NEW MEXICO
ENVIRONMENT DEPARTMENT

Hazardous Waste Bureau

2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303
Phone (505) 476-6000 Fax (505) 476-6030
www.nmenv.state.nm.us

BILL RICHARDSON
Governor

DIANE DENISH
Lieutenant Governor

RON CURRY
Secretary

JON GOLDSTEIN
Deputy Secretary

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

January 22, 2009

Mark Patterson
Ravenna Army Ammunition Plant
Building 1037
8451 State Route 5
Ravenna, OH 44266

Steve Smith
CESWF-PER-DD
819 Taylor Street, Room 3A12
PO Box 17300
Fort Worth, TX 76102-0300

**RE: APPROVAL WITH DIRECTION
RELEASE ASSESSMENT REPORT FOR PARCEL 22
FORT WINGATE DEPOT ACTIVITY
EPA ID# NM6213820974
FWDA-07-010**

Dear Messrs. Patterson and Smith:

The New Mexico Environment Department (NMED) received the Department of the Army's (the Permittee) *Release Assessment Report for Parcel 22* (the Report), dated June 9, 2008. The submittal is a requirement of Section VII.F of the *Fort Wingate Depot Activity RCRA Permit (RCRA Permit)*. NMED hereby approves this Report with the following direction.

NMED received the Permittee's RCRA Facility Investigation (RFI) Work Plan for Parcel 22 (Work Plan), dated June 9, 2008, which is currently under review. The Areas of Concern (AOCs) 30, 69, 75, and 88 included in the Report must be addressed and characterized in detail in the revised Work Plan. Additional requirements for the Work Plan will be addressed in NMED's comments for Parcel 22 which will be mailed under separate cover.

In addition, NMED understands that AOC 71 will be addressed as part of the investigation for Parcel 21 (refer to Comment 77 of NMED's NOD for the Parcel 21 RFI Work Plan, dated September 5, 2007) and therefore does not need to be included as part of the Parcel 22 investigation.

If you have any questions regarding this letter, please contact Tammy Diaz-Martinez at (505) 476-6056.

Sincerely,

John E. Kieling
Manager
Permits Management Program
Hazardous Waste Bureau

cc: Tammy Diaz-Martinez, NMED HWB
Dave Cobrain, NMED HWB
Laurie King, U.S EPA Region 6
Chuck Hendrickson, U.S. EPA Region 6
Sharlene Begay-Platero, Navajo Nation
Eugenia Quintana, Navajo Nation
Steve Beran, Zuni Pueblo
Edward Wemytewa, Zuni Pueblo
Valerie Lahalla, Zuni Pueblo
Steven Davis, Zuni BIA
Clayton Seoutewa, Southwest Region BIA
Charles Long, Navajo Nation
Rose Duwyenie, Navajo BIA

File: FWDA 2009 & Reading File
FWDA-07-010

INTERIM FACILITY-WIDE GROUND WATER MONITORING PLAN VERSION 2

FORT WINGATE DEPOT ACTIVITY
McKinley County, New Mexico

28 March 2008

Contract No. W9126G-06-D-0016
Task Order No. 0002

Prepared for:

U.S. Army Corps of Engineers
Fort Worth, Texas

Prepared by:

TerranearPMC

222 Valley Creek Blvd.
Suite 210
Exton, PA 19341

Requests for this document must be referred to:
Commander, U.S. Army Corps of Engineers
Fort Worth District
Attn: CESWF-PER-DI (Beverly Post)
819 Taylor Street
Room 3A12
Fort Worth, TX 76112

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LIST OF ACRONYMS

AOC	Area of Concern
BCT	BRAC Cleanup Team
BEC	BRAC Environmental Coordinator
bgs	Below Ground Surface
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BRAC	Base Realignment and Closure
BRACD	BRAC Division
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
CY	Calendar Year
DO	Dissolved Oxygen
DOD	Department of Defense
DOI	Department of the Interior
DOT	Department of Transportation
DQO	Data Quality Objective
DRO	Diesel Range Organics
EDD	Electronic Data Deliverable
EIMS	Environmental Information Management System
^{o}F	Degree Fahrenheit
FWDA	Fort Wingate Depot Activity
GC/ECD	Gas Chromatography/Electron Capture Detector
GPM	Gallon per Minute
GRO	Gasoline Range Organics
GWMP	Ground Water Monitoring Plan
HWB	Hazardous Waste Bureau
HWMU	Hazardous Waste Management Unit
ID	Identification
IDW	Investigation Derived Waste
LDPE	Low-Density Polyethylene
LDR	Land Disposal Restriction
MDL	Method Detection Limit
mg/L	Milligrams per liter
ml	Milliliters
ml/min	Milliliters per minute
MS	matrix spike
MSA	Minimum Site Assessment
MSD	matrix spike duplicate
MSL	Mean Sea Level
NELAP	National Environmental Laboratory Accreditation Program
NMED	New Mexico Environmental Department
NOD	Notice of Disapproval
OB/OD	Open Burning/Open Detonation

LIST OF ACRONYMS (CONTINUED)

QSM	Quality System Manual
PCBs	Polychlorinated Biphenyls
PPE	Personal Protective Equipment
QA/QC	Quality Assurance/Quality Control
QSM	Quality Systems Manual
RCRA	Resource Conservation and Recovery Act
RDX	cyclotrimethylenetrinitramine
RFI	RCRA Facility Investigation
SOW	Statement of Work
SSHP	Site Safety and Health Plan
SVOC	Semi-Volatile Organic Compound
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TCL	Target Compound List
TCP	Traditional Cultural Property
TEAD	Tooele Army Depot
TPH	Total Petroleum Hydrocarbons
TSD	Treatment, Storage, or Disposal
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USTs	Underground Storage Tanks
VOC	Volatile Organic Compound
ZIST	Zone Isolation Sampling System

ES.0 EXECUTIVE SUMMARY

This Interim Facility-Wide Ground Water Monitoring Plan (GWMP) for Fort Wingate Depot Activity (FWDA) describes the proposed ground water monitoring to be conducted as part of the environmental restoration program at FWDA. This document has been prepared for submission to the New Mexico Environment Department (NMED) Hazardous Waste Bureau (HWB), as required by Section V.A of Resource Conservation and Recovery Act (RCRA) Permit No. NM 6213820974.

ES.1 PURPOSE

The purpose of this Interim Facility-Wide GWMP is to describe a facility-wide ground water monitoring program during the period before long-term monitoring can begin. Seven off-site wells identified in Permit Attachment 13 are being addressed under an Interim Measures Work Plan, as required by Permit Section VII.G.2.a, which will be submitted as a separate document.

ES.2 PROPOSED INVESTIGATIONS

As described in this GWMP, the facility-wide ground water monitoring program will consist of the following investigations.

ES.2.1 Ground Water Elevation Surveys

Ground water elevation data will be collected from all existing wells as listed in Table 1. As directed by NMED HWB, ground water elevation data will be collected on a quarterly basis, in January, April, July, and October.

ES.2.2 Ground Water Sampling

ES.2.2.1 OB/OD Unit Ground Water Sampling

Samples will be collected from 22 existing ground water monitoring wells. As described in this GWMP, the existing wells were installed to characterize releases from the Open Burning/Open Detonation (OB/OD) Unit Hazardous Waste Management Unit (HWMU) and Solid Waste Management Units (SWMUs) located in Parcel 3 (SWMUs 15, 16, and 35).

As directed by NMED HWB, samples will be collected semi-annually, in April and October. Ground water samples collected from wells in and around the OB/OD Unit and Parcel 3 SWMUs will be analyzed for constituent groups based on the Waste Characteristics section of Permit Attachment 1; the following constituent groups will be analyzed for all wells initially:

- Explosives;
- Nitrate/nitrite (non-specific);

- Nitrate;
- Perchlorate;
- Target Analyte List (TAL) metals (total and dissolved);
- White Phosphorus;
- Target Compound List (TCL) volatile organic compounds (VOCs);
- TCL semi-volatile organic compounds (SVOCs);
- Dioxins and Furans;
- Cyanide;
- Polychlorinated Biphenyls (PCBs); and
- Pesticides/Herbicides.

ES.2.2.2 Northern FWDA Ground Water Sampling

Samples will be collected from 40 existing ground water monitoring wells. As described in this GWMP, the existing wells were installed primarily to characterize releases from the TNT Leaching Beds Area (SWMU 1, located within Parcel 21), Administration Area (multiple SWMUs and AOCs located in Parcels 6, 7, and 11), Eastern Landfill Area (SWMU 13, located within Parcel 18), and the Buildings 542 and 600 Area (SWMUs 11 and 4, located within Parcel 6).

As directed by NMED HWB, samples will be collected semi-annually, in April and October. Ground water samples collected from wells in the northern portion of FWDA will be analyzed for constituent groups as summarized in Table 3. Samples from all wells will be analyzed for:

- Explosives;
- Nitrate/nitrite (non-specific);
- Nitrate;
- Perchlorate;
- TAL metals (total and dissolved);
- TCL VOCs;
- TCL SVOCs; and
- Dioxins and furans.

Samples from selected wells (see Table 3) where historical ground water data has detected pesticides (e.g., wells in and around the Administration Area) will be analyzed for pesticides.

Samples from selected wells (MW-18S, MW-18D, MW-20, MW-22S, and MW-22D; see Table 3) installed to monitor releases from SWMU 45 will be analyzed for Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) and Diesel Range Organics (DRO).

1.0 INTRODUCTION

This Interim Facility-Wide Ground Water Monitoring Plan (GWMP) for Fort Wingate Depot Activity (FWDA) describes the proposed ground water monitoring to be conducted as part of the environmental restoration program at FWDA. This document was prepared by TerranearPMC, LLC of Exton, Pennsylvania, in partial fulfillment of the requirements of Task Order No. 0002 under contract W9126G-06-D-0016. Contracting Officer's Representative and technical oversight responsibilities for the tasks described in this document were provided by the U.S. Army Corps of Engineers (USACE), Fort Worth District.

This document has been prepared for submission to the New Mexico Environment Department (NMED) Hazardous Waste Bureau (HWB), as required by Section V.A of the Resource Conservation and Recovery Act (RCRA) Permit (hereinafter referred to as "the Permit") for FWDA. The Permit (NM 6213820974) was finalized in December 2005 and became effective 31 December 2005.

A draft of this document was provided in October 2006 to designated representatives of the Navajo Nation and Pueblo of Zuni, for their review and comment as required by Permit Section VIII.B.1.b. At the same time, copies were also provided to designated U.S. Department of the Interior (DOI), Bureau of Land Management (BLM), and Bureau of Indian Affairs (BIA) representatives, for their review and comment. An on-site consultation meeting was conducted the week of 13 November 2006. Consultation process documentation is provided in Appendix A.

A revised draft GWMP was submitted to NMED HWB on 3 October 2007. A Notice of Disapproval (NOD) from NMED HWB was received in December 2007. The NOD provided comments on the revised draft GWMP, and this document has been revised to address the NOD. NOD comments and FWDA responses are provided in Appendix B.

1.1 PURPOSE/OBJECTIVE

The purpose of this Interim Facility-Wide GWMP is to describe facility-wide ground water monitoring during the period before long-term monitoring can begin. Seven off-site wells identified in Permit Attachment 13 are being addressed under an Interim Measures Work Plan, as required by Permit Section VII.G.2.a, which will be submitted as a separate document.

As required by Permit Section V.A.4, this document will be revised and updated annually to propose changes to the monitoring plan. Examples of possible changes include:

- Inclusion of additional monitoring wells completed pursuant to corrective action requirements.

- Deletion of existing monitoring wells not providing valid data.

- Changes to analytical parameter lists.

At this time, the Interim Facility-Wide GWMP will focus on existing monitoring wells installed during previous investigations as described in Section 2.2.

2.0 BACKGROUND

2.1 GENERAL DESCRIPTION

FWDA is a closed U.S. Army depot whose former mission was to receive, store, maintain, and ship assigned materials (primarily explosives and military munitions), and to dispose of obsolete or deteriorated explosives and military munitions. Since 1975, the installation has been under the administrative command of Tooele Army Depot (TEAD), located near Salt Lake City, Utah. The active mission of FWDA ceased and the installation closed in January 1993, as a result of the Defense Authorization Amendments and Base Realignment and Closure (BRAC) Act of 1988. In 2002, the Army reassigned many functions at FWDA to the BRAC Division (BRACD), including property disposal, caretaker duties, management of caretaker staff, and performance of environmental restoration and compliance activities. TEAD retained command and control responsibilities, and continues to provide support services to FWDA.

FWDA currently occupies approximately 24 square miles (approximately 15,277 acres) of land in northwestern New Mexico, in McKinley County. The installation is located 8 miles east of Gallup on U.S. Route 66 and approximately 130 miles west of Albuquerque on Interstate 40 (Figure 1).

As shown in Figure 2, the installation is almost entirely surrounded by federally owned or administered lands, including both national forest and Tribal lands. The installation can be divided into several areas based upon location and historical land use. These major land-use areas include (Figure 2):

- The Administration Area - located in the northern portion of the installation and encompassing approximately 800 acres; contains former office facilities, housing, equipment maintenance facilities, warehouse buildings, and utility support facilities;

- The Workshop Area - located south of the Administration Area and encompassing approximately 700 acres; consisting of an industrial area containing former ammunition maintenance and renovation facilities, the former TNT washout facility, and the TNT Leaching Beds Area;

- The Magazine (Igloo) Area - covering approximately 7,400 acres in the central portion of the installation and encompassing ten Igloo Blocks (A through H, J and K) consisting of 732 earth-covered igloos and 241 earthen revetments previously used for storage of munitions;

- Protection and Buffer Areas - encompassing approximately 4,050 acres consisting of buffer zones surrounding the former magazine and demolition areas; these areas are located adjacent to the eastern, northern, and western boundaries of the installation; and

- The Open Burning/Open Detonation (OB/OD) Area - located within the west central portion of the installation and encompassing approximately 1,800 acres; the OB/OD Area can be separated into two sub-areas based on period of operation, the Closed OB/OD Area and the Current OB/OD Area. The OB/OD Unit Hazardous Waste Management Unit (HWMU) is an area within the Current OB/OD Area.

FWDA has been undergoing final environmental restoration prior to property transfer/reuse. As part of the planned property transfer to DOI, the installation has been divided into reuse parcels (Figure 2). Parcels transferred to date consist of Parcels 1, 15, and 17.

2.2 PREVIOUS INVESTIGATIONS

The environmental restoration process at FWDA had been underway for 25 years prior to Permit issuance. With the exception of the OB/OD Area, environmental restoration activities at FWDA began in 1980 under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) guidelines, with the U.S. Environmental Protection Agency (USEPA) Region 6 as the lead regulatory agency.

Since that time, NMED has become the lead regulatory agency, and the pathway for environmental restoration has been evolving for a number of years. In 2002, NMED determined that the pathway would be a RCRA permit for post-closure care of the OB/OD Area, with a RCRA corrective action module attached to address requirements for other sites. The Permit (NM 6213820974) was finalized in December 2005 and became effective 31 December 2005 (NMED, 2005).

A number of ground water investigations have been completed at FWDA. Generally, these investigations have been conducted with multiple phases to sequentially characterize ground water at a single location over a period of time.

To date, a total of 74 ground water monitoring wells have been completed to characterize the nature and extent of releases from the OB/OD Unit and various Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs).

A map showing all existing monitoring well locations is included as Figure 3. Well construction information for all wells to date is included in Table 1. An Excel database of all ground water analytical results to date is included in Appendix C.

Ground water investigation and characterization efforts to date have primarily focused on five areas: TNT Leaching Beds Area (SWMU 1, located within Parcel 21), Administration Area (multiple SWMUs and AOCs located in Parcels 6, 7, and 11), Eastern Landfill Area (SWMU 13, located within Parcel 18), Buildings 542 and 600 Area (SWMUs 11 and 4, located within Parcel 6), and the OB/OD Area (located within Parcel 3). For discussion purposes, these areas have been grouped/identified as areas within and around the OB/OD Unit (Figure 4 and Figure 6) and Northern FWDA (Figure 5).

Ground water investigations to date are summarized below.

2.2.1 1981 Environmental Survey of FWDA

In 1981 an Environmental Survey of FWDA (ESE, 1981) was conducted to determine the potential presence and extent of contamination caused by activities related to munitions storage, recycling, and treatment.

Eleven monitoring wells (FW07, FW08, FW10, FW11, FW12, FW13, FW26, FW27, FW28, FW29, and FW35) were completed that focused on the northern boundary portion of FWDA during this assessment (Figures 3 and 5). Ground water was not encountered in the majority of the borings/wells completed during the assessment.

One monitoring well (FW24), located near an arroyo that drains the OB/OD Areas (Figures 3 and 4), was completed as part of the environmental survey of the OB/OD Areas in 1981. Upon completion of installation of monitoring well FW24, the well had insufficient water to sample.

One monitoring well (FW31) was completed as a background well (Figure 3 and Figure 6). This well was completed east and south of any known potentially contaminated areas during the 1981 environmental survey. This well is near the former Pistol Range, over 10,000 feet southeast of the TNT Leaching Beds Area and over 14,000 feet northeast of the OB/OD Areas.

Generally, most of the wells completed during the 1981 environmental survey have historically lacked sufficient water to sample.

2.2.2 Ground Water Investigations at Building 6 UST Area

During January 1993, four underground storage tanks (USTs) were removed from the Building 6 within the Administration Area (Envirotech, 1993). During the removal, petroleum contamination was suspected and reported to NMED. Onsite NMED personnel executed the NMED tank closure documentation and reported a spill incident. The USACE, Albuquerque District conducted a site investigation for the Building 6 USTs.

Six soil borings were completed to an average depth of 60 feet below ground surface (bgs) and five monitoring wells (MW-18S, MW-18D, MW-20, MW-22S, and MW-22D) were completed to an average depth of 57 feet bgs (Figure 5).

Two ground water sampling events were completed at the newly completed wells. These sampling events are documented in 1st Quarterly Report on Ground Water Monitoring at UST Bldg. 6 Area (USACE, 1995a) and 2nd Quarterly Report on Ground Water Monitoring at UST Bldg. 6 Area USACE, 1995b).

Based on the laboratory and field results from the sixteen borings completed at the site in May of 1993, the vertical extent of the contamination (primarily petroleum hydrocarbons and solvents) appeared to be limited by a continuous clay layer occurring at about 40 feet in depth. Ground water was generally encountered at depths between approximately 42 feet to 45 feet bgs.

2.2.3 1997 Remedial Investigation/Feasibility Study Report and RCRA Corrective Action Program Document

Environmental investigation activities at FWDA were implemented as part of base closure in the Fall of 1992 to determine the environmental impact (if any) from the SWMUs and AOCs previously identified for investigation and evaluation and to identify areas requiring environmental restoration prior to property transfer. Findings generated as a result of this effort were documented in the 1997 Remedial Investigation/Feasibility Study Report and RCRA Corrective Action Program Document (ERM PMC, 1997).

Four ground water monitoring wells (TMW01 through TMW04) were completed during the October 1996 investigation to further characterize ground water near the TNT Leaching Beds (Figure 5). Monitoring wells TMW01, TMW03, and TMW04 were completed to between 60 and 75 feet bgs in the unconsolidated material overlying the mudstone/sandstone bedrock. Monitoring well TMW02 was completed to a depth of approximately 85 feet bgs into a sandstone water-bearing zone that underlies the TNT Leaching Beds.

A single well (SMW01) was completed during the October 1996 investigation to monitor potential impacts from the Sewage Treatment Plant (Figure 5). This well was completed in the unconsolidated material overlying the mudstone/sandstone bedrock.

A single well (FW38) was completed during November 1993 in an arroyo that drains the Current OB/OD Area (Figures 3 and 4). This well was completed to approximately 7.5 feet bgs in the unconsolidated material overlying the mudstone/sandstone bedrock.

Explosives and nitrate were generally the primary constituents detected in monitoring wells completed to characterize ground water near the TNT Leaching Beds. Nitrate, pesticides, and metals were generally the primary constituents detected in the sample collected from SMW01 near the FWDA sewage treatment plant. Generally, explosives, nitrate/nitrite, and metals have been detected in samples collected from FW38.

2.2.4 1998 Minimum Site Assessment Report

The purpose of the Minimum Site Assessment (MSA) was to provide a summary of the actions taken by the USACE, Albuquerque District, on behalf of TEAD, to identify the horizontal and vertical extent of soil contamination, and to determine whether a release had impacted ground water at the UST removal site adjacent to Building 45 (USACE, 1998).

The MSA was initiated in November 1996 with the completion of six soil borings (SB-1 through SB-6) and three shallow monitoring wells (MW-1, MW-2, and MW-

3) to determine the vertical and horizontal extent of contamination near Building 45 (Figure 5).

Data generated during this MSA indicated that hydrocarbon contamination in the soil was limited to a small area identified by detection of hydrocarbon compounds at a single soil boring and extending vertically to less than 40 feet bgs. Chemical characterization of underlying ground water indicated minimal impact with a single detection of benzene at a low concentration at MW-1.

2.2.5 1999 RCRA Interim Status Closure Plan – Open Burning/Open Detonation Area Phase IB Report

Environmental characterization efforts in support of closure at the OB/OD Areas were documented in a report entitled *Final Open Burning/Open Detonation Area RCRA Interim Status Closure Plan, Phase IB – Characterization and Assessment of Site Conditions for the Ground Water Matrix* (PMC, 1999).

In 1996, three wells (KMW09, KMW10, and KWM11) were completed in the Closed OB/OD Area and 11 wells (CMW02, CMW04, CMW06, CMW07, CMW10, CMW14, and CMW16 through CMW20) were completed in the Current OB/OD Area (Figure 5).

Two wells were completed in 1998 (KMW12 and KMW13) within the Closed OB/OD Area ground water system (Figure 5). Four wells were completed in 1998 (CMW21, CMW22, CMW23, and CMW25) and were located north of previously-completed monitoring well CMW16 to identify the northern extent of impacted ground water within the first and second water-bearing zones (Figure 5).

One well completed in 1998 (CMW24) was located north and west of previously-completed monitoring well CMW16 (Figure 5) to determine if faults identified in the subsurface by the geophysical survey act as a ground water flow barrier or conduit, and to determine the direction of ground water flow in that area.

Within the Closed OB/OD Area ground water system, a thin veneer of unconsolidated material was identified that grades into competent shale of the Mancos Shale Formation. No ground water was detected in the unconsolidated materials, but ground water flow within this material would generally follow topography and be toward the center of the valley. Thus, the unconsolidated materials in the Closed OB/OD Area ground water system may act as a closed basin with limited lateral movement of shallow ground water. Shallow ground water was encountered in the Mancos Shale Formation and the Dakota Sandstone Formation. An additional boring drilled into the Dakota Sandstone Formation in the location thought most likely to receive infiltration of surface water and shallow ground water contained no free water throughout the entire thickness of the formation. No evidence of contamination was identified in any of these locations. The data generated by this investigation suggest that installation activities have not impacted the Dakota Sandstone Formation.

Within the Current OB/OD Area ground water system, a thin veneer of unconsolidated materials is present overlying a thick sequence of shale units belonging to the Chinle Formation. Water table conditions are present only within the thin unconsolidated materials present on top of the weathered shale bedrock. This shallow ground water may discharge to surface water pools within the Current OB/OD Area arroyo. During periodic site visits during the time period associated with this investigation, no surface water flow was observed in the arroyo. Ground water flow within both the weathered and competent shale bedrock located in the Current OB/OD Area is dominated by fracture flow. It was considered likely that the Sonsela Sandstone Member subcrops beneath the unconsolidated materials and fractured shale located in and near the arroyo of the Current OB/OD Area. From the Current OB/OD Area, ground water within the Sonsela Sandstone Member migrates down dip, in a northern direction. A monitoring well network was completed along this flow path that characterizes the ground water system. All or several of these monitoring wells may be appropriate for inclusion into a compliance monitoring well network to be developed at a later time. Intense structural deformation associated with formation of the Hogback makes correlation of lithologic units from the eastern and central portions of the Current OB/OD Area ground water system toward the western portion not possible. This lack of correlation precludes identification of the ground water flow paths in a westward direction. Extensive mudstone and siltstone units underlying the Current OB/OD Area ground water system, being of inherently lower primary permeability than surrounding sandstone units, inhibit vertical movement of ground water to underlying potable aquifer units, such as the Glorieta Sandstone and San Andreas Limestone. The shale units also restrict movement of potentially impacted ground water from the Current OB/OD Area down dip toward the west. If limited transport of impacted ground water toward the west were to occur, it would be at a significantly greater stratigraphic depth than the overlying Dakota and Gallup Sandstones that are used as potable ground water sources in areas west of FWDA.

