptions of the vegetation and any associated drainage and erosion control features. The perimeter fence, gates, and signage were included in the inspection if present at the site. The locations of the sites that were inspected are shown on Figure 3.

Each landfill cover was thoroughly examined by field personnel walking side-by-side in successive swaths to ensure current conditions were observed over the entire cover and that all components were inspected. Field observations pertaining to the inspections were recorded on the Cover System Inspection Reports for LF-03, LF-04, LF-25, and the Sewage Lagoons. The 2010 inspection reports are provided in Appendix A and photographic documentation of the inspection is contained in Appendix B. Complete documentation of the 2009 annual inspection is provided in Appendix E.

3 1 LF-03 (SWMU 105)

3.1.1 Items of Interest/Noted Deficiencies

The LF-03 vegetative cover was observed to be in generally good condition during the 2009 and 2010 inspections. The topographic surface was relatively flat to slightly hummocky; no defined drainage pathways were evident on the cover surface or in the area surrounding the former landfill site, nor was there evidence of wind or water erosion.

Vegetation dominated the landfill cover, consisting mostly of summer annuals and a variety of grasses. Perennial varieties typical of the Southern High Plains were scattered sparsely among the annuals and grasses and represented approximately 20 percent of the total cover. The total extent of vegetative cover over LF-03 was estimated to be 95 percent in 2010, providing substantial erosion control. Exposed soil was isolated and very limited in extent. These conditions are consistent with the results of the previous annual inspection in 2008 (Tetra Tech and Brown, Burdine, & Associates, LLC, 2008) and 2009 (Appendix E). Photographs and location coordinates documenting landfill cover conditions in 2010 are provided in Appendix B.

Limited areas of subsidence were visible and likely associated with linear waste burial trenches at the former landfill. The approximate dimensions of these depressions were documented during the 2010 inspection and compared to measurements recorded during the 2008 and 2009 inspections. Consistent with 2009 inspection (Appendix E), seven subsidence features and three minor depressions were observed. The linear subsidence features were 200 to 500 ft long, 10 to 30 ft wide, and up to 24 inches deep. These areas were all well vegetated and exhibited no evidence of recent subsidence or other changes. No adverse effects to the function or overall effectiveness of the landfill cover system were observed as a result of these features. These features and shallow depressions are further documented in Appendix B (2010) and Appendix E (2009).

3.1.2 Photographic Record

Photographs were taken to document the condition of the cover system in October 2010. The complete photographic record of the cover system, including status of vegetation and topographic features, is included in Appendix B. The results of the 2009 inspection are presented in Appendix E.

3.1.3 Other Monitoring and Maintenance Activities

No maintenance or repair of the cover system was required based on conditions observed at the time of the 2009 or 2010 inspections. Because they pose a potential concern to the integrity and function of the landfill cover, areas of historical subsidence will continue to be monitored in accordance with the M&M Plan. Conditions in 2010 indicate no further subsidence has occurred in the landfill cover since the last inspection in 2009.

3.1.4 Future Activities

Annual inspections will be performed in 2011 and 2012 to ensure the cover system continues to function as designed and meets operational objectives. The need for routine maintenance or repair will be evaluated during these inspections.

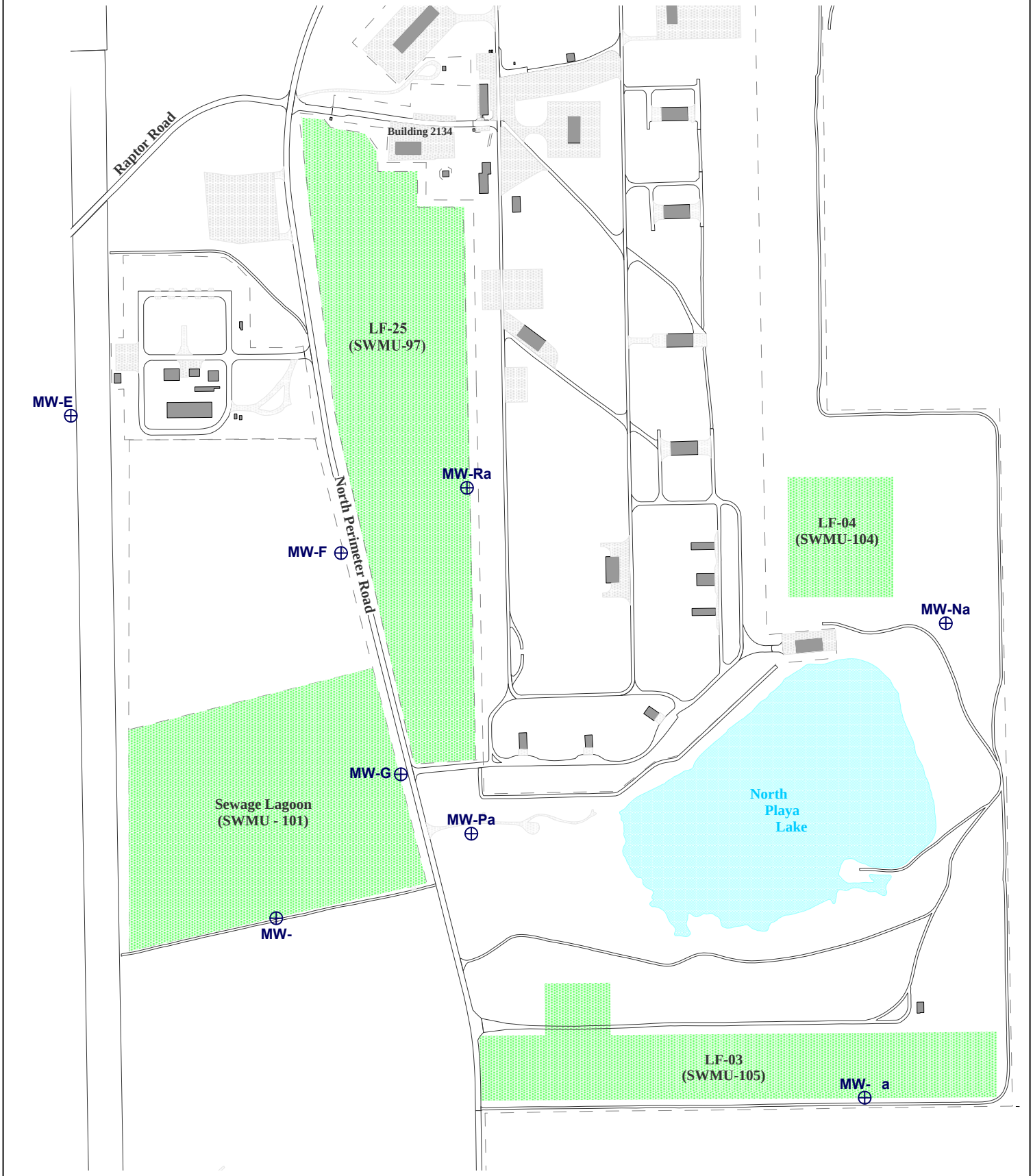
3 2 LF-04 (SWMU 104)

3.2.1 Items of Interest/Noted Deficiencies

The LF-04 cover system was observed to be in generally good condition during the 2009 and 2010 inspections. LF-04 is surrounded by a constructed earthen berm that prevents stormwater from flowing off site. The berm was in good condition and no evidence of ponding or leakage, either along the berm or adjacent to it, was noted. The topographic surface was flat to slightly hummocky within the berm, with no evidence of stormwater flow off site. Significant wind or water erosion was not evident at LF-04 during the inspections.

Vegetation dominated the landfill cover, consisting mostly of summer annuals and a variety of grasses. Perennial varieties typical of the Southern High Plains comprised approximately 20 percent of the cover and were sparsely scattered among the annuals and grasses. Total vegetative cover was 95 percent across LF-04 in 2010, providing substantial and sufficient erosion control. Additional erosion control was provided by the constructed earthen berm. Exposed soil was isolated and very limited in extent. These conditions are consistent with the results of the previous annual inspections in 2008 (Tetra Tech and Brown, Burdine, & Associates, LLC, 2008) and 2009 (Appendix E). Photographs and location coordinates documenting landfill cover conditions are provided in Appendix B.

Limited areas of subsidence were visible and likely associated with the linear waste burial trenches at the landfill. The approximate dimensions of these depressions were documented during the 2010 inspection and compared to measurements recorded during the 2008 and 2009 inspections. Consistent with the 2009 inspection (Appendix E), three features were identified, two nearly 600 ft long and one approximately 300 ft long. These north-south-oriented features were generally comparable in depth and width to those described for LF-03. No adverse effects to the function or overall effectiveness of the landfill cover system were observed as a result of the subsidence. These features are further documented in the photographic record contained in Appendix B (2010) and Appendix E (2009).



N
W E
S
0 500
feet

NOTES

ERP Sites/SWMUs

Long-Term Monitoring Wells

Digital data files provided by GeoBase/CAFB

Projection: UTM Zone 13N, NAD 83

FIGURE 3.
LF-03, -04, -25, and Sewage Lagoon
(SWMU 105, 104, 97, and 101)

Cannon Air Force Base

Curry County, New Mexico

Trinity Analysis and Development Corp.

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3.2.2 Photographic Record

Photographs were taken to document the condition of the LF-04 cover in October 2010. The complete photographic record of the cover system, including status of vegetation and topographic features, is included in Appendix B. The results of the 2009 inspection are presented in Appendix E.

3.2.3 Other Monitoring and Maintenance Activities

No maintenance or repair of the cover system was required based on conditions observed at the time of the 2009 or 2010 inspections. Because they pose a potential concern to the integrity and function of the landfill cover, areas of historical subsidence will continue to be monitored in accordance with the M&M Plan. Current conditions in 2010 indicate no further subsidence has occurred in the landfill cover since the last inspection in 2009.

3.2.4 Future Activities

Annual inspections will be performed in 2011 and 2012 to ensure the cover system continues to function as designed and meets operational objectives. The need for routine maintenance or repair will be evaluated during these inspections.

3 3 LF-25 (SWMU 97)

3.3.1 Items of Interest/Noted Deficiencies

The LF-25 cover system was observed to be in generally good condition during the 2009 and 2010 inspections. The site topography appears to generally conform to the contours shown on the topographic survey map produced after completion of cover construction. The final graded site topography in 2001 was reported to range from about 4,275 to 4,290 ft in elevation, reflecting 15 ft of relief across the site.

Vegetative cover was dominated by grasses, with small, scattered areas containing summer annuals and perennials typical of the Southern High Plains. The northernmost half of the landfill supported numerous trees of various sizes in addition to ground cover. Vegetation was estimated to cover approximately 60 to 70 percent of the landfill cover in 2010, providing generally sufficient erosion control. Small amounts of exposed concrete, glass, and gravel were observed, but did not appear to be the result of active erosion.

Minor soil slumping was observed on a slope near the northern end of the landfill; however, no exposed waste or other adverse consequences of the slumping were observed. A constructed earthen berm designed to contain stormwater on site protects the eastern and southern boundaries of the site. The berm was observed to be in excellent condition and evidence of periodic pooling of stormwater against the berm confirmed its effectiveness. The condition of rip-rap placed at the northern end of the cover was consistent with results of the previous inspections in 2008 (Tetra Tech and Brown, Burdine, & Associates, LLC, 2008) and 2009 (Appendix E). These features are further documented in the photographic record contained in Appendix B.

3.3.2 Photographic Record

Photographs were taken to document the condition of LF-25 in October 2010. The complete photographic record of the cover system features, including status of vegetation, topographic

features, and signage, is included in Appendix B. The results of the 2009 inspection are presented in Appendix E.

3.3.3 Other Monitoring and Maintenance Activities

No maintenance or repair of the cover system was required based on conditions observed at the time of the 2009 and 2010 inspections. Areas where soil slumping has been observed during previous inspections will continue to be monitored in accordance with the M&M Plan.

3.3.4 Future Activities

Annual inspections will be performed in 2011 and 2012 to ensure the cover system continues to function as designed and meets operational objectives. The need for routine maintenance or repair will be evaluated during these inspections.

3 4 Sewage Lagoons

3.4.1 Items of Interest/Noted Deficiencies

The cover system over the former south lagoon was observed to be in excellent condition during the 2009 and 2010 inspections. No visible signs of erosion were observed at any location across the site.

Dominant vegetation consisted of 80 percent summer annuals and 20 percent varieties of grasses. Perennial varieties typical of the Southern High Plains were sparsely scattered among the annuals and grasses. Vegetative cover was estimated to be 95 percent across the south lagoon area in 2010 and provides substantial and sufficient erosion control. A few small trees were observed at the western end of the site.

In 2003, the south lagoon area remediation—the construction of an engineered soil cover system—was completed. The topography of the soil cover observed in 2010 was consistent with the documented topography at the time remedial construction was completed. The cover is designed to direct stormwater flow off the site into a ditch located to the south of the former lagoon (near well MW-H). This stormwater ditch was in good condition and capable of conveying excess flow. The condition of all cover system components was consistent with results of the inspection in 2009 (Appendix E). These features are further documented in the photographic record contained in Appendix B.

3.4.2 Photographic Record

Photographs were taken to document the current condition of the south lagoon area in October 2010. The complete photographic record of the cover system features, including status of vegetation, topographic features, signage, and fencing, is included in Appendix B. The results of the 2009 inspection are presented in Appendix E.

3.4.3 Other Monitoring and Maintenance Activities

No maintenance or repair of the cover system was required based on conditions observed at the time of the 2009 or 2010 inspections. Aside from mowing to control the emergence of small trees, no components of the cover system were identified as areas of potential concern.

3.4.4 Future Activities

Annual inspections will be performed in 2011 and 2012 to ensure the cover system continues to function as designed and meet operational objectives. The need for routine maintenance or repair will be evaluated during these inspections.

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4 ASEWIDE AND SITE GR UNDWATER

4 1 asewide Groundwater

Cannon AFB is situated within the Southern High Plains physiographic region of New Mexico and is underlain by Ogallala Formation deposits. The water-bearing sediments of the Ogallala comprise the unconfined Southern High Plains aquifer, the principal potable water source for Cannon AFB and the surrounding area. Basewide groundwater levels were measured at 12 monitoring wells between October 30 and November 5, 2010 (Figure 4). Well construction details and elevation data for each well are presented in Table 1.

Ta le 1 Well Construction Details

Well No	Date Installed	Total Well Depth (ft)	Screened Inter al (ft)	T C Ele ation (ft a o e msl)	Stic up (ft)	Ground Surface Ele ation (ft a o e msl)
MW-E	11/17/1985	373.00	15.00	4,282.61	2.91	4,279.70
MW-F	11/19/1985	375.00	15.00	4,278.50	3.57	4,274.93
MW-G	11/10/1985	372.00	15.00	4,279.55	3.09	4,276.46
MW-H	11/18/1985	375.00	15.00	4,278.98	3.00	4,275.98
MW-Oa	02/29/2004	365.00	60.00	4,271.07	0.96	4,270.11
MW-Na	12/16/2004	358.00	60.00	4,268.40	2.40	4,266.00
MW-Pa	02/21/2004	360.00	60.00	4,271.82	0.97	4,270.85
MW-Ra	06/29/2001	311.00	30.00	4,275.31[1]	3.00	4,272.31
MW-T	12/10/1998	365.00	40.00	4,262.69	1.87	4,260.82
MW-V	08/08/2001	370.00	60.00	4,326.41	1.59	4,324.82
MW-W	06/01/2002	365.00	60.00	4,299.03	2.08	4,296.95
MW-X	02/26/2004	336.00	40.00	4,266.00	1.24	4,264.76

[1] The top of casing (TOC) elevation for MW-Ra could not be obtained; the approximate elevation was calculated from the known ground surface elevation.

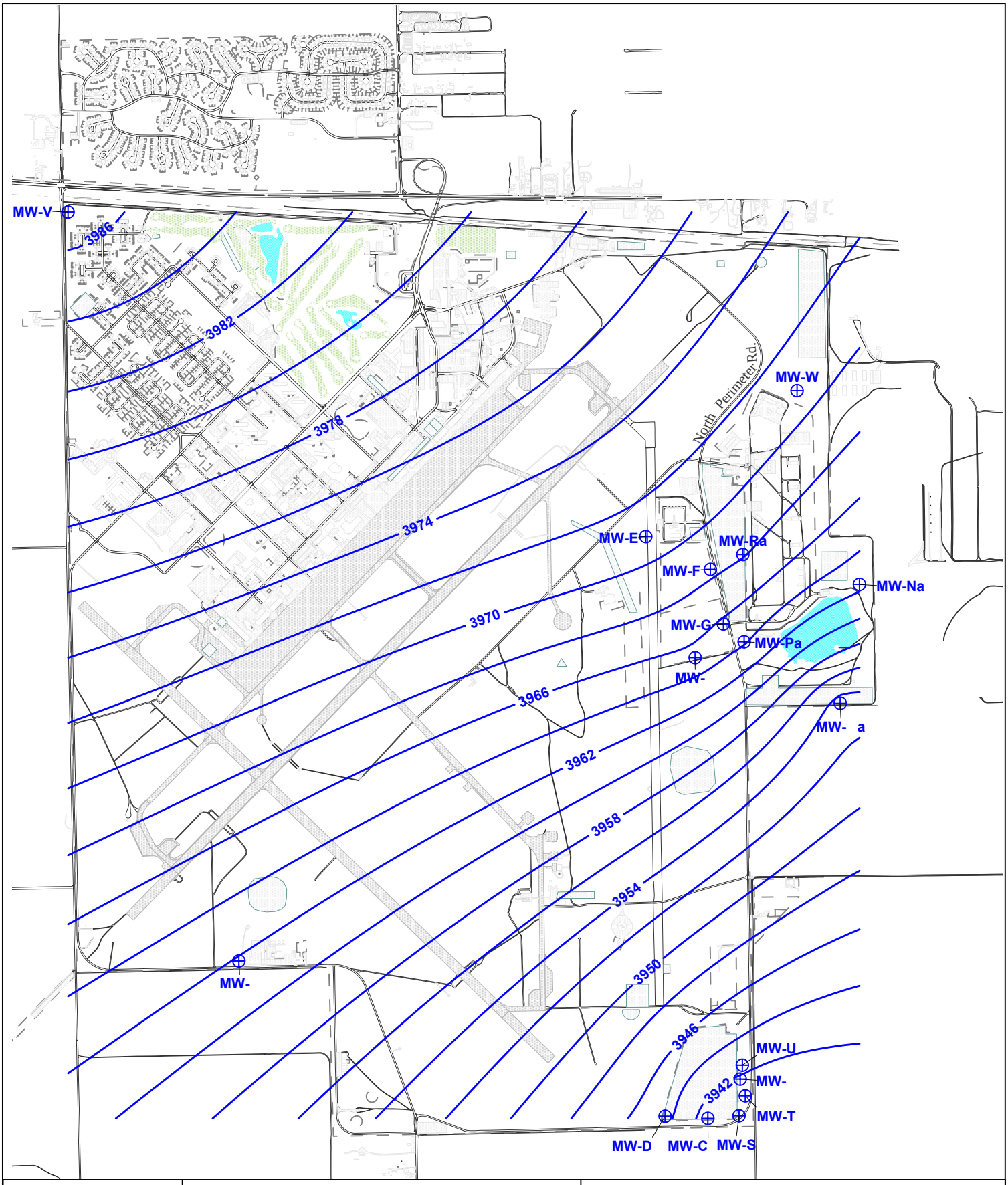
The calculated groundwater elevations ranged from 3,987.06 ft above mean sea level (msl) at MW-V (northwestern corner of the Base) to 3,940.18 ft above msl at MW-T (southeastern corner). Water levels were recorded in feet below the top of casing (TOC) elevation and used to construct a groundwater elevation and potentiometric flow map (Figure 4). The groundwater flow direction generally follows surface topography, moving in a southeasterly trend across the Base.

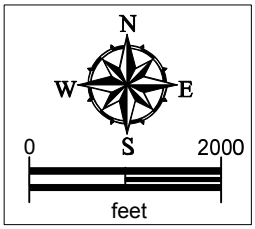
Groundwater elevation data for each well are listed in Table 2. These data were used to construct a hydrograph for the period from 1993 through 2010 (Figure 5). Water level data from U.S. Geological Survey (USGS) Scientific Investigations Report 2006-5280 (USGS, 2006) and Base gauging data demonstrate the significantly declining water table beneath Cannon AFB (Table 2 and Figure 5).

4 2 Groundwater at LF-03 LF-04 LF-25 and the Sewage Lagoons

Monitoring wells MW-Oa, MW-Na, MW-Pa, and MW-Ra are located southeast and downgradient of their respective landfills (Figure 4). Wells MW-E and MW-F are located upgradient of the sites,

and wells MW-G and MW-H are sidegradient and downgradient of the former Sewage Lagoons (Figure 4). As shown on the hydrograph (Figure 5) and Table 3, groundwater elevations measured in wells at LF-03, LF-04, LF-25 and the Sewage Lagoons are declining at rates between 1.68 and 2.99 ft per year. Based on the 2010 water levels (Table 3), the remaining saturated thickness is estimated to range between 43.33 and 63.41 ft in seven of the wells. The remaining saturated thickness in well MW-Ra is estimated to be approximately 6 ft.





NOTES

3976 Water table elevation contours (feet NAVD 88)

Top of casing elevations derived from USGS Report 2006-5280
MW-X omitted from calculation; suspect top of casing survey
Digital data files provided by GeoBase/CAFB
Projection: UTM Zone 13N, NAD 83

FIGURE 4.
Ground Water Flow Map
10-30-2010

Cannon Air Force Base

Curry County, New Mexico

Trinity Analysis and Development Corp.