2.2.6 OB/OD Ground Water Monitoring – 1999 to 2005

Several quarterly sampling events have been completed in the OB/OD Areas since the issuance of the 1999 RCRA Interim Status Closure Plan - Phase IB Report (PMC, 1999). Quarterly ground water monitoring events were conducted during calendar years (CYs) 2000 (PMC, 2001b), 2001 (PMC, 2002b), and 2002 (PMC, 2003). An additional sampling event was completed August 2005 (TPMC, 2005). These quarterly events were documented with letter reports for each quarter and a year-end inclusive report for each year.

Initially, a subset of nine wells (CMW02, CMW16, CMW18, CMW21, CMW22, CMW25, KMW09, KMW12, and KMW13) was sampled during the CY 2000 and first half of the CY 2001 quarterly sampling events. Monitoring well CMW23 was added midway through CY 2001 and the subset of 10 wells was sampled until CY 2005.

No additional ground water sampling has been conducted at the OB/OD Areas since August 2005.

2.2.7 2001 RCRA Facility Investigation Report of the TNT Leaching Beds Area

Additional ground water investigations were completed during the period from 1996 through 2001 in the TNT Leaching Beds Areas (PMC, 2001a).

Monitoring well TMW05 was drilled in a location up-gradient of the limit of ground water contamination defined by the pilot borings drilled in 1997 (Figure 5). This well was completed to provide background ground water chemistry.

Monitoring wells TMW06 and TMW07 were completed in a location that defined the lateral extent of explosives contamination (Figure 5).

Monitoring well TMW08 was drilled in a location north of the eastern portion of the Administration Area (Figure 5).

Monitoring well TMW10 was drilled in a location north of the western portion of the Administration Area (Figure 5).

Because TMW05 was located within the area of ground water found to be impacted by nitrate/nitrites, an additional well (TMW11) was drilled in a location approximately 1,700 feet west and 700 feet north of TMW05 (Figure 5). This cross-gradient location was selected because the subsurface bedrock unit encountered in TMW05 would be encountered closer to the land surface toward the south.

Monitoring well TMW13 was completed in a location north and west of the former Acid Holding Pond (Figure 5).

Generally consistent with expectations, ground water impacted by explosives, metals, nitrate, and nitrite appear to emanate from the TNT Leaching Beds Area and extend to just east of the Administration Area. Ground water impacted by pesticides and solvents appear to emanate from the Administration Area.

2.2.8 2002 Phase I RFI Report for Buildings 600 and 542

In 2001, soil and ground water were investigated to determine if detections of explosives in TMW11 were the result of activities at Buildings 600 and 542 (PMC, 2002a).

Monitoring well TMW11, drilled in a location cross-gradient from the TNT Leaching Beds, was intended to provide ground water chemical characterization data in an area thought to be unimpacted by historical operations. One explosive constituent, cyclotrimethylenetrinitramine (RDX), was detected at concentrations very close to the laboratory method detection limit (MDL) in samples collected from TMW11 during five of the six sampling events conducted between October 1998 and January 2000. These detections of an explosive constituent, in a location cross-gradient to previously identified sources, initiated an investigation to identify other potential sources of explosives in the area.

A total of six monitoring wells (TMW14A through TMW19) were completed near Buildings 542 and 600 to determine the source of the contamination at TMW11 (Figure 5). TMW14A was intended to replace TMW11 as a background well. Monitoring well TMW15 was completed in the first unconsolidated water-bearing zone, as was previously existing well TMW11. Monitoring wells TMW14A, TMW16, TMW17, TMW18, and TMW19 were completed in the second sandstone water-bearing zone.

Generally, only low concentrations of a single volatile organic compound (VOC), explosives, perchlorate, nitrate, nitrite, and a variety of metals were detected from samples collected during this investigation.

2.2.9 2005 Ground Water Investigation Report of the Eastern Landfill

The 2005 Groundwater Investigation Report of the Eastern Landfill (TtNUS, 2005) details ground water investigation and characterization conducted at the Eastern Landfill.

During the investigation, four wells (EMW01 through EMW04) were completed to depths ranging from 100 to 120 feet bgs (Figure 5). Immediately after installation, only two of the four wells (EMW02 and EMW03) contained water.

One round of ground water sampling has been completed to date at the Eastern Landfill wells. Several explosives, pesticides, VOCs, semi-volatile organic compounds (SVOCs), nitrate, and nitrite were detected in samples collected from the Eastern Landfill wells in the single sampling event.

2.2.10 2006 Administration and TNT Leaching Beds Areas Supplemental Ground Water Characterization Report

The purpose of the work described in this report was to gather additional information to address comments and discussions by members of the FWDA BRAC Cleanup Team (BCT) regarding information presented in the Final RCRA Facility Investigation Report for the TNT Leaching Beds Area dated 2001 (TPMC, 2006).

Eight monitoring well locations (TMW21 through TMW27, and TMW29) were proposed in the 6 December 2001 BCT meeting (Figure 5). Based upon discussions held during this meeting and follow-on discussions during the March and June 2002 BCT meetings, some monitoring well locations were shifted to more effectively monitor localized ground water flow regimes and potential contamination migration pathways. A ninth monitoring well (TMW28) was also added to the program to determine ground water quality in the Rio Puerco Valley sediments prior to flow through the northern limit of the Administration Area (Figure 5). Each of the proposed new monitoring wells was screened within the first unconsolidated water-bearing zone.

Upon completion of the new wells, a ground water sampling event that included all the wells in the northern portion of FWDA was conducted during October 2002 and April 2003.

Findings were similar to those of the 2001 RCRA Facility Investigation Report of the TNT Leaching Beds Area and provided further information about the leading edges of impacted ground water.

3.0 SITE CONDITIONS

The general information below is summarized from a document entitled *Final Remedial Investigation/Feasibility Study Report & RCRA Corrective Action Program Document* (ERM PMC, 1997). More specific information including land use, natural and manmade features, ecological setting, fate and transport information, and detailed surface and subsurface characterization will be included in other documents [e.g., RCRA Facility Investigation (RFI) Work Plans and Release Assessment Reports] prepared for the individual parcels as specified in the Permit.

3.1 CLIMATE

Northwestern New Mexico is characterized by a semiarid continental climate. Most precipitation occurs from May through October as localized and brief summer storms. Spring and fall droughts characterize the area.

Mean annual rainfall for the area ranges between 10 and 16 inches, while the recorded average annual precipitation for FWDA is 11 inches. Depending on local elevations, mean annual rainfall fluctuates between 8 and 20 inches. Most of the precipitation occurs as rain or hail in summer thunderstorms, and the remainder results from light winter snow accumulations.

The average seasonal temperatures for the area vary with elevation and topographic features. During winter, daily temperatures fluctuate as much as 50 to 70 degrees Fahrenheit (°F) in a 24-hour period. In summer, daily high temperatures are between 85° F and 95°F. Average temperatures in winter are about 27°F and in summer 70°F, while extreme temperatures are as low as -30°F in winter and as high as 100°F in summer. There are 100 to 150 frost-free days during the year from the middle of May to the middle of October.

The area has generally sunny weather, with the sun shining more than 3,000 hours annually. Average relative humidity varies from 50 to 15 percent, during the wet season (fall) and the dry season (spring), respectively. During spring, the area experiences strong winds from the west and southwest, with an average wind speed of 12 miles per hour. Strong winds, high temperatures, and low relative humidities in the area contribute to high evaporation rates.

3.2 TOPOGRAPHY

Topographically, FWDA may be divided into three areas: (1) the rugged north-to-south trending Hogback along the western and the southwestern boundaries; (2) the northern hill slopes of the Zuni Mountain Range in the southern portion; and (3) the alluvial plains marked by bedrock remnants in the northern portion of the installation. The Hogback area is formed by interbedded Mesozoic sedimentary rocks dipping sharply to the west and is dissected by northeastern-trending intermittent streams. The streams transport sediment to low-lying areas in the northern part of the installation, creating an extensive alluvial deposit among remnants of bedrock. The streams eventually discharge to the South Fork of the Puerco River near the northern boundary of FWDA.

The elevation of FWDA ranges from approximately 8,200 feet above mean sea level (MSL) in the south to 6,660 feet above MSL in the north. Main drainages, following the topography, flow from south to north and discharge to the South Fork of the Puerco River. However, many tributaries follow the regional trend, flowing from southwest to northeast. Because of the nature of precipitation in this semi-arid region, the surface drainage is relatively shallow near headwaters. Downward erosion intensifies as the stream moves downstream, resulting in a system of well-developed steep-walled arroyos. Arroyos form because of the erodibility of localized areas of silt- and clay-rich bedrock.

3.3 SOILS

The soils found on the installation are similar to those occurring in cool plateau and mountain regions of New Mexico. The major soil types at FWDA are permeable sand and sandy-loam clays. These soils are relatively thin, and the parent bedrock is either at or near the surface in more than a quarter of the installation.

According to U.S. Soil Conservation Service studies in 1981, four soil units occur on FWDA land: (1) Camborthids-Torriothents soils, which are shallow to deep loams and clays that occur on plains hillslopes (slopes of one to 12 percent) and occupy nearly the entire northeastern quarter of the installation; (2) Torriothents-Rock Outcrop soils, which are shallow, loamy soils and rock outcrop on the dissected plateaus, escarpments, and hillslopes (slopes three to 60 percent) on the north central-western quarter of FWDA; (3) Rock Outcrop-Haplustolls-Argiustolls soils, which are shallow, loamy, and clayey soils, rolling over steep hillsides and canyon walls (slopes of 30 to 70 percent) that are situated in the central (east-to-west) zone, and constitute less than half of the southern portion of the property; and (4) Eutrobocalfs-Argiborolls soils, which are shallow to moderately deep, loams and clays that occur on slightly sloping to steep areas in the mountainous southeastern part of the installation.

The thickness of these four soil types varies widely over the installation, with alluvial accumulations deepest along canyon floors and in the Puerco River Valley. Bedrock exposures are common throughout the area to the south. Generally, the soils are loamy or loam/clay mixtures that contain varying amounts of silt, sand, gravel, and rock fragments. All of these soils are fragile. Wind and water cause extensive soil erosion, especially where vegetative cover is absent.

3.4 REGIONAL GEOLOGY

FWDA is located in an erosional basin within the Navajo section of the Colorado Plateau Physiographic Province. During the uplift of the Zuni Mountain Range in the southern and southeastern portion of the installation, the area occupied by the erosional basin was under tensional stress that extensively fractured the bedrock. Differential weathering and erosion along the fractures resulted in the formation of the basin currently occupied by FWDA.

In the northern part of the installation, where the Administration, Workshop, and Magazine/Igloo areas are located, the surface is covered by either remnants of the Chinle Formation or alluvial deposits. The alluvial deposits consist of sediment deposited by outwash from the Zuni Mountains to the south and the Hogback in the western part of the installation. The Hogback is thought to represent a monocline fold, where westerly dipping Mesozoic bedrock is exposed to form a long, sharp-crested ridge trending north to south. The bedrock in areas east of the Hogback generally dips to the north. In the southeastern part of FWDA, bedrock of Permian and Triassic age was uplifted by a northwest thrust fault.

The majority of FWDA is underlain by the Chinle Formation (Triassic) and dissected by arroyos. The Chinle Formation consists primarily of calcareous mudstone, with minor amounts of fine-grained calcareous sandstone. The sandstone is relatively weather-resistant and forms the cap rock of the remnant bedrock exposures in the northern portion of FWDA. The softer mudstone is easily eroded to form badlands or arroyos on hillslopes and in eroded valleys.

Alluvial deposits are most prevalent in the northern part of FWDA in lowland areas between bedrock remnants. Alluvial deposits are also present along intermittent streams draining the Hogback and Zuni Mountains which flow through the northern part of the installation before joining the South Fork of the Puerco River. Because the alluvium was generally deposited by braided streams, the texture and internal structure are characterized by lateral and vertical variability. The grain size of the alluvium ranges from clay to gravel, typical of braided stream deposits.

Information obtained from records of previously-installed wells indicates that the alluvial deposits are thickest near major drainages. The alluvium has been shown to be 150 feet thick northwest of the installation near the South Fork of the Puerco River. Near Fort Wingate High School (located east of the installation), the alluvial deposits are 75 feet thick. In the Administration Area, a water supply well record indicates a 30-foot-thick alluvial deposit, while another well record 30 feet away indicates a 70-foot-thick alluvial deposit. The alluvium present in these two wells is composed of fine- to medium-grained sand and sandy silt. Alluvial deposits not located immediately adjacent to the major drainages may be less than 15 feet thick. Bedrock, consisting of mudstones of the Chinle Formation, has been exposed at the bottoms of the arroyos. A well (FW31) near Igloo Block G penetrated 10 feet of alluvium composed of fragments of sandstone and siltstone in a clay matrix. The number of rock fragments increased as the bedrock contact was approached.

3.5 SURFACE WATER

FWDA lies between the South Fork of the Puerco River and the northern foothills of the Zuni Mountain Range. All drainages in this area are intermittent with flow occurring only during and after heavy rainfall events or during snowmelt. Drainages are fed by washes in the Zuni Mountain Range and the Hogback. The drainages generally flow toward the north until the South Fork of the Puerco River is encountered, except in the southwestern corner of the installation where drainage is toward the west.

3.6 HYDROGEOLOGY

Ground water is present in several of the rock units underlying FWDA. Examination of these rocks and records of wells in the area indicate that the only formations at FWDA capable of yielding more than a few gallons per minute (gpm) are the Quatowam Alluvium (Quaternary) and the San Andres Limestone and Glorieta Sandstone (Permian). However, minor amounts of ground water are present within the Chinle Formation (Triassic) and underlying rock units. Water-bearing formations of Jurassic and Cretaceous ages, capable of yielding 100 gpm or more, are present 4 to 6 miles to the west of FWDA, but not within installation boundaries.

The alluvial aquifer, which includes deposits in the Puerco River Valley along the northern edge of the installation, is composed of gravel, sand, silt, and clay derived from rocks of Triassic and Jurassic age that border the valley. These deposits are primarily recharged from surface runoff, although some deposits in the southern part of the installation are recharged by springs from underlying bedrock aquifers. Recharge of ground water within the alluvium occurs mainly during the wet seasons of the year, specifically with the snowmelt in the spring.

Ground water is expected to flow from areas of higher elevation toward lower elevations, parallel to the direction of flow in the arroyos. At FWDA, the general flow direction is from the Zuni Mountain Range, at the southern boundary of FWDA, to areas of lower elevation such as the Puerco River Valley, north of FWDA. The saturated thickness of the alluvium varies greatly and tends to increase as it nears drainage channels. The direction of ground water flow in the alluvium is generally toward the north and northwest

Several older bedrock units are associated with the Hogback, including the Entrada Sandstone. These units are recharged partially within the installation boundaries by precipitation. These rocks dip steeply to the west and yield very little water within installation boundaries; however, they do serve as water sources for much of the area west of the boundary.

The San Andres-Glorieta aquifer, which constitutes the primary ground water source for FWDA, outcrops near the installation’s southern boundary and dips to the north. The recharge zone is located east of a fault in the southeastern part of FWDA. Snowmelt and precipitation furnish much of the recharge water to the aquifer. According to records from the U.S. Weather Bureau, slightly more than 3 inches of water is received annually in the area as snow. It is assumed that 1 inch per year of precipitation infiltrates the San Andres-Glorieta aquifer at FWDA, and that approximately 2,300 acre-feet per year is recharged annually. Ground water flow in the San Andres-Glorieta aquifer is in a northwesterly direction.

The top of the San Andres-Glorieta aquifer lies about 1,100 feet below land surface near the Administration Area. At this location, the aquifer is about 200 feet thick and under artesian pressure. Local variations in aquifer permeability are reportedly large and unpredictable. The hydraulic conductivity ranges from 0.05 to 150 feet per day with yields that are highly variable from one location to another. The horizontal hydraulic gradient of the aquifer at FWDA has reportedly declined with time. Ground water from the San Andres-Glorieta aquifer flows upward along fractures because of the upward hydraulic gradient. The region around Gallup, including FWDA, was declared an underground water basin in 1980 by the State of New Mexico. This action prohibits any major new ground water withdrawals without the approval of the State Engineer. The basin covers 1,439 square miles and includes the communities of Gallup, Fort Wingate, Camerco, Mariano Lake, Navajo Wingate Village, and Rehoboth.

3.7 CULTURAL RESOURCES

Traditional Cultural Properties (TCPs) and other cultural resources have been documented within FWDA boundaries. As documented during the Consultation Process (Appendix A), existing ground water monitoring wells and access routes are not located within identified archaeological sites. Because cultural resources oversight was provided at the time the wells and access routes were installed, and because ground water sampling activities are non-intrusive and confined to a small area immediately surrounding a given well, cultural resource monitoring will not be required during proposed sampling activities at existing wells.

Maps showing the locations of TCPs relative to existing monitoring well locations will not be included in this Work Plan, which will be a public document when final.

4.0 SCOPE OF ACTIVITIES

The purpose of this section is to describe the types of activities that will be conducted as part of this GWMP.

4.1 GROUND WATER ELEVATION SURVEYS

Ground water elevation data will be collected from all existing wells as listed in Table 1. As directed by NMED HWB, ground water elevation data will be collected on a quarterly basis, in January, April, July, and October.

4.2 GROUND WATER SAMPLING

Sampling of ground water will be performed according to the methods presented in Section 5.0.

During CY 2001, NMED developed statewide guidance for low flow/low stress ground water sampling. Following this guidance, FWDA developed the low flow ground water sampling procedures outlined in Section 5.2.

Low flow ground water sampling is the preferred purging and sampling method at FWDA and if used, well purging and sampling will follow the procedures outlined in Section 5.2. However, because of the uncertainty of the yield of the proposed wells, other methods of purging and sampling may be used to sample the proposed wells. If a well is unable to be low flow purged and sampled, traditional well purging techniques will be employed, as outlined in Section 5.3.

Sampling will proceed from wells of known or suspected low contamination to wells of higher contamination. All purge water will be containerized and managed as an IDW following the procedures outlined in Section 5.7.

4.2.1 OB/OD Unit Ground Water Sampling

Samples will be collected from 24 existing ground water monitoring wells, as shown in Figure 4 and Figure 6, and Table 2. As directed by NMED HWB, samples will be collected semi-annually, in April and October. All wells containing sufficient ground water will be sampled.

Sampling of ground water will be performed according to the methods presented in Sections 5.2 and 5.3, as appropriate.

All purge water will be containerized and managed as an investigation derived waste (IDW) following the procedures outlined in Section 5.7.

4.2.2 Northern FWDA Ground Water Sampling

Samples will be collected from 40 existing ground water monitoring wells, as shown in Figure 5 and Table 3. As directed by NMED HWB, samples will be collected semi-annually, in April and October. All wells containing sufficient ground water will be sampled.

Sampling of ground water will be performed according to the methods presented in Section 5.2 and 5.3, as appropriate.

All purge water will be containerized and managed as IDW following the procedures outlined in Section 5.7.

5.0 INVESTIGATION METHODS

The methods detailed in this section will be followed during field investigations performed under this GWMP. The Site Safety and Health Plan (SSHP) for this investigation is included in Appendix D.

5.1 GROUND WATER ELEVATION SURVEYS

Measurement of ground water levels in all existing wells listed in Table 1 will be made over a single, 8- to 10-hour period. When a ground water elevation survey event coincides with a ground water sampling event, water level data collection will occur prior to the start of sample collection.

Surveyed well ground surface and top of casing reference mark (notch) elevation data are included in Table 1. The depth to ground water from the surveyed reference mark will be measured and recorded to the nearest 0.01 foot. The well total depth will also be measured and recorded. A blank ground water elevation survey form is included in Appendix E.

5.2 LOW FLOW PURGE AND SAMPLING PROCEDURES

5.2.1 Dedicated Sampling Equipment

Prior to the first sampling event, dedicated, adjustable rate, low flow pumps constructed of stainless steel, and/or Teflon and polyethylene will be installed in each well identified for sampling in Tables 2 and 3. Low-density polyethylene (LDPE) tubing will be used for both the air line and ground water discharge line of the pump for each well. Small diameter tubing for the ground water discharge line will be used to help ensure discharge tubing remains liquid filled when operating at very low pumping rates.

5.2.1.1 Traditional Low Flow Pumps

Traditional low flow pumps will be installed prior to the first sampling event.

The pump intake will be located approximately 2 feet from the bottom of the screened interval, to ensure that water will enter the pump from the formation and not the well casing; and to minimize mobilization of particulates present in the bottom of the well.

5.2.1.2 ZIST Low Flow Pumps

Zone Isolation Sampling System (ZIST) low flow pumping systems will be installed prior to the first sampling event. The ZIST consists of a low flow pump and in-well docking system.

These systems will be installed to isolate the screened interval from the casing with a mechanical packer, to ensure that water will enter the pump from the formation and not the well casing.

Additionally, pumping rates at each well proposed for ZIST purging and sampling will be determined prior to the first sampling event to ensure the pumping rate causes no drawdown of the water column.

5.2.2 Other Sampling Equipment

The following additional equipment is necessary to conduct low flow ground water sampling activities.

- Electronic water level meter, capable of measuring to 0.01 feet accuracy.
- Flow measurement supplies (e.g., graduated cylinder and stopwatch).
- Power source (generator, portable rechargeable battery, etc.). If a gasoline generator is used, it will be located downwind and at least 15 feet from the well so that the exhaust fumes do not contaminate the samples.
- Oil-less air compressor or pressurized gas cylinder for operation of sampling pump.
- Indicator field parameter monitoring instruments for pH, dissolved oxygen (DO), turbidity, specific conductance, and temperature. A flow-through-cell will be used to measure all listed parameters, except turbidity.
- Decontamination supplies including non-phosphate detergent, deionized water, brushes, and buckets.
- Logbook and ground water sampling forms.
- Disposable latex or nitrile gloves.
- Sample Bottles.
- Sample preservation supplies (as required by the analytical methods).
- Sample labels.
- Well construction data, location map, field data from last sampling event.
- Well keys.

5.2.3 Preliminary Site Activities

The well will be checked for security damage or evidence of tampering, and pertinent observations will be recorded. A sheet of clean polyethylene will be laid on the ground surface surrounding the wellhead to prevent monitoring and sampling equipment from touching the ground.

5.2.4 Purging and Sampling Procedure

Wells will be sequenced to ensure that efficiently sized daily sample lots are collected. Water generated during purging activities will be containerized and managed as IDW as described in Section 5.7.

5.2.4.1 Measure Initial Water Level

The water level depth (to ± 0.01 feet) will be measured prior to starting the pump. The water level probe will be carefully lowered down the well to minimize disturbance. Measurement of total well depth will not be performed until after sampling of the well is complete. All measurements will be taken from the surveyed reference point (casing notch).

These data will be recorded on the Low Flow Sampling Data Form included in Appendix E.

5.2.4.2 Purge Well – Traditional Low Flow Pump

Drawdown information from previous sampling event(s) will be checked for each well (field data sheets from past events are included in Appendix C; if there is no low flow data sheet in Appendix C for a given well, low flow sampling has not been performed at that location). The extraction rate (use final pump cycle setting information) from previous sampling event(s) will be duplicated to the extent practicable.

The pump will be started at the lowest speed setting and slowly increased until discharge occurs. The water level will be measured again. The pump speed will be adjusted until there is little or no water level drawdown (less than 4 inches or 0.33 feet). Although the goal is a drawdown of less than 4 inches or 0.33 feet, low ground water recharge rates at many of the FWDA wells may cause this goal to be exceeded.