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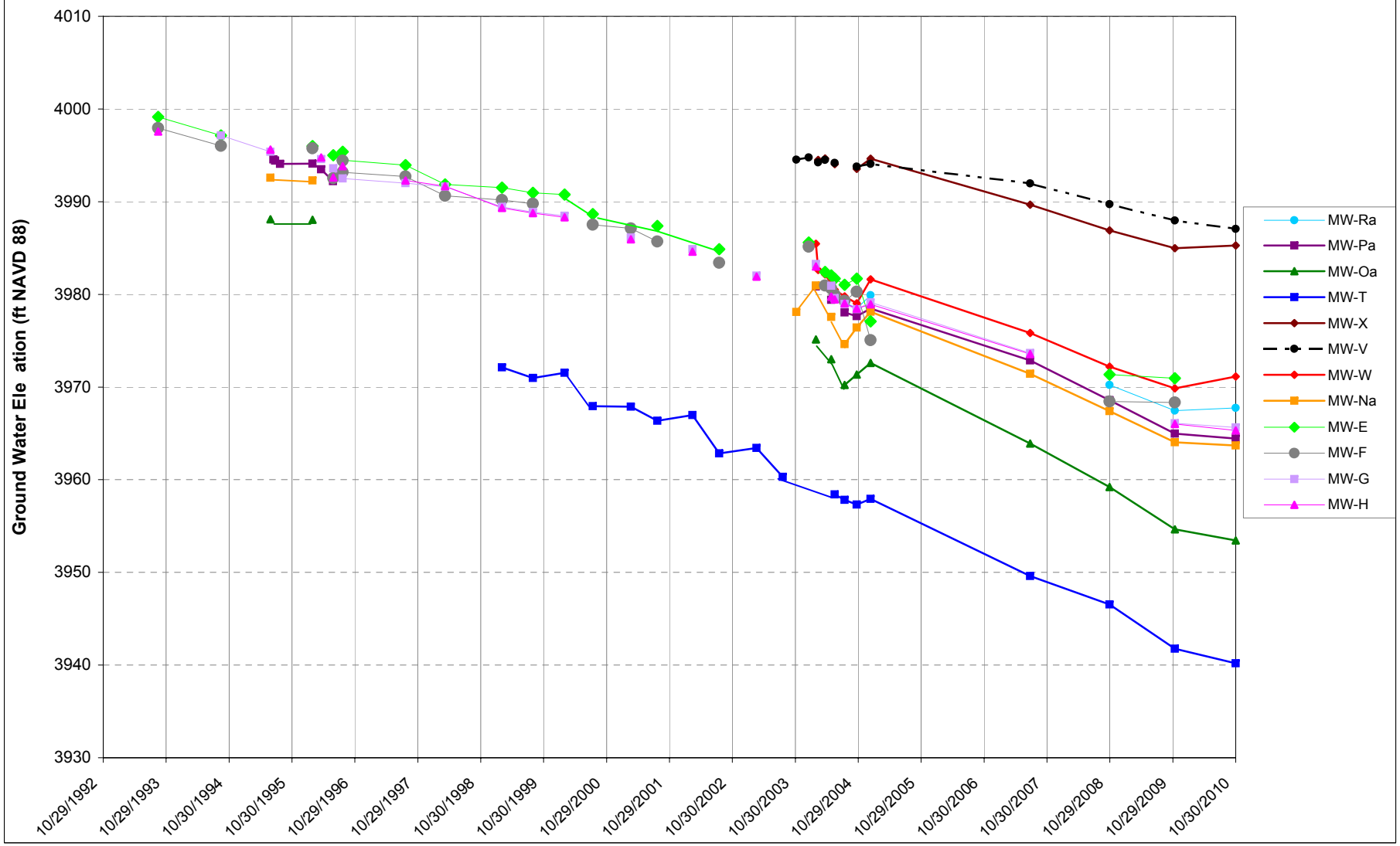
Ta le 2 Long-Term Groundwater Monitoring Program Groundwater Ele ations

Well No	MW-N/Na	MW- / a	MW-P/Pa	MW-Ra	MW-E	MW-F	MW-G	MW-	MW-T	MW-V	MW-W	MW-
Water Ele ation (ft a o e msl)												
09-13-93	—	—	—	—	—	—	—	3,997.58	—	—	—	—
09-13-94	—	—	—	—	3,999.15	3,997.94	3,997.15	—	—	—	—	—
06-27-95	3,992.57	3,988.11	—	—	3,997.14	3,996.02	3,995.38	3,995.63	—	—	—	—
07-15-95	—	—	3,994.56	—	—	—	—	—	—	—	—	—
07-24-95	—	—	3,994.42	—	—	—	—	—	—	—	—	—
08-23-95	—	—	3,994.07	—	—	—	—	—	—	—	—	—
02-27-96	3,992.29	3,988.05	3,994.10	—	—	—	—	—	—	—	—	—
04-17-96	—	—	3,993.49	—	3,996.00	3,995.76	3,994.57	3,994.78	—	—	—	—
06-25-96	—	—	3,992.22	—	—	—	—	—	—	—	—	—
08-19-96	—	—	—	—	—	—	—	3,993.83	—	—	—	—
06-26-96	—	—	—	—	3,995.38	3,994.43	3,993.60	3,992.60	—	—	—	—
08-19-96	—	—	—	—	3,995.02	3,992.54	3,992.50	—	—	—	—	—
08-19-97	—	—	—	—	3,994.47	3,993.18	3,992.00	3,992.30	—	—	—	—
04-06-98	—	—	—	—	3,993.93	3,992.72	3,991.63	3,991.67	—	—	—	—
03-02-99	—	—	—	—	3,991.85	3,990.63	3,989.43	3,989.32	3,972.12	—	—	—
08-29-99	—	—	—	—	3,991.51	3,990.19	3,988.86	3,988.76	3,970.98	—	—	—
02-29-00	—	—	—	—	3,990.96	3,989.78	3,988.47	3,988.30	3,971.53	—	—	—
03-15-00	—	—	—	—	3,990.77	—	—	—	—	—	—	—
08-10-00	—	—	—	—	—	—	—	—	3,967.92	—	—	—
03-20-01	—	—	—	—	3,988.66	3,987.52	3,986.12	3,985.94	3,967.89	—	—	—
08-21-01	—	—	—	—	—	3,987.12	—	—	3,966.35	—	—	—
03-13-02	—	—	—	—	3,987.37	3,985.70	3,984.87	3,984.61	3,966.98	—	—	—
08-15-02	—	—	—	—	—	—	—	—	3,962.83	—	—	—
03-19-03	—	—	—	—	3,984.88	3,983.40	3,982.02	3,981.91	3,963.42	—	—	—
08-19-03	—	—	—	—	—	—	—	—	3,960.31	—	—	—
11-06-03	3,978.10	—	—	—	—	—	—	—	—	3,994.52	—	—
01-16-04	—	—	—	—	—	—	—	—	—	3,994.78	—	—

Ta le 2 Long-Term Groundwater Monitoring Program Groundwater Ele ations (Concluded)

Well No	MW-N/Na	MW- / a	MW-P/Pa	MW-Ra	MW-E	MW-F	MW-G	MW-	MW-T	MW-V	MW-W	MW-
Water Ele ation (ft a o e msl)												
02-27-04	3,980.96	3,975.14	3,980.85	—	3,985.60	3,985.15	3,983.27	3,983.00	—	—	3,985.46	—
03-11-04	—	—	—	—	—	—	—	—	—	3,994.23	3,982.63	3,994.50
04-20-04	—	—	—	—	—	—	—	—	—	3,994.51	3,982.14	3,994.66
05-26-04	3,977.55	3,972.99	3,979.39	3,980.46	3,982.43	3,980.94	3,980.93	3,979.76	—	—	3,981.15	—
06-15-04	—	—	—	—	3,982.04	3,980.64	3,979.59	3,979.45	3,958.41	3,994.18	3,980.51	3,994.05
08-12-04	3,974.63	3,970.23	3,978.03	3,979.13	3,981.69	3,979.97	3,978.94	3,979.04	3,957.83	—	3,979.77	—
10-21-04	3,976.41	3,971.36	3,977.65	3,978.48	3,981.04	3,979.29	3,978.39	3,978.47	3,957.32	3,993.78	3,979.04	3,993.55
01-10-05	3,978.12	3,972.61	3,978.48	3,979.91	3,981.71	3,980.29	3,979.13	3,978.93	3,957.93	3,994.08	3,981.62	3,994.64
07-24-07	3,971.44	3,963.91	3,972.87	—	3,977.07	3,975.06	3,973.67	3,973.57	3,949.61	3,991.96	3,975.84	3,989.67
10-27-08	3,967.39	3,959.22	3,968.56	3,970.22	—	—	—	—	3,946.55	3,989.72	3,972.20	3,986.89
11-10-09	3,964.05	3,954.65	3,964.97	3,967.46	3,971.36	3,968.43	3,966.08	3,966.00	3,941.77	3,987.96	3,969.86	3,984.99
10-30-10	3,963.69	3,953.44	3,964.44	3,967.74	3,970.96	3,968.34	3,965.63	3,965.32	3,940.18	3,987.06	3,971.13	3,985.28

Figure 5 Long-Term Groundwater Monitoring Program drograph (1993-2010)



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Ta le 3 Pro ected Remaining Well Life

Well No	Top of Casing Water Le el Measuring Point (ft a o e msl)	Groundwater Ele ation (ft a o e msl)	Screen Length (ft)	ottom Ele ation of Screen (ft a o e msl)	Saturated Screen Inter al Remaining (ft)	Cumulati e Rate Groundwater Decline[5] (ft/ ear)	Annual Groundwater Rise/Decline[6] (ft)	Pro ected Well Life (ears)
LF-03 (SWMU 105)								
MW-Oa	4,271.07	3,953.44[1]	60	3,910.11	43.33	-2.99	-1.21	14.5
LF-04 (SWMU 104)								
MW-Na	4,268.40	3,963.69[1]	60	3,912.88	50.81	-2.12	-0.36	24.0
LF-25 (SWMU 97)								
MW-Pa	4,271.82	3,964.44[1]	60	3,915.85	48.59	-2.20	-0.53	22.1
MW-Ra	4,275.31	3,967.74[1]	30	3,961.75	5.99	-1.79	+0.28	3.3
Sewage Lagoons (SWMU 101)								
MW-E	4,282.61	3,970.96[2]	15	3,909.70	61.26	-1.68	-0.40	36.5
MW-F	4,278.50	3,968.34[3]	15	3,904.93	63.41	-1.82	-0.09	34.7
MW-G	4,279.55	3,965.63[4]	15	3,904.46	61.17	-2.13	-0.45	28.7
MW-H	4,278.98	3,965.32[4]	15	3,905.98	59.34	-2.19	-0.68	27.1

[1] Well gauged on October 23, 2010.

[2] Well gauged on November 4, 2010.

[3] Well gauged on November 2, 2010.

[4] Well gauged on November 5, 2010.

[5] Cumulative decline in water levels based on gauging data presented in Table 2 for the 6-year period from October 21, 2004, through October 30, 2010.

[6] Annual change in water levels based on gauging data presented in Table 2 for the period from November 10, 2009, through October 30, 2010.

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5 GR UNDWATER UALIT (LF-03 LF-04 LF-25 AND SEWAGE LAG NS)

5 1 Regulator Criteria

The biennial groundwater monitoring was developed performed in accordance with the M&M Plan (Tetra Tech and Brown, Burdine, & Associates, LLC, 2009). The work is required by the Cannon AFB Hazardous and Solid Waste Amendments Permit and is consistent with RCRA. The NMED is the lead agency overseeing this project.

The New Mexico Water Quality Control Commission (WQCC) regulations (20.6.2.3103, New Mexico Administrative Code [NMAC]) were used as guidance to determine whether constituents detected in monitoring wells MW-Na, -Oa, -Pa, -E, -F, -G, and -H exceeded applicable groundwater standards. If no NMED standard for a particular constituent was established, then U.S. Environmental Protection Agency (EPA) primary maximum contaminant levels (MCLs) or secondary MCLs (SMCLs) were used as guidance.

5 2 Groundwater Sampling

5.2.1 Sampling Methodology and Equipment

Water levels were measured using a Solinst™ brand electronic water level indicator prior to initiation of pumping and were recorded in feet below TOC.

A rented stainless-steel QED Environmental Systems® (QED) low-flow bladder pump was utilized for the sampling of wells MW-E, -F, -G, and -H after inoperable dedicated pumps and tubing were removed from wells MW-E, -G, and -H. Dual-bonded low-density polyethylene tubing was left dedicated to each well for future use. Dedicated tubing and QED pumps were utilized at wells MW-Na, -Oa, and -Pa. Tubing was affixed to the bladder pump to deliver compressed nitrogen gas to the pump and groundwater to the surface. The bladder pump was decontaminated between each well sampling event. A QED MP10UH® control unit was used to control the timing and delivery of pressurized gas to the pump and the flow rate of water to the surface. Low-flow/minimal-drawdown sampling methods were applied to ensure that representative samples of groundwater were collected. The pump was positioned within the screened interval and operated at a rate that induced negligible groundwater drawdown. As groundwater reached the surface, it was directed to a flow-through cell where water quality indicator parameters were collected and observed for stability prior to sample collection. Sample containers were filled directly from the tubing after it was disconnected from the flow-through cell.

Groundwater indicator parameters were measured in the field utilizing a YSI® multi-parameter meter, flow-through cell, and a Hannah® turbidity meter. Recorded parameters included temperature, specific conductance, pH, dissolved oxygen (DO), oxidation-reduction potential (ORP), and turbidity. Water sample collection field sheets completed for each well are contained in Appendix C. The multi-parameter and turbidity meter were calibrated in the field to factory standards prior to sampling each day and checked randomly to ensure accuracy. In addition, the beginning and ending pumping times and cumulative volume of water purged from the system at

each well sampled were recorded. Sampled wells were purged at low-flow rates of 0.08 to 0.30 liters per minute while indicator parameters were monitored for stabilization.

Samples collected and/or submitted for this biennial event include:

- Primary groundwater samples from wells MW-E, -F, -G, -H, -Na, -Oa, and -Pa
- Matrix spike/matrix spike duplicate (MS/MSD) samples from well MW-Na
- Duplicate sample from well MW-Pa

Well MW-RA had insufficient water to support sampling.

Prior to sample collection the sample containers were properly labeled. Subsequent to sample collection, samples were packed for shipment in an insulated leak-proof cooler with wet ice to ensure a temperature of 4 degrees Celsius upon arrival at the laboratory. TestAmerica Inc. of Arvada, Colorado, performed all analyses for this sampling event.

5.2.2 Investigation-Derived Waste

Purge water derived from this sampling event was containerized in dedicated storage tanks located adjacent to each monitoring well where sampling was performed. Waste characterization is performed by reviewing the groundwater sample analytical results for each well and comparing the detected constituents to New Mexico WQCC regulations. Disposal is recommended to NMED based on the analytical results of the groundwater samples. Cannon AFB will notify the NMED Groundwater Bureau of the wells that exceed the New Mexico WQCC criteria and the amount of purge water to be discharged. All personal protective equipment and additional investigation-derived waste was placed in plastic trash bags and disposed of in dumpsters located on Base.

5 3 Groundwater Sampling Results

5.3.1 Compliance with Monitoring Requirements

In 2006, Cannon AFB submitted an RFI Report for LF-03/SWMU 105, LF-04/SWMU 104, and LF-25/SWMU 97 (HGL, 2006). The NMED approval letter for the RFI dated December 5, 2007, requires biennial groundwater monitoring of the wells located at each of the landfills. The first biennial sampling event for LF-03, LF-04, and LF-25 was conducted in October 2008 and reported in the 2008 Biennial Groundwater Monitoring and Annual Inspection Report (Tetra Tech and Brown, Burdine, & Associates, LLC, 2008).

In a letter dated March 26, 2008, NMED outlined the specific landfill cover inspection, biennial sampling, and reporting actions required at LF-03, LF-04, and LF-25, and incorporated an additional site, the former Sewage Lagoons (SWMU 101), into the program. To address LTM requirements at the landfills and the former Sewage Lagoons, the M&M Plan was prepared and approved in July 2009. The plan specifies submittal of a biennial report summarizing the sampling results at the four sites by December 31 of each monitoring year, beginning in 2008. Submission of this 2010 biennial report is in accordance with and satisfies the stated requirements of the NMED.

The M&M Plan outlines the analytical parameters and reporting requirements for the sites and includes the following:

- Volatile organic compounds (VOCs)—EPA Method 8260B
- Total Priority Pollutant metals (arsenic, selenium, cadmium, copper, lead, antimony, silver, thallium, zinc, beryllium, mercury, nickel, and barium)—EPA Methods 6020A/7470A
- Trivalent and hexavalent chromium—EPA Method 7196A and calculation
- Nitrate and nitrate-nitrite nitrogen—EPA Methods 300.0A/353.2
- Perchlorate—EPA Method 6860

5.3.2 Compliance with Water Quality Standards

5.3.2.1 Landfill Sites (LF-03, LF-04, and LF-25)

During the 2010 biennial sampling event, VOCs, metals, and perchlorate were reported at concentrations below applicable groundwater standards in samples collected from wells MW-Oa, -Na, and -Pa. Two inorganics, nitrate nitrogen (11 milligrams per liter [mg/L]) and nitrate-nitrite nitrogen (11 mg/L), slightly exceeded the EPA MCL (10 mg/L) and New Mexico WQCC groundwater standard (10 mg/L) in well MW-Oa. As shown on Figure 4, this well is located downgradient of North Playa Lake, which receives treated effluent from the Base wastewater treatment plant. The data are consistent with previous sampling events and indicate that LF-03, LF-04, and LF-25 are not impacting groundwater quality. The analytical results for groundwater sampling conducted at sites LF-03, LF-04, and LF-25 are provided in Tables 4, 5, and 6, respectively, and the laboratory data reports are contained in Appendix C.

5.3.2.2 Former Sewage Lagoons

Wells MW-E, -F, -G, and -H were included in the 2010 biennial LTM sampling event to evaluate potential impacts to groundwater associated with the former Sewage Lagoons. The analytical results for these wells are provided in Table 7, and the laboratory data reports are contained in Appendix C.

VOCs were detected in all of the wells except for MW-F. Toluene was detected in Sewage Lagoon wells MW-G and MW-H and in upgradient well MW-E. The detections in MW-E and MW-G were reported at estimated concentrations below the reporting limit, and all three detections were significantly less than the applicable EPA MCL and New Mexico WQCC groundwater standards. Two additional VOCs, 1,2,4-trimethylbenzene and naphthalene, were also detected at estimated concentrations below the reporting limit in well MW-G. No groundwater standards have been established for these compounds.

Based on the groundwater elevation and potentiometric flow map (Figure 4), well MW-H is downgradient of the former Sewage Lagoons, while MW-G is located sidegradient to this site, with only a small contributing downgradient component. Both of these wells are downgradient of MW-E, where a low concentration of toluene was also detected. The distribution of reported toluene concentrations suggests that toluene contamination in wells MW-E and MW-G, and some or all of the toluene reported in MW-H may have a source upgradient of the former Sewage Lagoons. This detection pattern suggests that the 1,2,4-trimethylbenzene and napththalene concentrations reported in well MW-G also have a potential upgradient source. There is no direct evidence from the distribution of VOCs that the former Sewage Lagoons are adversely impacting groundwater quality.

No metals, inorganics, or perchlorate were reported at concentrations exceeding the MCLs, SMCLs, or New Mexico WQCC standards in groundwater samples collected from wells MW-E, -F, -G, or -H, with the exception of lead in well MW-E. The concentration of lead in this well (20 micrograms per liter [μg/L]) slightly exceeded the EPA MCL of 15 μg/L, although the detected concentration was less than the New Mexico WQCC standard of 50 μg/L. The location of MW-E suggests that the elevated lead concentration is associated with a potential upgradient source, and there is no evidence that the former Sewage Lagoons are adversely impacting groundwater quality.

5.3.3 Quality Assurance and Quality Control

Based on data validation of the 2010 biennial LTM sampling event, the data were determined to be valid and achieved greater than 99 percent data completeness. The Quality Assurance Summary Report and data validation reports are provided in Appendix D.

Ta le 4 Summar of Groundwater Anal tical Results for Monitoring Well MW- a Landfill No 3 (LF-03) SWMU 105 2010 iennial Sampling E ent

Anal tes[1]	MW- a[2]	Reporting Limit	EPA MCL/SMCL	New Me ico W CC
Volatile rganic Compounds EPA Method 8260 (μg/L)				
All analytes	ND	Various	Various	Various
Total Mercur EPA Method 7470A (μg/L)				
Mercury	ND	0.2	2.0	2.0
Total Metals EPA Methods 6020 and 7196A (μg/L) and Calculation				
Arsenic	2.2J	5.0	10.0	100
Barium	55	3.0	2,000	1,000
Beryllium	ND	1.0	4.0	NE
Cadmium	ND	1.0	5.0	10
Copper	ND	2.0	1,000	1,000
Lead	ND	3.0	15	50
Nickel	3.2	3.0	NE	200
Selenium	3.3J	5.0	50	50
Silver	ND	5.0	100	50
Thallium	ND	1.0	2.0	NE
Zinc	ND	20	5,000	10,000
Hexavalent chromium	ND	20	NE	NE
Trivalent chromium	ND	20	NE	NE
Inorganics EPA Methods 300 0A and 353 2 (mg/L)				
Nitrate nitrogen	**11( )**	0.5	10	10
Nitrate-nitrite nitrogen[3]	**11**	0.10	10	10
Perchlorate EPA Method 6860 (μg/L)				
Perchlorate	0.91	0.50	NE	NE
Field Measurements				
pH	6.76	NA	6.5–8.5	6.0-9.0
Specific conductance (μmhos/cm)	166	NA	NE	NE
Temperature (^{o}F)	62	NA	NE	NE
Turbidity (NTU)	0.99	NA	NE	NE
Dissolved Oxygen (mg/L)	4.0	NA	NE	NE
ORP (mV)	484.5	NA	NE	NE

[1] Complete analytical results are provided in Appendix C. Methods include *Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March 1983 and Updates*; and SW846 *Test Methods for Evaluating Solid Waste, Third Edition, November 1986 and Updates.*

[2] Bolded values exceed applicable groundwater standards.

[3] EPA and New Mexico WQCC groundwater standards have not been established for nitrate-nitrite nitrogen. For the purpose of evaluation, the nitrate nitrogen groundwater standard was used as the comparison standard for the sum of nitrate + nitrite.

J Value is below the reporting limit and above the method detection limit.

(J) Data value qualified based on validation procedure (see Appendix D).

NA Not applicable

ND Not detected at or above the reporting limit

NE Not established

Ta le 5 Summar of Groundwater Anal tical Results for Monitoring Well MW-Na Landfill No 4 (LF-04) SWMU 104 2010 iennial Sampling E ent

Anal tes[1]	MW-Na	Reporting Limit	EPA MCL/SMCL	New Me ico W CC
Volatile rganic Compounds EPA Method 8260 (μg/L)				
All analytes	ND	Various	Various	Various
Total Mercur EPA Method 7470A (μg/L)				
Mercury	ND	0.2	2.0	2.0
Total Metals EPA Methods 6020 and 7196A (μg/L) and Calculation				
Antimony	0.14J	6.0	6.0	NE
Arsenic	4.2J	5.0	10	100
Barium	47	3.0	2,000	1,000
Beryllium	ND	1.0	4.0	NE
Cadmium	ND	1.0	5.0	10
Copper	3.5	2.0	1,000	1,000
Lead	0.49J	3.0	15	50
Nickel	0.68J	3.0	NE	200
Selenium	5.5	5.0	50	50
Silver	ND	5.0	100	50
Thallium	0.037J	1.0	2.0	NE
Zinc	ND	20	5,000	10,000
Hexavalent chromium	7.5J (J)	20	NE	NE
Trivalent chromium	ND	20	NE	NE
Inorganics EPA Methods 300 0A and 353 2 (mg/L)				
Nitrate nitrogen	1.3	0.5	10	10
Nitrate-nitrite nitrogen[2]	1.4	0.10	10	10
Perchlorate EPA Method 6860 (μg/L)				
Perchlorate	2.0	0.50	NE	NE
Field Measurements				
pH	7.58	NA	6.5–8.5	6.0–9.0
Specific conductance (μmhos/cm)	59	NA	NE	NE
Temperature (^{o}F)	60	NA	NE	NE
Turbidity (NTU)	9.4	NA	NE	NE
Dissolved Oxygen (mg/L)	8.48	NA	NE	NE
ORP (mV)	244.9	NA	NE	NE

[1] Complete analytical results are provided in Appendix C. Methods include *Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March 1983 and Updates*; and SW846 *Test Methods for Evaluating Solid Waste, Third Edition, November 1986 and Updates.*

[2] EPA and New Mexico WQCC groundwater standards have not been established for nitrate-nitrite nitrogen. For the purpose of evaluation, the nitrate nitrogen groundwater standard was used as the comparison standard for the sum of nitrate + nitrite.

J Value is below the reporting limit and above the method detection limit.

(J) Data value qualified based on validation procedure (see Appendix D).

NA Not applicable

ND Not detected at or above the reporting limit

NE Not established

Ta le 6 Summar of Groundwater Anal tical Results for Monitoring Well MW-Pa Landfill No 25 (LF-25) SWMU 97 2010 iennial Sampling E ent

Anal tes[1]	MW-Pa	MW-Pa Duplicate	Reporting Limit	EPA MCL/SMCL	New Me ico W CC
Volatile rganic Compounds EPA Method 8260 (μg/L)					
All analytes	ND	ND	Various	Various	Various
Total Mercur EPA Method 7470A (μg/L)					
Mercury	ND	ND	0.2	2.0	2.0
Total Metals EPA Methods 6020 and 7196A (μg/L) and Calculation					
Antimony	ND	ND	6.0	6.0	NE
Arsenic	2.6J	2.6J	5.0	10	100
Barium	35	33	3.0	2,000	1,000
Beryllium	ND	ND	1.0	4.0	NE
Cadmium	ND	ND	1.0	5.0	10
Copper	ND	ND	2.0	1,000	1,000
Lead	ND	ND	3.0	15	50
Nickel	0.54J	0.49J	3.0	NE	200
Selenium	4.5J	4.1J	5.0	50	50
Silver	ND	ND	5.0	100	50
Thallium	ND	ND	1.0	2.0	NE
Zinc	ND	ND	20	5,000	10,000
Hexavalent chromium	ND	4.6J	20	NE	NE
Trivalent chromium	ND	ND	20	NE	NE
Inorganics EPA Methods 300 0A and 353 2 (mg/L)					
Nitrate nitrogen	1.8	1.9	0.5	10	10
Nitrate-nitrite nitrogen[2]	2.0	1.9	0.10	10	10
Perchlorate EPA Method 6860 (μg/L)					
Perchlorate	1.7	1.7	0.50	NE	NE
Field Measurements					
pH	6.96	6.96	NA	6.5–8.5	6.0–9.0
Specific conductance (μmhos/cm)	77	77	NA	NE	NE
Temperature (^{o}F)	69	69	NA	NE	NE
Turbidity (NTU)	0.81	0.81	NA	NE	NE
Dissolved Oxygen (mg/L)	6.96	6.96	NA	NE	NE
ORP (mV)	494	494	NA	NE	NE

[1] Complete analytical results are provided in Appendix C. Methods include *Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March 1983 and Updates*; and SW846 *Test Methods for Evaluating Solid Waste, Third Edition, November 1986 and Updates.*

[2] EPA and New Mexico WQCC groundwater standards have not been established for nitrate-nitrite nitrogen. For the purpose of evaluation, the nitrate nitrogen groundwater standard was used as the comparison standard for the sum of nitrate + nitrite.

J Value is below the reporting limit and above the method detection limit.

NA Not applicable

ND Not detected at or above the reporting limit

NE Not established

Ta le 7 Summar of Groundwater Anal tical Results for Monitoring Wells MW-E MW-F MW-G and MW- Sewage Lagoons SWMU 101 2010 iennial Sampling E ent

Anal tes[1]	MW-E[2]	MW-F	Reporting Limit	EPA MCL/SMCL	New Me ico W CC
Volatile rganic Compounds EPA Method 8260 (μg/L)					
Toluene	0.28J	ND	1.0	1,000	750
All other analytes	ND	ND	Various	Various	Various
Total Mercur EPA Method 7470A (μg/L)					
Mercury	ND	ND	0.2	2.0	2.0
Total Metals EPA Methods 6020 and 7196A (μg/L) and Calculation					
Antimony	0.071J	ND	6.0	6.0	NE
Arsenic	3.1J	3.3J	5.0	10	100
Barium	46	38	3.0	2,000	1,000
Beryllium	ND	ND	1.0	4.0	NE
Cadmium	0.057J	ND	1.0	5.0	10
Copper	1.5IJ	ND	2.0	1,000	1,000
Lead	**20**	0.44J	3.0	15	50
Nickel	2.4J	1.1J	3.0	NE	200
Selenium	7.6	7.5	5.0	50	50
Silver	ND	ND	5.0	100	50
Thallium	0.023J	ND	1.0	2.0	NE
Zinc	120	81	20	5,000	10,000
Hexavalent chromium	ND	4.1J (J)	20	NE	NE
Trivalent chromium	ND	ND	20	NE	NE
Inorganics EPA Methods 300 0A and 353 2 (mg/L)					
Nitrate nitrogen	1.7	1.3	0.5	10	10
Nitrate-nitrite nitrogen[3]	1.8	1.4	0.10	10	10
Perchlorate EPA Method 6860 (μg/L)					
Perchlorate	3.1	2.8	0.50	NE	5.0
Field Measurements					
pH	7.60	7.03	NA	6.5–8.5	6.0–9.0
Specific conductance (μmhos/cm)	62	80	NA	NE	NE
Temperature (^{o}F)	62	64	NA	NE	NE
Turbidity (NTU)	8.36	3.0	NA	NE	NE
Dissolved Oxygen (mg/L)	1.65	7.0	NA	NE	NE
ORP (mV)	252.1	520.4	NA	NE	NE

[1] Complete analytical results are provided in Appendix C. Methods include *Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March 1983 and Updates*; and SW846 *Test Methods for Evaluating Solid Waste, Third Edition, November 1986 and Updates.*

[2] Bolded values exceed groundwater standard.

[3] EPA and New Mexico WQCC groundwater standards have not been established for nitrate-nitrite nitrogen. For the purpose of evaluation, the nitrate nitrogen groundwater standard was used as the comparison standard for the sum of nitrate + nitrite.

J Value is below the reporting limit and above the method detection limit.

(J) Data value qualified based on validation procedure (see Appendix D).

NA Not applicable

ND Not detected at or above the reporting limit

NE Not established

Ta le 7 Summar of Groundwater Anal tical Results for Monitoring Wells MW-E MW-F MW-G and MW- Sewage Lagoons SWMU 101 2010 iennial Sampling E ent (Concluded)

Anal tes[1]	MW-G	MW-	Reporting Limit	EPA MCL/SMCL	New Me ico W CC
Volatile rganic Compounds EPA Method 8260 (μg/L)					
1,2,4-trimethylbenzene	0.17J	ND	1.0	NE	NE
Naphthalene	0.63J	ND	1.0	NE	NE
Toluene	0.33J	1.8	1.0	1,000	750
All other analytes	ND	ND	Various	Various	Various
Total Mercur EPA Method 7470A (μg/L)					
Mercury	ND	ND	0.2	2.0	2.0
Total Metals EPA Methods 6020 and 7196A (μg/L) and Calculation					
Antimony	0.13J	0.21J	6.0	6.0	NE
Arsenic	3.8J	4.2J	5.0	10	100
Barium	39	44	3.0	2,000	1,000
Beryllium	ND	ND	1.0	4.0	NE
Cadmium	0.049J	0.14J	1.0	5.0	10
Copper	10	11	2.0	1,000	1,000
Lead	5.1	6.2	3.0	15	50
Nickel	9.0	25	3.0	NE	200
Selenium	6.6	6.8	5.0	50	50
Silver	0.20J	0.11J	5.0	100	50
Thallium	ND	ND	1.0	2.0	NE
Zinc	99	380	20	5,000	10,000
Hexavalent chromium	7.5J	19J (J)	20	NE	NE
Trivalent chromium	ND	ND	20	NE	NE
Inorganics EPA Methods 300 0A and 353 2 (mg/L)					
Nitrate nitrogen	1.3	1.7	0.5	10	10
Nitrate-nitrite nitrogen[2]	1.4	1.9	0.10	10	10
Perchlorate EPA Method 6860 (μg/L)					
Perchlorate	2.4	2.6	0.50	NE	NE
Field Measurements					
pH	7.45	7.65	NA	6.5–8.5	6.0–9.0
Specific conductance (μmhos/cm)	57	54	NA	NE	NE
Temperature (^{o}F)	65	60	NA	NE	NE
Turbidity (NTU)	12.9	17.8	NA	NE	NE
Dissolved Oxygen (mg/L)	5.17	4.49	NA	NE	NE
ORP (mV)	438.1	164.4	NA	NE	NE

[1] Complete analytical results are provided in Appendix C. Methods include *Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March 1983 and Updates*; and SW846 *Test Methods for Evaluating Solid Waste, Third Edition, November 1986 and Updates.*

[2] EPA and New Mexico WQCC groundwater standards have not been established for nitrate-nitrite nitrogen. For the purpose of evaluation, the nitrate nitrogen groundwater standard was used as the comparison standard for the sum of nitrate + nitrite.

J Value is below the reporting limit and above the method detection limit.
(J) Data value qualified based on validation procedure (see Appendix D).
NA Not applicable
ND Not detected at or above the reporting limit
NE Not established

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6 SUMMAR

Annual cover system inspections for LF-03, LF-04, LF-25, and the Sewage Lagoons were conducted on November 9 and 10, 2009, and on October 23, 2010. The cover systems on each of the three landfills and the former Sewage Lagoons were determined to be in good to excellent condition. No repairs or preventive maintenance were required.

The biennial LTM sampling event was conducted from November 1 through November 5, 2010. Based on the laboratory analytical results, no VOCs or perchlorate detections were reported at concentrations exceeding the EPA primary MCLs, SMCLs, or the New Mexico WQCC standards in groundwater samples collected from wells MW-Oa, MW-Na, MW-Pa, MW-E, MW-F, MW-G, or MW-H. The detected concentrations of nitrate nitrogen and nitrate-nitrite nitrogen in well MW-Oa slightly exceeded the EPA MCL and New Mexico WQCC groundwater standard. One metal, lead, exceeded the EPA MCL in well MW-E, located upgradient of the former Sewage Lagoons. The low concentrations of VOCs detected in three of the wells associated with the former Sewage Lagoons are also potentially attributable to an upgradient source. The groundwater sample results from the 2010 biennial LTM sampling event indicate ERP sites LF-03, LF-04, LF-25, and the former Sewage Lagoons are not adversely impacting groundwater quality.

Annual landfill cover inspections are scheduled in 2011 and 2012, and the next biennial LTM groundwater sampling event is scheduled for 2012. A summary report will be submitted to NMED prior to December 31, 2012.

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Appendi A
2010 Co er S stem Inspection Reports for LF-03 LF-04 LF-25 and Sewage Lagoons

Cover System Inspection Report
Landfill 3 (SWMU 105)
Cannon Air Force Base, Curry County, New Mexico

Inspector Name and Title: T. Schmucker - Geologist
Date: 10-23-10
Days since last rain fall: 2
Amount of rainfall: 0.76 in
(Contact Base Weather Service)

Inspection Type	Check as Appropriate
Annual	✓
Other (identify)	

	LF-03	
1. Cover:	Yes	No
• Overall structural integrity maintained?	✓	
• Surface erosion present?		✓
• Gullies/washouts or areas of subsidence present? (inactive subsidence only)	✓	
• Exposed buried waste?		✓
• As-~~constructed~~ graded contours (topographic highs) intact? (minimal relief)	✓	
• As-~~constructed~~ graded contours (depressions) intact? (minimal relief)	✓	
• Stormwater runoff contained within boundaries of site?	✓	
• Evidence of drainage pathways/diverted runoff?		✓
• Tumbleweeds or silt built up?		✓

Describe overall condition:
Good condition; no noticeable change from 2009

Problems observed with the cover:
None

Maintenance or repairs required:
None

Maintenance to be performed by (Subcontractor name and date):
None

	LF-03	
2. Vegetation:	Yes	No
• Vegetation native perennial? (Annuals + perennials)	✓	✓
• Vegetation in good condition?	✓	
• Bare/sparse areas?		✓

Describe overall condition:
Mature coverage @ time of inspection, few to no bare areas, mowing occurred days after cover inspection.

Estimate extent and type of vegetative cover:
95% total cover, 80% annuals, 20% perennials

Maintenance or repairs required: None
Maintenance to be performed by (Subcontractor name and date): None

	LF-03	
3. Berms (Indicate NA if no berms are present):	Yes	No
• Is any erosion present?		✓
• Is any ponding present?		✓
• Stormwater runoff contained onsite?	✓	

Describe location and condition: No berms associated with this site
Problems observed with berms: NA
Maintenance or repairs required: NA
Maintenance to be performed by (Subcontractor name and date): NA

	LF-03	
4. Drainage Ditches/Channels (Indicate NA if no channels are present):	Yes	No
• Is any erosion present?	N	A
• Is buildup of sediment/silt debris present?	N	A
• Stormwater runoff contained onsite?	N	A
• Excess accumulation of tumbleweeds present?	N	A

Describe location and condition: No drainage ditches or channels are associated with this site
Problems observed with channels: NA
Maintenance or repair required: NA
Maintenance to be performed by (Subcontractor name and date): NA

	LF-03	
5. Monitoring Wells:	Yes	No
• Evidence of tampering?		✓
• Damage?		✓

Problems observed with wells:

None

	LF-03	
6. Fences/Gates/Signage (Indicate NA if not present):	Yes	No
• Structural integrity?	N	A
• Gate locks in place?	N	A
• Signage in place?	N	A
• Tumbleweeds or silt built up?	N	A

Problems observed with fencing/gates/signage:

N/A

Maintenance or repair required:

NA

Maintenance to be performed by (Subcontractor name and date):

NA

7. Changes required to the Monitoring and Maintenance Plan?

None

Tony Schmucker

Inspector's Name

Inspector's Signature

10-23-10

Date

Cover System Inspection Report
Landfill 4 (SWMU 104)
Cannon Air Force Base, Curry County, New Mexico

Inspector Name and Title: T. Schmucker - Geologist Date: 10-23-10
Days since last rain fall: 2 Amount of rainfall: 0.76 in
(Contact Base Weather Service)

Inspection Type	Check as Appropriate
Annual	✓
Other (identify)	

	LF-04	
1. Cover:	Yes	No
• Overall structural integrity maintained?	✓	
• Surface erosion present?		✓
• Gullies/washouts or areas of subsidence present? (inactive subsidence only)	✓	
• Exposed buried waste?		✓
• As-~~constructed~~ graded contours (topographic highs) intact? (minimal relief)	✓	
• As-~~constructed~~ graded contours (depressions) intact? (minimal relief)	✓	
• Stormwater runoff contained within boundaries of site?	✓	
• Evidence of drainage pathways/diverted runoff?		✓
• Tumbleweeds or silt built up?		✓

Describe overall condition:
Good condition; no significant or noticeable changes from 2009

Problems observed with the cover:
None

Maintenance or repairs required:
None

Maintenance to be performed by (Subcontractor name and date):
None

	LF-04	
2. Vegetation:	Yes	No
• Vegetation native perennial? Combination of annuals and perennials	✓	✓
• Vegetation in good condition?	✓	
• Bare/sparse areas?		✓

Describe overall condition:
Mature coverage @ time of inspection, few to no bare areas, mowing of vegetation occurred just days after inspection.

Estimate extent and type of vegetative cover:
95% total cover, 80% annuals, 20% native perennials

Maintenance or repairs required:

None

Maintenance to be performed by (Subcontractor name and date):

None

	LF-04	
3. Berms (Indicate NA if no berms are present):	Yes	No
• Is any erosion present?		✓
• Is any ponding present?		✓
• Stormwater runoff contained onsite?	✓	

Describe location and condition:

Berms on north, west, and south sides in good condition

Problems observed with berms:

None

Maintenance or repairs required:

None

Maintenance to be performed by (Subcontractor name and date):

None

	LF-04	
4. Drainage Ditches/Channels (Indicate NA if no channels are present):	Yes	No
• Is any erosion present?	N	A
• Is buildup of sediment/silt debris present?	N	A
• Stormwater runoff contained onsite?	N	A
• Excess accumulation of tumbleweeds present?	N	A

Describe location and condition:

N/A

Problems observed with channels:

N/A

Maintenance or repair required:

N/A

Maintenance to be performed by (Subcontractor name and date):

N/A

	LF-04	
5. Monitoring Wells:	Yes	No
• Evidence of tampering?		✓
• Damage?		✓

Problems observed with wells:

None

	LF-04	
6. Fences/Gates/Signage (Indicate NA if not present):	Yes	No
• Structural integrity?	NA	
• Gate locks in place?	NA	
• Signage in place?	NA	
• Tumbleweeds or silt built up?	NA	

Problems observed with fencing/gates/signage:

NA

Maintenance or repair required:

NA

Maintenance to be performed by (Subcontractor name and date):

NA

7. Changes required to the Monitoring and Maintenance Plan?

None

Tony Schmucker
Inspector's Name

Inspector's Signature

10-23-10
Date

Cover System Inspection Report
Landfill 25 (SWMU 97)
Cannon Air Force Base, Curry County, New Mexico

Inspector Name and Title: T. Schmucker - Geologist
Date: 10-23-10
Days since last rain fall: 2
Amount of rainfall: 0.76 in
(Contact Base Weather Service)

Inspection Type	Check as Appropriate
Annual	✓
Other (Identify)	

	LF-25	
1. Fences and Gates:	Yes	No
• Structural integrity?	✓	
• Gates locks in place?	✓	
• Signage in place?	✓	
• Tumbleweeds and silt built up?		✓

Problems observed with the fences/gates/signage:
None

Maintenance or repairs required:
None

Maintenance to be performed by (Subcontractor name and date):
None

	LF-25	
2. Cover:	Yes	No
• Overall structural integrity maintained?	✓	
• Surface erosion present? very minor, no offsite diversion	✓	
• Gullies/washouts or areas of subsidence present?		✓
• Exposed buried waste? Minor amounts of concrete, gravel visible		✓
• As-constructed contours (topographic highs) intact?	✓	
• As-constructed contours (depressions) intact?	✓	
• Stormwater runoff contained within boundaries of site?	✓	
• Evidence of drainage pathways/diverted runoff?		✓
• Tumbleweeds or silt built up?		✓

Problems observed with the cover:
None

Maintenance or repair required:
None

Maintenance to be performed by (Subcontractor name and date):
None

	LF-25	
3. Berms (Indicate NA if not present):	Yes	No
• Is any erosion present?		✓
• Is any ponding present? (As designed)	✓	
• Stormwater runoff contained onsite?	✓	

Describe location and condition:

Berm along east side only; remains in excellent condition

Problems observed with berms:

None

Maintenance or repairs required:

None

Maintenance to be performed by (Subcontractor name and date):

None

	LF-25	
4. Rip-Rap (Indicate NA if not present):	Yes	No
• Is any erosion present?		✓
• Is buildup of sediment/silt debris present?		✓
• Is displaced concrete present?		✓
• Excess accumulation of tumble weeds present?		✓

Describe location and condition:

Single location at north end; good condition no noticeable change

Problems observed with rip-rap:

None

Maintenance or repairs required:

None

Maintenance to be performed by (Subcontractor name and date):

None

	LF-25	
5. Drainage Ditches/Channels (Indicate NA if no channels are present):	Yes	No
• Is any erosion present?	NA	
• Is buildup of sediment/silt debris present?	NA	
• Is displaced crushed concrete present?	NA	
• Is stormwater runoff contained onsite?	NA	
• Excess accumulation of tumbleweeds present?	NA	

Describe location and condition:

NA

Problems observed with channels:

NA

Maintenance or repair required:
NA
Maintenance to be performed by (Subcontractor name and date):
NA

	LF-25	
6. Vegetation:	Yes	No
• Vegetation native perennial?	✓	✓
• Vegetation in good condition?	✓	
• Bare/sparse areas?	✓	

Describe overall condition:
Northern half of site is treed and grass varieties vary with available moisture. Southern half of site is combination annuals, perrenials

Estimate extent and type of vegetative cover:
Approximately 40 - 70 % cover, mainly grass varieties

Maintenance or repairs required:
None

Maintenance to be performed by (Subcontractor name and date):
None

	LF-25	
7. Monitoring Wells:	Yes	No
• Evidence of tampering?		✓
• Damage?		✓

Problems observed with the wells.
None

8. Changes required to the Monitoring and Maintenance Plan?
None

Tony Schmucker
Inspector's Name

Inspector's Signature

10-23-10
Date

Cover System Inspection Report
Sewage Lagoon (South Area) (SWMU 101)
Cannon Air Force Base, Curry County, New Mexico

Inspector Name and Title: T. Schmucker - Geologist Date: 10-23-10
Days since last rain fall: 2 Amount of rainfall: 0.76 in
(Contact Base Weather Service)

Inspection Type	Check as Appropriate
Annual	✓
Other (Identify)	

	Sewage Lagoons	
1. Fences and Gates:	Yes	No
• Structural integrity?	✓	
• Gates locks in place?	✓	
• Signage in place?	✓	
• Tumbleweeds and silt built up?		✓

Problems observed with the fences/gates/signage:
None

Maintenance or repairs required:
None

Maintenance to be performed by (Subcontractor name and date):
None

	Sewage Lagoons	
2. Cover:	Yes	No
• Overall structural integrity maintained?	✓	
• Surface erosion present?		✓
• Gullies/washouts or areas of subsidence present?		✓
• Exposed buried waste?		✓
• As-constructed contours (topographic highs) intact?	✓	
• As-constructed contours (depressions) intact?	✓	
• Stormwater runoff contained within boundaries of site? (As designed)		✓
• Evidence of drainage pathways/diverted runoff?	✓	
• Tumbleweeds or silt built up?		✓

Problems observed with the cover:
None - Site is designed for runoff to flow toward perimeter

Maintenance or repair required:
None

Maintenance to be performed by (Subcontractor name and date):

None

	Sewage Lagoons	
3. Berms (Indicate NA if not present):	Yes	No
• Is any erosion present?	N	A
• Is any ponding present?	N	A
• Stormwater runoff contained onsite?	N	A

Describe location and condition:

NA

Problems observed with berms:

NA

Maintenance or repairs required:

NA

Maintenance to be performed by (Subcontractor name and date):

NA

	Sewage Lagoons	
4. Drainage Ditches/Channels (Indicate NA if no channels are present):	Yes	No
• Is any erosion present?		✓
• Is buildup of sediment/silt debris present?		✓
• Is displaced crushed concrete present?		✓
• Is stormwater runoff contained onsite?		✓
• Excess accumulation of tumbleweeds present?		✓

Describe location and condition:

Stormwater exits site on south side near MW-H. Ditch in good condition.

Problems observed with channels:

None

Maintenance or repair required:

None

Maintenance to be performed by (Subcontractor name and date):

None

	Sewage Lagoons	
5. Vegetation:	Yes	No
• Vegetation native perennial? (Annuals and perennials)	✓	✓
• Vegetation in good condition?	✓	
• Bare/sparse areas?		✓

Describe overall condition:
Mature coverage, few small trees developing at western end
Estimate extent and type of vegetative cover:
95% total coverage, 80% annuals, 20% perennials
Maintenance or repairs required:
None
Maintenance to be performed by (Subcontractor name and date):
None

	Sewage Lagoons	
6. Monitoring Wells:	Yes	No
• Evidence of tampering?		✓
• Damage?		✓

Problems observed with the wells.

None

7. Changes required to the Monitoring and Maintenance Plan?

None

Tony Schmucker
Inspector's Name

Inspector's Signature

10-23-10
Date

Appendi
Photographic Record

Landfill ID	Photo #	GPS Coordinates		Location Description	Visual Description / Interpretation	Action Required
		Easting UTM (meters)	Northing UTM (meters)			
LF-3 (SWMU 105)	P-1			Southern edge of landfill. Photograph taken facing west.	General photo showing well vegetated, relatively flat topography.	No
	P-2			Central portion of LF-3 looking toward Playa Lake. Photograph taken facing north.	General photo showing well vegetated, relatively flat topography.	No
	P-3	656489	3806033	Central portion of LF-3. Photograph taken facing east.	Long, narrow areas of assumed subsidence occur on LF-3. The features are generally 10 to 30 feet in width, 200 to 500 feet in length and up to 1 to 2 feet in depth. They are evident to the eye by a change in foliage in addition to the elevation differences. No evident change is observed since the previous annual inspection.	No
	P-4	656489	3806033	Photograph of assumed subsidence.		
	P-5			Central portion of LF-3. Photograph taken facing northwest.	General photo showing well vegetated, relatively flat topography.	No
	P-6			Central portion of LF-3. Photograph taken facing northeast.	General photo showing well vegetated, relatively flat topography.	No
	P-7	656384	3806012	Central portion of LF-3.	Depression measuring approximately 14 feet across and two feet deep. No observable change.	No
	P-8			Western portion of LF-3. Photograph taken facing west.	General photos showing well vegetated, flat topography.	No
	P-9			Mid portion of LF-3.	General photo showing well vegetated ground cover.	No
LF-4 (SWMU 104)	P-1			General photo of LF-4. Photograph taken from the south side facing northwest.	Well vegetated and relatively flat across the majority of the site.	No
	P-2			General photos of LF-4. Photograph taken from the south side facing northeast.	Well vegetated and relatively flat across the majority of the site.	No
	P-3			Central portion of LF-4.	Numerous animal burrows were visible across the majority of the site.	No
	P-4	656328	3806701	Photograph of assumed subsidence.	Long narrow areas of subsidence occur on LF-4. Two distinct features are generally 10 to 30 feet in width, and nearly 600 feet in length, with a third feature nearly 300 feet in length. Subsidence is up to 2 feet in depth. They are evident to the eye by a distinct change in foliage in addition to the elevation differences. No observable changes have occurred since the previous annual inspection.	No
	P-5	656328	3806701	Photograph of assumed subsidence.		
	P-6	656529	3806572	Photograph of assumed subsidence.		
	P-7			Central portion of LF-4. Photograph taken facing south.	Well vegetated and relatively flat across the majority of the site. Playa lake is visible in background.	No
LF-25 (SWMU 97)	P-1			Located just south of the gate on the western boundary of LF-25. Photo taken facing due east (2009 photo).	Bilingual warning sign with emergency contact phone number in excellent condition.	No
	P-2			General photograph of LF-25 on northern portion of landfill. The photograph was taken facing south.	General photo showing well vegetated, mounded topography.	
	P-3	656000	3806995	Southeast of the landfill gate. Photo taken facing east.	Area exhibiting slight slumping on hillside near north end of landfill. Does not warrant action but does warrant ongoing monitoring.	No
	P-4			Central portion of LF-25.	Well mounded and graded landfill cover, free of erosion, slumping, settling and exposed waste. Cover construction is not visually compelling, but no evidence exists to disprove the effectiveness of the cover. Vegetative coverage is estimated at 60% to 70% across the northern end of LF-25.	No
	P-5			Central portion of LF-25.		
	P-6			Eastern portion of landfill near monitoring well MW-Ra	Good demonstration of berm and fence surrounding LF-25. Fence is structurally sound and continuous around the landfill. Berm along eastern boundary of landfill is also in excellent condition.	No
	P-7			Photograph taken along the western boundary near the center of the LF-25.	Photograph showing portion of LF-25 with minimal vegetative cover. Cover construction is not visually compelling, but no evidence exists to disprove the effectiveness of the cover.	No
	P-8	655981	3806691	Along eastern berm of landfill.	A slightly depressed area exists where ponding may temporarily occur during heavy rain events. Indicators include change in vegetative cover, a slight physical depression and mud cracks in a limited area. Appears stable when compared to last years inspection.	No
	P-9			Southern portion of landfill. Photo taken facing south.	General photo showing well vegetated, flat topography.	No

Landfill ID	Photo #	GPS Coordinates		Location Description	Visual Description / Interpretation	Action Required
		Easting UTM (meters)	Northing UTM (meters)			
South Sewage Lagoon (SWMU-101)	P-1	656011	3806234	Access gate and signage. Photograph taken facing north.	Bilingual warning sign with emergency contact phone number located adjacent to entrance gate.	No
	P-2	656011	3806234	Northwestern corner of SWMU-101. Photographs taken facing east.	General photo showing well vegetated, mounded topography.	No
	P-3			General photograph of SWMU-101 near western extent. Photograph was taken facing east.	General photo showing well vegetated, mounded topography.	No
	P-4			General photograph of SWMU-101 on southern portion of site. The photograph was taken facing west.	General photo showing well vegetated, flat topography along perimeter of site. Storage tank is associated with monitoring well MW-H along southern boundary.	No
	P-5			Photograph taken facing east along southern site boundary.	Good demonstration of fence surrounding SWMU-101. Fence is structurally sound and continuous around the landfill.	No
	P-6			Western end of SWMU-101 facing north.	Small trees emerging near western end of site.	No
	P-7			General photograph of SWMU-101 on central portion of site. The photograph was taken facing east.	General photo showing well vegetated, mounded topography.	No
	P-8			Photograph taken facing east along southern site boundary.	Good demonstration of fence surrounding SWMU-101. Fence is structurally sound and continuous around the landfill. Photo showing well vegetated, flat topography along perimeter of site.	No
	P-9			Photograph taken adjacent to MW-H.	Vegetative cover from the south side facing northeast.	No

Photo #1

Photo #2

Photo #3

Photo #4

Photo #5

Photo #6

Photo #7

Photo #8

Photo #9

Photographic Log for Annual Landfill Survey-LF-03
Cannon Air Force Base, Curry County, NM
Date of photos: 10/23/2010

Photo #1

Photo #2

Photo #3

Photo #4

Photo #5

Photo #6

Photo #7

Photographic Log for Annual Landfill Survey-LF-04
Cannon Air Force Base, Curry County, NM
Date of photos: 10/23/2010

Photo #1

Photo #2

Photo #3

Photo #4

Photo #5

Photo #6

Photo #7

Photo #8

Photo #9

Photographic Log for Annual Landfill Survey-LF-25
Cannon Air Force Base, Curry County, NM
Date of photos: 10/23/2010

Photo #1

Photo #2

Photo #3

Photo #4

Photo #5

Photo #6

Photo #7

Photo #8

Photo #9

Photographic Log for Annual Landfill Survey-Sewage Lagoon
Cannon Air Force Base, Curry County, NM
Date of photos: 10/23/2010

Appendi C
Water ualit Field Data Forms and La orator Anal tical Data

42°
1
11-2-10
FP

TETRA TECH EC, INC.