Because the pumps will be dedicated and will remain in place between sampling events, approximately 1 liter of water (or more, depending on pump installation depth/length of discharge tubing and volume of water contained in tubing) will be purged to clear any stagnant water from the pump and discharge tubing. The initial purge volume must be greater than the internal pump volume plus the extraction tubing volume. The water level will then be measured and recorded. If the water level has dropped more than 0.33 feet, no further purging will be performed and sample collection will be performed as described in Section 5.2.4.4

If the water level did not drop more than 0.33 feet during the initial purge, purging will continue and field indicator parameters will be monitored. The water level and pumping rate will be monitored and recorded continuously (approximately every 2-4 minutes) during purging. Any pumping rate adjustments (both time and flow rate) will be recorded. Pumping rates will, as needed, be reduced to the minimum capabilities of the pump [for example, 30 to 400 milliliters per minute (ml/min)] to ensure stabilization of indicator parameters. Adjustments will be made within the first 15 minutes of pumping in order to help minimize purging time. Every attempt will be made to not allow the water level to fall to the intake level (if the static water level is above the well screen, lowering the water level into the screen will be avoided, if possible).

During well purging, indicator field parameters (turbidity, temperature, specific conductance, pH, and DO) will be monitored and recorded continuously (approximately every 2-4 minutes) on the Low Flow Sampling Data Form (Appendix E). During the early phase of purging, emphasis will be put on minimizing and stabilizing pumping stress, and recording those adjustments. Purging is considered complete and sampling will begin when the indicator field parameters have stabilized. Stabilization has occurred when three consecutive readings are within the following limits:

- turbidity (±10% for values greater than 1 Nephelometric Turbidity Unit [NTU])
- DO (±10%); DO levels less than 1.0 milligrams per liter (mg/L) fall within the margin of error limits)
- specific conductance (±10%)
- temperature (±10%)
- pH (± 0.5 unit)

All measurements, except turbidity, will be obtained using a transparent flow-through-cell that prevents air bubble entrapment in the cell. Transparent flow-through-cells are preferred, because they allow field personnel to watch for particulate build-up within the cell. This build-up may affect indicator field parameter values measured within the cell, and may also cause an underestimation of turbidity values measured after the cell. If the cell needs to be cleaned during purging operations, pumping will continue and the cell will be disconnected for cleaning. The flow-through-cell will then be reconnected and monitoring activities will continue. When the pump is turned off or cycling on/off, water in the cell must not drain out. Monitoring probes must be submerged in water at all times, with the exception of the time spent cleaning particulate build-up in the flow-through-cell.

When indicator parameters have stabilized (or if indicator parameters have not stabilized after 30 minutes of purging), purging will be considered complete and samples will be collected as described in Section 5.2.4.4.

5.2.4.3 Purge Well – ZIST Low Flow Pump

The extraction rate from the initial setup will be duplicated to the extent practicable. The pump will be started at the predetermined extraction rate and allowed to purge until discharge occurs.

The water level will be measured during the purging process to ensure no drawdown of the water column occurs; if drawdown occurs, this will indicate the mechanical packer system has failed and the ZIST will need to be removed, inspected, and repaired before continuing.

Because the pumps will be dedicated and will remain in place between sampling events, approximately 1 liter of water (or more, depending on pump installation depth/length of discharge tubing and volume of water contained in tubing) will be purged to clear any stagnant water from the pump and discharge tubing. The initial purge volume must be greater than the internal pump volume plus the extraction tubing volume.

Purging will continue and field indicator parameters will be monitored. The water level and pumping rate will be monitored and recorded continuously during purging. Every attempt will be made to not allow the water level to fall to the intake level.

If the water level falls to the intake level during purging, the pump will be stopped and purging will be considered complete. The well will be allowed to recharge and samples will be collected from the pump discharge as soon as recovery allows. Samples will be collected as described in Section 5.2.4.4.

During well purging, indicator field parameters (turbidity, temperature, specific conductance, pH, and DO) will be monitored and recorded continuously on the Low Flow Sampling Data Form (Appendix E). During the early phase of purging, emphasis will be put on minimizing and stabilizing pumping stress, and recording those adjustments. Purging is considered complete and sampling will begin when the indicator field parameters have stabilized. Stabilization has occurred when three consecutive readings are within the following limits:

- turbidity (±10% for values greater than 1 Nephelometric Turbidity Unit [NTU])
- DO (±10%); DO levels less than 1.0 mg/L fall within the margin of error limits)
- specific conductance (±10%)
- temperature (±10%)
- pH (± 0.5 unit)

All measurements, except turbidity, will be obtained using a transparent flow-through-cell that prevents air bubble entrapment in the cell. Transparent flow-through-cells are preferred, because they allow field personnel to watch for particulate build-up within the cell. This build-up may affect indicator field parameter values measured within the cell, and may also cause an underestimation of turbidity values measured after the cell. If the cell needs to be cleaned during purging operations, pumping will continue and the cell will be disconnected for cleaning. The flow-through-cell will then be reconnected and monitoring activities will continue. When the pump is turned off or cycling on/off, water in the cell must not drain out. Monitoring probes must be submerged in water at all times, with the exception of the time spent cleaning particulate build-up in the flow-through-cell.

When indicator parameters have stabilized, purging will be considered complete and samples will be collected as described in Section 5.2.4.4.

5.2.4.4 Collect Water Samples

Following stabilization of indicator parameters, the flow through cell will be disconnected. Water samples will be collected directly from the pump discharge tubing, and the pump will be operated at approximately the same flow rate at which the well was purged. Personnel handling sample bottles will wear disposable latex or nitrile gloves.

A constituent sampling order will be determined prior to initiating field activities, with sample bottles for VOC and SVOC analyses filled first. All sample containers will be filled in order by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence.

The tubing will remain filled with water during sampling so as to minimize possible changes in water chemistry caused by contact with the atmosphere. If the pump tubing is not completely filled to the sampling point, a clamp or connector (Teflon or stainless steel) will be added to constrict the sampling end of the tubing, or the flow rate will be increased slightly until the water completely fills the tubing.

Filtered metal water samples will be collected in an unpreserved sampling container of similar size to the final preserved sampling container. These samples will be sent to the analytical laboratory to be filtered and processed.

After a sample container is filled, the container will be immediately placed into a cooler with ice. Sample management will be conducted as discussed in Section 5.4.

5.2.5 Post Sampling Activities

After collection of the samples, disposable materials (e.g., disposable gloves) will be properly discarded as described in Section 5.7. The total well depth (to ± 0.01 feet) will be measured and recorded, and the well will be secured.

5.3 TRADITIONAL GROUND WATER SAMPLING PROCEDURES

Low flow/low stress ground water sampling is the preferred purging and sampling method at FWDA. However, because of the uncertainty of the yield of the proposed wells, other methods of purging and sampling may be used to sample the proposed wells. If a well is unable to be low flow purged and sampled, traditional well purging using a Teflon bailer will be used to purge the wells. This section provides procedures for traditional forms of sampling.

Prior to initiation of sampling, a sampling sequence will be established; sampling will proceed from wells of known or suspected low contamination to wells of higher contamination.

These procedures provide a general framework for collecting ground water samples from wells that cannot sustain low flow sampling techniques. These procedures emphasize the need to remove sufficient volume of water from each well to ensure ground water representative of the surrounding formation is collected.

Stabilization of indicator field parameters is used to indicate that conditions are suitable for sampling to begin. If after five well volumes are evacuated during purging, indicator field parameters have not stabilized, purging will be discontinued, samples will be collected, and a full explanation of attempts to achieve stabilization will be provided.

5.3.1 Equipment

The following equipment is necessary to conduct ground water sampling activities.

- Dedicated Teflon or polyethylene bailers.
- Electronic water level measuring device, capable of measuring to 0.01 feet accuracy.
- Flow measurement supplies (e.g., graduated bucket and stopwatch)
- Indicator field parameter monitoring instruments with pH, Eh (or ORP), DO, turbidity, specific conductance, and temperature.
- Decontamination supplies including non-phosphate detergent, deionized water, brushes, and buckets.
- Logbook and ground water sampling forms.
- Sample Bottles.
- Sample preservation supplies (as required by the analytical methods).
- Sample labels.
- Well construction data, location map, field data from last sampling event.
- Well keys.
- OVM for health and safety purposes, and to provide qualitative field evaluations.

5.3.2 Preliminary Site Activities

The well will be checked for security damage or evidence of tampering, and pertinent observations will be recorded. A sheet of clean polyethylene will be laid on the ground surface surrounding the wellhead to prevent monitoring and sampling equipment from touching the ground. The well cap will be removed and

VOCs will be immediately measured at the rim of the well with an OVM. The reading will be recorded in the field logbook or on the ground water sampling form. If the well casing does not have a reference point (usually a V-cut or indelible mark in the well casing), one will be made. Its location and the date of the mark will be documented in the logbook.

A synoptic water level measurement round will be performed (in the shortest possible time) before any purging and sampling activities begin. The water level depth (to +/- 0.01 feet) and total well depth (to +/- 0.1 feet) will be measured. Measurement of total well depth will not be measured until after sampling of the well is complete. All measurements must be taken from the established referenced point.

5.3.3 Purging and Sampling Procedure

Wells will be sampled in order of increasing chemical concentrations (known or anticipated). An additional factor to consider is that of well yield. Wells will be sequenced to ensure that efficiently sized daily sample lots are collected.

Water generated during purging activities will be containerized and managed as an IDW as described in Section 5.7.

5.3.3.1 Install Bailer

Sufficient cord to reach the bottom of the well will be attached to the bailer and the bailer lowered into the well.

5.3.3.2 Purge Well

Removal of a quantity of water equal to five times the calculated volume of standing water in the well (including the saturated annulus) will be completed wherever possible. If the recovery rate is rapid, the well will be allowed to recover to its original volume and the sample collected. If recovery is very slow, samples may be obtained as soon as sufficient water is available after one volume has been removed. Sampling logs will identify the type of equipment used for purging and sampling.

5.3.3.3 Monitor Indicator Field Parameters

During well purging, indicator field parameters (turbidity, temperature, specific conductance, pH, Eh, and DO) will be monitored prior to and throughout purging and recorded on the well sampling form (Appendix E). Purging is considered complete and sampling will begin when the indicator field parameters have stabilized. Stabilization has occurred when three consecutive readings, are within the following limits:

- turbidity (10% for values greater than 1 NTU)
- DO (10%)

- specific conductance (3%)
- temperature (3%)
- pH (± 0.1 unit)
- ORP/Eh (± 10 millivolts)

Stabilization of indicator field parameters is used to indicate that conditions are suitable for sampling to begin. If after five well volumes are evacuated during purging, indicator field parameters have not stabilized, purging will be discontinued, samples will be collected, and a full explanation of attempts to achieve stabilization will be provided.

5.3.3.4 Collect Water Samples

Water samples for laboratory analyses will be collected using a dedicated bailer. A constituent sampling order will be determined prior to initiating field activities. All sample containers will be filled in order by allowing the bailer discharge to flow gently down the inside of the container with minimal turbulence.

Filtered metal water samples will be collected in an unpreserved sampling container of similar size to the final preserved sampling container. These samples will be sent to the analytical laboratory to be filtered and processed.

After a sample container is filled, the container will be immediately placed into a cooler with ice. Sample management will be conducted as discussed in Section 5.4.

5.3.4 Post Sampling Activities

After collection of the samples, the sampling equipment (e.g., bailer cord and disposable bailer) will be removed from the well. Disposable materials will be properly discarded. The total well depth (to +/- 0.01 feet) will be measured and recorded, and the well will be secured.

5.4 SAMPLE IDENTIFICATION, CHAIN-OF-CUSTODY, AND PACKAGING/SHIPPING PROCEDURES

Sample identification, chain-of-custody, and sample packaging/shipping procedures are discussed in the following sections.

5.4.1 Sample Identification Procedures

Sample identification (ID) methodology may be changed in the field. Sample identification will be consistent with USACE requirements as well as the requirements of the Environmental Information Management System (EIMS) being developed for FWDA.

Ground water samples will simply carry the well number as the sample identification.

Quality assurance (QA) samples (as described in Section 5.6.2) will carry the same ID as the parent sample. Equipment rinsate blanks, trip blanks, and field blanks will carry the designation TRIPXXX, or FBLKXXX (XXX representing the sequence number of the sample), respectively.

5.4.2 Chain-of-Custody Procedures

Chain-of-custody forms will be completed and will accompany each sample at all times. Data on the forms will include the sample ID, tracking number, depth interval, date sampled, time sampled, project name, project number, and signatures of those in possession of the sample. Forms will accompany those samples shipped to the designated laboratory so that sample possession information can be maintained. The field team will retain a separate copy of the chain-of-custody reports at the field office. Additionally, the sample ID; date and time collected; collection location; tracking number; and analysis will be documented in the field logbook as discussed in Section 5.6.3.

5.4.3 Packaging and Shipping Procedures

All samples will be shipped daily by overnight air freight to the laboratory. Unless otherwise indicated, samples will be treated as environmental samples, shipped in heavy-duty coolers, packed in materials to prevent breakage, and preserved with ice in sealed plastic bags. Each shipment will include the appropriate field QC samples (i.e., trip blanks, duplicates, and field blanks). Corresponding chain-of-custody forms will be placed in waterproof bags and taped to the inside of the coolers lids. Each cooler shipped from the laboratory containing aqueous sample bottles for VOC analyses will contain a trip blank. The trip blank will stay with the cooler until the cooler is returned to the analytical laboratory.

5.5 DECONTAMINATION PROCEDURES

Decontamination of non-disposable sampling equipment (e.g., water level meter) will be performed to ensure chemical analyses reflect actual concentrations at sampling locations by maintaining the quality of samples and preventing cross-contamination.

Sampling and field equipment cleaned in accordance with the following sections will meet the minimum requirements for definitive-level data collection.

General specifications for equipment and personnel decontamination are discussed in the following paragraphs.

5.5.1 Specifications for Cleaning Materials

Specifications for standard cleaning materials referred to in this section are as follows:

- Soap will be a standard brand of phosphate-free laboratory detergent. Use of other detergent will be documented in the field logbooks and investigative reports. Soap will be obtained from a laboratory supply distributor.

- Tap water will be obtained from the on-site water supply system (if operable) or from potable water purchased locally.

- Analyte free water (deionized water) is water that has been treated by passing through a standard deionizing resin column. Analyte free water will be obtained from the contract laboratory as needed.

- If a solvent rinse is required (at highly contaminated sites), the solvent will be pesticide-grade iso-propanol. Use of other solvents will be documented in field logbooks and investigation reports. Solvent will be obtained from the contract laboratory or a laboratory supply distributor.

- Other solvents may be substituted for a particular purpose if required. The equipment will be subjected to the standard cleaning procedure after cleaning with a non-standard solvent. The equipment will be completely dry prior to use.

- Solvents, laboratory detergent, and rinse waters used to clean equipment will not be reused during field decontamination.

5.5.2 Handling and Containers for Cleaning Solutions

Improperly handled cleaning solutions may easily become contaminated. Storage and application containers must be constructed of the proper materials to ensure their integrity. Following are acceptable materials used for containing the specified cleaning solutions:

- Soap will be kept in clean plastic, metal, or glass containers until used. It will be poured directly from the container during use.

- Solvent will be stored in the unopened original containers until used.

- Tap water will be kept in clean tanks, hand-held sprayers, squeeze bottles, or applied directly from a hose.

- Constituent free water will be stored in clean glass, stainless steel, or plastic containers that can be closed until just prior to use. It may be applied from plastic squeeze bottles.

Hand-held pump sprayers are not acceptable storage or application containers for the above materials (with the exception of tap water). This also applies to stainless steel sprayers. All sprayers have internal gaskets and seals that may contaminate the solutions.

5.5.3 Safety Procedures for Field Cleaning Operations

Some of the materials used to implement the cleaning procedures outlined in this section can be harmful if used improperly. Caution should be exercised by all field personnel and all applicable safety procedures should be followed. At a minimum, the following precautions will be observed in the field during decontamination operations:

- Safety glasses with splash shields or goggles, and latex or nitrile gloves will be worn during all cleaning operations.
- Solvent rinsing operations will be conducted in the open (never in a closed room or vehicle).
- No eating, smoking, drinking, chewing, or any hand to mouth contact shall be permitted during cleaning operations.
- All decontamination fluids will be properly containerized and managed as described in Section 5.7.

5.5.4 Handling of Cleaned Equipment

After field cleaning, equipment will be handled only by personnel wearing clean gloves to prevent re-contamination. The equipment will be moved away from the cleaning area to prevent re-contamination. If the equipment is not to be immediately re-used it will be covered with plastic sheeting or wrapped in aluminum foil to prevent re-contamination. The area where the equipment is stored prior to re-use must be free of contaminants.

5.6 QUALITY ASSURANCE PROCEDURES

5.6.1 Field Equipment Calibration and Preventative Maintenance

Field instruments will be calibrated, operated, and maintained in accordance with the manufacturer's instructions. Daily, on-site field instrument calibrations will be performed before and during each day's use by trained technicians using certified standards. Instrument calibrations will be recorded in bound logbooks and will include field instrument identification, date of calibration, standards used, and calibration results (as described in Section 5.6.3.1).

If an individual suspects an equipment malfunction, the meter will be removed from service and tagged so that it is not used inadvertently, and a substitute piece of equipment will be used. Additionally, equipment that fails calibration or becomes inoperable during use will be removed from service and tagged. Such equipment will be repaired and satisfactorily re-calibrated. The results of activities performed using equipment that has failed re-calibration will be evaluated. If the results are adversely affected, the outcome of the evaluation will be documented and the Project Manager will be notified.

Equipment that cannot be repaired will be replaced. Backup equipment will be available in the field for use in case of a malfunction.

Preventative maintenance procedures for the field instruments will be carried out in accordance with procedures outlined by the manufacturer's equipment manuals. All records of inspection and maintenance will be dated and documented in the field logbook. Critical spare parts for field instruments will be included in the sampling kits to minimize downtime. In addition, backup meters will be available, if needed. Spare parts will be purchased from accepted vendors. Daily inspections of field equipment will be conducted to ensure that equipment is functioning properly. If inspection results indicate that a piece of field equipment is deemed faulty or not useable, replacement equipment will be cleaned, calibrated if necessary, and used in place of the faulty equipment. The faulty equipment will then be shipped back to the vendor for repair.

5.6.2 Sample Collection Quality Assurance

Several types of field quality control samples will be submitted to the analytical laboratory to assess the quality of the data resulting from the field sampling program. These samples will include field duplicate samples, field triplicate samples (also known as split samples), trip blanks, equipment rinsate blanks, and matrix spike (MS) and matrix spike duplicate (MSD) samples.

Field QA samples are summarized in Tables 4 and 5.

Field duplicate and QA split samples will be collected at a frequency of one per 10 environmental samples.

As noted in Section 5.2, the only non-dedicated sampling equipment to be used is a water level meter. Field equipment rinsate blanks will be collected at a frequency of one per 20 environmental samples.

Each cooler shipped from the laboratory containing aqueous sample bottles for VOC analyses will contain a trip blank. The trip blank will stay with the cooler until the cooler is returned to the analytical laboratory.

Additional volume will be collected at specified sample locations so that one MS/MSD pair will be submitted to the laboratory for every 20 environmental samples for each medium sampled.

5.6.3 Documentation Quality Assurance

Field documentation shall consist of one or more job- or area-specific field logbooks, field forms, sample Chains-of-Custody, and sample logs/labels. Photographic documentation is not required.

5.6.3.1 Logbooks

Site and field logbooks provide a daily handwritten record of all field activities. All logbooks will be permanently bound and have a hard cover. Logbooks will be ruled, or ruled and gridded, with sequentially numbered pages. All entries into field logbooks will be made with indelible ink. Field logbooks are detailed daily records that are kept in real time and are assigned to specific activities, positions, or areas within the site. Separate logbooks shall be used for each sampling and field team.

Documentation in field notebooks will include the following (as necessary):

- Location
- Date and time
- Names of field crew
- Names of subcontractors
- Weather conditions during field activity
- Sample type and sampling method
- Location of sample
- Sample identification number
- Sample description (such as color, odor, clarity)
- Amount of sample
- Field measurements
- Calibration results
- Adverse trends in instrument calibration behavior
- Equipment specifications
- Depth to groundwater
- Decontamination and health and safety procedures

If entries in the field notebooks need to be corrected or changed, corrections will be made by crossing out mistakes with a single line, writing the corrections, and initialing and dating the entry. The use of correction fluid is not permitted.

At the conclusion of each day in the field, the sampling team leader will review each page of the logbook for errors and omissions. He or she will then date and sign each reviewed page.

5.6.3.2 Field Data Record Forms

In addition to the field notebooks, various forms will also be used to document field efforts (Appendix E). These forms will ensure that all required data and observations were recorded in a consistent manner. No blank spaces will be left; all non-applicable items will be marked “N/A.” Forms that will be used include Chain of Custody Forms and Well Sampling Forms.

5.6.3.3 Final Evidence File Documentation

All evidential file documentation will be maintained under an internal project file system. The Project Manager will ensure that all project documentation and QA records are properly stored and retrievable.

5.7 INVESTIGATION-DERIVED WASTE CHARACTERIZATION AND DISPOSAL

Investigation derived waste will be managed in accordance with the Facility-Wide Investigation Derived Waste Management Plan (TPMC, 2006).

Three types of IDW may be generated during the sampling of ground water: monitoring well purge water, decontamination fluids, and disposable sampling equipment and personal protective equipment (PPE).

Used, non-decontaminated sampling equipment/PPE will be placed in polyethylene trash bags which will be placed in removable head drums. General refuse and decontaminated sampling equipment/PPE shall be placed in polyethylene trash bags or other suitable containers.

Because low flow sampling will be employed using dedicated sampling pumps, the volumes of purge water and decontamination fluids are anticipated to be small. These liquids will be containerized at the well head in a clean 5-gallon bucket with a watertight lid. Depending upon the volumes generated, water from more than one well may be consolidated in the same bucket, or multiple buckets may be required for the same well. When filled or at the end of the sampling day, filled 5-gallon buckets will be emptied using a funnel into an open head 55-gallon steel drum conforming to United Nations Performance-Oriented Packaging standards and Department of Transportation (DOT) specifications in 49 Code of Federal Regulations (CFR) 178.

The 55-gallon drum(s) will be stored in the FWDA less than 90 day storage area located in Building 5. A label reading “Caution, This Drum/Container May Contain Hazardous Material” or similar will be affixed to each drum/container.

Each drum will be labeled with a unique ten-character identifier: The first two characters are "FW," the second two will be “GW” for ground water, the next four are the Julian date on which filling commenced, and the last two are the consecutive number of the container among all being filled on a given day.

Example Identifier:

FWGW**268**6**01** is:

FW Fort Wingate Depot Activity

GW Ground water purge and decontamination water

268 25 September

6 2006

01 Container 01

The label shall also indicate the contents (e.g., ground water and decontamination fluids), source (e.g., monitor well numbers), and the date on which filling is completed (90-day start date).

Inventory forms will be completed for all IDW containers placed at the less than 90-day holding area. Information on the form shall be verified with respect to container labeling. Copies of inventory forms will be provided to the FWDA BRAC Environmental Coordinator (BEC). An example inventory form is included in Appendix E.

Representative samples will be collected for each container of purge water/decontamination fluids, consisting of a composite of the material, to characterize IDW for disposal as hazardous, special, or non-hazardous waste. Characterization results for these media shall serve to classify associated sampling equipment and PPE for disposal, unless this PPE and equipment was decontaminated prior to disposal, in which case it will be handled as general refuse. Samples will be collected within five days of the date on which the drum is filled, and analytical results will be provided within 10 days of sampling.

The liquid IDW samples will be analyzed for the same parameters as the ground water samples for the wells where they were generated, plus appropriate RCRA parameters (e.g., ignitability, corrosivity, RCRA VOCs, SVOCs, pesticides, and metals).

Upon receipt of waste characterization results, copies will be provided to the FWDA BEC and USACE Technical Manager, and inventory forms at the 90-day holding area will be updated with IDW classifications and applicable USEPA waste codes.

IDW will be classified as hazardous waste if the material exhibits the characteristics of ignitibility, corrosivity, reactivity, or toxicity as listed by the USEPA in 40 CFR 261.20-24 (Subpart C).

IDW will be classified as non-hazardous waste if potential contaminants are not detected or are detected at concentrations less than applicable regulatory limits.

All IDW will be manifested and transported off site within the lesser of 30 days of receipt of characterization results or within 90 days of placement at the temporary holding area. No IDW containers will be stored beyond 90 days at the holding area unless the FWDA BEC grants an extension.