Chain-of-Custody #

Project ID: Cannon AFB - LTM Group 1 Wells	*Sample Date:* 11-1-10	Preservative				Sample	
Project #: 106-8605DK02	*Project Chemist:* Jon Karnath (303) 980-3635	HNO3	H2SO4	HCL	NONE	METHOD	MATRIX

LOCID	SAMPLE_ID	TIME	DEPTH	HNO3	H2SO4	HCL	NONE	METHOD	MATRIX	VOCs	NITRATE	NO2—NO3	METALS	CHROME VI	PERCHLORATE
								Containers		3	1	1	1	1	1
LF25-MW-PA	LF25-MW-PA-01	1420					X	B	GW		X			X	X
						X		B	GW	X					
					X			B	GW			X			
				X									X		
LF25-MW-PA	LF25-MW-PA-01-FD						X		GW		X			X	X
		1420				X			GW	X					
					X				GW			X			
				X					GW				X		
	TB-01	1425								X					

METALS = Priority Pollutant Metals

Relinquished by: (signature)	*Date/Time*	*Received by: (signature)*	*Date/Time*
[signature]	11-1-10 1500	Lora Miller	11/2/10 0830
Relinquished by: (signature)	*Date/Time*	*Received by: (signature)*	*Date/Time*
Acknowledment of VOCs:		*Acknowledged by: (signature)*	*Date/Time*

Remarks:

LABORATORY USE ONLY	Y	N
Package Received/Custody Seals Intact		
Sample Labels/C-O-Cs agree		
Temperature within Specification C		
Corrected Copy Attached		
Problems or Discrepancies		

2-4
4.0 IRFP
LM
11/3/10

TETRA TECH EC, INC.

Chain-of-Custody #

Project ID:	Sample Date:
Cannon AFB - LTM Group 1 Wells	
Project #: 106-8605DK02	**Project Chemist:** Jon Karnath (303) 980-3635

LOCID	SAMPLE_ID	TIME	DEPTH	Preservative: HNO3	H2SO4	HCL	NONE	Sample: METHOD	MATRIX	VOCs	NITRATE	NO2—NO3	METALS	CHROME VI	PERCHLORATE
								Containers		3	1	1	1	1	1
LF04-MW-NA	LF04-MW-NA-01	820	350'				X	B	GW		X			X	X
						X		B	GW	X					
					X			B	GW			X			
				X									X		
	TB-02	845				X				X					

METALS = Priority Pollutant Metals

Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time
[signature]	11-2-10 1630	[signature]	11/3/10 800
Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time
Acknowledment of VOCs:		Acknowledged by: (signature)	Date/Time
Remarks:			

LABORATORY USE ONLY	Y	N
Package Received/Custody Seals Intact		
Sample Labels/C-O-Cs agree		
Temperature within Specification ____ C		
Corrected Copy Attached		
Problems or Discrepancies		

TETRA TECH EC, INC.

Chain-of-Custody #

Project ID: Cannon AFB - LTM Group 1 Wells	*Sample Date:*	Preservative				Sample		VOCs	NITRATE	NO2—NO3	METALS	CHROME VI	PERCHLORATE
Project #: 106-8605DK02	*Project Chemist:* Jon Karnath (303) 980-3635	HNO3	H2SO4	HCL	NONE	METHOD	MATRIX						
LOCID	SAMPLE_ID / TIME / DEPTH					Containers		3	1	1	1	1	1
LF04-MW-NA	LF04-MW-NA-MS 820 350'				X	B	GW		X			X	X
				X		B	GW	X					
			X			B	GW			X			
		X									X		

METALS = Priority Pollutant Metals

Relinquished by: (signature)	*Date/Time*	*Received by: (signature)*	*Date/Time*
[signature]	11-2-10 1630	[signature]	11/3/10 900
Relinquished by: (signature)	*Date/Time*	*Received by: (signature)*	*Date/Time*
Acknowledment of VOCs:		*Acknowledged by: (signature)*	*Date/Time*
Remarks:			

LABORATORY USE ONLY	Y	N
Package Received/Custody Seals Intact		
Sample Labels/C-O-C agree		
Temperature within Specification °C		
Corrected Copy Attached		
Problems or Discrepancies		

TETRATECH EC, INC.

Chain-of-Custody #

Project ID: Cannon AFB - LTM Group 1 Wells	*Sample Date:*	Preservative				Sample	
Project #: 106-8605DK02	*Project Chemist:* Jon Karnath (303) 980-3635	HNO3	H2SO4	HCL	NONE	METHOD	MATRIX

LOCIID	SAMPLE_ID	TIME	DEPTH	HNO3	H2SO4	HCL	NONE	METHOD	MATRIX	VOCs	NITRATE	NO2—NO3	METALS	CHROME VI	PERCHLORATE
								Containers		3	1	1	1	1	1
LF04-MW-NA	LF04-MW-NA-SD	820	350'				X	B	GW		X			X	X
						X		B	GW	X					
					X			B	GW			X			
				X									X		

METALS = Priority Pollutant Metals

Relinquished by: (signature)	*Date/Time*	*Received by: (signature)*	*Date/Time*
[signature]	11-2-10 1630	[signature]	11/3/10 900
Relinquished by: (signature)	*Date/Time*	*Received by: (signature)*	*Date/Time*
Acknowledment of VOCs:		*Acknowledged by: (signature)*	*Date/Time*
Remarks:			

LABORATORY USE ONLY	Y	N
Package Received/Custody Seals Intact		
Sample Labels/C-O-Cs agree		
Temperature within Specification C		
Corrected Copy Attached		
Problems or Discrepancies		

TETRA TECH EC, INC.

Chain-of-Custody #

Project ID: Cannon AFB - LTM Group 1 Wells	*Sample Date:*	Preservative				Sample	
Project #: 106-8605DK02	*Project Chemist:* Jon Karnath (303) 980-3635	HNO3	H2SO4	HCL	NONE	METHOD	MATRIX

LOCIID	SAMPLE_ID	TIME	DEPTH	HNO3	H2SO4	HCL	NONE	METHOD	MATRIX	VOCs	NITRATE	NO2—NO3	METALS	CHROME VI	PERCHLORATE
								Containers		3	1	1	1	1	1
MW-F	MW-F-01	1450	365'				X	B	GW		X			X	X
						X		B	GW	X					
					X			B	GW			X			
				X									X		

METALS = Priority Pollutant Metals

Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time
[signature]	11-2-10 1630	[signature]	11/3/10 900
Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time
Acknowledment of VOCs:		Acknowledged by: (signature)	Date/Time
Remarks:			

LABORATORY USE ONLY	Y	N
Package Received/Custody Seals Intact		
Sample Labels/C-O-C agree		
Temperature within Specification C		
Corrected Copy Attached		
Problems or Discrepancies		

TETRATECH EC, INC.

Chain-of-Custody #

Project ID: Cannon AFB - LTM Group 1 Wells	*Sample Date:*	Preservative				Sample	
Project #: 106-8605DK02	*Project Chemist:* Jon Karnath (303) 980-3635	HNO3	H2SO4	HCL	NONE	METHOD	MATRIX

LOCIID	SAMPLE_ID	TIME	DEPTH	HNO3	H2SO4	HCL	NONE	METHOD	MATRIX	VOCs	NITRATE	NO2—NO3	METALS	CHROME VI	PERCHLORATE
								Containers		3	1	1	1	1	1
LF03-MW-OA	LF03-MW-OA-01	1110	350				X	B	GW		X			X	X
						X		B	GW	X					
					X			B	GW			X			
				X									X		

METALS = Priority Pollutant Metals

Relinquished by: (signature)	*Date/Time*	*Received by: (signature)*	*Date/Time*
	11-2-10 1630		11/3/10 900
Relinquished by: (signature)	*Date/Time*	*Received by: (signature)*	*Date/Time*
Acknowledment of VOCs:		*Acknowledged by: (signature)*	*Date/Time*
Remarks:			

LABORATORY USE ONLY	Y	N
Package Received/Custody Seals Intact		
Sample Labels/COCs agree		
Temperature within Specification °C		
Corrected Copy Attached		
Problems or Discrepancies		

3.4°, ~~3.8°~~ 4.0 IRF
MB 11/5/10

TETRA TECH EC, INC.

Chain-of-Custody #

Project ID:	Sample Date:	Preservative				Sample	
Cannon AFB - LTM Group 1 Wells		HNO3	H2SO4	HCL	NONE	METHOD	MATRIX
Project #: 106-8605DK02	Project Chemist: Jon Karnath (303) 980-3635						

LOCIID	SAMPLE_ID	TIME	DEPTH	HNO3	H2SO4	HCL	NONE	METHOD	MATRIX	VOCs	NITRATE	NO2—NO3	METALS	CHROME VI	PERCHLORATE
								Containers		3	1	1	1	1	1
MW-E	MW-E-01	930	347'				X	B	GW		X			X	X
						X		B	GW	X					
					X			B	GW			X			
				X									X		
	TB-03	1600	NA							X					

METALS = Priority Pollutant Metals

Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time
	11-4-10 1600		11-5-10 0800
Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time
Acknowledment of VOCs:		Acknowledged by: (signature)	Date/Time
Remarks:			

LABORATORY USE ONLY	Y	N
Package Received/Custody Seals Intact		
Sample Labels/C-O-Cs agree		
Temperature within Specification C		
Corrected Copy Attached		
Problems or Discrepancies		

1.7 1R1
SC
11/16

TETRA TECH EC, INC.

Chain-of-Custody #

Project ID:	Sample Date:
Cannon AFB - LTM Group 1 Wells	11-5-10
Project #:	**Project Chemist:**
106-8605DK02	Jon Karnath (303) 980-3635

LOCIID	SAMPLE_ID	TIME	DEPTH	Preservative HNO3	H2SO4	HCL	NONE	Sample METHOD	MATRIX	VOCs	NITRATE	NO2—NO3	METALS	CHROME VI	PERCHLORATE
								Containers		3	1	1	1	1	1
MW-G	MW-G-01	1050	320'				X	B	GW		X			X	X
						X		B	GW	X					
					X			B	GW			X			
				X									X		

METALS = Priority Pollutant Metals

Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time
[signature]	11-5-10 1500	[signature]	11/6/10 1000
Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time
Acknowledment of VOCs:		Acknowledged by: (signature)	Date/Time
Remarks:			

LABORATORY USE ONLY	Y	N
Package Received/Custody Seals Intact		
Sample Labels/C-O-Cs agree		
Temperature within Specification °C		
Corrected Copy Attached		
Problems or Discrepancies		

TETRA TECH EC, INC.

Chain-of-Custody #

Project ID:	Sample Date:
Cannon AFB - LTM Group 1 Wells	11-5-10
Project #:	**Project Chemist:**
106-8605DK02	Jon Karnath (303) 980-3635

LOCIID	SAMPLE_ID	TIME	DEPTH	Preservative: HNO3	H2SO4	HCL	NONE	Sample: METHOD	MATRIX	VOCs	NITRATE	NO2—NO3	METALS	CHROME VI	PERCHLORATE
								Containers		3	1	1	1	1	1
MW-H	MW-H-01	815	30/35				X	B	GW		X			X	X
						X		B	GW	X					
					X			B	GW			X			
				X									X		
	TB-04	1400				X				X					

METALS = Priority Pollutant Metals

Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time
	11-5-10 1500		11/6/10 1000
Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time
Acknowledment of VOCs:		Acknowledged by: (signature)	Date/Time
Remarks:			

LABORATORY USE ONLY	Y	N
Package Received/Custody Seals Intact		
Sample Labels/C-O-C agree		
Temperature within Specification C		
Corrected Copy Attached		
Problems or Discrepancies		

Sample Login Acknowledgement

Job 280-9206-1

Client Job Description:	Cannon AFB	**Report To:**	Tetra Tech EC, Inc.
Purchase Order #:	1066547 Mod.1		Pam Moss
Work Order #:	106-8605DK02, Task 0002.00010		143 Union Boulevard Suite 1010 Lakewood, CO 80228-1824
Project Manager:	Elaine Walker		
Job Due Date:	11/23/2010		
Job TAT:	21 Days		
Max Deliverable Level:	IV	**Bill To:**	Tetra Tech EC, Inc.
			Pam Moss
Earliest Deliverable Due:	11/23/2010		143 Union Boulevard Suite 1010 Lakewood, CO 80228-1824

Login 280-9206

Sample Receipt:	11/2/2010 8:30:00 AM	**Number of Coolers:**	1
Method of Delivery:	FedEx Priority Overnight	**Cooler Temperature(s) (C°):**	4.2

Lab Sample # / Method	Client Sample ID / Method Description / Work Location	Date Sampled	Matrix	Rpt Basis	Dry / Wet **
280-9206-1	**LF25-MW-PA-01**	**11/1/2010 2:20:00 PM**	**Water**		
300_48HR	Nitrate / In-Lab			Total	Wet
	Analytes: Nitrate as N				
353.2_Pres	Nitrogen, Nitrate-Nitrite / In-Lab			Total	Wet
	Analytes: Nitrate Nitrite as N				
6020A	Priority Pollutants Metals 6020 / In-Lab			Total	Wet
	Analytes: Ag, As, Ba, Be, Cd, Cu, Ni, Pb, Se, Tl, Zn				
6860	Perchlorate / In-Lab			Total	Wet
7196A_CR3	Chromium, Trivalent (Colorimetric) / In-Lab			Total	Wet
	Analytes: Cr, Cr (III), Cr (VI)				
7196A	Chromium, Hexavalent / In-Lab			Total	Wet
	Analytes: Cr (VI)				
7470A	Mercury / In-Lab			Total	Wet
	Analytes: Hg				
8260_DoD	8260B VOCs / In-Lab			Total	Wet
280-9206-2	**LF25-MW-PA-01-FD**	**11/1/2010 2:20:00 PM**	**Water**		
300_48HR	Nitrate / In-Lab			Total	Wet
	Analytes: Nitrate as N				
353.2_Pres	Nitrogen, Nitrate-Nitrite / In-Lab			Total	Wet
	Analytes: Nitrate Nitrite as N				
6020A	Priority Pollutants Metals 6020 / In-Lab			Total	Wet
	Analytes: Ag, As, Ba, Be, Cd, Cu, Ni, Pb, Se, Tl, Zn				
6860	Perchlorate / In-Lab			Total	Wet
7196A_CR3	Chromium, Trivalent (Colorimetric) / In-Lab			Total	Wet
	Analytes: Cr, Cr (III), Cr (VI)				
7196A	Chromium, Hexavalent / In-Lab			Total	Wet
	Analytes: Cr (VI)				

* Method on-hold

** Wet/Dry indicates whether the reported results will be corrected for moisture content, and based on sample Wet weight or Dry weight.

Sample Login Acknowledgement

Lab Sample #	Client Sample ID	Date Sampled	Matrix		
Method	**Method Description / Work Location**			**Rpt Basis**	**Dry / Wet ****
7470A	Mercury / In-Lab			Total	Wet
	Analytes:				
	Hg				
8260_DoD	8260B VOCs / In-Lab			Total	Wet
280-9206-3	**TB-01**	**11/1/2010 2:25:00 PM**	**Water**		
8260_DoD	8260B VOCs / In-Lab			Total	Wet

* Method on-hold

** Wet/Dry indicates whether the reported results will be corrected for moisture content, and based on sample Wet weight or Dry weight.

Sample Login Acknowledgement

Job 280-9393-1

Client Job Description:	Cannon AFB	**Report To:**	Tetra Tech EC, Inc.
Purchase Order #:	1066547 Mod.1		Jonathan Karnath
Work Order #:	106-8605DK02, Task 0002.00010		143 Union Boulevard Suite 1010 Lakewood, CO 80228-1824
Project Manager:	Elaine Walker		
Job Due Date:	11/26/2010		
Job TAT:	21 Days		
Max Deliverable Level:	IV	**Bill To:**	Tetra Tech EC, Inc.
			Jonathan Karnath
Earliest Deliverable Due:	11/26/2010		143 Union Boulevard Suite 1010 Lakewood, CO 80228-1824

Login 280-9393

Sample Receipt:	11/5/2010 9:00:00 AM	**Number of Coolers:**	1
Method of Delivery:	FedEx Priority Overnight	**Cooler Temperature(s) (C°):**	3.4

Lab Sample # / Method	Client Sample ID / Method Description / Work Location	Date Sampled	Matrix	Rpt Basis	Dry / Wet **
280-9393-1	**MW-E-01**	**11/4/2010 9:30:00 AM**	**Water**		
300_48HR	Nitrate / In-Lab			Total	Wet
	Analytes:				
	Nitrate as N				
353.2_Pres	Nitrogen, Nitrate-Nitrite / In-Lab			Total	Wet
	Analytes:				
	Nitrate Nitrite as N				
6020A	Priority Pollutants Metals 6020 / In-Lab			Total	Wet
	Analytes:				
	Ag, As, Ba, Be, Cd, Cu, Ni, Pb, Se, Tl, Zn				
6860	Perchlorate / In-Lab			Total	Wet
7196A_CR3	Chromium, Trivalent (Colorimetric) / In-Lab			Total	Wet
	Analytes:				
	Cr, Cr (III), Cr (VI)				
7196A	Chromium, Hexavalent / In-Lab			Total	Wet
	Analytes:				
	Cr (VI)				
7470A	Mercury / In-Lab			Total	Wet
	Analytes:				
	Hg				
8260_DoD	8260B VOCs / In-Lab			Total	Wet
280-9393-2	**TB-03**	**11/4/2010 4:00:00 PM**	**Water**		
8260_DoD	8260B VOCs / In-Lab			Total	Wet

* Method on-hold

** Wet/Dry indicates whether the reported results will be corrected for moisture content, and based on sample Wet weight or Dry weight.

Sample Login Acknowledgement

Job 280-9482-1

Client Job Description:	Cannon AFB	**Report To:**	Tetra Tech EC, Inc.
Purchase Order #:	1066547 Mod.1		Jonathan Karnath
Work Order #:	106-8605DK02, Task 0002.00010		143 Union Boulevard Suite 1010 Lakewood, CO 80228-1824
Project Manager:	Elaine Walker		
Job Due Date:	11/24/2010		
Job TAT:	18 Days		
Max Deliverable Level:	IV	**Bill To:**	Tetra Tech EC, Inc.
			Jonathan Karnath
Earliest Deliverable Due:	11/24/2010		143 Union Boulevard Suite 1010 Lakewood, CO 80228-1824

Login 280-9482

Sample Receipt:	11/6/2010 10:00:00 AM	**Number of Coolers:**	1
Method of Delivery:	FedEx Saturday Delivery	**Cooler Temperature(s) (C°):**	1.7

Lab Sample # / Method	Client Sample ID / Method Description / Work Location	Date Sampled	Matrix	Rpt Basis	Dry / Wet **
280-9482-1	**MW-G-01**	**11/5/2010 10:50:00 AM**	**Water**		
300_48HR	Nitrate / In-Lab			Total	Wet
	Analytes: Nitrate as N				
353.2_Pres	Nitrogen, Nitrate-Nitrite / In-Lab			Total	Wet
	Analytes: Nitrate Nitrite as N				
6020A	Priority Pollutants Metals / In-Lab			Total	Wet
	Analytes: Ag, As, Ba, Be, Cd, Cu, Ni, Pb, Se, Tl, Zn				
6860	Perchlorate / In-Lab			Total	Wet
7196A_CR3	Chromium, Trivalent (Colorimetric) / In-Lab			Total	Wet
	Analytes: Cr, Cr (III), Cr (VI)				
7196A	Cr+6 / Cr+3 / In-Lab			Total	Wet
	Analytes: Cr (VI)				
7470A	Mercury / In-Lab			Total	Wet
	Analytes: Hg				
8260_DoD	Volatile Organic Compounds / In-Lab			Total	Wet
280-9482-2	**MW-H-01**	**11/5/2010 8:15:00 AM**	**Water**		
300_48HR	Nitrate / In-Lab			Total	Wet
	Analytes: Nitrate as N				
353.2_Pres	Nitrogen, Nitrate-Nitrite / In-Lab			Total	Wet
	Analytes: Nitrate Nitrite as N				
6020A	Priority Pollutants Metals / In-Lab			Total	Wet
	Analytes: Ag, As, Ba, Be, Cd, Cu, Ni, Pb, Se, Tl, Zn				
6860	Perchlorate / In-Lab			Total	Wet
7196A_CR3	Chromium, Trivalent (Colorimetric) / In-Lab			Total	Wet
	Analytes: Cr, Cr (III), Cr (VI)				
7196A	Cr+6 / Cr+3 / In-Lab			Total	Wet
	Analytes: Cr (VI)				

* Method on-hold

** Wet/Dry indicates whether the reported results will be corrected for moisture content, and based on sample Wet weight or Dry weight.

Sample Login Acknowledgement

Lab Sample #	Client Sample ID	Date Sampled	Matrix		
Method	**Method Description / Work Location**			**Rpt Basis**	**Dry / Wet ****
7470A	Mercury / In-Lab			Total	Wet
	Analytes:				
	Hg				
8260_DoD	Volatile Organic Compounds / In-Lab			Total	Wet
280-9482-3	**TB-04**	**11/5/2010 2:00:00 PM**	**Water**		
8260_DoD	Volatile Organic Compounds / In-Lab			Total	Wet

* Method on-hold

** Wet/Dry indicates whether the reported results will be corrected for moisture content, and based on sample Wet weight or Dry weight.