IDW classified as hazardous waste will be disposed of off-site at a RCRA Subtitle C permitted treatment, storage, and disposal (TSD) facility. Prior to transport, containers of shall be labeled according to DOT regulations in 49 CFR 172; additionally those containers with a capacity of 110 gallons or less shall be labeled as follows:

HAZARDOUS WASTE - Federal Law Prohibits Improper Disposal. If found, contact the nearest police or public safety authority or the U.S. Environmental Protection Agency.
Generator's Name and Address ______________________________
Manifest Document Number ______________________________

This labeling shall be displayed in accordance with DOT requirements in 49 CFR 172.304.

Manifests will be prepared according to USEPA requirements in 40 CFR 262.20, and acquisition, copies, and use of the manifest will be in accordance with USEPA requirements in 40 CFR 262.21-23. The FWDA BEC will sign the manifest as the generator. The transporter, who shall be fully licensed and insured to transport hazardous waste, will then sign the manifest and a copy will be provided both the FWDA BEC and USACE Technical Manager. Inventory forms at the less than 90-day storage area shall be annotated with the transport date and manifest number.

Concurrent with the manifest, a Land Disposal Restriction (LDR) shall be prepared in accordance with USEPA requirements in 40 CFR 268.7 and submitted for review and signature by the FWDA BEC. The signed LDR shall accompany each shipment of hazardous waste and serve as notification to the receiving TSD facility of any requirements for treatment prior to land disposal.

Non-hazardous sampling equipment/PPE and general refuse may be disposed of in FWDA trash containers, or transported off-site for disposal as municipal waste if large quantities of material are generated. Liquid IDW classified as non-hazardous waste shall be transported off-site to a facility approved for disposal of such material.

6.0 MONITORING AND SAMPLING PROGRAM

6.1 DATA QUALITY OBJECTIVES

Data quality objectives (DQOs) are quantitative and qualitative statements specified to ensure that data of known and appropriate quality are obtained during environmental investigation activities. To ensure that data generated during field activities are adequate to support decisions regarding the selection of appropriate corrective measures, the objectives and the method by which decisions will be made must be established in the project planning process and thoroughly discussed in the Work Plan. DQOs are selected based on the specific use of the data collected. The DQO statements derived from the output of each step of the DQO process shall:

- clarify the study objective,
- define the most appropriate type of data to collect,
- determine the most appropriate conditions from which to collect data, and
- specify acceptance levels of decision errors that will be used as the basis for establishing the quantity and quality of data needed to support the decision.

As such, DQOs are management tools used to develop a scientific and resource-effective sampling design. DQOs must strike a balance between time, money, and data quality; therefore, initiating the full DQO process for every site and investigation may not always be necessary. The DQO process must be initiated during project planning to produce investigations that result in data having a quantifiable degree of certainty. The end use of data to be collected, quality of data required, and cost to produce data will determine required DQOs.

6.1.1 Data Quality Objective Process

The DQO process consists of seven steps.

Step 1: State the Problem

The purpose of this step is to clearly define the problem that requires new environmental data so the study focus will be clear and unambiguous.

Step 2: Identify the Decision

The purpose of this step is to define the decision that will be resolved using data to address the problem.

Step 3: Identify Inputs to the Decision

The purpose of this step is to identify informational inputs required to resolve the decision and to determine which inputs require environmental measurements.

Step 4: Define Boundaries of the Study

The purpose of this step is to specify spatial and temporal circumstances covered by the decision.

Step 5: Develop a Decision Rule

The purpose of this step is to integrate output from previous steps into a single statement that describes the logical basis for choosing among alternative actions.

Step 6: Specify Limits on Decision Errors

The purpose of this step is to specify the decision maker's acceptance limits on decision errors. The limits are used to establish appropriate performance goals for limiting uncertainty in the data.

Step 7: Optimize the Design

The purpose of this step is to identify the most resource-effective sampling and analysis design for generating data expected to satisfy DQOs.

In most cases, each successive step derives information from the previous ones; thus, each step should be completed in the order shown above. The DQO process is iterative, however, so it may be useful to refine the outputs from previous steps. For more information on the DQO process, refer to *Guidance on Systematic Planning Using the Data Quality Objectives Process* (USEPA, 2006).

6.1.2 Facility-Wide Interim Ground Water Monitoring Data Quality Objectives

The objective of the Facility-Wide Interim Ground Water Monitoring Program is to monitor constituents exceeding cleanup levels in ground water during the period before long-term monitoring can begin.

In using the seven-step DQO process outlined above, the following DQOs for the sampling and analytical program for the Facility-Wide Interim Ground Water Monitoring Program were identified:

- NMED- and USEPA-approved sampling methods will be used to provide definitive-level quantitative analytical data that will meet the applicable or relevant and appropriate requirements specified in the Permit.

- Samples will be analyzed using NMED- and USEPA-approved methods currently approved by NMED.

- Laboratories performing the sample analyses will follow the most recent version of the USACE EM 200-1-3 for Appendix I, "Shell for Analytical Chemistry Requirements" and the most recent version of Department of Defense (DOD) "Quality Systems Manual" (QSM). Laboratories performing sample analyses will hold current National Environmental Laboratory

Accreditation Program (NELAP) accreditation for all appropriate fields of testing. Laboratories will also meet NMED and USEPA standards, as required. Laboratories will submit self-declarations forms (including supporting documentation) as well as information related to NELAP accreditation to the USACE Technical Manager.

- Data reporting and electronic data deliverable (EDD) will be required to be compatible with the EIMS being developed for FWDA; because the EIMS has not been finalized, additional details will be provided in the ground water sampling Statement of Work (SOW).
- Analytical results will be validated in accordance with the most current versions of USEPA Contract Laboratory Program (CLP) National Functional Guidelines for Organic Data Review and USEPA CLP National Functional Guidelines for Inorganic Data Review to ensure the data are of sufficient quality for the intended use.
- Sample results will be compared to cleanup levels specified in the Permit to determine if action levels are exceeded.

In going through this DQO process, the questions of why this investigation is being conducted and what decisions are to be supported have been answered. In addition, conduct of the DQO process ensures that the data collected will have a quantifiable degree of certainty.

6.2 INTERIM GROUND WATER MONITORING ANALYTICAL PROGRAM

6.2.1 OB/OD Unit

Ground water samples collected from wells in and around the OB/OD Unit (Section 4.2) will be analyzed for constituent groups based on the Waste Characteristics section of Permit Attachment 1 (NMED, 2005); the following constituent groups will be analyzed for all wells initially (Table 2):

- Explosives;
- Nitrate/nitrite (non-specific);
- Nitrate;
- Perchlorate;
- TAL metals (total and dissolved);
- White Phosphorus;
- TCL VOCs (see Appendix F for list);
- TCL SVOCs (see Appendix F for list);
- Dioxins and Furans;

- Cyanide;
- PCBs (see Appendix F for list); and
- Pesticides/Herbicides (see Appendix F for list).

Additionally, ground water quality parameters (including dissolved oxygen, pH, specific conductance, turbidity, and temperature) will be collected and recorded as described in Sections 5.2 and 5.3. QA samples will be collected as summarized in Table 4. Analyte target reporting limits are presented in Appendix G.

During preparation of the annual revision of this plan in accordance with Section V.A.4 of the Permit, the constituents detected during previous sampling events will be used to re-evaluate the constituent groups to be analyzed at each well. Sample constituents collected during subsequent sampling events will be proposed for only the list of constituents detected in any well. In other words, if a constituent is detected in one well, that constituent will remain on the list of analytes for all wells, to allow evaluation of constituent migration. Consequently, if a constituent is not detected in any well, it will be proposed to drop the constituent from analyte list for subsequent sampling events.

6.2.2 Northern FWDA

Ground water samples collected from wells in the northern portion of FWDA will be analyzed for constituent groups as summarized in Table 3. Samples from all wells will be analyzed for:

- Explosives;
- Nitrate/nitrite (non-specific);
- Nitrate;
- Perchlorate;
- TAL metals (total and dissolved);
- TCL VOCs (see Appendix F for list);
- TCL SVOCs (see Appendix F for list);
- Dioxins and Furans.

Samples from selected wells (see Table 3) where historical ground water data has detected pesticides (e.g., wells in and around the Administration Area) will be analyzed for pesticides.

Samples from selected wells (MW-18S, MW-18D, MW-20, MW-22S, and MW-22D; see Table 3) installed to monitor releases from SWMU 45 will be analyzed for Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) and Diesel Range Organics (DRO).

Additionally, ground water quality parameters (including dissolved oxygen, pH, specific conductance, turbidity, and temperature) will be collected and recorded as described in Sections 5.2 and 5.3. QA samples will be collected as summarized in Table 5. Analyte target reporting limits are presented in Appendix G.

During preparation of the annual revision of this plan in accordance with Section V.A.4 of the Permit, the constituents detected during previous sampling events will be used to re-evaluate the constituent groups to be analyzed at each well. Sample constituents collected during subsequent sampling events will be proposed for only the list of constituents detected in any well. In other words, if a constituent is detected in one well, that constituent will remain on the list of analytes for all wells, to allow evaluation of constituent migration. Consequently, if a constituent is not detected in any well, it will be proposed to drop the constituent from analyte list for subsequent sampling events.

6.3 DATA VALIDATION

Independent data validation of the results of all chemical analyses performed by the laboratory will be performed. This effort will consist of the following:

- Verification that the amount of data requested matches the amount of data received (i.e., completeness check);
- Verification of the procedures/methods used;
- Verification that documentation/deliverables are complete;
- Verification that hard copy and electronic versions of the data are identical;
- Verification that the data seem reasonable based on analytical methodologies;
- Evaluation and qualification of results based on sample receipt (sample temperature and preservation) and holding time compliance;
- Qualification of results based on method, field and rinse blank results;
- Evaluation and qualification of results based on MS/MSD analyses;
- Evaluation and qualification of results based on surrogate recoveries;
- Evaluation and qualification of results based on internal standard performance;
- Verification that the analytical instrument was calibrated in accordance with required instrument and method criteria;

- Evaluation and qualification of results based on initial and continuing instrument calibration verification check sample analyses, and initial and continuing instrument calibration blank results;
- Evaluation and qualification of results based on LCS analyses;
- Evaluation and qualification of results based on laboratory and field duplicate precision;
- Verification that the instrument was properly tuned before sample analyses; and,
- Verification that the analytical sequence included pertinent information required to track the analyses of all QA/QC and environmental samples.

For new data, the Army has specified Functional Guideline equivalent validation procedures, with 100% validation for blanks, duplicates, and holding times for all sample data generated for FWDA, with a lesser number (typically 10%) receiving full validation.

Standard USEPA data qualifiers shall be used to indicate: (1) blank contamination, (2) sample-analytical anomalies associated with a constituent, (3) analytical results which fall between the MDL and the PQL, (4) data qualified because of an exceedance of method-specific holding times, high cooler temperatures, or other significant QA/QC data deficiencies, and (5) data results which exceed the upper calibration curve limit for that constituent and associated analytical instrument.

A Data Validation Report will be prepared that will discuss the performance of the laboratory with respect to the factors presented above. As much as possible, data will be presented in tabular form. In addition, the Data Validation Report will discuss the following:

- Actual MDLs and/or PQLs, as applicable;
- Adequacy of the detection limit for the intended purpose;
- The possible influence(s) of matrix interferences, dilution factors, unusual shipping conditions, and any variance from the reference analytical methods;
- Usability of the data with respect to the project objectives; and
- Attainment of DQO process–derived decision statements with respect to chemical data quality.

An electronic data deliverable will be provided in an Excel format compatible with USACE Fort Worth District and FWDA EIMS standards.

6.4 ENVIRONMENTAL DATA MANAGEMENT

Following review and approval, the data will be loaded into the EIMS being developed for FWDA. At this time, the EIMS is under development, and additional details regarding availability and access to data are not available. As noted in Section 6.1.2, the ground water sampling SOW will contain the required information to ensure that the data generated during efforts described in this Interim Facility-Wide GWMP are compatible with the FWDA EIMS.

6.5 DATA EVALUATION

As described in Section 6.1.2, ground water data generated during ground water monitoring will be evaluated with respect to cleanup levels described in Permit Attachment 7 (NMED, 2005).

6.6 REPORTING

Analytical results will be submitted in a report prepared in accordance with NMED guidance entitled *General Reporting Requirements for Routine Ground Water Monitoring at RCRA Sites* (NMED, 2003, included in Appendix H). The report will be submitted to NMED not more than 60 days subsequent to the receipt of final laboratory reports.

7.0 SCHEDULE

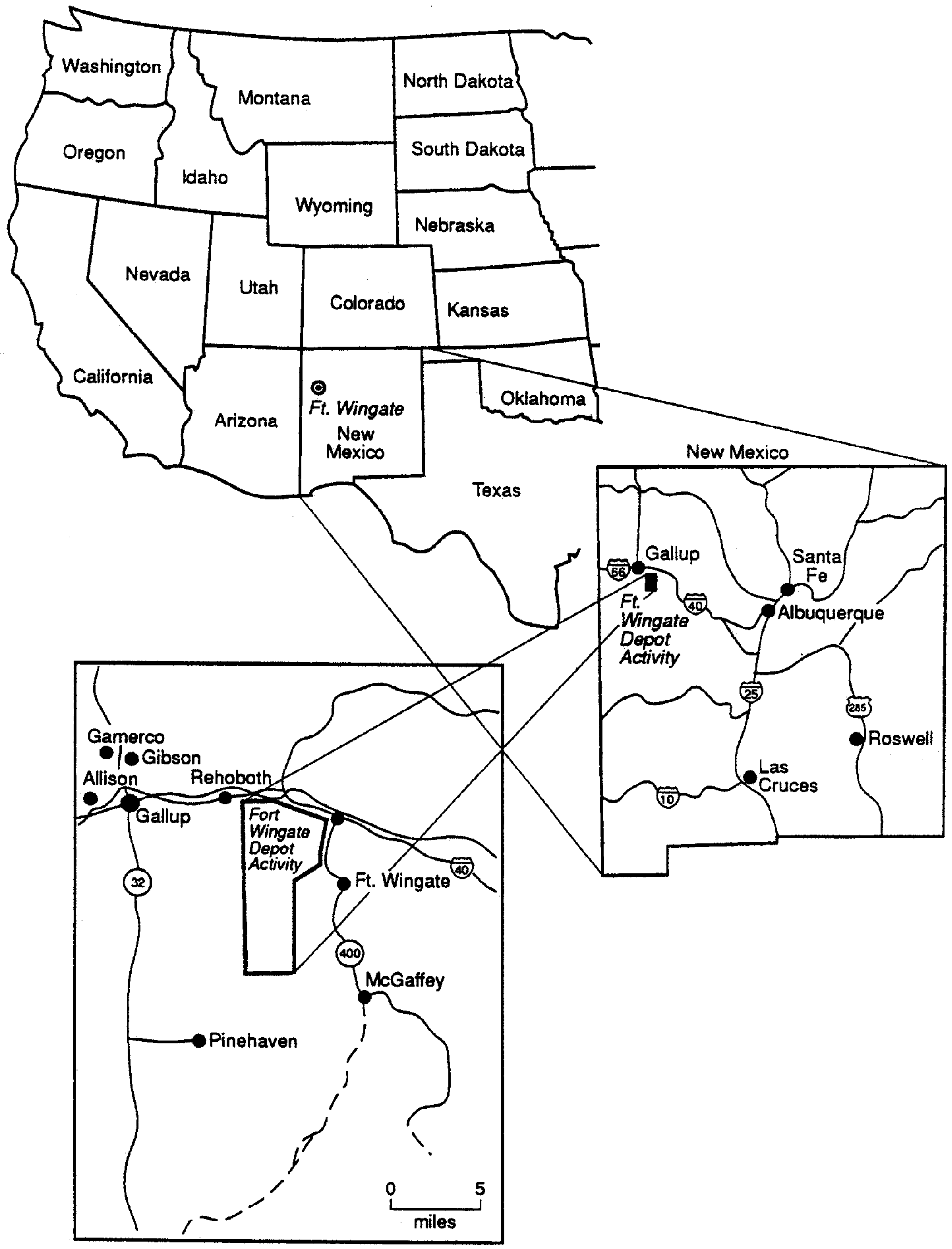
As noted in Section 4.1, ground water elevation data will be collected on a quarterly basis, in January, April, July, and October.

As noted in Section 4.2.1 and Section 4.2.2, ground water samples from in and around the OB/OD Unit and in the northern portion of FWDA will be collected semi-annually, in April and October.

The first sample collection under this Interim Plan will take place in April 2008. The second and final event for 2008 will occur in October 2008.

FIGURES

Figure 1
Installation Location
Fort Wingate Depot Activity
McKinley County, New Mexico

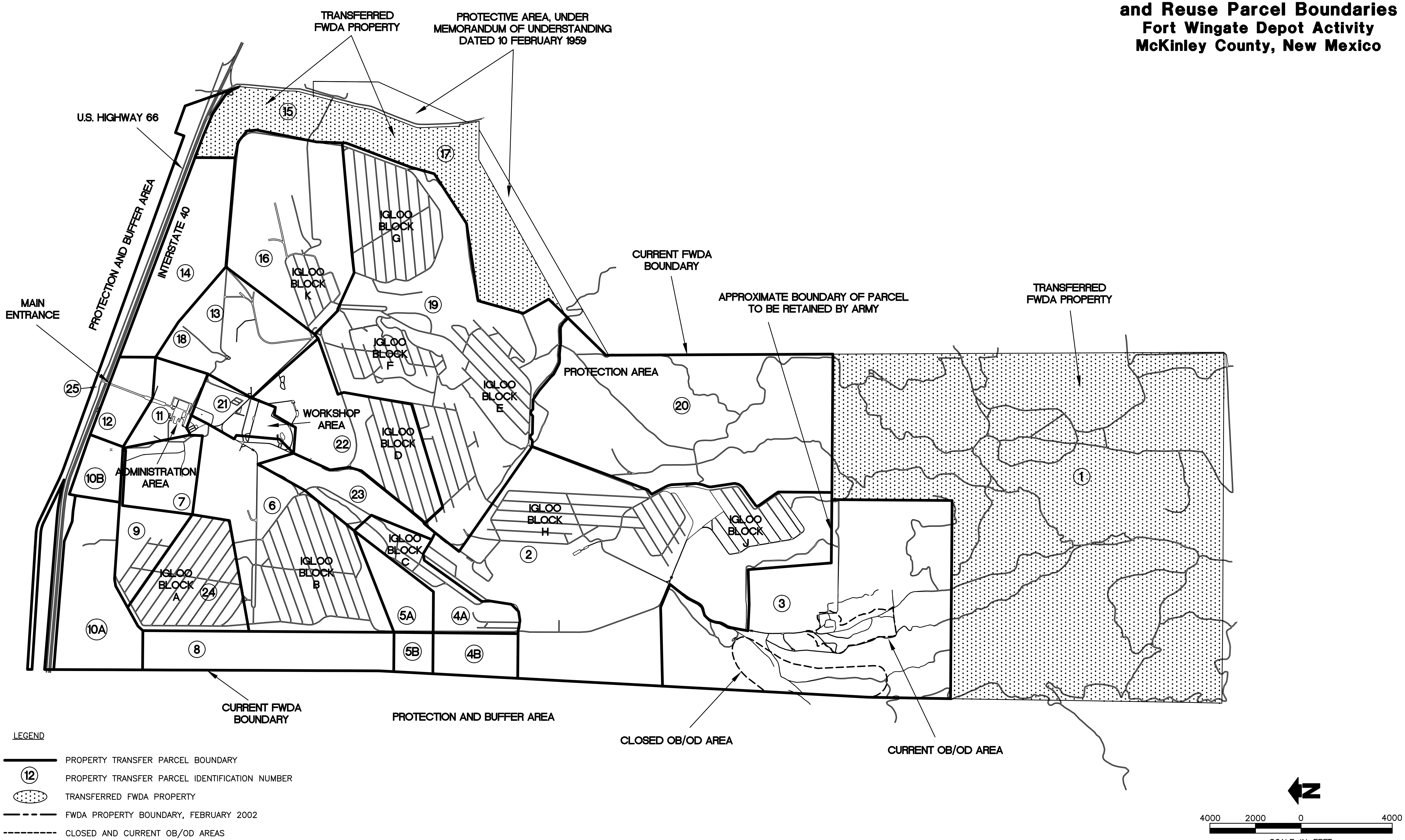


SOURCE: "MASTER ENVIRONMENTAL PLAN: WINGATE DEPOT ACTIVITY, GALLUP, NEW MEXICO," DECEMBER 1990.

N

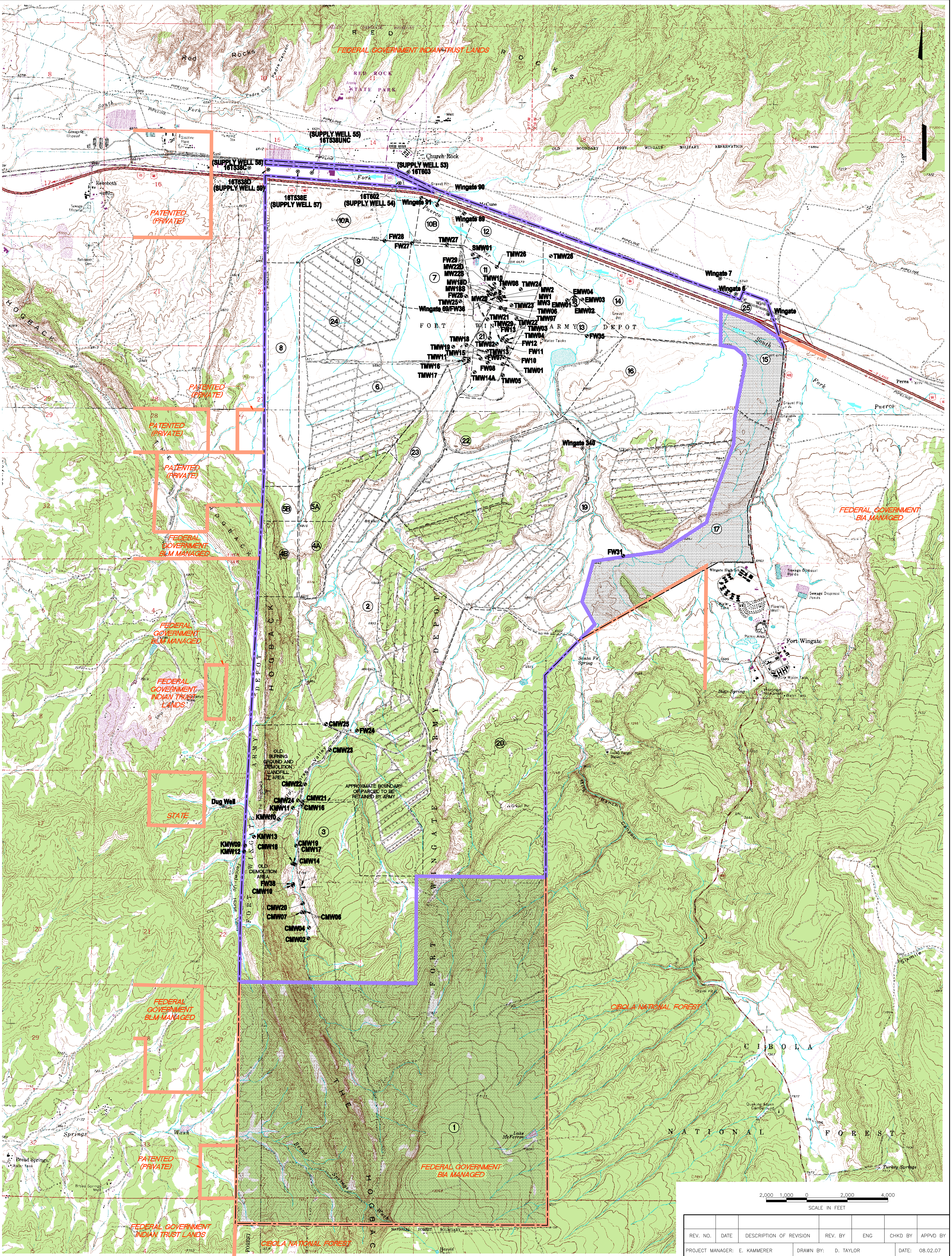
NOT TO SCALE

Figure 2
Historical Land Use and Reuse Parcel Boundaries
Fort Wingate Depot Activity
McKinley County, New Mexico



LEGEND

- PROPERTY TRANSFER PARCEL BOUNDARY
- (12) PROPERTY TRANSFER PARCEL IDENTIFICATION NUMBER
- TRANSFERRED FWDA PROPERTY
- FWDA PROPERTY BOUNDARY, FEBRUARY 2002
- CLOSED AND CURRENT OB/OD AREAS



REV. NO.	DATE	DESCRIPTION OF REVISION	REV. BY	ENG	CHKD BY	APPVD BY

PROJECT MANAGER: E. KAMMERER | DRAWN BY: D. TAYLOR | DATE: 08.02.07

2,000 1,000 0 2,000 4,000
SCALE IN FEET

TerranearPMC
222 VALLEY CREEK BLVD.
SUITE 210
EXTON, PA 19341-2843
(610) 862-5000 PHONE
(610) 862-5050 FAX

Figure 3
Well Locations - Site Wide

Fort Wingate Depot Activity
McKinley County, New Mexico

PROJECT NO.	FILE NO.	CHKD:	DRAWING NUMBER	REV. NO.
33202		ENG.	60A401	0
		APPVD:	SCALE: 1" = 2,000'	

LEGEND

- MONITORING WELL LOCATION
- SUPPLY WELL LOCATION
- DIRECTION OF FLOW FOR THE SOUTH FORK OF THE SOUTH PUERCO RIVER
- PROPERTY TRANSFER PARCEL BOUNDARY
- PROPERTY TRANSFER PARCEL IDENTIFICATION NUMBER
- TRANSFERRED FWDA PROPERTY
- FWDA PROPERTY BOUNDARY, FEBRUARY 2002
- ADJOINING PROPERTY BOUNDARY

NOTES: 1. ADJACENT PROPERTY INFORMATION PROVIDED BY DWIGHT HEMPEL, DEPARTMENT OF INTERIOR, TEAM LEAD, FORT WINGATE TRANSFER, MAY 2003.
2. CONTOUR INTERVAL EQUALS 20 FEET.