Sample Login Acknowledgement

Job 280-9265-1

Client Job Description:	Cannon AFB	**Report To:**	Tetra Tech EC, Inc. Jonathan Karnath 143 Union Boulevard Suite 1010 Lakewood, CO 80228-1824
Purchase Order #:	1066547 Mod.1		
Work Order #:	106-8605DK02, Task 0002.00010		
Project Manager:	Elaine Walker		
Job Due Date:	11/24/2010		
Job TAT:	21 Days		
Max Deliverable Level:	IV	**Bill To:**	Tetra Tech EC, Inc. Jonathan Karnath 143 Union Boulevard Suite 1010 Lakewood, CO 80228-1824
Earliest Deliverable Due:	11/24/2010		

Login 280-9265

Sample Receipt:	11/3/2010 9:00:00 AM	**Number of Coolers:**	2
Method of Delivery:	FedEx Priority Overnight	**Cooler Temperature(s) (C°):**	2.4; 4.0

Lab Sample # / Method	Client Sample ID / Method Description / Work Location	Date Sampled	Matrix	Rpt Basis	Dry / Wet **
280-9265-1	**LF04-MW-NA-01**	**11/2/2010 8:20:00 AM**	**Water**		
300_48HR	Nitrate / In-Lab			Total	Wet
	Analytes: Nitrate as N				
353.2_Pres	Nitrogen, Nitrate-Nitrite / In-Lab			Total	Wet
	Analytes: Nitrate Nitrite as N				
6020A	Priority Pollutants Metals 6020 / In-Lab			Total	Wet
	Analytes: Ag, As, Ba, Be, Cd, Cu, Ni, Pb, Se, Tl, Zn				
6860	Perchlorate / In-Lab			Total	Wet
7196A_CR3	Chromium, Trivalent (Colorimetric) / In-Lab			Total	Wet
	Analytes: Cr, Cr (III), Cr (VI)				
7196A	Chromium, Hexavalent / In-Lab			Total	Wet
	Analytes: Cr (VI)				
7470A	Mercury / In-Lab			Total	Wet
	Analytes: Hg				
8260_DoD	8260B VOCs / In-Lab			Total	Wet
280-9265-1 MS	**LF04-MW-NA-01**	**11/2/2010 8:20:00 AM**	**Water**		
300_48HR	Nitrate / In-Lab			Total	Wet
	Analytes: Nitrate as N				
353.2_Pres	Nitrogen, Nitrate-Nitrite / In-Lab			Total	Wet
	Analytes: Nitrate Nitrite as N				
6020A	Priority Pollutants Metals 6020 / In-Lab			Total	Wet
	Analytes: Ag, As, Ba, Be, Cd, Cu, Ni, Pb, Se, Tl, Zn				
6860	Perchlorate / In-Lab			Total	Wet
7196A_CR3	Chromium, Trivalent (Colorimetric) / In-Lab			Total	Wet
	Analytes: Cr, Cr (III), Cr (VI)				
7196A	Chromium, Hexavalent / In-Lab			Total	Wet
	Analytes: Cr (VI)				

* Method on-hold

** Wet/Dry indicates whether the reported results will be corrected for moisture content, and based on sample Wet weight or Dry weight.

Sample Login Acknowledgement

Lab Sample #	Client Sample ID	Date Sampled	Matrix		
Method	**Method Description / Work Location**			**Rpt Basis**	**Dry / Wet ****
7470A	Mercury / In-Lab			Total	Wet
	Analytes:				
	Hg				
8260_DoD	8260B VOCs / In-Lab			Total	Wet
280-9265-1 MSD	**LF04-MW-NA-01**	**11/2/2010 8:20:00 AM**	**Water**		
300_48HR	Nitrate / In-Lab			Total	Wet
	Analytes:				
	Nitrate as N				
353.2_Pres	Nitrogen, Nitrate-Nitrite / In-Lab			Total	Wet
	Analytes:				
	Nitrate Nitrite as N				
6020A	Priority Pollutants Metals 6020 / In-Lab			Total	Wet
	Analytes:				
	Ag, As, Ba, Be, Cd, Cu, Ni, Pb, Se, Tl, Zn				
6860	Perchlorate / In-Lab			Total	Wet
7196A_CR3	Chromium, Trivalent (Colorimetric) / In-Lab			Total	Wet
	Analytes:				
	Cr, Cr (III), Cr (VI)				
7196A	Chromium, Hexavalent / In-Lab			Total	Wet
	Analytes:				
	Cr (VI)				
7470A	Mercury / In-Lab			Total	Wet
	Analytes:				
	Hg				
8260_DoD	8260B VOCs / In-Lab			Total	Wet
280-9265-2	**MW-F-01**	**11/2/2010 2:50:00 PM**	**Water**		
300_48HR	Nitrate / In-Lab			Total	Wet
	Analytes:				
	Nitrate as N				
353.2_Pres	Nitrogen, Nitrate-Nitrite / In-Lab			Total	Wet
	Analytes:				
	Nitrate Nitrite as N				
6020A	Priority Pollutants Metals 6020 / In-Lab			Total	Wet
	Analytes:				
	Ag, As, Ba, Be, Cd, Cu, Ni, Pb, Se, Tl, Zn				
6860	Perchlorate / In-Lab			Total	Wet
7196A_CR3	Chromium, Trivalent (Colorimetric) / In-Lab			Total	Wet
	Analytes:				
	Cr, Cr (III), Cr (VI)				
7196A	Chromium, Hexavalent / In-Lab			Total	Wet
	Analytes:				
	Cr (VI)				
7470A	Mercury / In-Lab			Total	Wet
	Analytes:				
	Hg				
8260_DoD	8260B VOCs / In-Lab			Total	Wet
280-9265-3	**LF03-MW-OA-01**	**11/2/2010 11:10:00 AM**	**Water**		
300_48HR	Nitrate / In-Lab			Total	Wet
	Analytes:				
	Nitrate as N				
353.2_Pres	Nitrogen, Nitrate-Nitrite / In-Lab			Total	Wet
	Analytes:				
	Nitrate Nitrite as N				
6020A	Priority Pollutants Metals 6020 / In-Lab			Total	Wet

* Method on-hold

** Wet/Dry indicates whether the reported results will be corrected for moisture content, and based on sample Wet weight or Dry weight.

Sample Login Acknowledgement

Lab Sample #	Client Sample ID	Date Sampled	Matrix		
Method	**Method Description / Work Location**			**Rpt Basis**	**Dry / Wet ****
	Analytes:				
	Ag, As, Ba, Be, Cd, Cu, Ni, Pb, Se, Tl, Zn				
6860	Perchlorate / In-Lab			Total	Wet
7196A_CR3	Chromium, Trivalent (Colorimetric) / In-Lab			Total	Wet
	Analytes:				
	Cr, Cr (III), Cr (VI)				
7196A	Chromium, Hexavalent / In-Lab			Total	Wet
	Analytes:				
	Cr (VI)				
7470A	Mercury / In-Lab			Total	Wet
	Analytes:				
	Hg				
8260_DoD	8260B VOCs / In-Lab			Total	Wet
280-9265-4	**TB-02**	**11/2/2010 8:45:00 AM**	**Water**		
8260_DoD	8260B VOCs / In-Lab			Total	Wet

* Method on-hold

** Wet/Dry indicates whether the reported results will be corrected for moisture content, and based on sample Wet weight or Dry weight.

WATER SAMPLE COLLECTION FIELD SHEET

GENERAL INFORMATION

SITE NAME Cannon AFB PROJECT NO. 106-8605DK02

SAMPLE NO. LF04-MW-NA-01 WELL NO. MW-Na

DATE/TIME COLLECTED 11-2-10 820 PERSONNEL T. Schmucker, J. Kramer

SAMPLE METHOD Bladder pump - low flow

SAMPLE MEDIA: Groundwater

SAMPLE QA SPLIT: YES (NO) SPLIT SAMPLE NO.

SAMPLE QC DUPLICATE: YES (NO) DUPLICATE SAMPLE NO.

MS/MSD REQUESTED (YES) NO MS/MSD SAMPLE NO. LF04-MW-NA-MS, LF04-MW-NA-SD

SAMPLE CONTAINERS, PRESERVATIVES, ANALYSIS

Sample Container	Preservative	Analysis Requested
40 ml Vial (3)	HCl	VOCs
250 ml plastic	None	Nitrate
500 ml amber glass	H_2SO_4	Nitrate/Nitrite
500 ml plastic	HNO_3	Metals
250 ml plastic	None	Hex Chrome
125 ml plastic	None	Perchlorate

WELL PURGING DATA

		Well Depth (ft BTOC)	358
Date	11-2-10	Depth to Water (ft BTOC)	304.72
Time Started	0705	Water Column Length	
Time Completed	0820	Well Casing Volume (per ft)	
PID Measurements		Volume of Water in Well (L)	
Background		Casing Volumes to Purge	
Breathing Zone		Minimum to Purge (L)	
Well Head		Actual Purge (L)	
Purge Water			

FIELD MEASUREMENTS

Time	Amount Purged (L)	pH	Temperature (Celsius)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Redox (mV)	Turbidity (NTU)	Depth to Water (ft BTOC)	Purge Rate (L/min)
0735		7.51	14.61	59	9.22	201.1	36.9	305.10	0.28
0745		7.58	15.24	59	8.93	207.2	20.5	305.13	
0755		7.60	15.63	59	8.86	212.2	16.6	305.13	
0805		7.59	15.54	59	8.60	221.8	16.4	305.13	
0815		7.59	15.68	59	8.52	232.4	10.4	305.13	
0820	20.8	7.58	15.78	59	8.48	244.9	9.4	305.13	

FIELD EQUIPMENT AND CALIBRATION

Equipment	Model	Calibration
YSI Multimeter		Cond 1310 -> 1413 pH 7.04 -> 7.00 DO 97 -> 100%
Hannah turbimeter		15.1 -> 15.0

GENERAL COMMENTS

Multi-Parameter Probe Unit #

Field Parameters Measured in Flow-Through Cell

Pump Placement Depth = 348

Pump Rate = 0.28 L/m

Well Diameter = 4"

Screen Interval = 298-358

WATER SAMPLE COLLECTION FIELD SHEET

GENERAL INFORMATION

SITE NAME Cannon AFB PROJECT NO. 106-8605DK02

SAMPLE NO. LF03-MW-OA-01 WELL NO. MW-OA

DATE/TIME COLLECTED 11-2-10 1110 PERSONNEL T. Schmucker, J. Kramer

SAMPLE METHOD Bladder pump - low flow

SAMPLE MEDIA: Groundwater

SAMPLE QA SPLIT: YES (NO) SPLIT SAMPLE NO.

SAMPLE QC DUPLICATE: YES (NO) DUPLICATE SAMPLE NO.

MS/MSD REQUESTED YES (NO) MS/MSD SAMPLE NO.

SAMPLE CONTAINERS, PRESERVATIVES, ANALYSIS

Sample Container	Preservative	Analysis Requested
40 ml Vial (3)	HCl	VOCs
250 ml plastic	None	Nitrate
500 ml amber glass	H_2SO_4	Nitrate/Nitrite
500 ml plastic	HNO_3	Metals
250 ml plastic	None	Hex Chrome
125 ml plastic	None	Perchlorate

WELL PURGING DATA

Date	11-2-10	Well Depth (ft BTOC)	365
Time Started	0915	Depth to Water (ft BTOC)	317.63
Time Completed	1110	Water Column Length	
PID Measurements		Well Casing Volume (per ft)	
Background		Volume of Water in Well (L)	
Breathing Zone		Casing Volumes to Purge	
Well Head		Minimum to Purge (L)	
Purge Water		Actual Purge (L)	

FIELD MEASUREMENTS

Time	Amount Purged (L)	pH	Temperature (Celsius)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Redox (mV)	Turbidity (NTU)	Depth to Water (ft BTOC)	Purge Rate (L/min)
0945		7.16	15.74	164	8.95	303.3	2.99	318.25	0.30
0955		7.09	15.84	164	5.02	324.8	1.96	318.21	
1005		7.00	15.97	165	4.62	336.9	1.94	318.30	
1015		6.94	16.08	165	4.35	381.1	2.04	318.22	
1025		6.91	16.32	166	4.19	412.4	1.74	318.22	
1035		6.84	16.53	166	4.06	434.8	1.60	318.23	
1045		6.82	16.62	166	4.02	453.8	1.32	318.23	
1100		6.78	16.92	166	4.02	474.7	1.01	318.21	
1110	34.0	6.76	16.89	166	4.00	484.5	0.99	318.23	

FIELD EQUIPMENT AND CALIBRATION

Equipment	Model	Calibration
YSI Multimeter		Cond 1310 → 1413 pH 7.04 → 7.00, D.O. 102 → 100%
Hannah turbimeter		10.0 → 15.0

GENERAL COMMENTS

Multi-Parameter Probe Unit #

Field Parameters Measured in Flow-Through Cell

Pump Placement Depth = 350

Pump Rate = 0.30 L/m

Well Diameter = 4"

Screen Interval = 305-365

WATER SAMPLE COLLECTION FIELD SHEET

GENERAL INFORMATION

SITE NAME Cannon AFB PROJECT NO. 106-8605DK02

SAMPLE NO. LF25-MW-PA-01 WELL NO. MW-P2

DATE/TIME COLLECTED 11-1-10 1420 PERSONNEL T. Schmucker, J. Kramer

SAMPLE METHOD Bladder pump - low flow

SAMPLE MEDIA: Groundwater

SAMPLE QA SPLIT: YES (NO) SPLIT SAMPLE NO.

SAMPLE QC DUPLICATE: (YES) NO DUPLICATE SAMPLE NO. LF25-MW-PA-01-FD

MS/MSD REQUESTED YES (NO) MS/MSD SAMPLE NO.

SAMPLE CONTAINERS, PRESERVATIVES, ANALYSIS

Sample Container	Preservative	Analysis Requested
40 ml vial (3)	HCl	VOCs
250 ml plastic	None	Nitrate
500 ml amber glass	H_2SO_4	Nitrate/Nitrite
500 ml plastic	HNO_3	Metals
250 ml plastic	None	Hex Chrome
125 ml plastic	None	Perchlorate

WELL PURGING DATA

		Well Depth (ft BTOC)	360
Date	11-1-10	Depth to Water (ft BTOC)	307.38
Time Started	1245	Water Column Length	
Time Completed	1415	Well Casing Volume (per ft)	
PID Measurements		Volume of Water in Well (L)	
Background		Casing Volumes to Purge	
Breathing Zone		Minimum to Purge (L)	
Well Head		Actual Purge (L)	
Purge Water			

FIELD MEASUREMENTS

Time	Amount Purged (L)	pH	Temperature (Celsius)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Redox (mV)	Turbidity (NTU)	Depth to Water (ft BTOC)	Purge Rate (L/min)
1310		7.38	20.42	84	7.40	280	4.65	307.40	.084
1320		7.17	20.45	83	9.27	379	3.84	307.00	
1330		7.02	20.64	77	8.97	434	3.58	307.21	
1340		7.00	20.63	76	8.32	456	1.50	307.52	
1350		6.98	21.02	70	7.56	478	0.86	307.41	
1400		6.91	20.81	76	7.18	492	1.55	307.00	
1410		6.95	20.79	76	6.95	497	0.82	307.35	
1415	7.57	6.96	20.78	77	6.96	494	0.81	307.21	

FIELD EQUIPMENT AND CALIBRATION

Equipment	Model	Calibration
YSI Multimeter		Cond 1413 -> 1421 pH 6.87 -> 7.00 DO 99 -> 100 %
Hanna Turbidimeter		15.0 -> 15.0

GENERAL COMMENTS

Multi-Parameter Probe Unit #

Field Parameters Measured in Flow-Through Cell

Pump Placement Depth = 350

Pump Rate = .084 L/m

Well Diameter = 4"

Screen Interval = 300-360

WATER SAMPLE COLLECTION FIELD SHEET

GENERAL INFORMATION

SITE NAME Cannon AFB PROJECT NO. 106-8605DK02

SAMPLE NO. MW-E-01 WELL NO. MW-E

DATE/TIME COLLECTED 11-4-10 0930 PERSONNEL T. Schmucker, J. Kramer

SAMPLE METHOD Bladder pump - low flow

SAMPLE MEDIA: Groundwater

SAMPLE QA SPLIT: YES (NO) SPLIT SAMPLE NO.

SAMPLE QC DUPLICATE: YES (NO) DUPLICATE SAMPLE NO.

MS/MSD REQUESTED YES (NO) MS/MSD SAMPLE NO.

SAMPLE CONTAINERS, PRESERVATIVES, ANALYSIS

Sample Container	Preservative	Analysis Requested
40 ml Vial (3)	HCl	VOCs
250 ml plastic	None	Nitrate
500 ml amber glass	H_2SO_4	Nitrate/Nitrite
500 ml plastic	HNO_3	Metals
250 ml plastic	None	Hex Chrome
125 ml plastic	None	Perchlorate

WELL PURGING DATA

		Well Depth (ft BTOC)	357
Date	11-4-10	Depth to Water (ft BTOC)	311.65
Time Started	0810	Water Column Length	
Time Completed	0925	Well Casing Volume (per ft)	
PID Measurements		Volume of Water in Well (L)	
Background		Casing Volumes to Purge	
Breathing Zone		Minimum to Purge (L)	
Well Head		Actual Purge (L)	
Purge Water			

FIELD MEASUREMENTS

Time	Amount Purged (L)	pH	Temperature (Celsius)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Redox (mV)	Turbidity (NTU)	Depth to Water (ft BTOC)	Purge Rate (L/min)
0900		7.62	15.84	62	4.65	226.8	7.59	311.90	0.20
0910		7.54	16.10	61	3.02	233.3	7.51	311.95	)
0920		7.56	16.43	62	1.66	245.8	8.79	311.91	)
0925	15.1	7.60	16.47	62	1.65	252.1	8.36	311.91	)

FIELD EQUIPMENT AND CALIBRATION

Equipment	Model	Calibration
YSI Multimeter		Cond 2000 → 1409, D.O. 83.2 → 100%, pH 3.84-4.00, 6.93 → 7.00, 10.25 → 10.00
Hanna Turbidimeter		15.1 → 15.0

GENERAL COMMENTS

Multi-Parameter Probe Unit #

Field Parameters Measured in Flow-Through Cell

Pump Placement Depth = 347'

Pump Rate = 0.20 L/min

Well Diameter = 4"

Screen Interval = ~~358-373~~ 342-357'

WATER SAMPLE COLLECTION FIELD SHEET

GENERAL INFORMATION

SITE NAME Cannon AFB PROJECT NO. 106-8605DK02

SAMPLE NO. MW-F-01 WELL NO. MW-F

DATE/TIME COLLECTED 11-2-10 1450 PERSONNEL T. Schmucker, J. Kramer

SAMPLE METHOD Bladder pump - low flow

SAMPLE MEDIA: Groundwater

SAMPLE QA SPLIT: YES (NO) SPLIT SAMPLE NO.

SAMPLE QC DUPLICATE: YES (NO) DUPLICATE SAMPLE NO.

MS/MSD REQUESTED YES (NO) MS/MSD SAMPLE NO.

SAMPLE CONTAINERS, PRESERVATIVES, ANALYSIS

Sample Container	Preservative	Analysis Requested
40 ml Vial (3)	HCl	VOCs
250 ml plastic	None	Nitrate
500 ml amber glass	H_2SO_4	Nitrate/Nitrite
500 ml plastic	HNO_3	Metals
250 ml plastic	None	Hex Chrome
125 ml plastic	None	Perchlorate

WELL PURGING DATA

		Well Depth (ft BTOC)	375
Date	11-2-10	Depth to Water (ft BTOC)	310.14
Time Started	1320	Water Column Length	
Time Completed	1450	Well Casing Volume (per ft)	
PID Measurements		Volume of Water in Well (L)	
Background		Casing Volumes to Purge	
Breathing Zone		Minimum to Purge (L)	
Well Head		Actual Purge (L)	
Purge Water			

FIELD MEASUREMENTS

Time	Amount Purged (L)	pH	Temperature (Celsius)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Redox (mV)	Turbidity (NTU)	Depth to Water (ft BTOC)	Purge Rate (L/min)
1340		7.49	17.82	81	7.39	282.3	7.28	310.40	0.21
1350		7.24	18.07	80	7.29	414.6	4.33	310.41	
1400		7.13	18.15	80	7.22	462.4	4.65	310.41	
1410		7.11	18.30	80	7.11	483.1	3.83	310.41	
1420		7.02	17.85	80	7.14	503.4	3.76	310.41	
1430		7.04	17.93	80	7.02	510.2	3.18	310.38	
1440		7.02	17.94	80	6.98	518.0	2.64	310.37	
1450	18.9	7.03	17.81	80	7.00	520.4	3.00	310.41	

FIELD EQUIPMENT AND CALIBRATION

Equipment	Model	Calibration
Hanna turbidimeter		
YSI Multimeter		

GENERAL COMMENTS

Multi-Parameter Probe Unit #

Field Parameters Measured in Flow-Through Cell

Pump Placement Depth = 365

Pump Rate = 0.21 L/min

Well Diameter = 4"

Screen Interval = 360-375

WATER SAMPLE COLLECTION FIELD SHEET

GENERAL INFORMATION

SITE NAME Cannon AFB PROJECT NO. 106-8605DK02

SAMPLE NO. MW-6-01 WELL NO. MW-6

DATE/TIME COLLECTED 11-5-10 1050 PERSONNEL T. Schmucker, J. Kramer

SAMPLE METHOD Bladder pump - low flow

SAMPLE MEDIA: Groundwater

SAMPLE QA SPLIT: YES (NO) SPLIT SAMPLE NO.

SAMPLE QC DUPLICATE: YES (NO) DUPLICATE SAMPLE NO.

MS/MSD REQUESTED YES (NO) MS/MSD SAMPLE NO.

SAMPLE CONTAINERS, PRESERVATIVES, ANALYSIS

Sample Container	Preservative	Analysis Requested
40 ml Vial (3)	HCl	VOCs
250 ml plastic	None	Nitrate
500 ml amber glass	H_2SO_4	Nitrate/Nitrite
500 ml plastic	HNO_3	Metals
250 ml plastic	None	Hex Chrome
125 ml plastic	None	Perchlorate

WELL PURGING DATA

		Well Depth (ft BTOC)	372
Date	11-5-10	Depth to Water (ft BTOC)	313.92
Time Started	0855	Water Column Length	
Time Completed	1050	Well Casing Volume (per ft)	
PID Measurements		Volume of Water in Well (L)	
Background		Casing Volumes to Purge	
Breathing Zone		Minimum to Purge (L)	
Well Head		Actual Purge (L)	
Purge Water			

FIELD MEASUREMENTS

Time	Amount Purged (L)	pH	Temperature (Celsius)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Redox (mV)	Turbidity (NTU)	Depth to Water (ft BTOC)	Purge Rate (L/min)
0930		7.66	16.36	57	5.94	238.1	10.4	314.16	0.18
0940		7.55	16.51	57	5.84	278.5	12.4	314.15	
0950		7.50	16.95	57	5.82	314.3	6.3	314.18	
1000		7.46	17.88	57	5.53	349.4	11.9	314.07	
1010		7.45	17.34	57	5.50	399.2	12.1	314.12	
1020		7.43	17.37	57	5.35	414.6	10.9	314.14	
1030		7.45	17.81	57	5.31	420.4	13.9	314.08	
1040		7.45	18.09	57	5.22	429.4	11.3	314.08	
1050	20.8	7.45	18.60	57	5.17	438.1	12.9	314.12	

FIELD EQUIPMENT AND CALIBRATION

Equipment	Model	Calibration
YSI Multimeter		
Hanna Turbidimeter		

GENERAL COMMENTS

Multi-Parameter Probe Unit #

Field Parameters Measured in Flow-Through Cell

Pump Placement Depth = 370

Pump Rate = 0.18 L/min

Well Diameter = 4"

Screen Interval = 357 - 372

WATER SAMPLE COLLECTION FIELD SHEET

GENERAL INFORMATION

SITE NAME Cannon AFB PROJECT NO. 106-8605DK02

SAMPLE NO. MW-H-01 WELL NO. MW-H

DATE/TIME COLLECTED 11-5-10 0815 PERSONNEL T. Schmucker, J. Kramer

SAMPLE METHOD Bladder pump - low flow

SAMPLE MEDIA: Groundwater

SAMPLE QA SPLIT: YES ~~NO~~ SPLIT SAMPLE NO.

SAMPLE QC DUPLICATE: YES ~~NO~~ DUPLICATE SAMPLE NO.

MS/MSD REQUESTED YES ~~NO~~ MS/MSD SAMPLE NO.

SAMPLE CONTAINERS, PRESERVATIVES, ANALYSIS

Sample Container	Preservative	Analysis Requested
40 ml Vial (3)	HCl	VOCs
250 ml plastic	None	Nitrate
500 ml amber glass	H_2SO_4	Nitrate/Nitrite
500 ml plastic	HNO_3	Metals
250 ml plastic	None	Hex Chrome
125 ml plastic	None	Perchlorate

WELL PURGING DATA

		Well Depth (ft BTOC)	345
Date	11-5-10	Depth to Water (ft BTOC)	313.66
Time Started	0700	Water Column Length	
Time Completed	0815	Well Casing Volume (per ft)	
PID Measurements		Volume of Water in Well (L)	
Background		Casing Volumes to Purge	
Breathing Zone		Minimum to Purge (L)	
Well Head		Actual Purge (L)	
Purge Water			

FIELD MEASUREMENTS

Time	Amount Purged (L)	pH	Temperature (Celsius)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Redox (mV)	Turbidity (NTU)	Depth to Water (ft BTOC)	Purge Rate (L/min)
0725		7.95	13.32	52	5.65	180.8	23.00	313.89	0.20
0735		7.74	14.35	53	4.63	158.4	28.4	313.88	
0745		7.70	14.57	53	4.34	155.4	22.4	313.89	
0755		7.67	14.55	54	4.38	158.0	22.2	313.88	
0805		7.66	15.02	53	4.28	160.8	25.2	313.88	
0815	15.1	7.65	15.48	54	4.49	164.4	17.8	313.88	

FIELD EQUIPMENT AND CALIBRATION

Equipment	Model	Calibration
YSI Multimeter		
Hannah Turbidimeter		

GENERAL COMMENTS

Multi-Parameter Probe Unit #

Field Parameters Measured in Flow-Through Cell

Pump Placement Depth = 345

Pump Rate = 0.20

Well Diameter = 4"

Screen Interval = 338 - 353

Appendi D
Data Validation Summar Report

Tetra Tech Inc
Data Validation Report

Job Number 280-9206-1

Project/Site Name:	Cannon Air Force Base
Collection Date:	11/1/2010
Report Date:	11/30/2010
Matrix:	Groundwater
Validation Level:	Sample-Specific
Validation Guidelines:	Project-Specific
Laboratory:	TestAmerica

Analytical Parameter:	Analysis Method:
Volatile Organic Compounds (VOCs)	SW-846 8260B
ICP-MS Metals	SW846 6020
Mercury	SW846 7470A
Perchlorate	SW846 6860
Nitrate	MCAWW 300.0A
Nitrate/Nitrite	MCAWW 353.2
Hexavalent Chromium	SW846 7196A
Trivalent Chromium (by calculation)	SW846 7196A

DATA REVIEW AND VALIDATI N

A laboratory data review and independent data validation were performed on the data. The data validation process for the November 2010 sampling event included a review of the following parameters as applicable:

- Chain-of-custody (C-O-C) documentation
- Holding time compliance
- Method and trip blank data
- MS/MSD sample recovery
- Laboratory Control Sample (LCS) recovery
- Surrogate spike recovery
- Internal standard area response
- ICP Interference Check Sample
- Duplicate sample analysis

Sample Identification

LF25-MW-PA-01 LF25-MW-PA-01-FD TB-01

Validation Summar

1 olding Time

All analyses were performed within specified holding times.

2 Surrogates

The surrogate recoveries were within limits.

3 Matri Spi es/Post Digestion Spi e

All spike recoveries were within laboratory limits.

4 lan s

Traces of zinc and silver were observed in the prep and calibration blanks, respectively. No qualifications were required.

5 Internal Standards

All internal standards were within limits.

6 Duplicates

All MS/MSD, LCS/LCSD, and lab duplicate analyses were satisfactory.

7 La orator Control Sample (LCS)

All LCS analyses were acceptable.

8 Interference Chec Sample

All criteria were met.

9 Miscellaneous

Matrix spike analyses were not performed for the volatiles, perchlorate, ICPMS metals, or wet chemistry (353.2) analyses. In addition, laboratory duplicate and serial dilution analyses were not performed. No action was taken.

ualifiers used during alidation

J	Indicates an estimated value.
R	Quality control indicates the data is not usable.
U	Indicates the compound or analyte was analyzed for but subsequently qualified due to blank contamination.

All data are accepta le and alid No qualifications are required

Tetra Tech Inc
Data Validation Report

Job Number 280-9265-1

Project/Site Name:	Cannon Air Force Base
Collection Date:	11/2/2010
Report Date:	11/30/2010
Matrix:	Groundwater
Validation Level:	Sample-Specific
Validation Guidelines:	Project-Specific
Laboratory:	TestAmerica

Analytical Parameter:	Analysis Method:
Volatile Organic Compounds (VOCs)	SW-846 8260B
ICP-MS Metals	SW846 6020
Mercury	SW846 7470A
Perchlorate	SW846 6860
Nitrate	MCAWW 300.0A
Nitrate/Nitrite	MCAWW 353.2
Hexavalent Chromium	SW846 7196A
Trivalent Chromium	SW846 7196A

DATA REVIEW AND VALIDATI N

A laboratory data review and independent data validation were performed on the data. The data validation process for the November 2010 sampling event included a review of the following parameters as applicable:

- Chain-of-custody (C-O-C) documentation
- Holding time compliance
- Method and trip blank data
- MS/MSD sample recovery
- Laboratory Control Sample (LCS) recovery
- Surrogate spike recovery
- Internal standard area response
- ICP Interference Check Sample
- ICP serial dilution
- Post digestion (analytical) spike recoveries
- Duplicate sample analysis

Sample Identification

LF04-MW-NA-01	MW-F-01	LF03-MW-OA-01	TB-04

Validation Summar

1 olding Time

Hexavalent chromium was qualified as estimated (J) in samples LF04-MW-NA-01 and MW-F-01 because the analyses were performed out of holding time. The non-detect result for LF03-MW-OA-01 was also acquired out the 24-hour hold time. In addition, since the trivalent chromium results are determined by calculation based upon the Cr^{+6} values, they too are considered out of holding time. However, qualification of non-detect results was not performed under the specifications of the project guidelines. Therefore, the Cr^{+6} and Cr^{+3} non-detected results were not estimated. Nitrate was estimated (J) in LF03-MW-OA-01 because the dilution analysis exceeded specified holding time. All other analyses were performed within specified holding times.

2 Surrogates

All surrogates were within limits.

3 Matri Spi es/Post Digestion Spi e

All spike recoveries were within laboratory limits.

4 lan s

Traces of zinc and silver were observed in the prep and calibration blanks, respectively. All affected samples were qualified accordingly.

5 Internal Standards

All internal standards were within limits.

6 Duplicates

All MS/MSD, LCS/LCSD, and lab duplicate analyses were satisfactory.

7 La orator Control Sample (LCS)

All LCS analyses were acceptable.

8 Interference Chec Sample

All criteria were met.

9 Serial Dilution

The serial dilution analysis was acceptable.

ualifiers used during alidation

J	Indicates an estimated value.
R	Quality control indicates the data is not usable.
U	Indicates the compound or analyte was analyzed for but subsequently qualified due to blank contamination.

Data ualification Summar

Sample Identification	Anal te	ualifiers Applied	ualifier Code	Reason for ualification
LF04-MW-NA-01 MW-F-01	Hexavalent chromium	J	HT	Holding time exceeded
LF03-MW-OA-01	Nitrate	J	HT	Holding time exceeded
LF04-MW-NA-01 LF03-MW-OA-01	Zinc	10.0 U 6.0 U	PB	Prep blank contamination
LF04-MW-NA-01 LF03-MW-OA-01	Silver	0.063 U 0.045 U	CCB	Continuing calibration blank contamination

Tetra Tech Inc
Data Validation Report

Job Number 280-9393-1

Project/Site Name:	Cannon Air Force Base
Collection Date:	11/4/2010
Report Date:	11/30/2010
Matrix:	Groundwater
Validation Level:	Sample-Specific
Validation Guidelines:	Project-Specific
Laboratory:	TestAmerica

Analytical Parameter:	Analysis Method:
Volatile Organic Compounds (VOCs)	SW-846 8260B
ICP-MS Metals	SW846 6020
Mercury	SW846 7470A
Perchlorate	SW846 6860
Nitrate	MCAWW 300.0A
Nitrate/Nitrite	MCAWW 353.2
Hexavalent Chromium	SW846 7196A
Trivalent Chromium	SW846 7196A

DATA REVIEW AND VALIDATI N

A laboratory data review and independent data validation were performed on the data. The data validation process for the November 2010 sampling event included a review of the following parameters as applicable:

- Chain-of-custody (C-O-C) documentation
- Holding time compliance
- Method and trip blank data
- MS/MSD sample recovery
- Laboratory Control Sample (LCS) recovery
- Surrogate spike recovery
- Internal standard area response
- ICP Interference Check Sample
- Duplicate sample analysis

Sample Identification

MW-E-01 TB-03

Validation Summar

1 olding Time

Hexavalent chromium in sample MW-E-01 was performed 3 hours out of holding time. Since the trivalent chromium result is determined by calculation based upon the Cr^{+6} value, it too is considered out of holding time. However, qualification of non-detect results was not performed under the specifications of the project guidelines. Therefore, the Cr^{+6} and Cr^{+3} results were not estimated. All other analyses were performed within specified holding times.

2 Surrogates

The surrogate recoveries were within limits.

3 Matri Spi es/Post Digestion Spi e

All spike recoveries were within laboratory limits.

4 lan s

Low level acetone and/or methylene chloride were present in the method and trip blanks. Traces of zinc and silver were observed in the prep and calibration blanks, respectively. The affected analytes were qualified accordingly.

5 Internal Standards

All internal standards were within limits.

6 Duplicates

All MS/MSD, LCS/LCSD, and lab duplicate analyses were satisfactory.

7 La orator Control Sample (LCS)

All LCS analyses were acceptable.

8 Interference Chec Sample

All criteria were met.

9 Miscellaneous

Matrix spike analyses were not performed for the volatiles, metals, or wet chemistry (353.2, 300.0) analyses. In addition, laboratory duplicate and serial dilution analyses were not performed. No action was taken.

ualifiers used during alidation

J	Indicates an estimated value.
R	Quality control indicates the data is not usable.
U	Indicates the compound or analyte was analyzed for but subsequently qualified due to blank contamination.

Data ualification Summar

Sample Identification	Anal te	ualifiers Applied	ualifier Code	Reason for ualification
MW-E-01	Acetone	6.4 U	MB	Method blank contamination
MW-E-01	Silver	0.067 U	CCB	Continuing calibration blank contamination

Tetra Tech Inc
Data Validation Report

Job Number 280-9482-1

Project/Site Name:	Cannon Air Force Base
Collection Date:	11/5/2010
Report Date:	11/30/2010
Matrix:	Groundwater
Validation Level:	Sample-Specific
Validation Guidelines:	Project-Specific
Laboratory:	TestAmerica

Analytical Parameter:	Analysis Method:
Volatile Organic Compounds (VOCs)	SW-846 8260B
ICP-MS Metals	SW846 6020
Mercury	SW846 7470A
Perchlorate	SW846 6860
Nitrate	MCAWW 300.0A
Nitrate/Nitrite	MCAWW 353.2
Hexavalent Chromium	SW846 7196A
Trivalent Chromium	SW846 7196A

DATA REVIEW AND VALIDATI N

A laboratory data review and independent data validation were performed on the data. The data validation process for the November 2010 sampling event included a review of the following parameters as applicable:

- Chain-of-custody (C-O-C) documentation
- Holding time compliance
- Method and trip blank data
- MS/MSD sample recovery
- Laboratory Control Sample (LCS) recovery
- Surrogate spike recovery
- Internal standard area response
- ICP Interference Check Sample
- ICP serial dilution
- Post digestion (analytical) spike recoveries
- Duplicate sample analysis

Sample Identification

MW-G-01	MW-H-01	TB-04

Validation Summar

1 olding Time

Hexavalent chromium was qualified as estimated (J) in sample MW-H-01 because the analysis was performed 2 hours out of holding time. Since the trivalent chromium result is determined by calculation based upon the Cr^{+6} value, it too is considered out of holding time. However, qualification of non-detect results was not performed under the specifications of the project guidelines. Therefore, the Cr^{+3} value was not estimated. All other analyses were performed within specified holding times.

2 Surrogates

All surrogates were within limits.

3 Matri Spi es/Post Digestion Spi e

All spike recoveries were within laboratory limits.

4 lan s

Low level acetone and methylene chloride were present in the method blank. Traces of thallium, barium and silver were observed in the prep and calibration blanks. All affected samples were qualified accordingly.

5 Internal Standards

All internal standards were within limits.

6 Duplicates

All MS/MSD, LCS/LCSD, and lab duplicate analyses were satisfactory.

7 La orator Control Sample (LCS)

All LCS analyses were acceptable.

8 Interference Chec Sample

All criteria were met.

9 Serial Dilution

The serial dilution analysis was acceptable.

ualifiers used during alidation

J	Indicates an estimated value.
R	Quality control indicates the data is not usable.
U	Indicates the compound or analyte was analyzed for but subsequently qualified due to blank contamination.

Data ualification Summar

Sample Identification	Anal te	ualifiers Applied	ualifier Code	Reason for ualification
MW-H-01	Acetone	6.4 U	MB	Method blank contamination
MW-H-01	Hexavalent chromium	J	HT	Holding time exceeded
MW-G-01 MW-H-01	Thallium	0.13 U 0.06 U	PB	Prep blank contamination

Appendi E
2009 Annual Co er
S stem Inspection Report

2009 Long-Term Monitoring and Maintenance Inspection Report for Landfill No 3 (LF-03/SWMU 105) Landfill No 4 (LF-04/SWMU 104) Landfill No 25 (LF-25/SWMU 97) and Sewage Lagoons (SWMU 101) Cannon Air Force ase New Me ico

Contract No FA4890-04-D-0006 Tas rder D 02
Pro ect No C 20087600M

Final
Decem er 2010

Prepared for:

27 SOCES/CEAN
Cannon Air Force Base, New Mexico

U.S. Army Corps of Engineers
Omaha District

Prepared by:

Tetra Tech, Inc.
143 Union Boulevard
Lakewood, Colorado 80228

Trinity Analysis and Development Corp.
90 NW Beal Parkway, Suite A2
Fort Walton Beach, Florida 32548

REPORT DOCUMENTATION PAGE	Form Approved OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington Virginia 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, D.C. 20503.

1. AGENCY USE ONLY	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	December 2010	2009 Long-Term Monitoring and Maintenance Inspection Report for Landfill No. 3 (LF-03/SWMU 105), Landfill No. 4 (LF-04/SWMU 104), Landfill No. 25 (LF-25/SWMU 97), and Sewage Lagoons (SWMU 101)

4. TITLE AND SUBTITLE	5. FUNDING NUMBERS
Cannon Air Force Base, New Mexico 2009 Long-Term Monitoring and Maintenance Inspection Report for Landfill No. 3 (LF-03/SWMU 105), Landfill No. 4 (LF-04/SWMU 104), Landfill No. 25 (LF-25/SWMU 97), and Sewage Lagoons (SWMU 101)	Contract No. FA4890-04-D-0006 Task Order DK02
6. AUTHOR Ms. Carol Rieger and Ms. Deborah Wilson	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Tetra Tech, Inc. 143 Union Blvd. Suite 1010 Lakewood, Colorado 80228	8. PERFORMING ORGANIZATION REPORT NUMBER
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This report documents the vegetative cover inspection performed at four Environmental Restoration Program sites at Cannon Air Force Base, New Mexico. The annual inspection was conducted in November 2009 at Landfill No. 3 (LF-03/Solid Waste Management Unit [SWMU] 105), Landfill No. 4 (LF-04/SWMU 104), Landfill No. 25 (LF-25/SWMU 97), and the Sewage Lagoons (SWMU 101). Annual inspection and maintenance, if required, are conducted to ensure that the cover systems at LF-03, LF-04, LF-25, and the Sewage Lagoons are functioning as designed and meet operational objectives.

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LIST F ACR N MS AND A REVIATI NS

ACM	Asbestos-Containing Material
AFB	Air Force Base
CMS	Corrective Measures Study
ERP	Environmental Restoration Program
ft	foot/feet
M&M	Monitoring and Maintenance
M&M Plan	*Long-Term Monitoring and Maintenance Work Plan for Landfill No. 3 (LF-03/SWMU 105), Landfill No. 4 (LF-04/SWMU 104), Landfill No. 25 (LF-25/SWMU 97), and Sewage Lagoons (SWMU 101)*
NMED	New Mexico Environment Department
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SWMU	Solid Waste Management Unit
Tetra Tech	Tetra Tech, Inc.
USACE	U.S. Army Corps of Engineers

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1 INTR DUCTI N

Annual vegetative cover inspections were conducted in November 2009 at four Environmental Restoration Program (ERP) sites on Cannon Air Force Base (AFB), located in Curry County, New Mexico (Figure 1). The New Mexico Environment Department (NMED) previously outlined specific cover inspection, monitoring, and reporting actions required at LF-03 (Solid Waste Management Unit [SWMU] 105), LF-04 (SWMU 104), LF-25 (SWMU 97), and the former Sewage Lagoons (SWMU 101). The covers were installed to minimize percolation and leachate production and prevent any potential impact to groundwater beneath each site. Because the vegetative covers constructed at LF-03, LF-04, LF-25, and the Sewage Lagoon site are similar, a single, comprehensive long-term inspection and maintenance program was specified for all four sites.

To address NMED requirements, the *Long-Term Monitoring and Maintenance Work Plan, Landfill No. 3 (SWMU 105), Landfill No. 4 (SWMU 104), Landfill No. 25 (SWMU 97), and Sewage Lagoons (SWMU 101)* (M&M Plan) (Tetra Tech and Brown, Burdine, & Associates, LLC, 2009) was developed. The plan guides the inspection program at the four ERP sites designed to verify establishment and proper maintenance of the vegetative covers. The approved M&M Plan was prepared for NMED and the U.S. Army Corps of Engineers (USACE), Omaha District, under Contract No. FA4890-04-D-0006, Task Order DK02.

This Annual Long-Term Monitoring and Maintenance (M&M) Inspection Report documents the results of the inspection activities performed at LF-03, LF-04, LF-25, and the south lagoon area at Cannon AFB. The locations of these sites are shown in Figure 2. The annual cover inspection was performed on November 9 and 10, 2009. The following activities were conducted during the 2009 inspection:

1. Annual inspection of the vegetative covers at LF-03, LF-04, LF-05, and south lagoon area and documentation of the inspection results

2. Evaluation of the need for routine maintenance to ensure the cover systems function as designed and meet operational objectives

3. Document the current condition of the cover systems with photographs

The cover systems at all four sites were observed to be in good to excellent condition with no noted deficiencies or required maintenance or repair. The next annual M&M cover inspection will be conducted in 2010. A summary report of the findings will be submitted to NMED prior to December 31, 2010.

2 SITE DESCRIPTI N AND IST R

Cannon AFB is located in Curry County, New Mexico, approximately 7 miles west of the city of Clovis (Figure 1). Cannon AFB occupies 4,320 acres that consist of the airfield and associated operations, maintenance, and support facilities that are located northwest of the airfield. Housing facilities are located in the former northwestern portion of the Base, west of U.S. Highway 277 and

north of U.S. Highway 60. Additional Base support facilities, such as the Munitions Storage Area and current fire department training area, are located south and east of the airfield.

The following sections describe the operational history of the sites and associated cover systems.

2 1 LF-03 istor and Site Description

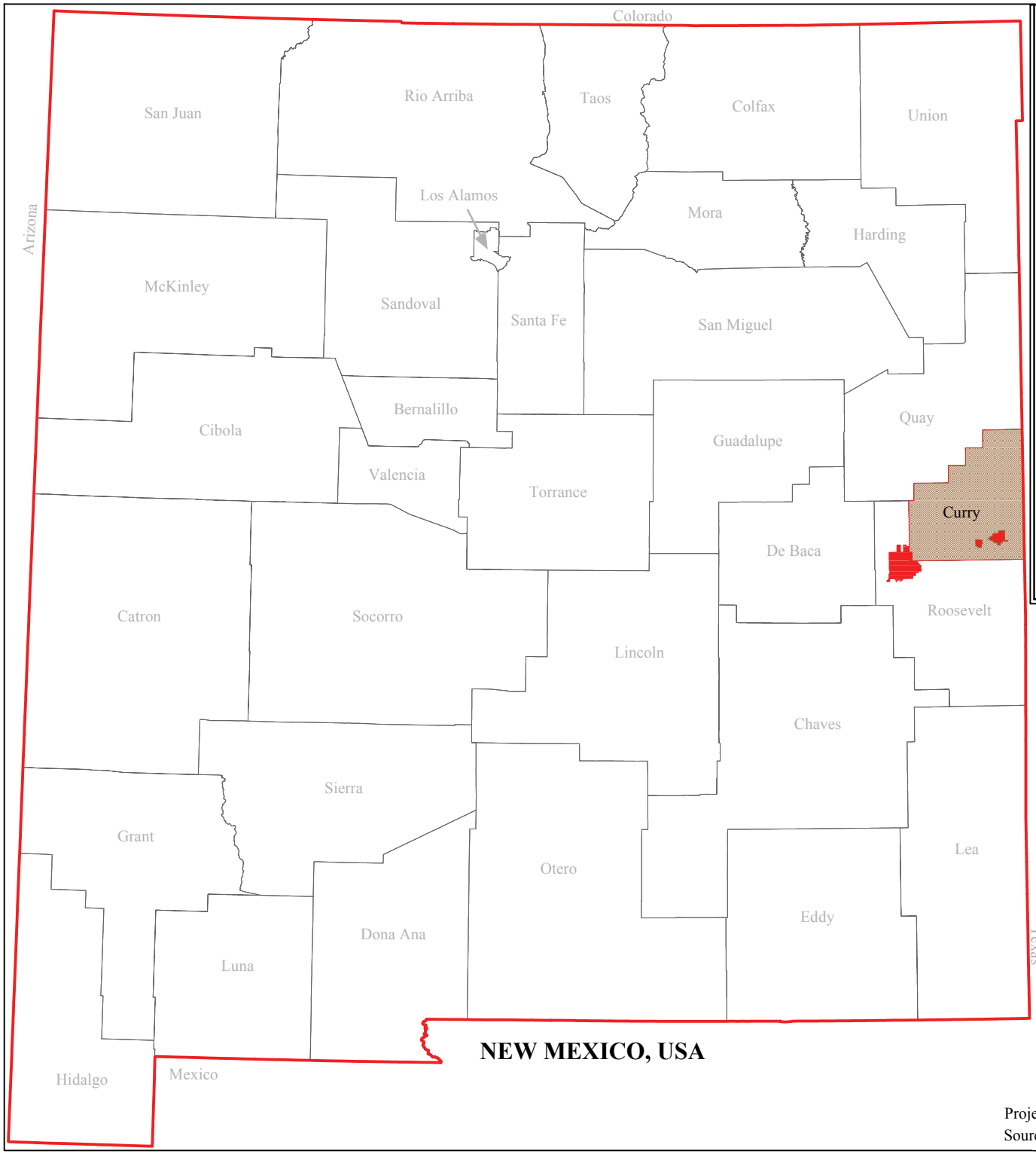
This section provides a brief background and history of LF-03 based on the results of Resource Conservation and Recovery Act (RCRA) Facility Investigations (RFIs) conducted at the site. This site was investigated along with LF-04 during the Appendix I, Phase I RFI (Radian, 1994a). A detailed summary of the site's background and history, results of previous investigations, corrective measures, and status is presented in the *RCRA Facility Investigation Report for Landfill No. 3 (LF-03/SWMU 105), Landfill No. 4 (LF-04/SWMU 104), and Landfill No. 25 (LF-25/SWMU 97)* (HGL, 2006).

LF-03 is an inactive landfill formerly used for burn and disposal trenching operations. The 9-acre site is located in the east-central portion of Cannon AFB and is bounded to the north by a road leading to the transmitter tower, to the south and east by barbed-wire fences and agricultural fields, and on the west by Perimeter Road. The ground surface in this area is slightly hummocky and is covered with prairie grasses. Limited shallow areas of subsidence are visible and associated with the waste burial trenches at the landfill. Playa Lake, which lies approximately 450 feet (ft) north of LF-03, is the closest surface water body to the landfill. The location of the landfill with respect to the surrounding facility is shown in Figure 2.