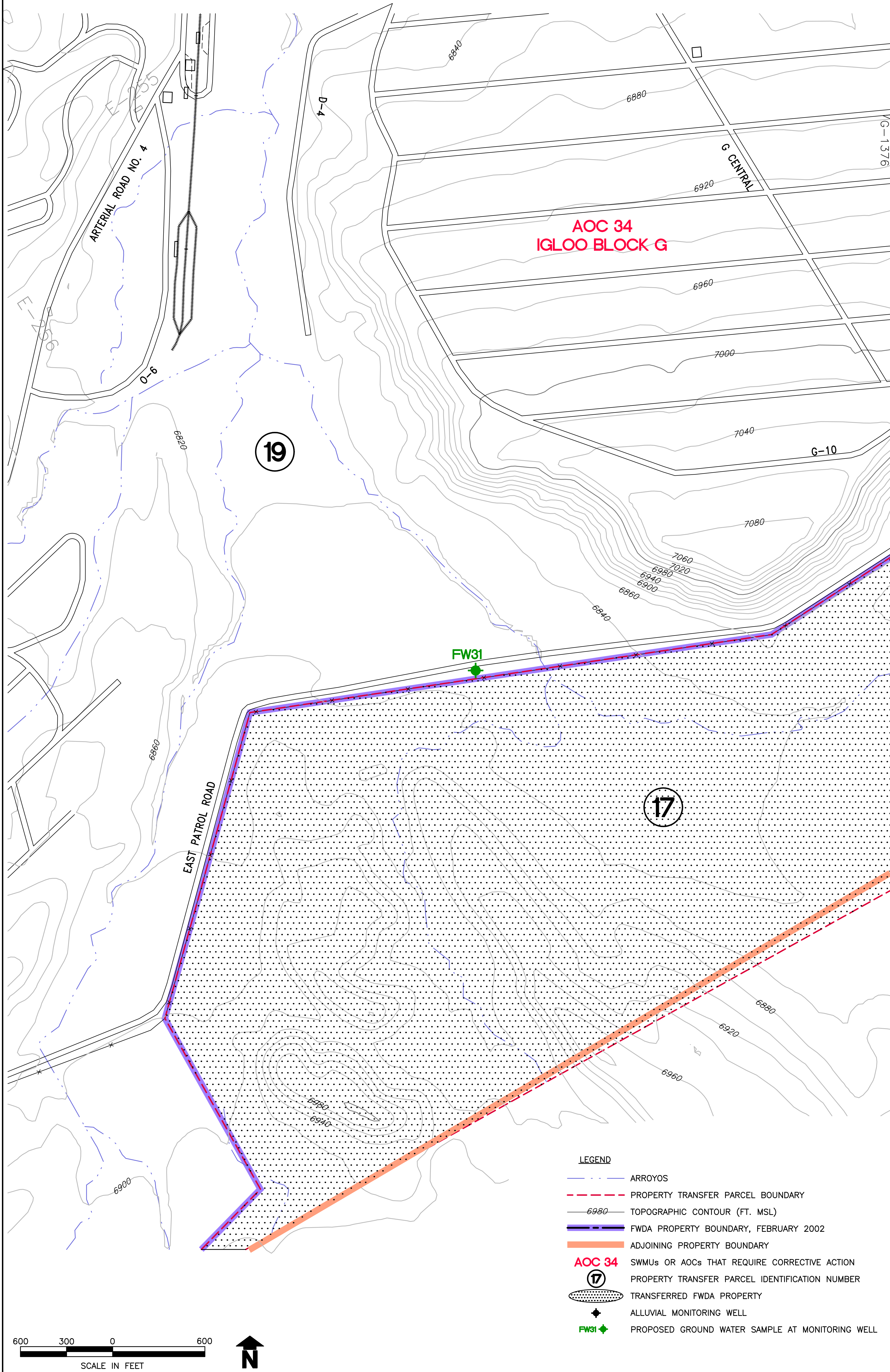
SOURCE: USGS 7.5 MINUTE SERIES (TOPOGRAPHIC) QUADRANGLES FOR MCKINLEY COUNTY, NEW MEXICO INCLUDING: GALLUP EAST, BREAD SPRINGS, CHURCH ROCK, FORT WINGATE, PINEHAVEN, AND UPPER NUTRIA

TerranearPMC, LLC
222 VALLEY CREEK BLVD., SUITE 210
EXTON, PA 19341-2843
(610) 862-5000 PHONE
(610) 862-5050 FAX
TerranearPMC
PROJECT MANAGER: E. KAMMERER
DRAWN BY: D. TAYLOR
DATE: 03.21.08
Figure 4
Monitoring Well Locations
OB/OD Areas
Fort Wingate Depot Activity
McKinley County, New Mexico
PROJECT NO. 33202
DRAWING NUMBER 60I402-1C
REV. NO. 0
SCALE: 1" = 400'
KEY MAP
LEGEND
APPROXIMATE BOUNDARY OF GEOPHYSICAL ANOMALY/SURFACE DEBRIS/RESIDUE PILE
INTERPRETED SUBSURFACE RESIDUE/DEBRIS PILE AREA
APPROXIMATE LOCATION OF FORMER OPEN DETONATION CRATER
APPROXIMATE LOCATION OF EXISTING OPEN DETONATION CRATER
APPROXIMATE BOUNDARY OF BURNING GROUND AREA
APPROXIMATE BOUNDARY OF OB/OD UNIT
6-FOOT CHAIN LINK SECURITY FENCE WITH 3-STRANDBARBED WIRE TOP
5-STRAND BARBED WIRE FENCE
100-YEAR FLOODPLAIN
ARROYOS
PROPERTY TRANSFER PARCEL BOUNDARIES
FWDA PROPERTY BOUNDARY, FEBRUARY 2002
ADJOINING PROPERTY BOUNDARY
SWMU 14 SWMUs OR AOCs THAT REQUIRE CORRECTIVE ACTION
PROPERTY TRANSFER PARCEL IDENTIFICATION NUMBER
SWMU/AOC LOCATION
PROPOSED GROUND WATER SAMPLE LOCATION
ALLUVIAL MONITORING WELL
MANCOS SHALE FORMATION MONITORING WELL
DAKOTA SANDSTONE FORMATION MONITORING WELL
ENTRADA SANDSTONE FORMATION MONITORING WELL
PAINTED DESERT MEMBER MONITORING WELL
SONSELA SANDSTONE MEMBER MONITORING WELL
FEDERAL GOVERNMENT BLM MANAGED
FEDERAL GOVERNMENT INDIAN TRUST LANDS
FEDERAL GOVERNMENT BIA MANAGED
AOC 76 FEATURE 19 ON THE 1973 AERIAL PHOTO API-5
AOC 89 FEATURES 30 AND 34 ON THE 1973 AERIAL PHOTO API-5
SWMU 14 OLD BURNING GROUND AND DEMOLITION LANDFILL AREA (INCLUDES KGA-3, KGA-4, KGA-5, KP-2, KP-3, KP-4, ARROYO IN FENCED-UP HORSE VALLEY, AND DUMP PILE)
SWMU 15 OLD DEMOLITION AREA (INCLUDES INACTIVE EOD AREA, KGA-1, KGA-2, OLD OB/OD AND BURIED PHOSPHORUS ROUNDS, AND THREE MOUNDS IN FENCED-UP HORSE VALLEY)
SWMU 33 WASTE PILE KP1
AOC 90 FEATURE 36 ON THE 1973 AERIAL PHOTO API-5
AOC 36 IGLOO BLOCK J (INCLUDES MISSILE LAUNCH PAD USED BY MDA)
AOC 92 FEATURE 31 ON THE 1973 AERIAL PHOTO API-5 AND FEATURE 21 ON THE 1978 AERIAL PHOTO API-7
SWMU 74 AREA 16 OR SITE 16 (PROPOSED BURNING GROUND)
AOC 91 FEATURE 41 ON THE 1973 AERIAL PHOTO API-5 AND FEATURE 27 ON THE 1978 AERIAL PHOTO API-7
CLOSED OB/OD AREA
CURRENT OB/OD AREA
THE HOGBACK
HWMU OB/OD UNIT
BURNING GROUND AREA
OLD DEMOLITION AREA
FENCED-UP HORSE VALLEY
IGLOO BLOCK H
IGLOO BLOCK J
GATE 209
GATE 209A
GATE 209B
BUILDING 601 BREAK ROOM
BUILDING 604 CONTROL SHELTER AND TRUCK BARRICADE
OPEN-SIDED STORAGE SHED
WESTERN SECURITY FENCE WITH WARNING SIGNS OWNED BY ARMY (EXTENDS NORTH TO NORTHERN BOUNDARY OF FWDA)
MAIN INSTALLATION SECURITY FENCE MAINTAINED BY BMDO
APPROXIMATE BOUNDARY OF PARCEL TO BE RETAINED BY ARMY
EASTERN SECURITY FENCE OWNED BY BMDO (EXTENDS EAST TO FWDA BOUNDARY FENCE)
EASTERN SECURITY FENCE WITH WARNING SIGNS OWNED BY ARMY
CURRENT OB/OD AREA SECURITY FENCE OWNED BY ARMY
SOUTHERN SECURITY FENCE OWNED BY ARMY
SOUTHERN BOUNDARY FENCE WITH WARNING SIGNS OWNED BY ARMY
ESTIMATED EXTENT OF BURIED, BURNED SMOKE CANISTERS FOUND IN 1993
CMW25 FW24 CMW23 CMW22 CMW24 CMW21 CMW16 KMW11 KMW10 KMW13 KMW09 KMW12 CMW19 CMW18 CMW17 CMW14 FW38 CMW10 CMW20 CMW07 CMW08 CMW04 CMW02
1 2 3 20
BY PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHS TAKEN SEPTEMBER 28, 1995
SCALE IN FEET
NOTE: THERE ARE NO INJECTION OR WITHDRAWAL WELLS WITHIN 1,000 FEET OF THE PARCEL TO BE RETAINED BY THE ARMY.

Figure 5
Monitoring Well Locations
Northern FWDA

Fort Wingate Depot Activity
McKinley County, New Mexico

Figure 6
Monitoring Well FW31 Location Map
Fort Wingate Depot Activity
McKinley County, New Mexico



TerranearPMC, LLC

33202.60/03.21.08-DST/I201-1C

TABLES

Table 1
Monitoring Well Construction Data
Fort Wingate Depot Activity
McKinley County, New Mexico

WELL ID	FWDA PARCEL	DATE INSTALLED	DRILLING METHOD	NORTHING	EASTING	GROUND ELEVATION (FT AMSL)	TOP OF CASING ELEVATION (FT AMSL)	PVC STICKUP (FEET)	CASING DIAMETER (INCHES)	BOREHOLE DIAMETER (INCHES)	TOTAL DEPTH DRILLED (FT BGS)	TOTAL WELL DEPTH (FT TOC)	SCREEN LENGTH (FEET)	SCREENED INTERVAL (FT BGS)	SCREENED INTERVAL (FT AMSL)			SCREENED FORMATION
OB/OD AREA																		
CMW02	3	8/15/1996	A.R.	1612192.54	2489293.48	7256.61	7258.29	2.30	2.0	8.0	43.00	37.90	10.0	25.0 - 35.0	7230.39	-	7220.39	Silty Clay
CMW04	3	8/15/1996	A.R.	1612725.21	2489318.83	7249.50	7251.21	2.30	2.0	8.0	136.60	137.91	20.0	115.0 - 135.0	7133.30	-	7113.30	Silty Clay
CMW06	3	10/5/1996	H.S.A.	1613477.48	2489087.84	7214.13	7216.05	2.50	2.0	4.0	18.60	21.10	10.0	8.3 - 18.3	7204.95	-	7194.95	Silty Clay/Silty Sand
CMW07	3	8/12/1996	H.S.A./A.R.	1613480.48	2488966.63	7233.61	7235.50	2.30	2.0	8.0	65.80	66.60	20.0	44.0 - 64.0	7188.90	-	7168.90	Clayey Silt/Sandstone
CMW10	3	10/1/1996	H.S.A./A.R.	1614801.00	2488526.03	7177.71	7179.59	2.50	2.0	8.0	70.85	73.10	20.0	50.5 - 70.5	7126.49	-	7106.49	Silty Clay
CMW14	3	9/30/1996	H.S.A./A.R.	1615834.07	2488638.27	7151.56	7153.57	2.50	2.0	9.0	94.55	96.75	10.0	84.2 - 94.2	7066.82	-	7056.82	Silty Clay
CMW16	3	9/6/1996	H.S.A./A.R.	1618788.98	2488995.95	7082.17	7084.23	2.00	2.0	8.0	31.80	32.72	10.0	20 - 30	7061.51	-	7051.51	Siltstone/Sandstone
CMW17	3	8/17/1996	H.S.A./A.R.	1615859.71	2488582.77	7143.72	7145.39	1.60	2.0	8.0	53.00	54.24	20.0	32.0 - 52.0	7111.15	-	7091.15	Silty Clay
CMW18	3	8/21/1996	H.S.A./A.R.	1615884.92	2488504.36	7156.63	7158.58	1.95	2.0	8.0	53.00	54.10	20.0	32.0 - 52.0	7124.48	-	7104.48	Silty Clay/Clayey Silt
CMW19	3	9/28/1996	H.S.A./A.R.	1616765.47	2488680.89	7128.11	7130.19	2.50	2.0	8.0	52.80	51.30	15.0	33.5 - 48.5	7093.89	-	7078.89	Silty Clay
CMW20	3	10/5/1996	H.S.A.	1613921.11	2489020.65	7193.14	7194.98	2.50	2.0	4.0	5.80	8.15	3.0	2.5 - 5.5	7189.83	-	7186.83	Clayey Sand
CMW21	2	8/12/1998	H.S.A./A.R.	1618931.33	2488996.93	7083.66	7085.16	1.50	2.0	5.5	74.50	69.44	10.0	57-67	7025.72	-	7015.72	Sandstone/Siltstone
CMW22	2	8/10/1998	H.S.A./A.R.	1619789.76	2489134.45	7077.48	7078.98	1.50	2.0	5.5	122.00	69.30	20.0	96.5-116.5	7029.68	-	7009.68	Sandstone/Siltstone
CMW23	2	9/4/1998	H.S.A./A.R.	1621476.93	2490358.70	7030.22	7032.42	2.20	2.0	5.5	112.00	106.60	20.0	84-104	6945.82	-	6925.82	Sandstone
CMW24	3	7/31/1998	H.S.A./A.R.	1618994.16	2488774.57	7094.94	7096.67	1.73	2.0	6.3	262.00	262.34	30.0	230-260	6864.33	-	6834.33	Sandstone
CMW25	2	9/15/1998	H.S.A./A.R.	1622766.19	2490167.82	7002.19	7004.52	2.33	2.0	5.0	97.00	98.78	25.0	71-96	6930.74	-	6905.74	Sandstone
KMW09	3	9/28/1996	H.S.A./A.R.	1616770.94	2486174.10	7186.54	7188.38	2.50	2.0	9.0	80.40	72.90	10.0	60 - 70	7125.48	-	7115.48	Silty Clay/Sandy Clay
KMW10	3	9/27/1996	H.S.A./A.R.	1618066.38	2487828.13	7129.65	7131.73	2.50	2.0	8.0	168.45	171.02	10.0	158 - 168	6970.71	-	6960.71	Siltstone/Sandstone
KMW11	3	8/6/1996	H.S.A.	1618633.16	2488523.98	7107.25	7109.04	1.80	2.0	9.0	63.00	57.44	20.0	35 - 55	7071.60	-	7051.60	Silty Clay
KMW12	3	9/2/1998	H.S.A./A.R.	1616474.97	2486128.70	7188.48	7190.23	1.75	2.0	8.8	75.00	75.49	20.0	53-73	7134.74	-	7114.74	Claystone
KMW13	3	8/17/1998	H.S.A./A.R.	1617202.52	2486607.02	7163.82	7165.62	1.80	2.0	8.8	52.50	53.83	20.0	32-52	7131.79	-	7111.79	Clayey/Sandy Shale
FW24	2	11/13/1980	H.S.A.	1622438.23	2491682.83	6991.91	6993.91	2.00	4.0	8.0	25.00	24.35	15.0	8-23	6984.56	-	6969.56	Clay
FW31	19	11/14/1980	H.S.A.	1631055.13	2504816.16	6825.71	6827.71	2.00	4.0	8.0	50.00	52.00	40.0	10-50	6815.71	-	6775.71	Clay
FW38	3	11/19/1993	H.S.A.	1614874.93	2488534.12	7169.43	7172.35	2.92	2.0	3.0	7.50	10.55	ND	ND	ND	-	ND	ND
NORTHERN AREAS																		
TMW01	21	7/31/1996	H.S.A	1640504.39	2498871.88	6710.64	6712.41	1.77	2.0	8.0	60.00	61.23	15.0	44.0 - 59.0	6666.18	-	6651.18	Clay with Sand Layer
TMW02	21	7/31/1996	H.S.A./A.R.	1641503.24	2498583.98	6704.69	6706.15	1.47	2.0	8.0	85.00	84.09	14.0	67.9 - 81.9	6636.06	-	6622.06	Sandstone
TMW03	21	7/25/1996	H.S.A.	1641773.52	2498882.55	6701.20	6702.92	1.72	2.0	8.0	70.10	72.06	20.0	49.8 - 69.8	6650.86	-	6630.86	Silty Clay/Clayey Sand
TMW04	21	7/26/1996	H.S.A.	1641690.26	2499094.96	6699.63	6701.33	1.70	2.0	8.0	70.50	72.25	20.0	50.0 - 70.0	6649.08	-	6629.08	Upper Sand/Lower Clay
TMW05	22	7/23/1998	H.S.A./A.R.	1639949.55	2498884.35	6713.78	6715.30	1.52	2.0	5.5	37.40	37.61	10.0	25-35	6687.69	-	6677.69	Sandstone/Silt
TMW06	11	8/27/1998	H.S.A.	1643285.74	2498783.72	6689.65	6691.09	1.44	2.0	8.8	57.00	57.24	10.0	45-55	6643.85	-	6633.85	Sandy Silt
TMW07	11	7/24/1998	H.S.A./A.R.	1643289.23	2498772.27	6689.60	6691.11	1.51	2.0	5.5	76.00	67.37	10.0	65-75	6633.74	-	6623.74	Sandy Silt
TMW08	11	8/29/1998	H.S.A.	1644255.12	2498929.83	6679.44	6680.84	1.40	2.0	8.8	62.00	62.41	30.0	30-60	6648.43	-	6618.43	Silty Sand/Clay
TMW10	11	8/20/1998	H.S.A.	1644455.60	2498459.70	6678.78	6680.66	1.88	2.0	8.8	65.00	61.80	30.0	28-58	6648.86	-	6618.86	Silty Sand/Clay
TMW11	6	9/9/1998	H.S.A.	1640758.22	2497201.35	6717.17	6718.92	1.76	2.0	8.8	82.00	82.68	25.0	55-80	6661.24	-	6636.24	Silty Gravel/Sand
TMW13	21	8/11/1998	H.S.A.	1641150.46	2498112.14	6706.64	6708.13	1.49	2.0	8.8	72.50	73.78	10.0	60.7-70.7	6644.35	-	6634.35	Sandy Clay/Silt
TMW14A	21	1/25/2001	A.R.	1640105.79	2497489.27	6722.36	6724.54	2.18	2.0	5.6	110.00	112.20	15.0	94.25-109.25	6627.34	-	6612.34	Sandstone
TMW15	21	12/9/2001	A.R.	1640779.66	2497787.27	6711.61	6714.53	2.92	2.0	6.1	82.00	76.65	15.0	56-71	6652.88	-	6637.88	Silty Gravel/Sand
TMW16	6	12/5/2001	A.R.	1640687.67	2496941.05	6712.67	6715.15	2.48	2.0	6.0	142.00	142.20	15.0	123-138	6587.95	-	6572.95	Sandstone
TMW17	6	12/13/2001	A.R.	1640639.83	2497193.43	6718.39	6720.94	2.55	2.0	5.6	152.00	130.45	15.0	112-127	6605.49	-	6590.49	Sandstone
TMW18	6	12/14/2001	A.R.	1641437.85	2497082.86	6711.65	6714.36	2.71	2.0	6.0	220.00	160.70	10.0	150-160	6563.66	-	6553.66	Sandstone
TMW19	6	12/3/2001	A.R.	1641357.27	2496432.95	6698.93	6701.54	2.61	2.0	6.0	187.00	187.97	15.0	169-184	6528.57	-	6513.57	Sandstone
TMW21	21	8/9/2002	H.S.A.	1642714.98	2498127.88	6694.01	6696.07	2.07	2.0	8.0	72.00	61.31	10.0	48-58	6644.76	-	6634.76	Sand/Silt/Clay
TMW22	21	8/8/2002	H.S.A.	1642741.13	2499552.16	6690.52	6692.36	1.84	2.0	8.0	77.00	65.23	10.0	52-62	6637.13	-	6627.13	Sand/Silt/Clay
TMW23	11	8/6/2002	H.S.A.	1643402.32	2499309.51	6686.28	6688.38	2.10	2.0	8.0	72.00	59.57	10.0	46-56	6638.81	-	6628.81	Clay/Sand
TMW24	11	8/3/2003	H.S.A.	1644192.07	2499766.28	6679.08	6680.71	1.64	2.0	8.0	75.00	57.41	10.0	44-54	6633.30	-	6623.30	Silty Sand/Silt/Sand
TMW25	7	8/1/2002	H.S.A.	1643598.10	2496776.41	6671.39	6672.97	1.58	2.0	8.0	74.00	55.25	10.0	42.5-52.5	6627.72	-	6617.72	Silty Sand/Clay
TMW26	11	7/30/2002	H.S.A.	1645294.74	2498581.83	6675.65	6678.21	2.56	2.0	8.0	64.80	58.24	10.0	45-55	6629.97	-	6619.97	Silt/Sand/Clay
TMW27	9	7/26/2002	H.S.A.	1646399.76	2496126.43	6666.58	6668.63	2.05	2.0	8.0	102.20	73.26	10.0	60-70	6605.37	-	6595.37	Sand
TMW28	14	7/24/2002	H.S.A.	1645827.16	2501250.03	6687.89	6690.09	2.20	2.0	8.0	72.50	50.30	10.0	37-47	6649.79	-	6639.79	Silty Sand/Sand/Clay
TMW29	21	8/19/2002	H.S.A.	1641786.09	2498235.59	6701.62	6703.97	2.36	2.0	8.0	69.00	61.65	10.0	49-59	6652.32	-	6642.32	Sand/Sandy Clay
EMW01	18	7/14/2004	H.S.A.	1643653.28	2502047.57	6715.16	6717.61	2.45	2.0	7.8	120.70	120.70	15.0	105-120	6610.16	-	6595.16	Siltstone/Claystone
EMW02	18	7/19/2004	H.S.A./A.R.	1643388.64	2502478.93	6699.14	6701.57	2.43	2.0	6.0	120.00	108.40	15.0	93-108	6606.14	-	6591.14	Silt/Clay
EMW03	18	7/21/2004	H.S.A./A.R.	1643684.94	2502802.90	6697.69	6700.21	2.52	2.0	6.0	100.00	92.90	15.0	78-93	6619.69	-	6604.69	Silt