The landfill was operated from 1959 to 1967 and was reported to have received domestic and industrial wastes including solvents, paints, thinners, waste oils, and peroxide containers. Disposal activities consisted of placing collected waste material into a trench, burning the accumulated waste, and then covering the burned material with soil the following day. The disposal trench excavations were reported to be up to 16.5 ft deep and over 250 ft in length. The amount of waste material disposed within the landfill trenches has not been determined. No waste disposal activities are known to have occurred for over 40 years. Subsurface investigation activities encountered waste material such as soda and beer bottles, plastic sheeting and bags, clothing, synthetic rubber machinery belt, Styrofoam, scrap metal, insulated and non-insulated wiring, and a crushed 5-gallon can with no lid. Consistent with historical waste disposal operations, both burned and unburned materials have been encountered in the burial trenches during site investigations.

2 2 LF-04 istor and Site Description

This section provides a brief background and history of LF-04 based on the results of RFIs conducted at the site. This site was investigated along with LF-03 during the Appendix I, Phase I RFI (Radian, 1994b). A detailed summary of the site's background and history, results of previous investigations, corrective measures, and status is presented in the *RCRA Facility Investigation Report for Landfill No. 3 (LF-03/SWMU 105), Landfill No. 4 (LF-04/SWMU 104), and Landfill No. 25 (LF-25/SWMU 97)* (HGL, 2006).



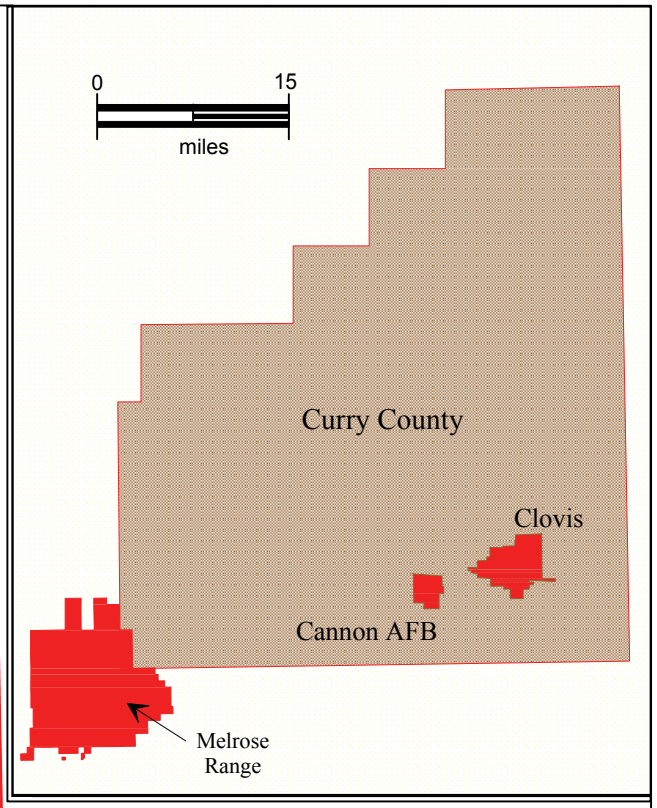
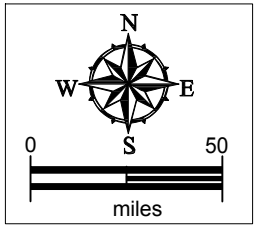


FIGURE 1.
Site Location

Cannon Air Force Base

Curry County, New Mexico



Projection: UTM meters, NAD 83
Source files: New Mexico Resource Geographic Information System Program

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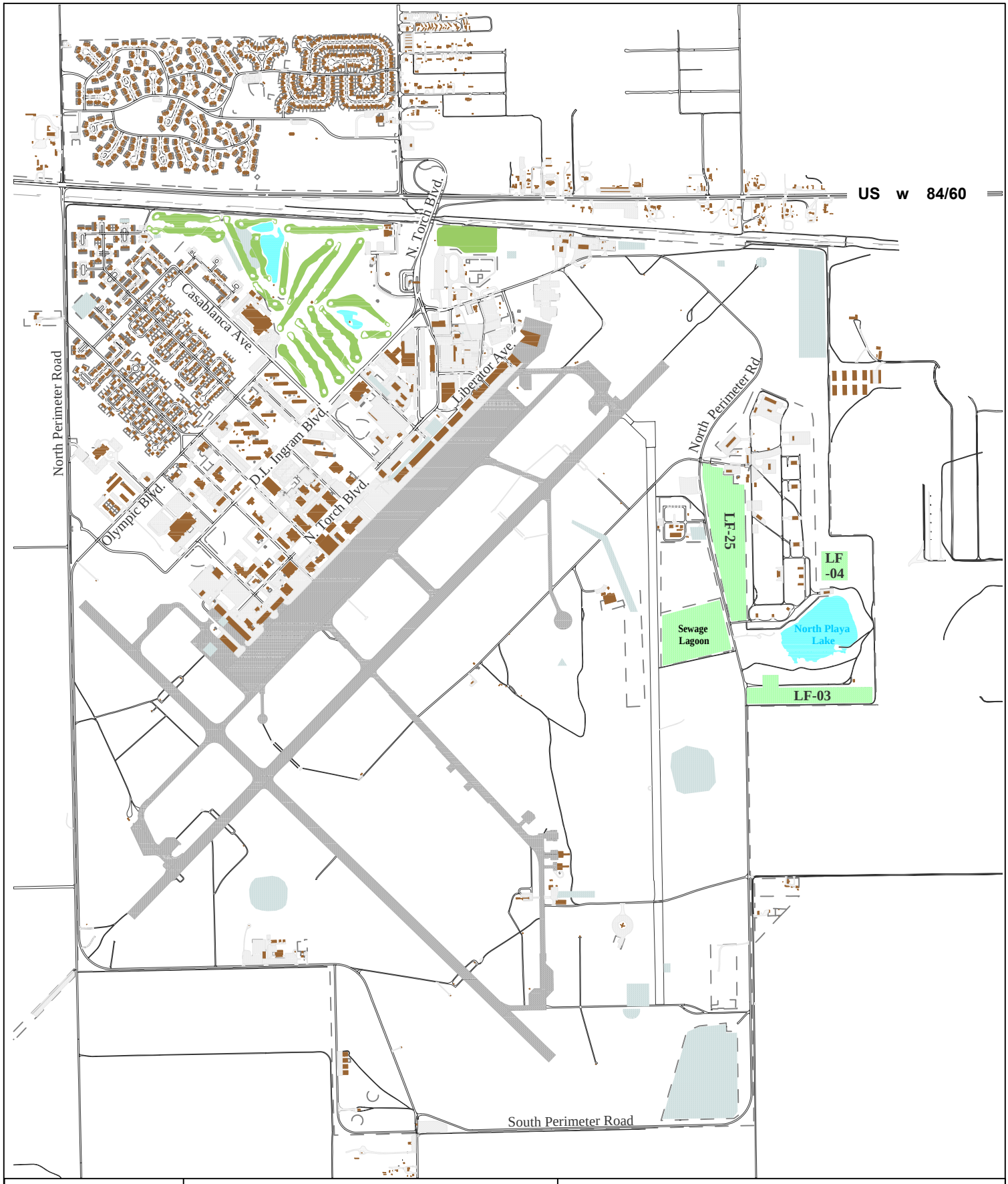

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NOTES

ERP Site/SWMU
ERP LTM Sites
Existing building
Airfield surface

Digital data files provided by GeoBase/CAFB
Projection: UTM Zone 13N, NAD 83

FIGURE 2.
Plan View

Cannon Air Force Base

Curry County, New Mexico

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LF-04 is an inactive landfill formerly used for burn and disposal trenching operations. The 7-acre site is located in the east-central portion of Cannon AFB and lies approximately 800 ft west of the Munitions Storage Area and is bounded to the north by Perimeter Road, to the west by a barbed-wire fence, and to the east and south by vacant fields. The site is an open field covered with prairie grasses.

Limited shallow areas of subsidence are visible and associated with the waste burial trenches at the landfill. A constructed earthen berm surrounds the landfill site, providing additional erosion control and containment. Playa Lake, which lies approximately 1,000 ft south of LF-04, is the closest surface water body to the landfill. The location of the landfill with respect to the surrounding facility is shown in Figure 2.

The landfill was operated for one year from 1967 to 1968. The landfill reportedly received domestic and industrial wastes including solvents, paints, thinners, waste oils, and peroxide containers. Disposal activities consisted of placing collected waste material into a trench, burning the accumulated waste, and then covering the burned material with soil the following day. The disposal trench excavations were reported to be up to 16.5 ft deep and over 250 ft in length.

The amount of waste material disposed within the landfill trenches has not been determined. No waste disposal activities are known to have occurred for over 40 years. Subsurface investigation activities encountered waste materials such as glass, soda and beer cans, clothing, plastic sheeting and bags, scrap metal, insulated and non-insulated wiring, and one crushed 5-gallon can.

2 3 LF-25 istor and Site Description

This section provides a brief background and history of LF-25 based on the results of RFIs conducted at the site. This site was investigated during the Appendix I, Phase I RFI (Radian, 1994c). A detailed summary of the site's background and history, results of previous investigations, corrective measures, and status is presented in the *RCRA Facility Investigation Report for Landfill No. 3 (LF-03/SWMU 105), Landfill No. 4 (LF-04/SWMU 104), and Landfill No. 25 (LF-25/SWMU 97)* (HGL, 2006).

LF-25 is an inactive construction and demolition debris landfill located in the east-central portion of Cannon AFB. The former landfill covers a 32-acre area roughly trapezoidal in shape, located east of Perimeter Road and approximately 500 ft northwest of Playa Lake. The topography of the LF-25 area slopes from north to south. The site encompasses multiple rubble piles that vary in height across the site and reach a maximum of 15 ft in the northern portion of the unit. Most of the rubble piles are approximately 3 to 4 ft high. The oldest piles of rubble are present on the north and west sides of the unit and are covered with grasses, shrubs, and small trees. A 2-ft-high permanent earthen berm is present adjacent to the southern and eastern borders of the unit to prevent stormwater runoff from leaving the site. Near the northeastern corner of the site, Base personnel have placed concrete slabs (rip-rap) to control erosion. The landfill location with respect to the surrounding facility is shown in Figure 2.

The landfill was used as a waste disposal site from approximately 1945 through the 1980s, but the exact period of operation is unknown. After World War II, construction demolition debris was disposed at the landfill. The accumulation of debris within the former concrete rubble pile is

unknown but is believed to have begun around 1961. The debris consisted of concrete, wood, asbestos tiles, metal, transite and cement pipe, and asphalt mixed with soil. Trenches excavated during a 1990 environmental assessment revealed the majority of material was airfield pavement and subgrade material, followed by building demolition rubble. Glass, metal cinders, ash, and other burned materials were encountered in what appeared to be burn trenches.

In 2001 exposed non-friable asbestos-containing material (ACM) was observed at the site. Approximately 56 cubic yards of ACM and 16,000 cubic yards of concrete rubble waste were removed from LF-25. Other remedial activities conducted at the site included tree trimming, tree removal, recycling of concrete debris, and site grading. A permanent earthen berm was constructed to a height of 2 ft above ground surface along the landfill's southern and eastern edges to prevent stormwater runoff from leaving the site. Final site contours act to retain and control stormwater runoff.

A 6-inch-thick topsoil cover was installed using clean fill generated from site grading to minimize percolation through the landfill, leachate production, and potential impact to the groundwater. The cover system was revegetated by seeding and mulching with native grasses using an approved seed mix. A three-strand barbed-wire fence with gates and signage was installed around the site boundary. Cover construction was completed in June 2001 (Foster Wheeler Environmental 2001a).

2 4 Sewage Lagoons istor and Site Description

The former Sewage Lagoons are located in east-central portion of Cannon AFB. The location of the site with respect to the surrounding facility is shown in Figure 2.

The Sewage Lagoons were constructed in 1966. The lagoons consisted of two unlined surface impoundments that received combined sanitary and industrial wastewater from Base facilities. The north and south lagoons had concrete-lined banks and unlined earthen bottoms, operated in series, and had a combined surface area of approximately 39 acres. In 1998, a new wastewater treatment plant was put in operation at Cannon AFB. Although sewage discharge to the lagoons stopped in 1998, the Base continued to discharge treated wastewater to the lagoons in order to prevent direct exposure to the underlying sludge. In early 1998 the Base stopped discharging treated wastewater to the lagoons and allowed them to dry.

SWMU 101 was investigated in 1992 during the Appendix I RFI (Woodward-Clyde, 1992). Based on the results the lagoons were recommended for continued annual groundwater monitoring. A Corrective Measures Study (CMS) for closure identified potential corrective actions (Foster Wheeler Environmental, 2001b). Human health and ecological risk assessments were conducted as part of the CMS to determine the requirements for contaminant containment and source control. The CMS recommended sludge removal from the former north lagoon, in-place consolidation in the former south lagoon, and closure using an engineered cover with a biotic barrier as voluntary corrective actions for closing the lagoons. The same economical solution to close the lagoons permanently was identified in two reports, *Sludge Management, Compliance Evaluation, and Requirements Identification Phase III* (E&E, 1998) and *Sewage Lagoons Closure Final Specifications* (USACE, 2002). The solution involved dewatering, consolidation, and compaction of the contaminated material, followed by installation of a protective cover. The cover design assumed that the contaminated medium at the site consisted of approximately 2 ft of sludge overlying a 1-ft-thick layer of soil.

In 2003, a voluntary corrective measure was implemented at SWMU 101 to construct an engineered earthen cover to minimize any potential threat to human health and the environment from contaminated material within the lagoons. Sludge and the underlying contaminated soil from the north lagoon were excavated and consolidated into the south lagoon. The south lagoon area was then graded and compacted to prepare a substrate. Finally, a 20-acre, 42-inch-thick engineered earthen cover system with a biotic barrier was installed over the south lagoon area to reduce infiltration of moisture into the underlying layer of contaminated material.

The Construction Completion Report (Foster Wheeler Environmental, 2006) documents the activities conducted to complete the voluntary remedial action at the former Sewage Lagoons. The preliminary construction activities included grading and drainage construction and demolition and removal of concrete and piping. Contaminated media were then excavated from the former north lagoon area followed by in-place consolidation of excavated material, random fill, and grading in the south lagoon area. The cover consists of an 18- to 21-inch-thick earthen soil-barrier layer; an 18-inch-thick biota barrier of recycled, crushed concrete; and a 6-inch-thick erosion/vegetation layer. A drainage ditch surrounds the cover to prevent stormwater runoff from leaving the site. In April 2004, the cover was revegetated by seeding with native species. A five-strand barbed-wire fence was installed on the northern boundary of the capped area to separate the north and south lagoons and control access. This fence was tied in with the existing fencing that had been installed around the other sides of the site.

3 VEGETATIVE C VER INSPECTI N RESULTS

The 2009 annual vegetative cover inspection consisted of physically walking, observing, and documenting the current condition of the cover systems at each of the three landfills and the south lagoon area. The review included description of the vegetation and any associated drainage and erosion control features. The perimeter fence, gates, and signage were included in the inspection, if present at the site. The locations of the sites that were inspected are shown on Figure 3. All inspections were performed on November 9 and 10, 2009.

Each site's vegetative cover was thoroughly examined by field personnel walking side-by-side in successive swaths to ensure current conditions were observed over the entire cover and that all components were inspected. Field observations pertaining to the inspections were recorded on the Cover System Inspection Reports for LF-03, LF-04, LF-25, and the Sewage Lagoons. The inspection reports are provided in Attachment 1 and photographic documentation of the inspection is contained in Attachment 2.

3 1 LF-03

3.1.1 Cover System Inspection Results

The LF-03 vegetative cover was observed to be in generally good condition during the inspection on November 9, 2009. The topographic surface was flat to slightly hummocky; no defined drainage pathways were evident on the cover surface or away from the former landfill site, nor was there evidence of wind or water erosion.

Vegetation dominated the landfill cover, consisting mostly of summer annuals and a variety of grasses. Perennial varieties typical of the Southern High Plains were scattered sparsely among the annuals and grasses, and comprised between 10 to 20 percent of the total cover. The total extent of vegetative cover over LF-03 was estimated to be between 80 and 90 percent, providing substantial erosion control. Exposed soil was isolated and limited in extent to areas of slumping observed around abandoned prairie dog burrows. These conditions were consistent with the results of the previous annual inspection in 2008 (Tetra Tech and Brown, Burdine, & Associates, LLC, 2008). Photographs and location coordinates documenting landfill cover conditions are provided in Attachment 2.

Limited areas of subsidence were visible and likely associated with linear waste burial trenches at the landfill. The approximate dimensions of these depressions were measured and recorded in the field log book. These data will be used as a reference point during future inspections to characterize changes, if any, in the cover condition that occur over time. Measurements for seven subsidence features and three minor depressions were recorded in the field log book. The linear subsidence features were 200 to 500 ft long, 10 to 30 ft wide, and up to 24 inches deep. These areas were all well vegetated and exhibited no evidence of recent subsidence or other changes. No adverse effects to the function or overall effectiveness of the landfill cover system were observed as a result of these features. These features and shallow depressions are further documented in Attachment 2.

3.1.2 Photographic Record

Photographs were taken to document the condition of the cover system in November 2009. The complete photographic record of the cover system, including status of vegetation and topographic features, is included in Attachment 2.

3.1.3 Other Monitoring and Maintenance Activities

No maintenance or repair of the cover system was required based on conditions observed at the time of the inspection. Because they pose a potential concern to the integrity and function of the landfill cover, areas of historical subsidence will continue to be monitored in accordance with the M&M Plan. Current conditions indicate no further subsidence has occurred in the landfill cover since the last inspection in 2008.

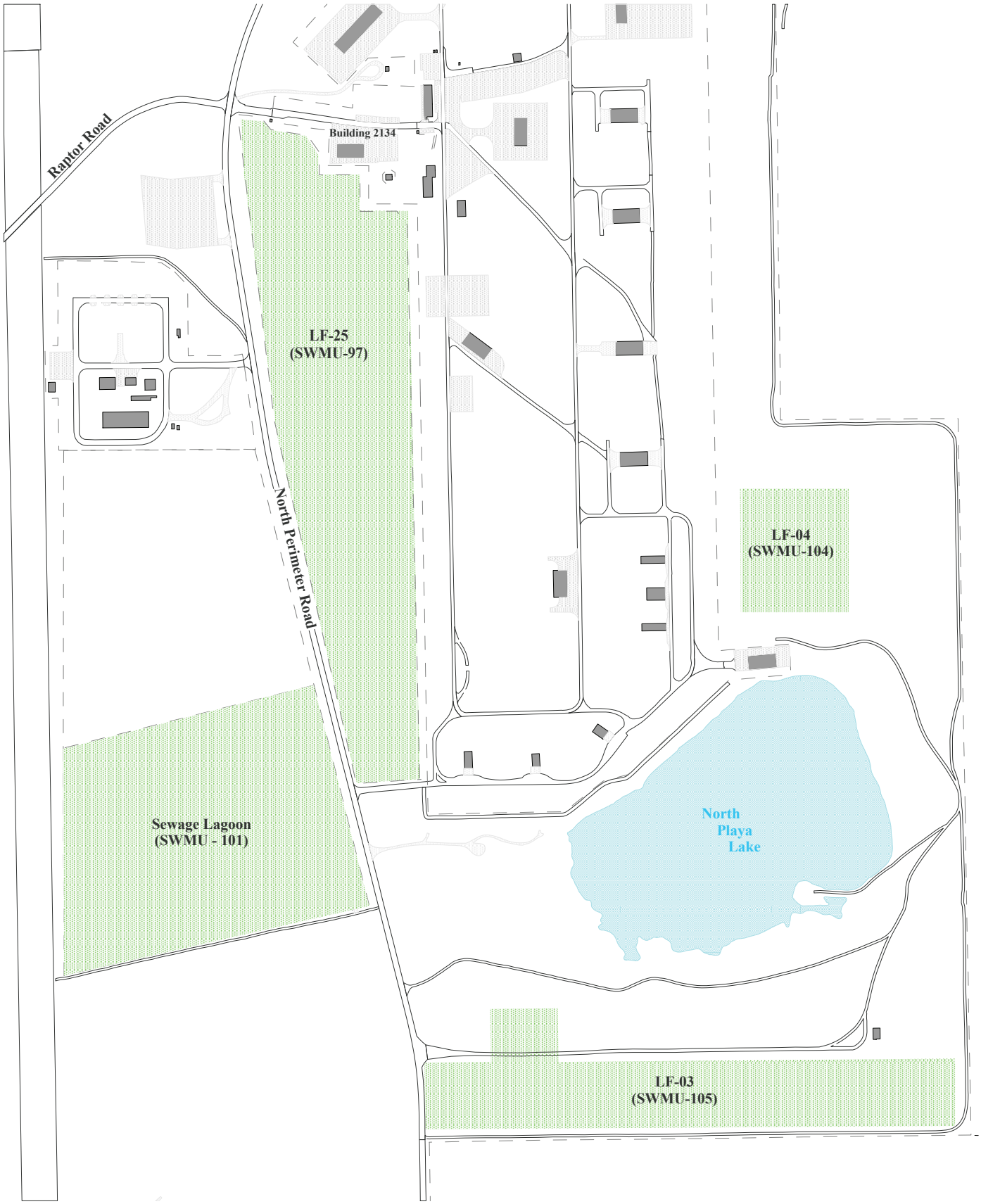
3.1.4 Future Activities

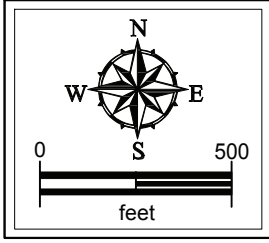
Annual inspection will be performed in 2010 to ensure the cover system continues to function as designed and meets operational objectives. The need for routine maintenance or repair will be evaluated at that time. Biennial groundwater monitoring of associated wells is also scheduled for 2010. The scope of inspection and monitoring activities planned for 2010 is described in the M&M Plan.

3 2 LF-04

3.2.1 Cover System Inspection Results

The LF-04 cover system was observed to be in generally good condition during the inspection performed on November 9, 2010. LF-04 is surrounded by a constructed earthen berm that prevents stormwater from flowing off site. The berm was in good condition and no evidence of ponding or leakage, either along the berm or adjacent to it, was noted. The topographic surface was flat to





NOTES

ERP Sites/SWMUs

Digital data files provided by GeoBase/CAFB

Projection: UTM Zone 13N, NAD 83

Figure 3. Landfill Inspection Overview

LF-03, -04, and -25 (SWMU 105, 104, and 97)
&
Sewage Lagoon (SWMU 101)

Cannon Air Force Base
Curry County, New Mexico

Brown, Burdine & Associates, LLC

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slightly hummocky within the berm, with no evidence of stormwater flow off site. Significant wind or water erosion was not evident at LF-04 during the inspection.

Vegetation dominated the landfill cover, consisting mostly of summer annuals and a variety of grasses. Perennial varieties typical of the Southern High Plains comprised approximately 10 percent of the cover and were scattered sparsely among the annuals and grasses. Total vegetative cover approached 95 percent across LF-04, providing substantial and sufficient erosion control. Additional erosion control was provided by the constructed earthen berm.

Limited areas of subsidence were visible and likely associated with the linear waste burial trenches at the landfill. The approximate dimensions of these features were measured and recorded in the field log book. These data will be used as a reference point during future inspections to characterize changes in the cover condition, if any, that occur over time. Three distinguishable features were identified: two nearly 600 ft in length and one approximately 300 ft in length. These north-south-oriented features were generally comparable in depth and width to those described for LF-03. The observed conditions were consistent with the results of the 2008 annual inspection (Tetra Tech and Brown, Burdine, & Associates, LLC, 2008). No adverse effects to the function or overall effectiveness of the landfill cover system were observed as a result of the subsidence. These features are further documented in the photographic record contained in Attachment 2.

3.2.2 Photographic Record

Photographs were taken to document the condition of the cover system in November 2009. The complete photographic record of the cover system, including status of vegetation and topographic features, is included in Attachment 2.

3.2.3 Other Monitoring and Maintenance Activities

No maintenance or repair of the cover system was required based on conditions observed at the time of the inspection. Because they pose a potential concern to the integrity and function of the landfill cover, areas of historical subsidence will continue to be monitored in accordance with the M&M Plan. Current conditions indicate no further subsidence has occurred in the landfill cover since the last inspection in 2008.

3.2.4 Future Activities

Annual inspection will be performed in 2010 to ensure the cover system continues to function as designed and meets operational objectives. The need for routine maintenance or repair will be evaluated at that time. Biennial groundwater monitoring of associated monitoring wells is also scheduled for 2010. The scope of inspection and monitoring activities planned for 2010 is described in the M&M Plan.