Table 1
Monitoring Well Construction Data
Fort Wingate Depot Activity
McKinley County, New Mexico

WELL ID	FWDA PARCEL	DATE INSTALLED	DRILLING METHOD	NORTHING	EASTING	GROUND ELEVATION (FT AMSL)	TOP OF CASING ELEVATION (FT AMSL)	PVC STICKUP (FEET)	CASING DIAMETER (INCHES)	BOREHOLE DIAMETER (INCHES)	TOTAL DEPTH DRILLED (FT BGS)	TOTAL WELL DEPTH (FT TOC)	SCREEN LENGTH (FEET)	SCREENED INTERVAL (FT BGS)	SCREENED INTERVAL (FT AMSL)	SCREENED FORMATION
EMW04	18	7/23/2004	H.S.A./A.R.	1643812.62	2502421.78	6704.84	6707.51	2.67	2.0	6.0	120.00	115.00	15.0	100-115	6604.84 - 6589.84	Clay
FW07	21	11/22/1980	H.S.A.	1640839.18	2498075.06	6709.87	6712.51	2.64	4.0	8.0	30.00	28.48	16.0	10-26	6700.03 - 6684.03	Silty Sand/Sand/Clay
FW08	21	11/21/2005	H.S.A./A.R.	1640572.38	2498132.10	6713.32	6715.29	1.97	4.0	8.0	51.00	48.13	40.0	9-49	6707.16 - 6667.16	Silty Sand/Sand/Clay
FW10	21	11/20/1980	H.S.A.	1640849.19	2498936.81	6707.39	6708.93	1.54	4.0	8.0	51.50	50.91	40.0	9 - 49	6698.02 - 6658.02	Silty Sand/Silty Clay
FW11	21	11/20/1980	H.S.A.	1641334.02	2499124.16	6701.24	6703.48	2.24	4.0	8.0	31.50	30.70	20.0	8-28	6692.78 - 6672.78	Silty Sand/Silty Clay
FW12	21	11/22/1980	H.S.A.	1641609.82	2499038.13	6699.98	6702.00	2.02	4.0	8.0	32.00	31.21	20.0	9-29	6690.79 - 6670.79	Silt/Clay
FW13	21	11/22/1980	H.S.A.	1641688.40	2498830.01	6701.24	6702.31	1.07	4.0	8.0	33.00	32.32	20.0	10.5-30.5	6689.99 - 6669.99	Silty Sand/Silty Clay/Clay
FW26	7	11/19/1980	H.S.A.	1643853.34	2497067.39	6672.17	6674.38	2.21	4.0	8.0	32.00	30.38	20.0	11-31	6664.00 - 6644.00	Silt/Sand/Clay
FW27	9	11/17/1980	H.S.A.	1646461.36	2494395.53	6656.17	6657.32	1.15	4.0	8.0	32.00	31.93	20.0	10-30	6645.39 - 6625.39	Silty Sand/Silty Clay/Clay
FW28	9	11/18/1980	H.S.A.	1646582.65	2493051.26	6655.83	6657.39	1.56	4.0	8.0	33.00	34.42	23.0	10-23	6645.97 - 6622.97	Silt/Clay
FW29	11	11/16/1980	H.S.A.	1645804.27	2497681.64	6669.44	6671.50	2.05	4.0	8.0	32.00	31.81	20.0	10-30	6659.69 - 6639.69	Gravel/Clay
FW35	13	11/15/1980	H.S.A.	1641888.56	2503025.66	6709.47	6711.41	1.94	4.0	8.0	30.00	32.15	20.0	10-30	6699.26 - 6679.26	Clay
MW01	11	11/22/1996	H.S.A.	1643726.92	2498748.42	6687.00	6686.65	-0.34	4.0	10.5	55.00	54.66	20.0	33.6-53.6	6651.99 - 6631.99	Sand/Silty Clay
MW02	11	11/25/1996	H.S.A.	1643783.37	2498712.09	6685.60	6685.09	-0.51	2.0	10.5	48.00	49.33	10.0	37-47	6645.76 - 6635.76	Clayey Sand/Clay
MW03	11	11/26/1996	H.S.A.	1643644.43	2498801.92	6688.18	6690.53	2.35	2.0	10.5	53.00	56.11	10.0	43-53	6644.42 - 6634.42	Silty Sand/Clay
MW18D	11	11/1/1994	H.S.A.	1643948.21	2498331.29	6685.26	6686.94	1.68	2.0	ND	ND	59.90	10.0	47-57	6637.04 - 6627.04	ND
MW18S	11	11/1/1994	H.S.A.	1643948.21	2498331.29	6685.26	6687.21	1.95	2.0	ND	ND	39.04	10.0	27-37	6658.17 - 6648.17	ND
MW20	11	11/1/1994	H.S.A.	1643922.32	2498193.54	6686.03	6688.19	2.17	2.0	ND	ND	59.40	10.0	47-57	6638.79 - 6628.79	ND
MW22D	11	11/1/1994	H.S.A.	1644178.44	2498343.27	6683.29	6685.17	1.89	2.0	8.0	ND	58.62	10.0	47-57	6636.55 - 6626.55	ND
MW22S	11	11/1/1994	H.S.A.	1644178.57	2498343.05	6683.29	6685.11	1.83	2.0	8.0	ND	43.54	10.0	31-41	6651.57 - 6641.57	ND
Wingate 89*	10B	1963	ND	1647927.37	2496971.13	6664.00	6664.34	0.34	12.8	ND	ND	102.43	ND	ND	ND - ND	ND
Wingate 90*	10B	1963	ND	1648334.82	2495645.93	6656.61	6657.72	1.11	8.6	ND	102.00	95.31	ND	ND	ND - ND	ND
Wingate 91*	10B	1963	ND	1648707.16	2494862.49	6655.32	6656.18	0.86	12.7	ND	ND	113.12	ND	ND	ND - ND	ND
SMW01	11	7/29/1996	H.S.A.	1645906.92	2497393.00	6668.54	6670.01	1.47	2.0	8.0	50.21	52.15	20.0	29.9 - 49.9	6637.86 - 6617.86	Silty Sand/Sandy Clay

Notes:

FT AMSL = Feet Above Mean Sea Level
FT BGS = Feet Below Ground Surface
FT TOC = Feet Below Top of Casing
ND = No Data Available
* = Wingate 89, 90, and 91 were installed as water supply wells to support construction of Interstate 40; information is included in this table because they have been sampled, but they are not ground water monitoring wells

Drilling Method

A.R. = Air Rotary
H.S.A. = Hollow Stem Auger
W.R. = Wet Rotary

Table 2
Ground Water Sample Matrix
OB/OD Unit
Fort Wingate Depot Activity
McKinley County, New Mexico

Well Identification	**Quarterly Ground Water Elevation Measurement**	**Total Explosives Expanded List (SW-846 Modified 8330)** (1x1-L Amber)	**TCL Volatile Organic Compounds (SW-846 8260)** (3x40-mL Glass, HCL to pH <2)	**TCL Semi-volatile Organic Compounds (SW-846 8270)** (1x1-L Amber)	**Dioxins/Furans (SW-846 8280/8290)** (1x1-L Amber)	**TCL Pesticides (SW-846 8081/8141)** (1x1-L Amber)	**TAL Total Metals (SW-846 6010, 6020, 7470)** (1x1-L Plastic, HNO_3 to pH <2)	**TAL Dissolved Metals (SW-846 6010, 6020, 7470)** (1x1-L Plastic, HNO_3 to pH <2)	**Nitrate/nitrite non-specific (EPA 353.2)** (1x500-mL Plastic, H_2SO_4 to pH<2)	**Total Nitrate (EPA 300.0)** (1x250-mL Plastic)	**White Phosphorus (SW-846 7580)**	**Total Cyanide (EPA 335.2)**	**Herbicides (SW-846 8151)** (1x1-L Amber)	**PCBs (SW-846 8082)** (1x1-L Amber)	**Perchlorate (SW-846 6860/6850)** (1x250-mL Plastic)	**Comments**
CMW02	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	ZIST Low Flow Proposed
CMW04	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	ZIST Low Flow Proposed
CMW06	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
CMW07	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Traditional Low Flow Proposed
CMW10	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	ZIST Low Flow Proposed
CMW14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	ZIST Low Flow Proposed
CMW16	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
CMW17	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	ZIST Low Flow Proposed
CMW18	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Traditional Low Flow Proposed
CMW19	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	ZIST Low Flow Proposed
CMW20	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
CMW21	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Traditional Low Flow Proposed
CMW22	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
CMW23	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	ZIST Low Flow Proposed
CMW24	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	ZIST Low Flow Proposed
CMW25	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	ZIST Low Flow Proposed
KMW09	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	ZIST Low Flow Proposed
KMW10	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
KMW11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Traditional Low Flow Proposed
KMW12	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	ZIST Low Flow Proposed
KMW13	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
FW24	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Typically Dry
FW31	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	ZIST Low Flow Proposed
FW38	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	

X: Denotes analyses to be performed

Table 3
Ground Water Sample Matrix
Northern FWDA
Fort Wingate Depot Activity
McKinley County, New Mexico

Well Identification	**Quarterly Ground Water Elevation Measurement**	**Total Explosives Expanded List (SW-846 Modified 8330)** (1x1-L Amber)	**TCL Volatile Organic Compounds (SW-846 8260)** (3x40-mL Glass, HCL to pH <2)	**TCL Semi-volatile Organic Compounds (SW-846 8270)** (1x1-L Amber)	**Dioxins/Furans (SW-846 8290)** (1x1-L Amber)	**TCL Pesticides (SW-846 8081)** (1x1-L Amber)	**TAL Total Metals (SW-846 6010, 6020, 7470)** (1x1-L Plastic, HNO3 to pH <2)	**TAL Dissolved Metals (SW-846 6010, 6020, 7470)** (1x1-L Plastic, HNO3 to pH <2)	**Nitrate/nitrite non-specific (EPA 353.2)** (1x500-mL Plastic, H2SO4 to pH<2)	**Total Nitrate (EPA 300.0)** (1x250-mL Plastic)	**Perchlorate (SW-846 6860/6850)** (1x250-mL Plastic)	**Total Petoleum Hydrocarbons Gasoline Range Organics and Diesel Range Organics (SW-846 8015B)**	Comments
EMW01	X	X	X	X	X	X	X	X	X	X	X		ZIST Low Flow Proposed
EMW02	X	X	X	X	X	X	X	X	X	X	X		ZIST Low Flow Proposed
EMW03	X	X	X	X	X	X	X	X	X	X	X		ZIST Low Flow Proposed
EMW04	X	X	X	X	X	X	X	X	X	X	X		ZIST Low Flow Proposed
TMW01	X	X	X	X	X		X	X	X	X	X		Traditional Low Flow Proposed
TMW02	X	X	X	X	X		X	X	X	X	X		Traditional Low Flow Proposed
TMW03	X	X	X	X	X		X	X	X	X	X		Traditional Low Flow Proposed
TMW04	X	X	X	X	X		X	X	X	X	X		Traditional Low Flow Proposed
TMW05	X	X	X	X	X		X	X	X	X	X		
TMW06	X	X	X	X	X		X	X	X	X	X		Traditional Low Flow Proposed
TMW07	X	X	X	X	X		X	X	X	X	X		ZIST Low Flow Proposed
TMW08	X	X	X	X	X	X	X	X	X	X	X		Traditional Low Flow Proposed
TMW10	X	X	X	X	X	X	X	X	X	X	X		Traditional Low Flow Proposed
TMW11	X	X	X	X	X		X	X	X	X	X		Traditional Low Flow Proposed
TMW13	X	X	X	X	X		X	X	X	X	X		Traditional Low Flow Proposed
TMW14A	X	X	X	X	X		X	X	X	X	X		ZIST Low Flow Proposed
TMW15	X	X	X	X	X		X	X	X	X	X		Traditional Low Flow Proposed
TMW16	X	X	X	X	X		X	X	X	X	X		Traditional Low Flow Proposed
TMW17	X	X	X	X	X		X	X	X	X	X		ZIST Low Flow Proposed
TMW18	X	X	X	X	X		X	X	X	X	X		ZIST Low Flow Proposed
TMW19	X	X	X	X	X		X	X	X	X	X		ZIST Low Flow Proposed
TMW21	X	X	X	X	X		X	X	X	X	X		Traditional Low Flow Proposed
TMW22	X	X	X	X	X		X	X	X	X	X		ZIST Low Flow Proposed
TMW23	X	X	X	X	X	X	X	X	X	X	X		ZIST Low Flow Proposed
TMW24	X	X	X	X	X	X	X	X	X	X	X		ZIST Low Flow Proposed

Table 3
Ground Water Sample Matrix
Northern FWDA
Fort Wingate Depot Activity
McKinley County, New Mexico

Well Identification	Quarterly Ground Water Elevation Measurement	Total Explosives Expanded List (SW-846 Modified 8330) (1x1-L Amber)	TCL Volatile Organic Compounds (SW-846 8260) (3x40-mL Glass, HCL to pH <2)	TCL Semi-volatile Organic Compounds (SW-846 8270) (1x1-L Amber)	Dioxins/Furans (SW-846 8290) (1x1-L Amber)	TCL Pesticides (SW-846 8081) (1x1-L Amber)	TAL Total Metals (SW-846 6010, 6020, 7470) (1x1-L Plastic, HNO3 to pH <2)	TAL Dissolved Metals (SW-846 6010, 6020, 7470) (1x1-L Plastic, HNO3 to pH <2)	Nitrate/nitrite non-specific (EPA 353.2) (1x500-mL Plastic, H2SO4 to pH<2)	Total Nitrate (EPA 300.0) (1x250-mL Plastic)	Perchlorate (SW-846 6860/6850) (1x250-mL Plastic)	Total Petoleum Hydrocarbons Gasoline Range Organics and Diesel Range Organics (SW-846 8015B)	Comments
TMW25	X	X	X	X	X	X	X	X	X	X	X		Traditional Low Flow Proposed
TMW26	X	X	X	X	X	X	X	X	X	X	X		ZIST Low Flow Proposed
TMW27	X	X	X	X	X	X	X	X	X	X	X		Traditional Low Flow Proposed
TMW28	X	X	X	X	X	X	X	X	X	X	X		Traditional Low Flow Proposed
TMW29	X	X	X	X	X		X	X	X	X	X		
SMW01	X	X	X	X	X		X	X	X	X	X		ZIST Low Flow Proposed
MW18S	X	X	X	X	X	X	X	X	X	X	X	X	Typically dry
MW18D	X	X	X	X	X	X	X	X	X	X	X	X	Traditional Low Flow Proposed
MW20	X	X	X	X	X	X	X	X	X	X	X	X	Traditional Low Flow Proposed
MW22S	X	X	X	X	X	X	X	X	X	X	X	X	
MW22D	X	X	X	X	X	X	X	X	X	X	X	X	Traditional Low Flow Proposed
MW1	X	X	X	X	X	X	X	X	X	X	X		Traditional Low Flow Proposed
MW2	X	X	X	X	X	X	X	X	X	X	X		Traditional Low Flow Proposed
MW3	X	X	X	X	X	X	X	X	X	X	X		Traditional Low Flow Proposed
FW07	X	X	X	X	X		X	X	X	X	X		Typically dry
FW08	X	X	X	X	X		X	X	X	X	X		Typically dry
FW10	X	X	X	X	X		X	X	X	X	X		
FW11	X	X	X	X	X		X	X	X	X	X		Typically dry
FW12	X	X	X	X	X		X	X	X	X	X		Typically dry
FW13	X	X	X	X	X		X	X	X	X	X		Typically dry
FW26	X	X	X	X	X		X	X	X	X	X		Typically dry
FW27	X	X	X	X	X		X	X	X	X	X		Typically dry
FW28	X	X	X	X	X		X	X	X	X	X		Typically dry
FW29	X	X	X	X	X		X	X	X	X	X		Typically dry
FW35	X	X	X	X	X		X	X	X	X	X		ZIST Low Flow Proposed

Table 3
Ground Water Sample Matrix
Northern FWDA
Fort Wingate Depot Activity
McKinley County, New Mexico

Well Identification	Quarterly Ground Water Elevation Measurement	Total Explosives Expanded List (SW-846 Modified 8330) (1x1-L Amber)	TCL Volatile Organic Compounds (SW-846 8260) (3x40-mL Glass, HCL to pH <2)	TCL Semi-volatile Organic Compounds (SW-846 8270) (1x1-L Amber)	Dioxins/Furans (SW-846 8290) (1x1-L Amber)	TCL Pesticides (SW-846 8081) (1x1-L Amber)	TAL Total Metals (SW-846 6010, 6020, 7470) (1x1-L Plastic, HNO3 to pH <2)	TAL Dissolved Metals (SW-846 6010, 6020, 7470) (1x1-L Plastic, HNO3 to pH <2)	Nitrate/nitrite non-specific (EPA 353.2) (1x500-mL Plastic, H2SO4 to pH<2)	Total Nitrate (EPA 300.0) (1x250-mL Plastic)	Perchlorate (SW-846 6860/6850) (1x250-mL Plastic)	Total Petoleum Hydrocarbons Gasoline Range Organics and Diesel Range Organics (SW-846 8015B)	Comments
Wingate89	X												Sampling not required by NMED
Wingate90	X												Sampling not required by NMED
Wingate91	X												Sampling not required by NMED

X: Denotes analyses to be performed

Table 4
Environmental and Quality Control Samples Summary Matrix
OB/OD Unit
Fort Wingate Depot Activity
McKinley County, New Mexico

Matrix	Analysis	Analytical Method	Container and Preservation	Analytical Holding Time	Number of Samples	Number of Field Duplicates	Number of Field Triplicate (Split) Samples	Number of MS/MSD Samples	Number of Field Blank Samples
Ground Water Samples - OB/OD Unit	Explosives	Modified 8330B	2-1 liter amber. Cool to 4 degrees C.	7 days to extraction; 40 days from extraction to analysis	24	2	2	2	2
	Total Nitrate	EPA 300.0	1-250 ml plastic. Cool to 4 degrees C.	48 hours to analysis	24	2	2	2	2
	Nitrate/Nitrite Non-specific	EPA 353.2	1 - 500-mL plastic. H2SO4 to pH<2. Cool to 4 degrees C.	28 days to analysis	24	2	2	2	2
	Perchlorate	6850/6860	1-250 ml plastic. Cool to 4 degrees C.	28 days	24	2	2	2	2
	TAL Total Metals	6010/6020/7470	1-1 L plastic. HNO3 to pH<2. Cool to 4 degrees C.	6 months; 28 days for Mercury	24	2	2	2	2
	TAL Dissolved Metals	6010/6020/7470	1-1 L plastic. HNO3 to pH<2. Cool to 4 degrees C.	6 months; 28 days for Mercury	24	2	2	2	2
	Dioxins/Furans	8280/8290	1 - 1L Amber	30 days to extraction; 45 days from extraction to analysis	24	2	2	2	2
	White Phosphorus	7580	1-1 liter amber. Cool to 4 degrees C.	5 days extraction/20 days analysis	24	2	2	2	2
	Cyanide	9012A	1 - 500 ml plastic. NaOH to pH>12. Cool to 4 degrees C.	14 days to analysis	24	2	2	2	2
	Herbicides	8151	2 - 1 L amber glass bottles. Cool to 4 degrees C.	7 days to extraction; 40 days from extraction to analysis	24	2	2	2	2
	Pesticides	8081/8141	1-1 liter amber. Cool to 4 degrees C.	7 days to extraction; 40 days from extraction to analysis	24	2	2	2	2
	TCL PCBs	8082	1-1 liter amber. Cool to 4 degrees C.	7days to extraction/40 days to analysis	24	2	2	2	2
	TCL VOCs	8260C	3- 40 ml. glass vials w/HCL. Cool to 4 degrees C.	14 days to analysis	24	2	2	2	2
	TCL SVOCs	8270C	1-1 liter amber. Cool to 4 degrees C.	7 days extraction/40 days analysis	24	2	2	2	2

Frequency of QC Samples:
Field Duplicates: 1 duplicate for every 10 environmental samples.
Field Triplicates (Split): 1 Triplicate for every 10 environmental samples (sent to different analytical laboratory for analysis).
Field Blanks: 1 field blank for every 20 environmental samples.
Rinse Blanks: 1 rinse blank for every 20 environmental samples (None, if disposable equipment is used).
MS/MSD: 1 MS/MSD set for every 20 environmental samples.
Trip Blanks: 1 trip blank for every cooler containing samples to be submitted for VOC analysis.

Table 5
Environmental and Quality Control Samples Summary Matrix
Northern Area Wells
Fort Wingate Depot Activity
McKinley County, New Mexico

Matrix	Analysis	Analytical Method	Container and Preservation	Analytical Holding Time	Number of Samples	Number of Field Duplicates	Number of Field Triplicate (Split) Samples	Number of MS/MSD Samples	Number of Field Blank Samples
Ground Water Samples - Northern FWDA	Explosives	Modified 8330B	2-1 liter amber. Cool to 4 degrees C.	7 days to extraction; 40 days from extraction to analysis	50	5	5	3	3
	Total Nitrate	EPA 300.0	1-250 ml plastic. Cool to 4 degrees C.	48 hours to analysis	50	5	5	3	3
	Nitrate/Nitrite Non-specific	EPA 353.2	1 - 500-mL plastic. H_2SO_4 to pH<2. Cool to 4 degrees C.	28 days to analysis	50	5	5	3	3
	Perchlorate	6850/6860	1-250 ml plastic. Cool to 4 degrees C.	28 days	50	5	5	3	3
	TAL Total Metals	6010/6020/7470	1-1 L plastic. HNO_3 to pH<2. Cool to 4 degrees C.	6 months; 28 days for Mercury	50	5	5	3	3
	TAL Dissolved Metals	6010/6020/7470	1-1 L plastic. HNO_3 to pH<2. Cool to 4 degrees C.	6 months; 28 days for Mercury	50	5	5	3	3
	Dioxins/Furans	8280/8290	1 - 1L Amber	30 days to extraction; 45 days from extraction to analysis	50	5	5	3	3
	Pesticides	8081/8141	1-1 liter amber. Cool to 4 degrees C.	7 days to extraction; 40 days from extraction to analysis	20	2	2	1	1
	TPH - GRO/DRO	8015B	1-1 liter amber. Cool to 4 degrees C.	7 days extraction/40 days analysis	5	1	1	1	1
	TCL VOCs	8260C	3- 40 ml. glass vials w/HCL. Cool to 4 degrees C.	14 days to analysis	50	5	5	3	3
	TCL SVOCs	8270C	1-1 liter amber. Cool to 4 degrees C.	7 days extraction/40 days analysis	50	5	5	3	3

Frequency of QC Samples:
Field Duplicates: 1 duplicate for every 10 environmental samples.
Field Triplicates (Split): 1 Triplicate for every 10 environmental samples (sent to different analytical laboratory for analysis).
Field Blanks: 1 field blank for every 20 environmental samples.
Rinse Blanks: 1 rinse blank for every 20 environmental samples (None, if disposable equipment is used).
MS/MSD: 1 MS/MSD set for every 20 environmental samples.
Trip Blanks: 1 trip blank for every cooler containing samples to be submitted for VOC analysis.