3 3 LF-25

3.3.1 Cover System Inspection Results

The LF-25 cover system was observed to be in generally good condition during the inspection on November 10, 2010. The current site topography appears to generally conform to the contours shown on the topographic survey map produced after completion of cover construction. The final

graded site topography in 2001 was reported to range from about 4,275 to 4,290 ft in elevation, reflecting 15 ft of relief across the site.

Vegetative cover was dominated by grasses, with small, scattered areas containing summer annuals and perennials typical of the Southern High Plains. The northernmost half of the landfill supported numerous trees of various sizes in addition to ground cover. Vegetation was estimated to cover approximately 50 percent of the landfill cover, providing generally sufficient erosion control. Small amounts of exposed concrete, glass, and gravel were observed, but did not appear to be the result of active erosion.

Minor soil slumping was observed on a slope near the northern end of the landfill; however, no exposed waste or other adverse consequences of the slumping were observed. A constructed earthen berm designed to contain stormwater on site protects the eastern and southern boundaries of the site. The berm was observed to be in excellent condition and evidence of periodic pooling of stormwater against the berm confirmed its effectiveness. The condition of rip-rap placed at the northern end of the cover was consistent with results of the 2008 inspection (Tetra Tech and Brown, Burdine, & Associates, LLC, 2008). These features are further documented in the photographic record contained in Attachment 2.

3.3.2 Photographic Record

Photographs were taken to document the condition of the cover system in November 2009. The complete photographic record of the cover system features, including status of vegetation, topographic features, and signage, is included in Attachment 2.

3.3.3 Other Monitoring and Maintenance Activities

No maintenance or repair of the cover system was required based on conditions observed at the time of the inspection. Areas where soil slumping has been observed during previous inspections will continue to be monitored in accordance with the M&M plan.

3.3.4 Future Activities

Annual inspection and routine maintenance will be performed in 2010 to ensure the cover system continues to function as designed and meet operational objectives. The need for routine maintenance or repair will be evaluated at that time. Biennial groundwater monitoring of associated monitoring wells is also scheduled for 2010. The scope of inspection and monitoring activities planned for 2010 is described in the M&M Plan.

3 4 Sewage Lagoons (South Area)

3.4.1 Inspection Results

The cover system over the south area of the Sewage Lagoons was observed to be in excellent condition. No visible signs of erosion were observed at any location across the site.

Dominant vegetation consisted of 50 percent summer annuals and 50 percent varieties of grasses. Perennial varieties typical of the Southern High Plains were scattered sparsely among the annuals and grasses. Vegetative cover was estimated at 80 percent across the south lagoon area, providing substantial and sufficient erosion control. Prairie dog burrows were observed in numerous areas, but their presence posed no adverse effects on the function or overall effectiveness of the cover.

In 2003, the south lagoon area remediation—the construction of an engineered soil cover system—was completed. The topography of the soil cover observed in 2009 was consistent with documented topography at the time remedial construction was completed. The cover is designed to direct stormwater flow off the site into a ditch located to the south of the former lagoon. This stormwater ditch was in good condition and capable of conveying excess flow. These features are further documented in the photographic record contained in Attachment 2.

3.4.2 Photographic Record

Photographs were taken to document the condition of the south lagoon area in November 2009. The complete photographic record of the cover system features, including status of vegetation, topographic features, signage, and fencing, is included in Attachment 2.

3.4.3 Other Monitoring and Maintenance Activities

No maintenance or repair of the cover system was required based on conditions observed at the time of the inspection. No components of the cover system were identified as areas of potential concern.

3.4.4 Future Activities

Annual inspection and routine maintenance will be performed in 2010 to ensure the cover system continues to function as designed and meet operational objectives. The need for routine maintenance or repair will be evaluated at that time. Biennial groundwater monitoring of associated monitoring wells is also scheduled for 2010. The scope of inspection and monitoring activities planned for 2010 is described in the M&M Plan.

4 INVESTIGATI N-DERIVED WASTE

No investigation-derived waste was generated as a result of the landfill cover inspection activities performed in November 2009.

5 REFERENCES

Tetra Tech, Inc. and Brown, Burdine, & Associates, LLC.

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Attachment 1
Co er S stem Inspection Report

Cover System Inspection Report
Landfill 3 (SWMU 105)
Cannon Air Force Base, Curry County, New Mexico

Inspector Name and Title: T. Schmucker, J. Kramer
Days since last rain fall: 12
(Contact Base Weather Service)

Date: 11-9-09
Amount of rainfall: 0.31"

Inspection Type	Check as Appropriate
Annual	✓
Other (identify)	

	LF-03	
1. Cover:	Yes	No
• Overall structural integrity maintained?	✓	
• Surface erosion present?		✓
• Gullies/washouts or areas of subsidence present? (No gullies/washouts; subsidence is likely historical and not active)	✓	
• Exposed buried waste?		✓
• As-~~constructed~~ graded contours (topographic highs) intact? (only minor topographical relief... inches)	✓	
• As-~~constructed~~ graded contours (depressions) intact?	✓	
• Stormwater runoff contained within boundaries of site?	✓	
• Evidence of drainage pathways/diverted runoff?		✓
• Tumbleweeds or silt built up?		✓

Describe overall condition:

Good, no erosional features, areas of subsidence consistent with '08 inspection; with no changes.

Problems observed with the cover:

None - Cover system is mature and stable

Maintenance or repairs required:

None

Maintenance to be performed by (Subcontractor name and date):

None

	LF-03	
2. Vegetation:	Yes	No
• Vegetation native perennial? (Combination of perennial and annuals)	✓	✓
• Vegetation in good condition?	✓	
• Bare/sparse areas?	✓	

Describe overall condition:

Mature annuals gone to seed, new vegetation greening, few bare areas.

Estimate extent and type of vegetative cover:

80-90% total cover, 80-90% annual, 10-20% perennial

Maintenance or repairs required:

None

Maintenance to be performed by (Subcontractor name and date):

None

	LF-03	
3. Berms (Indicate NA if no berms are present):	Yes	No
• Is any erosion present?		✓
• Is any ponding present?		✓
• Stormwater runoff contained onsite?	✓	

Describe location and condition:

No berms associated with this site

Problems observed with berms:

N/A

Maintenance or repairs required:

N/A

Maintenance to be performed by (Subcontractor name and date):

N/A

	LF-03	
4. Drainage Ditches/Channels (Indicate NA if no channels are present):	Yes	No
• Is any erosion present?		✓
• Is buildup of sediment/silt debris present?		✓
• Stormwater runoff contained onsite?	✓	
• Excess accumulation of tumbleweeds present?		✓

Describe location and condition:

No drainage ditches or channels associated with this site

Problems observed with channels:

N/A

Maintenance or repair required:

N/A

Maintenance to be performed by (Subcontractor name and date):

NA

	LF-03	
5. Monitoring Wells:	Yes	No
• Evidence of tampering?		✓
• Damage?		✓

Problems observed with wells:

None

	LF-03	
6. Fences/Gates/Signage (Indicate NA if not present):	Yes	No
• Structural integrity?	NA	
• Gate locks in place?	NA	
• Signage in place?	NA	
• Tumbleweeds or silt built up?	NA	

Problems observed with fencing/gates/signage:

NA

Maintenance or repair required:

NA

Maintenance to be performed by (Subcontractor name and date):

NA

7. Changes required to the Monitoring and Maintenance Plan?

None

T. Schmucker geologist

Inspector's Name

Inspector's Signature

11-9-09

Date

Cover System Inspection Report
Landfill 4 (SWMU 104)
Cannon Air Force Base, Curry County, New Mexico

Inspector Name and Title: T. Schmucker, J. Kramer
Date: 11-9-09
Days since last rain fall: 12
Amount of rainfall: 0.31"
(Contact Base Weather Service)

Inspection Type	Check as Appropriate
Annual	✓
Other (identify)	

	LF-04	
1. Cover:	Yes	No
• Overall structural integrity maintained?	✓	
• Surface erosion present?		✓
• Gullies/washouts or areas of subsidence present? (No gullies/washouts; subsidence is likely historical and not active.)	✓	
• Exposed buried waste?		✓
• As-~~constructed~~ graded contours (topographic highs) intact? (Only minor topographical relief .... inches)	✓	
• As-~~constructed~~ graded contours (depressions) intact?	✓	
• Stormwater runoff contained within boundaries of site?	✓	
• Evidence of drainage pathways/diverted runoff?		✓
• Tumbleweeds or silt built up?		✓

Describe overall condition:

Good, no erosion, areas of subsidence consistent with 08 inspection; with no changes.

Problems observed with the cover:

None - Cover system is mature and stable, scattered burrows inconsequential

Maintenance or repairs required:

None

Maintenance to be performed by (Subcontractor name and date):

None

	LF-04	
2. Vegetation:	Yes	No
• Vegetation native perennial? (Combination of perennial and annuals)	✓	
• Vegetation in good condition?	✓	
• Bare/sparse areas?	✓	

Describe overall condition:

Mature annuals gone to seed, new cover developing, scattered perennials present.

Estimate extent and type of vegetative cover:

90-95% total cover, 90% annuals, 10% perennial

Maintenance or repairs required:

None

Maintenance to be performed by (Subcontractor name and date):

None

	LF-04	
3. Berms (Indicate NA if no berms are present):	Yes	No
• Is any erosion present?		✓
• Is any ponding present?		✓
• Stormwater runoff contained onsite?	✓	

Describe location and condition:

Berms on north, west and south sides in good condition

Problems observed with berms:

None

Maintenance or repairs required:

None

Maintenance to be performed by (Subcontractor name and date):

None

	LF-04	
4. Drainage Ditches/Channels (Indicate NA if no channels are present):	Yes	No
• Is any erosion present?	NA	
• Is buildup of sediment/silt debris present?	NA	
• Stormwater runoff contained onsite?	NA	
• Excess accumulation of tumbleweeds present?	NA	

Describe location and condition:

NA

Problems observed with channels:

NA

Maintenance or repair required:

NA

Maintenance to be performed by (Subcontractor name and date):

NA

	LF-04	
5. Monitoring Wells:	Yes	No
• Evidence of tampering?		✓
• Damage?		✓

Problems observed with wells:

None

	LF-04	
6. Fences/Gates/Signage (Indicate NA if not present):	Yes	No
• Structural integrity?	NA	
• Gate locks in place?	NA	
• Signage in place?	NA	
• Tumbleweeds or silt built up?	NA	

Problems observed with fencing/gates/signage:

NA

Maintenance or repair required:

NA

Maintenance to be performed by (Subcontractor name and date):

NA

7. Changes required to the Monitoring and Maintenance Plan?

NA

T. Schmucker, geologist
Inspector's Name

Inspector's Signature

11-9-09
Date

Cover System Inspection Report
Landfill 25 (SWMU 97)
Cannon Air Force Base, Curry County, New Mexico

Inspector Name and Title: T. Schmueker, J. Kramer
Date: 11-10-09
Days since last rain fall: 12
Amount of rainfall: 0.31"
(Contact Base Weather Service)

Inspection Type	Check as Appropriate
Annual	✓
Other (Identify)	

	LF-25	
1. Fences and Gates:	Yes	No
• Structural integrity?	✓	
• Gates locks in place?	✓	
• Signage in place?	✓	
• Tumbleweeds and silt built up?		✓

Problems observed with the fences/gates/signage:
None

Maintenance or repairs required:
None

Maintenance to be performed by (Subcontractor name and date):
None

	LF-25	
2. Cover:	Yes	No
• Overall structural integrity maintained?	✓	
• Surface erosion present? (See note below)	✓	
• Gullies/washouts or areas of subsidence present?		✓
• Exposed buried waste? Minor amounts of crushed concrete, glass, gravel visible		✓
• As-~~constructed~~ graded contours (topographic highs) intact?	✓	
• As-~~constructed~~ graded contours (depressions) intact? (Stormwater Control)	✓	
• Stormwater runoff contained within boundaries of site?	✓	
• Evidence of drainage pathways/diverted runoff?		✓
• Tumbleweeds or silt built up?		✓

Problems observed with the cover:
Minor hillside erosion present toward north end; no off-site diversion

Maintenance or repair required:
None

Maintenance to be performed by (Subcontractor name and date):
None

	LF-25	
3. Berms (Indicate NA if not present):	Yes	No
• Is any erosion present?		✓
• Is any ponding present? (As designed to keep stormwater on-site)	✓	
• Stormwater runoff contained onsite?	✓	

Describe location and condition:

Berm along east side in excellent condition, contains storm water on site.

Problems observed with berms:

None

Maintenance or repairs required:

None

Maintenance to be performed by (Subcontractor name and date):

None

	LF-25	
4. Rip-Rap (Indicate NA if not present):	Yes	No
• Is any erosion present?		✓
• Is buildup of sediment/silt debris present?		✓
• Is displaced concrete present?	1	✓
• Excess accumulation of tumble weeds present?		✓

Describe location and condition:

Single rip-rap placement at north end is consistent with 08 inspection

Problems observed with rip-rap:

None

Maintenance or repairs required:

None

Maintenance to be performed by (Subcontractor name and date):

None

	LF-25	
5. Drainage Ditches/Channels (Indicate NA if no channels are present):	Yes	No
• Is any erosion present?	NA	
• Is buildup of sediment/silt debris present?	NA	
• Is displaced crushed concrete present?	NA	
• Is stormwater runoff contained onsite?	NA	
• Excess accumulation of tumbleweeds present?	NA	

Describe location and condition:

NA

Problems observed with channels:

NA

Maintenance or repair required:

NA

Maintenance to be performed by (Subcontractor name and date):

NA

	LF-25	
6. Vegetation:	Yes	No
• Vegetation native perennial? (Combination of perennial and annuals)	✓	✓
• Vegetation in good condition?	✓	
• Bare/sparse areas?	✓	

Describe overall condition:

Northern half of site is treed with ~~mostly~~ grasses as understory growth, south half also grass, heavy growth occurs along eastern berm.

Estimate extent and type of vegetative cover:

~50% cover, mainly grass, few broadleaf annuals

Maintenance or repairs required:

None

Maintenance to be performed by (Subcontractor name and date):

None

	LF-25	
7. Monitoring Wells:	Yes	No
• Evidence of tampering?		✓
• Damage?		✓

Problems observed with the wells.

None

8. Changes required to the Monitoring and Maintenance Plan?

None

T. Schmucker, geologist
Inspector's Name

Inspector's Signature

11/10-09
Date

Cover System Inspection Report
Sewage Lagoon (South Area) (SWMU 101)
Cannon Air Force Base, Curry County, New Mexico

Inspector Name and Title: T. Schmucker, J. Kramer
Date: 11-10-09
Days since last rain fall: 13
Amount of rainfall: 0.31
(Contact Base Weather Service)

Inspection Type	Check as Appropriate
Annual	✓
Other (Identify)	

	Sewage Lagoons	
1. Fences and Gates:	Yes	No
• Structural integrity?	✓	
• Gates locks in place?	✓	
• Signage in place?	✓	
• Tumbleweeds and silt built up?		✓

Problems observed with the fences/gates/signage:
None

Maintenance or repairs required:
None

Maintenance to be performed by (Subcontractor name and date):
None

	Sewage Lagoons	
2. Cover:	Yes	No
• Overall structural integrity maintained?	✓	
• Surface erosion present?		✓
• Gullies/washouts or areas of subsidence present?		✓
• Exposed buried waste?		✓
• As-constructed contours (topographic highs) intact?	✓	
• As-constructed contours (depressions) intact?	✓	
• Stormwater runoff contained within boundaries of site? (Designed to runoff to ditchs around perimeter)		✓
• Evidence of drainage pathways/diverted runoff?	✓	
• Tumbleweeds or silt built up?		✓

Problems observed with the cover:
None - excellent condition!!

Maintenance or repair required:
None

Maintenance to be performed by (Subcontractor name and date):

None

	Sewage Lagoons	
3. Berms (Indicate NA if not present):	Yes	No
• Is any erosion present?	N	A
• Is any ponding present?	N	A
• Stormwater runoff contained onsite?	N	A

Describe location and condition:

NA

Problems observed with berms:

NA

Maintenance or repairs required:

NA

Maintenance to be performed by (Subcontractor name and date):

NA

	Sewage Lagoons	
4. Drainage Ditches/Channels (Indicate NA if no channels are present):	Yes	No
• Is any erosion present?		✓
• Is buildup of sediment/silt debris present?		✓
• Is displaced crushed concrete present?		✓
• Is stormwater runoff contained onsite?		✓
• Excess accumulation of tumbleweeds present?		✓

Describe location and condition:

Stormwater exits site on south side near MW-H. Channel is in good condition

Problems observed with channels:

None

Maintenance or repair required:

None

Maintenance to be performed by (Subcontractor name and date):

None

	Sewage Lagoons	
5. Vegetation:	Yes	No
• Vegetation native perennial? (Combination of perennials and annuals)	✓	✓
• Vegetation in good condition?	✓	
• Bare/sparse areas?		✓

Describe overall condition:

Good, consistent cover across site

Estimate extent and type of vegetative cover:

80% cover, 50% grasses, 50% broadleaf annuals

Maintenance or repairs required:

None

Maintenance to be performed by (Subcontractor name and date):

None

	Sewage Lagoons	
6. Monitoring Wells:	Yes	No
• Evidence of tampering?		✓
• Damage?		✓

Problems observed with the wells.

None

7. Changes required to the Monitoring and Maintenance Plan?

None. Great condition!

T. Schmucker, geologist
Inspector's Name

Inspector's Signature

11-10-09
Date

Attachment 2
Site Photographs

Landfill ID	Photo #	GPS Coordinates		Location Description	Visual Description / Interpretation	Action Required
		Easting UTM (meters)	Northing UTM (meters)			
LF-3 (SWMU 105)	P-1			Eastern portion of LF-3 near eastern boundary of Cannon AFB. Photograph taken facing north.	General photo showing well vegetated, relatively flat topography.	No
	P-2			Eastern portion of LF-3 near eastern boundary of Cannon AFB. Photograph taken facing east.	General photo showing well vegetated, relatively flat topography.	No
	P-3	656489	3806033	Central portion of LF-3. Photograph taken facing east.	Long, narrow areas of assumed subsidence occur on LF-3. The features are generally 10 to 30 feet in width, 200 to 500 feet in length and up to 2 feet in depth. They are evident to the eye by a change in foliage in addition to the topographical differences.	No
	P-4	656489	3806033	Closeup photograph of assumed subsidence.		
	P-5			Central portion of LF-3. Photograph taken facing south.	General photo showing well vegetated, relatively flat topography.	No
	P-6			Central portion of LF-3. Photograph taken facing north.	General photo showing well vegetated, relatively flat topography.	No
	P-7	656384	3806012	Central portion of LF-3.	Depression measuring approximately 14 feet across and two feet deep with dead vegetation in bottom.	No
	P-8			Western portion of LF-3. Photograph taken facing east.	General photos showing well vegetated, flat topography.	No
	P-9			Western portion of LF-3. Photograph taken facing southwest.	General photos showing well vegetated, flat topography.	No
LF-4 (SWMU 104)	P-1			General photo of LF-4. Photograph taken from the south side facing northwest.	Well vegetated and relatively flat across the majority of the site.	No
	P-2			General photos of LF-4. Photograph taken from the south side facing north.	Well vegetated and relatively flat across the majority of the site.	No
	P-3			Central portion of LF-4.	Numerous animal burrows were visible across the majority of the site.	No
	P-4	656328	3806701	Photograph taken facing northeast.	Long, narrow areas of subsidence occur on LF-4. The features are generally 10 to 30 feet in width, and nearly 600 feet in length and up to 2 feet in depth. They are evident to the eye by a distinct change in foliage in addition to the topographical differences.	No
	P-5	656328	3806701	Closeup photograph of assumed subsidence.		
	P-6	656529	3806572	Photograph of assumed subsidence taken to the north.		
	P-7			Central portion of LF-4. Photograph taken facing south.	Well vegetated and relatively flat across the majority of the site. Playa lake is visible in background.	No
LF-25 (SWMU 97)	P-1			Located just south of the gate on the western boundary of LF-25. Photo taken facing due east.	Bilingual warning sign with emergency contact phone number in excellent condition.	No
	P-2			General photograph of LF-25 on northern portion of landfill. The photograph was taken facing south.	General photo showing well vegetated, mounded topography.	
	P-3	656000	3806995	Southeast of the landfill gate. Photo taken facing east.	Area exhibiting slight slumping on hillside near north end of landfill. Does not warrant action but does warrant ongoing monitoring.	No
	P-4			Central portion of LF-25.	Well mounded and graded landfill cover, free of erosion, slumping, settling and exposed waste. Cover construction is not visually compelling, but no evidence exists to disprove the effectiveness of the cover. Vegetative coverage is estimated at 60% to 70% across the northern end of LF-25.	No
	P-5			Central portion of LF-25.		
	P-6			Eastern portion of landfill near monitoring well MW-Ra	Good demonstration of berm and fence surrounding LF-25. Fence is structurally sound and continuous around the landfill. Berm along eastern boundary of landfill is also in excellent condition.	No
	P-7			Photograph taken along the western boundary near the center of the LF-25.	Photograph showing portion of LF-25 with minimal vegetative cover. Cover construction is not visually compelling, but no evidence exists to disprove the effectiveness of the cover.	No
	P-8	655981	3806691	Along eastern berm of landfill.	A slightly depressed area exists where ponding may temporarily occur during heavy rain events. Indicators include change in vegetative cover, a slight physical depression and mud cracks in a limited area. Appears stable when compared to last years inspection.	No
	P-9			Southern portion of landfill. Photo taken to the north.	General photo showing well vegetated, flat topography.	No

Landfill ID	Photo #	GPS Coordinates		Location Description	Visual Description / Interpretation	Action Required
		Easting UTM (meters)	Northing UTM (meters)			
South Sewage Lagoon (SWMU-101)	P-1	656011	3806234	Located just east of the gate. The photograph is taken to the north.	Bilingual warning sign with emergency contact phone number in excellent condition located adjacent to	No
	P-2	656011	3806234	Southeastern corner of SWMU-101. Photographs taken to the north and northwest, respectively.	General photo showing well vegetated, mounded topography.	No
	P-3			General photograph of SWMU-101 on central portion of site. The photograph was taken facing northwest.	General photo showing well vegetated, mounded topography.	No
	P-4			General photograph of SWMU-101 on southeastern portion of site. The photograph was taken facing east.	General photo showing well vegetated, flat topography along perimeter of site. Monitoring well MW-G is visible along the eastern portion of the site.	No
	P-5			Photograph taken facing west along northern site boundary.	Good demonstration of fence surrounding SWMU-101. Fence is structurally sound and continuous around the landfill.	No
	P-6			Typical photograph of cover.	Damp/wet soil was common at elevated portions of the site. The exposed, discolored soil that is not cracked is damp/wet.	No
	P-7			General photograph of SWMU-101 on central portion of site. The photograph was taken facing west.	General photo showing well vegetated, mounded topography.	No
	P-8			Photograph taken facing east along southern site boundary.	Good demonstration of fence surrounding SWMU-101. Fence is structurally sound and continuous around the landfill. Photo showing well vegetated, flat topography along perimeter of site. Monitoring well MW-H is visible along the southern portion of the site.	No
	P-9			Photograph taken adjacent to MW-H.	PVC pipes visible in photo are located along the southern site boundary just east of MW-H. The PVC pipe demarks the approximate beginning of an apparent stormwater ditch that travels from the southern site boundary to the south.	No

Photo #1

Photo #2

Photo #3

Photo #4

Photo #5

Photo #6

Photo #7

Photo #8

Photo #9

Photographic Log for Annual Landfill Survey—LF-3
Cannon Air Force Base, Curry County, NM
Date of photos: 11/10/2009

Photo #1

Photo #2

Photo #3

Photo #4

Photo #5

Photo #6

Photo #7

Photographic Log for Annual Landfill Survey—LF-4
Cannon Air Force Base, Curry County, NM
Date of photos: 11/10/2009

Photo #1

Photo #2

Photo #3

Photo #4

Photo #5

Photo #6

Photo #7

Photo #8

Photo #9

Photographic Log for Annual Landfill Survey—LF-25
Cannon Air Force Base, Curry County, NM
Date of photos: 11/10/2009

Photo #1

Photo #2

Photo #3

Photo #4

Photo #5

Photo #6

Photo #7

Photo #8

Photo #9

Photographic Log for Annual Landfill Survey—SWMU-101
Cannon Air Force Base, Curry County, NM
Date of photos: 11/10/2009