APPENDIX A
CONSULTATION PROCESS DOCUMENTATION

A.0 CONSULTATION PROCESS RESULTS

The purpose of this section is to document the results of the consultation process for this Interim Facility-Wide GWMP, as required by Permit Section VIII.B.1.b.

A draft of this document was provided in October 2006 to designated representatives of the Navajo Nation and Pueblo of Zuni, for their review and comment. At the same time, copies were also provided to designated DOI, Bureau of Land Management (BLM), and Bureau of Indian Affairs (BIA) representatives, for their review and comment.

An on-site consultation meeting was conducted the week of 13 November 2006. There were no issues identified regarding this Interim Facility-Wide GWMP during the consultation meeting.

Comments were received from representatives of the Navajo Nation, DOI, BLM, and BIA during the review period ending 9 January 2007. Additional comments were received from BIA Navajo Region on 16 January 2007. All review comments were incorporated into a single summary table, and responses to the comments were developed. A copy of the table summarizing comments and responses follows this page.

Interim Facility-Wide Ground Water Monitoring Plan, FWDA Comments
January 17, 2007

Cmt. No.	Page No./Line No.	Comment	Recommendation	Response
Jason John – Navajo Nation Department of Water Resources				
1	2-2/37-41	73 wells are noted but there are only 64 wells listed on Table 1		Table 1 has been revised to add information for all 74 wells installed as ground water monitoring wells.
2	2-3/6-7	Only FW10 is on Table 1. Don't forget to update the table as noted in the footnotes of Table 1.		Table 1 has been updated.
3	2-6/16	The Glorietta Sandstone aquifer should include the San Andreas Limestone. These two formations act together as one aquifer in the FWDA area.		Text revised as requested.
4	2-8/34	Is there any documentation that NTUA denied access for sampling of the off-site wells that NTUA is responsible for? Also, Navajo EPA should be able to get access through NTUA.		Denial of access by the Navajo Tribal Utility Authority (NTUA) for a second sampling effort at the off-site wells was not documented; this statement has been revised to simply note that the wells were not sampled a second time. FWDA will follow the request for access procedures outlined in the companion Interim Measures Work Plan for Off-site Water Supply Well Sampling.
5	4-1/12-21	Clarify that there are no alluvial or Entrada Formation wells.		As noted in Figure 5, no alluvial or Entrada Formation wells are included in the sampling program; text has been revised as requested.
6	4-1/27-31	What is the timing for suitable background wells to be installed?		New background wells will be completed as part of the ground water investigation and corrective action process, described in Section VI of the FWDA Permit. Because the Permit specifies that activities under Section VI will begin following completion of removal activities required under Section III.A, the timing for installation of new background wells is not known at this time.

Cmt. No.	Page No./Line No.	Comment	Recommendation	Response
7	4-3/9-14	Just because a constituent is not detected early in the sampling cycles does not mean that some constituents won't show up in later years due to migration of ground waters. Is there the possibility of sampling for all constituents in either all wells or a select group of wells in addition to the background wells every 5 years or so?		As noted within the document and in Permit Section V.A.4, this plan is subject to annual revision and review (including consultation). Interim monitoring results will be evaluated as described in the plan, and if changes to the program are required to address contaminant migration concerns, those changes can be integrated into the next update of the plan.
8	7-4/9-25	Will there be a form provided for the field technicians so the well data gathered can be consistent from year to year?		Ground water sampling forms are included in Appendix B.
9	Figure 5	Is the fault surface by CMW24, KMW11 and KMW10 dipping to the southeast or northwest? Please indicate on map.		No information regarding fault surface orientation is available, and therefore cannot be added to the map.
		E. Cleveland-Mason - NNAD		
1	59? Fig. 4 / N/A	The figures provided in the plan have several points marked for water sampling in Parcel 21. Based on what data NNAD has obtained from previous studies, there are a few sites in the immediate vicinity	There appears to be 2 archaeological sites in Parcel 21 that will need to be monitored during ground water sampling scheduled for April 2007	Comment noted; however, this plan describes sampling to be performed at existing ground water monitoring wells. Existing wells and access routes are not located within identified archaeological sites. Because cultural resources oversight was provided at the time the wells and access routes were installed, and because ground water sampling activities are non-intrusive and confined to a small area immediately surrounding a given well, cultural resource monitoring will not be required during proposed sampling activities at existing wells.

Interim Facility-Wide Ground Water Monitoring Plan, FWDA Comments
January 17, 2007

Cmt. No.	Page No./Line No.	Comment	Recommendation	Response
2	Fig. 5 / N/A	The figures provided in the plan have several points marked for water sampling in Parcel 3. Based on what data NNAD has obtained from previous studies, there are a few sites in the immediate vicinity	There are 2 archaeological sites in Parcel 3 that will need to be monitored by archaeologist during ground water sampling scheduled for April 2007	Please see Response to Comment 1.
3	52/2 52/3	Because there are multiple levels of review for this plan, a detailed schedule for implementation of the work elements described herein has not been developed.	Under 9.0 Schedule. It appears that the work elements have several levels of detailed scheduling involved. They will probably vary in timelines and types of services required for the plan (monitoring by Navajo archaeologists, etc.). When will this schedule be developed?	Please see Response to Comment 1.
4	N/A	No other comments from NNAD since the bulk of the plan is geared towards investigations that pertain to environmental and ground water, etc.	Navajo Nation Dept. of Water Resources would most likely have pertinent comments to address.	Comment noted.
		Mark Blakeslee – BLM, Santa Fe, NM		
1	p. 4.3, Sec 4-3, Last para. And p. 5-2 & 3, Sec. 5-3, Last para.	This section describes how after the first two quarters of sampling the constituent groups to be sampled for each well will only be those which were detected at that well. This seems like an overly restrictive approach guaranteed to miss movement of any plume if currently relatively clean wells are not sampled for all the constituent groups found at upgradient wells.	It would be more acceptable to say all constituent groups that are found in potentially contaminated area wells will be sampled for all other wells	Text revised as requested in both sections.

Interim Facility-Wide Ground Water Monitoring Plan, FWDA Comments
January 17, 2007

Cmt. No.	Page No./Line No.	Comment	Recommendation	Response
		Dwight Hempel - DOI		
1	General	No comments to add to Mark Blakeslee's comments of 11-20-06.		Comment noted.
		Mike Kipp - AEC		
1	General	Unless data storage and retrieval are discussed in some other QA/QC document, it might be a good idea to include some brief description of document and data repository in Section 7.0. I assume that this will entail data management by SAIC in GIS.		Text revised as directed; a brief description of the FWDA Environmental Information Management System has been added to the text.
2	General	Would recommend including a brief description of data reporting/deliverable requirements in Section 4 or 5.		Text revised as directed; a brief description of the FWDA Environmental Information Management System has been added to the text in Section 3.2.
		Shawn Smith, Civil Engineer, Navajo Division of Natural Resources – Branch of Water Resources & Safety of Dams		
1	2-4 / 12-17	Indicate the average depth of wells since in previous statements average depths were provided		Text has been revised as requested.
2	2-7 / 29-37	What is the location source from the contaminate constituents around Buildings 542 and 600 or is additional sampling needed to determine the contaminate locations?		Previous investigations have not conclusively identified sources of contaminants in this area. These sites will be address under the corrective action program described in Permit Section VII.
3	4-1 / 29-30	BIA has concerns using CMW02 and KMW 12 wells as background wells because the date indicates contamination. We would suggest drilling a new non-contaminated background well and/or comparing non-contaminated wells Off-Site levels.		Comment noted. New background wells will be completed as part of the ground water investigation and corrective action process, described in Section VI of the FWDA Permit.

Cmt. No.	Page No./Line No.	Comment	Recommendation	Response
4	4-2 / 2	Provide a brief statement as to why Well #29 is discussed in the Interim Monitoring Plan rather than the Off-Site Monitoring Plan.		The reference to well #19 has been removed from the Interim Facility-Wide GWMP. Well #19 is included in discussion in the IMWP for Off-Site Water Supply Well Sampling.
5	6-3 / 4	Each well's top of casing should have a v-notch at the top to designed as the reference point where all wells are marked in same location.		Comment noted. Existing monitoring wells addressed under this plan each have a surveyed reference notch as described in the comment. All future wells will meet the same standards.
6	6-11 / 20	"closed" should be changed to "opened".		Comment noted and text revised.
7	General	BIA recommends that the next digital copy be divided into different files. Using one file made it very difficult to switch between the text and the figures, tables, and appendixes. If one file is provided then add bookmarks.		Comment noted. The electronic copy will be broken into individual files for text, tables, figures, and appendices.

"Post, Beverly J SWF " <Beverly.J.Post@swf02.usace.army.mil>

01/17/2007 11:09 AM

To <EKammerer@TerranearPMC.com>

cc

bcc

Subject FW: FWDA Ground Water Interim Plans - Extension for Comments (UNCLASSIFIED)

Classification: **UNCLASSIFIED**

Caveats: NONE

FYI

From: Mark Patterson [mailto:mark.c.patterson@us.army.mil]
Sent: Friday, January 12, 2007 12:35 PM
To: Post, Beverly J SWF; Smith, Steve W SWF
Subject: FW: FWDA Ground Water Interim Plans - Extension for Comments (UNCLASSIFIED)
Importance: High

FYI – No comments from Zuni for the Ground Water Monitoring Plan .

Mark Patterson

BRAC Environmental Coordinator

Fort Wingate Depot Activity

From: Steve Beran [mailto:sberan@ashiwi.org]
Sent: Friday, January 12, 2007 9:07 AM
To: Mark Patterson
Cc: Rita Schoeneman
Subject: RE: FWDA Ground Water Interim Plans - Extension for Comments (UNCLASSIFIED)

Mark,

I asked other Zuni offices to determine if there were any comments for the Ground Water Monitoring Plan . Zuni does not have any comments for the Fort Wingate Ground Water Monitoring Plan .

Stephen Beran
ZEPP

From: Steve Beran
Sent: Thursday, January 11, 2007 9:37 AM
To: 'Mark Patterson'
Cc: Rita Schoeneman
Subject: RE: FWDA Ground Water Interim Plans - Extension for Comments (UNCLASSIFIED)

Mark,

Since Brian left Zuni, I am working the technical review for the Fort Wingate documents. I am currently coordinating the review of the RCRA Facility Investigation Work Plan, Parcel 21 and the Release Assessment Report, Parcel 21 drafts. Zuni will submit comments for these documents NLT February 8, 2007. I have not reviewed the Ground Water Monitoring Plan, however, I will inquire if Brian arranged for any type of review and will get back to you.

Stephen Beran
ZEPP

From: Mark Patterson [mailto:mark.c.patterson@us.army.mil]
Sent: Wednesday, January 10, 2007 3:06 PM
To: Rita Schoeneman; Steve Beran
Cc: 'Smith, Steve W SWF'; Post, Beverly J SWF
Subject: FW: FWDA Ground Water Interim Plans - Extension for Comments (UNCLASSIFIED)

Rita, Steve,

In order to meet our schedule with the state of New Mexico, Army will need to proceed with revising the latest version of the "Interim Facility-Wide Ground Water Monitoring Plan" in order to get it to NMED by our deadline. I don't have any record of receiving the comments (due date 1/9) from Zuni but Steve, you wrote in your email yesterday the tribe would be working on them. To the extent Army can, we will try to address the comments from Zuni if we receive them prior to submittal to the state but NMED is expecting us to submit the documents on time since they agreed to a longer tribal review. Originally tribes were only given 30 days but now NMED has agreed to a 60/90/120 review schedule – 60 days for work plans, 90 days for reports, and 120 days for legal documents.

Please send comments on all documents to me and copy Steve Smith.

Mark Patterson
BRAC Environmental Coordinator
Fort Wingate Depot Activity

From: Post, Beverly J SWF [mailto:Beverly.J.Post@swf02.usace.army.mil]
Sent: Tuesday, January 09, 2007 8:50 AM
To: Sharlene Begay-Platero; Sharlene Begay-Platero; Brian Martell; Dwight_Hempel@blm.gov; tombartmandoi@yahoo.com; ralphgonzalesbia@netscape.net; Mark_Blakeslee@nm.blm.gov; Kipp, Michael A USAEC/Versar; sberan@ashiwi.org; rschoe@ashiwi.org
Cc: Smith, Steve W SWF; Mark Patterson; BGregory@TerranearPMC.com; EKammerer@TerranearPMC.com; Diaz, Tammy, NMENV
Subject: FW: FWDA Ground Water Interim Plans - Extension for Comments (UNCLASSIFIED)

Classification: **UNCLASSIFIED**

Caveats: NONE
To All - Comments for the "Interim Facility-Wide Ground Water Monitoring Plan" and Navajo comments only for the "Interim Measures Work Plan for Off-Site Supply Wells", are due today. If you have not already submitted your comments, please do so by the end of today so that we can revise the plans as needed and submit to the NMED as required. If you will not be supplying comments, I would appreciate that reply to this e-mail.

Thanks for your attention to this matter.

Beverly
817-886-1884

From: Post, Beverly J SWF

Sent: Tuesday, November 21, 2006 8:22 AM
To: 'Sharlene Begay-Platero'; 'Brian Martell'; Dwight_Hempel@blm.gov; 'tombartmandoi@yahoo.com'; ralphgonzalesbia@netscape.net; 'Mark_Blakeslee@nm.blm.gov'; 'Kipp, Michael A USAEC/Versar'
Cc: Smith, Steve W SWF; mark.c.patterson@us.army.mil; 'Diaz, Tammy, NMENV'; 'Cobrain, Dave, NMENV'; 'BGregory@TerranearPMC.com'; 'EKammerer@TerranearPMC.com'
Subject: FW: FWDA Ground Water Interim Plans - Extension for Comments

To All - It was decided in meetings between both tribes, NMED, Mark Patterson and Steve Smith that the comment review period of 30 days does not provide reviewers enough time to review technical documents and a review period of 60 days is more reasonable.

An extension request has been made to the NMED for submittal of the "Interim Facility-Wide Ground Water Monitoring Plan" and the Interim Measures Work Plan for Off-Site Supply Wells". Assuming NMED acceptance of the extension request, these plans are due to the NMED on or before January 26, 2006; therefore, we need your review comments on and preferably before January 9, 2007 so that comments, corrections, etc. can be discussed and incorporated into the plans. The January 9, 2007 due date provides reviewers with more than 60 days because the review period falls within the busy holiday season. If you should have any questions during your review, please don't hesitate to call or e-mail.

Please provide your review comments to both plans by January 9, 2007. If you should have any questions during your review, please don't hesitate to call or e-mail.

Thanks

Beverly Post-Sustala
817-886-1884

From: Post, Beverly J SWF
Sent: Wednesday, October 25, 2006 10:19 AM
To: 'Sharlene Begay-Platero'; 'Brian Martell'; 'Dwight_Hempel@blm.gov'; 'tombartmandoi@yahoo.com'; ralphgonzalesbia@netscape.net; 'Mark_Blakeslee@nm.blm.gov'; 'Kipp, Michael A USAEC/Versar'
Cc: Smith, Steve W SWF; 'Mark Patterson'; 'Diaz, Tammy, NMENV'; 'Cobrain, Dave, NMENV'; ' BGregory@TerranearPMC.com'; 'EKammerer@TerranearPMC.com'
Subject:

To All - TerranearPMC has completed the Interim Ground Water Monitoring Plans for both the Facility-Wide wells and the Off-Post wells. You should be receiving the 2 documents by FedEx today. This document is due to the NMED on November 30. We ask for your best effort in completing your review within 30-days; therefore, the due date to us on Friday, November 24 and hopefully no later than Monday November 27.

As many of you know, Bob Gregory with TPMC will be at FWDA the week of November 13 to conduct a brief presentation of the Parcel 21 RFI Work Plan and a site visit to the SWMUs. He may be available to address any specific questions or concerns for the Ground Water Monitoring Plans to facilitate your review. Please let us know if that would be helpful to you and we will make arrangements.

If you should have any questions or concerns, please reply back or call me, Mark Patterson or Steve Smith.

Thanks

Beverly
817-886-1884

Classification: **UNCLASSIFIED**

Caveats: NONE

Classification: **UNCLASSIFIED**

Caveats: NONE Mark Patterson (mark.c.patterson@us.army.mil).vcf

"Post, Beverly J SWF" <Beverly.J.Post@swf02.usace.army.mil>

01/25/2007 10:40 AM

To <Mark_Blakeslee@nm.blm.gov>

cc <EKammerer@TerranearPMC.com>, <Dwight_Hempel@blm.gov>

bcc

Subject RE: Revised Text for FWDA Interim Facility-Wide GWMP (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Thanks for you quick response !!!!!

-----Original Message-----
From: Mark_Blakeslee@nm.blm.gov [mailto:Mark_Blakeslee@nm.blm.gov]
Sent: Thursday, January 25, 2007 9:25 AM
To: EKammerer@TerranearPMC.com
Cc: Post, Beverly J SWF; Dwight_Hempel@blm.gov
Subject: Re: Revised Text for FWDA Interim Facility-Wide GWMP

Eric
That revision looks good to me and more than addresses my concern.

Mark Blakeslee

EKammerer@TerranearPMC.com

01/25/2007 08:06 AM

To
mark_blakeslee@nm.blm.gov

cc
Dwight_Hempel@blm.gov, "Post, Beverly J SWF" <Beverly.J.Post@swf02.usace.army.mil>

Subject
Revised Text for FWDA Interim Facility-Wide GWMP

Mark -

Below is a possible revision to the text in Sections 4.3 and 5.3 of the Interim Facility-Wide GWMP, regarding changes in parameter lists in sampling events subsequent to the first two rounds. Would this address your concerns?

After the first two consecutive quarters, the constituents detected during those sampling events will be used to revaluate the constituent groups sampled at each well and the samples collected during remaining ground water sampling events will be sampled on a well-by-well basis analyzed for only those constituent groups detected at that well in any well. In other words, if any constituent is detected in one well, samples from all wells will be analyzed for that constituent. Consequently, if a constituent is not detected in any well, it will be dropped from the analyte list for subsequent sampling events. Background wells and the single off-site well will be sampled for all Permit constituent groups, regardless of detections/non-detections.

Eric Kammerer, P.E.
TerranearPMC
(888) 599-PMC1 (7621), ext. 5065

Classification: UNCLASSIFIED
Caveats: NONE

"Post, Beverly J SWF"
<Beverly.J.Post@swf02.usace.army.mil>
01/24/2007 12:54 PM

To "Smith, Steve W SWF" <Steve.W.Smith@swf02.usace.army.mil>, "Mark Patterson" <mark.c.patterson@us.army.mil>
cc <EKammerer@TerranearPMC.com>
bcc
Subject FW: Army Responses to comments for the FWDA Interim Ground WaterPlans (UNCLASSIFIED)

Classification: **UNCLASSIFIED**

Caveats: NONE

From: Navajo Archaeology- Shiprock Branch [mailto:ecmason@frontiernet.net]
Sent: Wednesday, January 24, 2007 11:35 AM
To: Post, Beverly J SWF
Cc: begayrmii@hotmail.com
Subject: Re: Army Responses to comments for the FWDA Interim Ground WaterPlans (UNCLASSIFIED)

Beverly,

If the wells are existing in the areas specified and cultural resource oversight was provided, then Navajo Nation Archaeology Department (NNAD) will agree with plan No other comments at this time.

Elaine

Classification: **UNCLASSIFIED**

Caveats: NONE

"Post, Beverly J SWF"
<Beverly.J.Post@swf02.usac
e.army.mil>

01/24/2007 04:50 PM

To "Jason John" <jasonjohn@navajo.org>

cc "Smith, Steve W SWF" <Steve.W.Smith@swf02.usace.army.mil>, "Mark Patterson" <mark.c.patterson@us.army.mil>,

bcc

Subject RE: Army Responses to FWDA Ground Water Imterim Plans (UNCLASSIFIED)

Classification: **UNCLASSIFIED**

Caveats: NONE

Jason - Thank you for your prompt reply.

From: Jason John [mailto:jasonjohn@navajo.org]
Sent: Wednesday, January 24, 2007 3:33 PM
To: Post, Beverly J SWF
Cc: srbp@navajoadvantage.com
Subject: RE: Army Responses to FWDA Ground Water Imterim Plans (UNCLASSIFIED)

January 24, 2007

WMB-0003-07

Beverly Post
U.S. Army
via email: Beverly.J.Post@swf02.usace.army.mil

Subject: Response to Comments Draft Interim Facility-Wide Ground Water Monitoring Plan

Beverly,

The responses to my comments concerning Draft Interim Facility-Wide Ground Water Monitoring Plan are sufficient. There were two comments I had on the Off-Site Plan that were identical to two of the comments in the Facility-Wide Plan and the responses to those comments were sufficient in the Facility-Wide Plan to satisfy the Off-Site Plan comments.

Jason John, Hydrologist
Water Managment Branch of
Navajo Department of Water Resources

From: Post, Beverly J SWF [mailto:Beverly.J.Post@swf02.usace.army.mil]
Sent: Tue 1/23/2007 1:55 PM
To: Jason John
Cc: Mark Patterson; Smith, Steve W SWF
Subject: Army Responses to FWDA Ground Water Imterim Plans (UNCLASSIFIED)

Classification: **UNCLASSIFIED**
Caveats: NONE

<<17Jan07_TPMCs Responses to Comments Draft Off-Post Wells Plans.doc>> <<17Jan07_TPMCs Responses to Comments Draft Int Plans.doc>>

Jason - as just discussed, I've attached the Army's responses to comments received for the Interim Ground Water Monitoring Plans. Unfortunately, we did not allow time in our schedule for review and concurrence or non-concurrence by the reviewers. The corrected Interim Plans are due to the NMED as required by the RCRA Permit on or before 26 January 2007. We would appreciate it if you could review the responses to the comments and let us know if you agree or disagree with the response. Please respond by e-mail to Mark Patterson, Steve Smith and me. Please give us a call if you wish to discuss.

In the future, we will be sure to include time in the schedule to allow for these important reviews.

Thank you for your consideration to this matter.

Beverly Post
817-886-1884

Classification: **UNCLASSIFIED**
Caveats: NONE

Classification: **UNCLASSIFIED**

Caveats: NONE

APPENDIX B
RESPONSES TO REGULATORY AGENCY COMMENTS

B.0 COMMENT RESPONSES

B.1 NMED HAZARDOUS WASTE BUREAU COMMENTS

The following comments were provided by NMED HWB via a Notice of Disapproval letter dated 17 December 2007.

Comment 1

The Permittee states in Section 2.1 (General Description), page 2-1, paragraph 3 that "[a]s shown in Figure 2, the installation is almost entirely surrounded by federally owned or administered lands, including both national forest and Tribal lands. The installation can be divided into several areas based upon location and historical land use. These major land-use areas include (Figure 2):..." "Protection and Buffer Areas" were not identified and labeled on Figure 2.

The Permittee must revise Figure 2 to label and identify the "Protection and Buffer Areas."

Response

Figure 2 has been revised to include Protection and Buffer Areas.

Comment 2

The Permittee states in Section 4.2 (Ground Water Sampling), page 4-1, paragraphs 1 and 2 that "[t]he Army proposes to install dedicated low flow sampling pumps (QED Environmental Sample Pro pumps or equivalent) in each well to be sampled, and will attempt to perform sampling at all wells using low flow techniques. Detailed low flow sampling procedures are provided in Section 5.2. There are a number of wells in the northern portion of FWDA that have historically been dry; if a minimum of 3 feet of water (a low flow pump is approximately2 feet long) is detected in any of these wells during a groundwater elevation survey event, an attempt to sample the well as described in Section 5.2 will be made during the next scheduled sampling event."

Low flow sampling may not be appropriate for all wells at Fort Wingate. For wells with limited yield (i.e., wells for which low flow sampling cannot be accomplished), water in the borehole must be evacuated and the recharge sampled as soon as practicable using traditional well purging methods, such as a centrifugal pump or bailer. Traditional groundwater sampling procedures and well purging methods must be discussed in the Interim Plan. The January 19, 2007 *Interim Facility-Wide Groundwater Monitoring Plan Draft* included a section on "Traditional Groundwater Sampling Procedures." It is not clear why this section was removed from the Interim Plan.

Response

The text has been revised (Section 5.3) to include discussion of traditional ground water sampling procedures.

<u>Comment 3</u>

The Permittee states in Section 4.2.1 (OB/OD Unit Ground Water Sampling), page 4-1, paragraph 1 that "[s]amples will be collected from 22 existing groundwater monitoring wells as shown in Figure 4 and Table 2."

Table 1 in the "OB/OD Area" section of the Interim Plan contains monitoring well FW24 and FW31, which are not identified in Table 2. The Permittee must revise Table 2 to include sampling of monitoring wells FW24 and FW31. If these wells are usually dry, they must be included in Table 2 and labeled as dry in the groundwater monitoring reports and in the table of the Interim Plan. The Permittee must also revise the sentence in Section 4.2.1 to state that samples will be collected from 24 rather than 22 of the existing ground water monitoring wells.

<u>Response</u>

The text, table, and figures have been revised to include monitoring wells FW24 and FW31.

<u>Comment 4</u>

The Permittee states in Section 4.2.2 (Northern FWDA Ground Water Sampling), page 4-1, paragraph 1 that "[s]amples will be collected from 40 existing groundwater monitoring wells, as shown in Figure 5 and Table 3."

Table 3 (Ground Water Sample Matrix Northern FWDA) contains 53 wells, three of which will not be sampled. Table 3 indicates that ten of the 40 wells are "[t]ypically dry," and that chemical analyses will not be conducted on water samples collected from nine of those ten wells, if water is present.

The Permittee must revise Table 3 to identify the analyses to be performed on samples collected from monitoring wells (FW07, FW08, FW11, FWI2, FW13, FW26, FW27, FW28, and FW29) if sufficient water is present. If these wells are dry during the groundwater sampling events, this must be indicated in the annual groundwater monitoring report. However, if sufficient water is present, the wells must be sampled. The Permittee must revise Section 4.2.2 to state that all wells containing sufficient water will be sampled.

<u>Response</u>

The text (Section 4.2.2) and Table 3 have been revised as requested.

<u>Comment 5</u>

The Permittee states in response to Comment 5 of the July 6, 2007 NOD in Appendix B "[t]he goal of the maps provided in this Interim Plan is to guide field personnel to well locations for the purpose of collecting ground water samples." The Permittee must revise the Figures 3-4 as described below:

a. It is difficult to distinguish individual features on Figure 3. The wells found in Parcels 7, 11, and 21 are clustered together, making it difficult to identify the individual well locations and road systems within the

installation. All well locations must be removed from Figure 3, allowing the reader to view the installation, parcel numbers, road systems and other features.

b. Figures 4 and 5 must be revised to include monitoring wells FW24 and FW31, respectively. An additional Figure may be added to depict the location of well FW31.

<u>Response</u>

a. Comment noted. Figure 3, Well Location Map, is intended to spatially show the well locations at FWDA. Figure 3 is not intended to be a road map or site features map. Figures 4 and 5, and newly included Figure 6, show the well locations in relationship to existing roads and site features.

b. Figure 4 has been revised to show FW24. An additional figure, Figure 6 has been included to show FW31.

<u>Comment 6</u>

The Permittee's response to Comment 6 in the July 6, 2007 NOD states, "[t]he forms provided in Appendix A-1 were simply the most recent field forms for each well proposed for sampling, to be used by field personnel as a reference for what to expect when sampling. Because additional wells have been proposed for sampling to address Comment 12, the most recent forms for the additional wells have been added to Appendix A-1."

The Permittee must clarify if the response to Comment 6 meant to reference Appendix C-1; there is no Appendix A-1 in the revised Interim Plan.

<u>Response</u>

Comment noted. The response to Comment 6, dated July 6, 2007, should have indicated Appendix C-1.

<u>Comment 7</u>

The Permittee's response to Comment 13j of Appendix B states "[t]o address Comment 13j (and as noted in the response to Comment l2e), target compound lists have been added as Appendix H to the Interim Plan." The Permittee's response to Comment 12e of Appendix B states "[t]o address Comment 12e, target compound lists have been added as Appendix G to the Interim Plan."

The Permittee must clarify which appendix should be referenced in the response to Comment 12e and 13j because neither of these appendices include the target compound lists.

<u>Response</u>

Comment noted. The response to Comments 13j and 12e, dated July 6, 2007, should have indicated Appendix F.

APPENDIX C
PREVIOUS INVESTIGATION DATA

C-1
HISTORICAL WELL SAMPLING DATA FORMS

FORT WINGATE DEPOT ACTIVITY
WELL SAMPLING DATA FORM

Well Number: CMW02
Start Date: 082905
Start Time: 1035

Well Casing Diameter (in): 2"
Bore Hole Diameter (in): 8"
Annular Space (AS) Length (ft): 13

Well TD = 37.82
Well DTW = 17.58
Water Column = 20.24

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back)	=	~~0.1632~~ 0.73
Column of water or length of AS (whichever is less)	X	~~20.2~~ 13
Volume of water in AS (gal)	=	9.49
Gallons per foot of casing (from chart on back)	=	0.1632
Column of water	X	20.24
Volume of water in casing (gal)	=	3.30
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	12.79
Number of EV to be purged	X	5
TOTAL VOLUME TO BE PURGED (gal)	=	64.0
ACTUAL VOLUME PURGED (gal)	=	64.0

Method of Purging: QED microPurge Pump

Field Parameters	082905				Reading 083005					
Time	1035	1145	1340	1415*	0930	1020	1315			Final
Volume (gal)	0	15	30	34	34	45	64			Sample
Flow Rate (gpm)	0.25	0.25	0.25	off	0.25	0.25	0.15	Top of pump		N/A
DTW (ft toc)	17.58	30.85	34.44	35.00	18.10	30.70	36.92			
pH	8.14	6.32	6.17	—	8.42	7.09	5.19			
Conductivity (µS/cm)	1594	1538	1539	—	1580	1377	784			
Temperature (C)	14.09	11.50	12.49	—	11.89	11.82	15.57			
Turbidity (NTU)	85	32	8.5	—	75	26	18			
Eh/Redox (mV)	100.4	232.9	301.7	—	96.5	218.1	224.1			
DO (mg/L)	2.74	4.71	7.10	—	7.98	7.35	6.83			

Purging Field Notes:
2.3 refill, 2.0 Discharge, 32 PSI

* Compressor Ran out of fuel.

Sample collected from pump after 64 gallons purged.

Sample Date/Time: 8/30/05 / 1315 Sample ID/TR #: CMW02 / 00920

Sampler's signature/date: Stephen E Dutton / 8/30/05

Reviewer's signature/date: [signature] 7 Sep 05

Collected Explosives, TOC, Extra Volume, Nitrate/Nitrite, Nitrate, Perchlorate, and

WELL SAMPLING DATA FORM KSF

Well Number: CMW04 Date: 1/20/99 Time: 1200 TD = 137.86

Boring Number: CMW04 Well casing diameter: 2" DTW = 25.98

Annular space length: 22 Stickup: 2' Column: 111.91

COLUMN OF WATER IN WELL

Gallons per foot of annular space (A.S.)	= 0.73
Column of water or length of A.S. (whichever is less)	x 22
Volume of annular space	= 16.06
Gallons per foot of casing	= 0.1632
Column of water	x 111.91
Volume of casing	= 18.26
TOTAL VOLUME (A.S. + Casing)	= 34.32
Number of volumes to be evacuated	= 5
Total volume to be evacuated	= 171.5
TOTAL VOLUME PURGED	= 175

Method of purging: 2" Submersible Grunfos

Sample date/time: 1/21/99 1300 SAMP 1305 DUP 1310 MS 1315 MSD 1320 SPLIT Sample Number: CMW04 TR#08051

TR#'s
MS 08092
MSD 08093
Dup 08094
Split 08095

FIELD PARAMETERS	UNITS	#1	#2	#3	#4	#5	#6	
READING		1215	1235	1300	1430	0910	1045	
VOL REMOVED	Gal	0.5	30	46	68	108	173	
pH		8.30	8.36	8.38	8.35	8.40	8.41	
Conductivity	mS/cm	3.87	4.06	3.99	3.99	3.76	3.68	
Temperature	°C	10.6	11.3	11.2	10.5	10.9	11.6	
TURBIDITY	NTU	3	10	11.	1	0	0	
Eh	mV	-131.0	-155.0	-161.2	-111.5	-99.5	-45.6	
DO	mg/L	3.79	1.71	1.53	1.63	2.23	1.86	

Sampler's signature/date: 22JAN99

Reviewer's signature/date: Ken S. Eden 1/21/99

1215 1/20/99 Started Purging @ ~1gpm
~~0 1/20/99 Increased Rate to ~2gpm
~~0 DTW 91'; Rate @ ~1.5gpm
~~00 ~~Pum~~ Generator cut out on us. Working on fixing it.
1410 Resumed pumping.
1445 2nd Generator Broke a connecting rod. We are returning to T-16 Pumped a total of 72 gallons
AM 0815 Setting up to continue purging

1045 PURGING COMPLETE @ 173 gallons, EK ALLOW WELL TO RECOVER BEFORE SAMPLING.

ERM

WELL SAMPLING DATA FORM

Well Number: CMW06 Date: 1/22/99 KSE Time: 1130 KSE TD = 20.96

Boring Number: CMW06 Well casing diameter: 2" DTW = 19.31

Annular space length: 13' Stickup: 2.5 Column: 1.65

COLUMN OF WATER IN WELL

PID = 0.0

Gallons per foot of annular space (A.S.)	= 0.15
Column of water or length of A.S. (whichever is less)	x 1.65
Volume of annular space	= 0.2475
Gallons per foot of casing	= 0.1632
Column of water	x 1.65
Volume of casing	= 0.27
TOTAL VOLUME (A.S. + Casing)	= 0.52
Number of volumes to be evacuated	= 5
Total volume to be evacuated	= 2.59
TOTAL VOLUME PURGED	= 0.52

Last Sampling event 10/20/98 0.5gal. Total Vol. was purged then sampled. Very Poor Recovery

Method of purging: Disposable Bailer

Sample date/time: 1/25/99 KSE 1225 KSE Sample Number: CMW06/08070

FIELD PARAMETERS	UNITS	#1 (1145)	#2 (1015 1-23-99)	#3	#4	#5		
VOL REMOVED		1pt.						
pH		7.01	7.06					
Conductivity		2.48	2.57					
Temperature		10.6	10.0					
TURBIDITY		9	41					
DO		2.77	2.41					
Eh		175.9	48.6					

READING

Sampler's signature/date:

Reviewer's signature/date:

1-22-99 Start-1145
Stop - 1150 @ 3 pints or .38 gals.

1-23-99 - DTW 20.13 PID 0.9 - 18 ozs. & dry.

* Ready for Sampling when recharged!

1225 - 1/25/99 - Started sampling - 1/2 liter & dry!

1/26/99 - 0825 - Completed Total explosives sample. Being shipped! ≈ 1/4 liter retained

1/27/99 - 1640 - ≈ 1/4 ltr. retrieved - Filling Total metals container (Preserved)

1/29 - 1110 - Completed TAL Tot metals!

2/1 - Sampling - 1/2 ltr. obtained to complete filtered metals

2/2 - ≈ 1/2 ltr. obtained.

.38
.14
.52

ERM

WELL SAMPLING DATA FORM (MP)

Well Number: CMW07 Date: 1-21-99 Time: 0910 TD = 66.55

Boring Number: ______ Well casing diameter: 2" DTW = 39.09

Annular space length: 23' Stickup: 2.3 Column: 27.46

COLUMN OF WATER IN WELL

Gallons per foot of annular space (A.S.)	= .73
Column of water or length of A.S. (whichever is less)	x 23
Volume of annular space	= 16.79
Gallons per foot of casing	= .1632
Column of water	x 27.46
Volume of casing	= 4.48
TOTAL VOLUME (A.S. + Casing)	= 21.27
Number of volumes to be evacuated	= 5
Total volume to be evacuated	= 106.35
TOTAL VOLUME PURGED	= 110 gals

Method of purging: 2" Submersible Grandfos

Sample date/time: 1-21-99 / 1410 Sample Number: CMW07 / 08052

FIELD PARAMETERS	UNITS	094 READING #1	1010 #2	1035 #3	1105 #4	1145 #5		
VOL REMOVED		22	44	66	88	110		
pH		7.41	7.69	7.62	7.67	7.66		
Conductivity		1.71	1.73	1.73	1.73	1.73		
Temperature		10.5	11.6	12.5	12.5	12.1		
TURBIDITY		15	19	10	2	2		
DO		2.87	2.89	1.47	1.74	1.78		
Eh mV		158.0	90.0	103.6	108.0	113.8		

Sampler's signature/date: ______

Reviewer's signature/date: ______

0925 - started purging

- Purging ≈ 1 gpm.

1145 - Purging Complete @ 110 gallons

41' - DTW TOC @ Time of Sampling.

ERM

22 JAN 99

WELL SAMPLING DATA FORM

Well Number: CMW10 Date: 1/22/99 Time: 1215 TD = 73.07

Boring Number: CMW10 Well casing diameter: 2 DTW = 65.05

Annular space length: 23 Stickup: 2.5 Column: 8.02

COLUMN OF WATER IN WELL

PID 0.4

Gallons per foot of annular space (A.S.)	= 0.73
Column of water or length of A.S. (whichever is less)	x 8.02
Volume of annular space	= 5.85
Gallons per foot of casing	= 0.1632
Column of water	x 8.02
Volume of casing	= 1.31
TOTAL VOLUME (A.S. + Casing)	= 7.16
Number of volumes to be evacuated	= 5
Total volume to be evacuated	= 35.8
TOTAL VOLUME PURGED	= 8 gals.

* Very Poor Recovery has not fully rechar since 10/20/98

Total Volume Purged on 10/20/98 27 gal.

Purged Dry 2x on 10/19/98

Method of purging: Disposable Bailer

1/23/99 - 0930 - Sampled for TAL Metals (Both) & Total Explosives! - ALL bottles triple ~~rinsed~~.

Sample date/time: 1/23-1/28 @ 0855 Sample Number: CMW10 / 08053

1-23-99

FIELD PARAMETERS	UNITS	1-22 #1	1-22 #2	READING #3	#4	#5		
VOL REMOVED		1/2 gal.	6 gals	8 gals				
pH		11.31	12.23	12.42				
Conductivity		5.03	7.38	9.5				
Temperature		11.0	11.2	10.5				
TURBIDITY		2.15	57	3				
DO		5.68	7.20	5.85				

Sampler's signature/date: ______________________

Reviewer's signature/date: ______________________

Eh 75.7 89.0 60.6

1/22/99 Start - 1220 Stop - 1250 dry @ 7.5 gals! Water Quality - Cloudy

- ady to Sample when well recovers!

1/23/99 - 0850 - DTW - 70.95 - Start Sampling

1/25/99 - 0845 - DTW - 72.02 - PID - .2 - Sampling - obtained 1Ltr for filtered material! Well dry!

1/26/99 - 0850 - 1/2 liter obtained.

1/27/99 - 1050 - 1/2 " " Filled T. Alk, T. Chloride, Sulfate, Nitrate!

Sampling Completed!!

ERM

WELL SAMPLING DATA FORM

Well Number: CMW 14 Date: 1-22-99 Time: 1300

Boring Number: ______ Well casing diameter: 2"

Annular space length: 13' Stickup: 2.5'

Borehole Diameter - 9"

TD = 96.80

DTW = 29.88

Column: 66.92

COLUMN OF WATER IN WELL

Gallons per foot of annular space (A.S.)	= 1.17
Column of water or length of A.S. (whichever is less)	x 13
Volume of annular space	= 15.21
Gallons per foot of casing	= .1632
Column of water	x 66.92
Volume of casing	= 10.92
TOTAL VOLUME (A.S. + Casing)	= 26.13
Number of volumes to be evacuated	= 5
Total volume to be evacuated	= 130.65
TOTAL VOLUME PURGED	= 29.0

Method of purging: 2" Submersible Grandfos Pump / Disposible Bailer

Sample date/time: 1-25-99/0930 Sample Number: CMW14/08054

1-23 @ 1055

1-23

FIELD PARAMETERS	UNITS	READING #1	#2	#3	#4	1-25 #5		
VOL REMOVED		5 gal	21 gal	22.5 gal	28 gals	29.0 gals		
pH		12.48	12.11	12.24	12.67	12.38		
Conductivity		9.9	12.3	7.74	12.9	10.7		
Temperature		11.2	12.6	11.5	10.9	11.3		
TURBIDITY		10	10	40	16	7		
DO →		8.03	6.73	5.23	4.72	6.97		

Sampler's signature/date: ______

Reviewer's signature/date: ______

Eh → 54.7 35.9 -170.0 ND 6.19

WHAT'S UP W/ ORP?

1/22/99 - Start - 1315 Stop - 1335 - Dry with 22 gals. purged.

1/23 - Start Bailing 1055 Stop 1125 - 1 gals. purged. Used bailer this time!

DTW - 88.75' HNu - 0.6

Ready to Sample when recharged!

0900 - 1-25-99 - DTW - 89.52 PID 0.0 - Sampling

0930 Samples Obtained on 1-25-99!

ERM

FORT WINGATE DEPOT ACTIVITY
LOW FLOW WELL SAMPLING DATA FORM

Well Number: CMW16
Start Date: 090105
Start Time: 0800

Well Casing Diameter (in): 2.0"
Bore Hole Diameter (in): 8.0"
Annular Space (AS) Length (ft): 13.0
Screened Interval (ft bgs): 22.74 - 32.74

Well TD: 32.59
Well DTW: 21.12
Water Column: 11.47
Pump Intake (ft ~~bgs~~ TOC): 30.0 ftTOC

WELL VOLUME CALCULATION

Gallons per foot of annular space (from chart on back)	=	0.73
Column of water or length of AS (whichever is less)	X	11.47
Volume of water in AS (gal)	=	8.37
Gallons per foot of casing (from chart on back)	=	0.1632
Column of water	X	11.47
Volume of water in casing (gal)	=	1.87
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	10.24
ACTUAL VOLUME PURGED (gal)	=	1.57

Method of Purging: Low Flow Pumps

Time	Minutes Elapsed	Flow Rate (mL/min)	Cumulative Volume (L)	DTW (ft toc)	pH	Cond. (µS/cm)	Temp. (C)	Turbidity (NTU)	Redox (mV)	DO (mg/L)
825	0	70	0	21.35	—	—	—	—	—	—
830	5	70	0.35	21.38	7.86	1077	14.59	36	101.3	6.46
835	10	90	0.80	21.38	7.76	1073	13.92	31	82.3	5.81
0840	15	90	1.25	21.38	7.72	1070	13.79	28	81.4	5.16
0845	20	90	1.60	21.38	7.75	1073	13.31	25	85.8	4.86
0850	25	90	2.05	21.38	7.74	1072	13.30	16	85.9	4.78
0855	30	90	2.50	21.38	7.65	1070	13.24	15	84.4	4.37
0900	35	90	2.95	21.38	7.60	1070	13.43	14	88.7	4.46
0905	40	90	3.40	21.38	7.50	1073	13.82	11	84.0	4.36
0910	45	90	3.85	21.38	7.41	1075	13.88	11	95.3	4.23
0915	50	90	4.30	21.38	7.29	1074	13.68	12	109.3	4.32
0920	55	90	4.75	21.39	7.11	1071	13.73	12	152.8	4.30
0925	60	90	5.20	21.39	6.97	1071	13.90	8.8	173.0	4.04
0930	65	90	5.65	21.39	6.98	1072	13.78	9.5	169.9	4.14
0935	70	90	6.10	21.39	7.01	1072	13.78	9.3	183.0	4.07
0940	75									

Purging Field Notes: Pump Settings: Fill 26.0 secs, Discharge 4.0 secs, Pressure 20 psi

Redox may not be working properly

Collected Explosives, Total+Dissolved metals, nitrate/nitrite, nitrate, TOC, perchlorate, and Extra blank.

Sample Date/Time: 09/01/05 / 0940 Sample ID/TR #: CMW16 / 00921

Sampler's signature/date: [illegible] 09/01/05

Reviewer's signature/date: [illegible] 7SEP05

WELL SAMPLING DATA FORM

Well Number: CMW17 Date: 1-27-99 Time: 1352 TD = 54.24

Boring Number: ______ Well casing diameter: 2" DTW = 17.32

Annular space length: 23' Stickup: 1.6' Column: 36.92

/Borehole diameter 8"

COLUMN OF WATER IN WELL

Gallons per foot of annular space (A.S.)	= .73
Column of water or length of A.S. (whichever is less)	x 23
Volume of annular space	= 16.79
Gallons per foot of casing	= .1632
Column of water	x 36.92
Volume of casing	= 6.03
TOTAL VOLUME (A.S. + Casing)	= 22.82
Number of volumes to be evacuated	= 5
Total volume to be evacuated	= 114.10
TOTAL VOLUME PURGED	= 35 gals.

Method of purging: 2" Submersible Grandfos Pump

Sample date/time: 1-28-98 / ~~1000~~ 1130 Sample Number: CMW17 / 08056

FIELD PARAMETERS	UNITS	READING #1	#2	#3	#4	#5		
VOL REMOVED		2 gals	7 gals	15 gals	22 gals			
pH		9.37	9.18	9.15	7.85			
Conductivity		1.09	1.06	1.08	1.12			
Temperature		11.6	11.4	11.5	10.8			
TURBIDITY		56	91	162	29			
DO		5.21	5.04	5.05	4.25			

Sampler's signature/date: ______

Reviewer's signature/date: ______

1-27-99 - 1352 Start purging. 1423 - Stop - Dry @ 19 gals.
28-99 - 0900 Start purging. 0915 Stop. " @ 16 gals.
35
- Ready to Sample
1100 - Back for Sampling - DTW 43.67
1130 CMW17 Sampled.

ERM

FORT WINGATE DEPOT ACTIVITY
LOW FLOW WELL SAMPLING DATA FORM

Well Number: CMW018
Start Date: 083105
Start Time: 0855
Well TD: 53.96
Well DTW: 40.33
Water Column: TOC 13.63
Pump Intake (ft bgs): 50. feet

Well Casing Diameter (in): 2.0"
Bore Hole Diameter (in): 8.0"
Annular Space (AS) Length (ft): 22
Screened Interval (ft bgs): 34-54

WELL VOLUME CALCULATION

Gallons per foot of annular space (from chart on back)	=	0.73
Column of water or length of AS (whichever is less)	X	13.63
Volume of water in AS (gal)	=	9.95
Gallons per foot of casing (from chart on back)	=	0.1632
Column of water	X	13.63
Volume of water in casing (gal)	=	2.22
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	12.17
ACTUAL VOLUME PURGED (gal)	=	1.81

Method of Purging: Low Flow Pumps

Time	Minutes Elapsed	Flow Rate (mL/min)	Cumulative Volume (L)	DTW (ft toc)	pH	Cond. (µS/cm)	Temp. (C)	Turbidity (NTU)	Redox (mV)	DO (mg/L)
0940	0	100	0	40.30	—	—	—	—	—	—
0945	5	100	0.5	40.44	6.40	1690	19.91	—	230.8	7.34
0950	10	100	1.0	40.44	6.16	1615	18.10	450	261.3	6.34
0955	15	100	1.5	40.45	5.54	1565	17.15	150	314.3	5.16
1000	20	100	2.0	40.46	5.35	1557	16.77	80	363.4	4.74
1005	25	100	2.5	40.48	5.18	1548	16.59	60	412.0	5.87
1010	30	100	3.0	40.49	4.92	1545	16.50	40	447.3	6.36
1015	35	100	3.5	40.49	4.87	1543	16.54	35	458.1	6.72
1020	40	100	4.0	40.49	5.08	1543	16.68	28	455.9	6.60
1025	45	100	4.5	40.49	5.49	1532	16.28	28	445.3	6.45
1030	50	100	5.0	40.50	5.69	1531	16.34	24	421.3	6.82
1035	55	100	5.5	40.50	5.88	1531	16.53	24	398.1	6.75
1040	60	100	6.0	40.50	5.99	1529	16.55	22	383.1	6.62
1045	65	100	6.5	40.50	6.01	1529	16.56	20	384.1	6.66
1050	70	100	7.0	40.50	6.03	1530	16.57	20	383.3	6.61
1055	75	100								

Purging Field Notes: Pump Settings: Fill ~~12~~ 12.2 secs, Discharge ~~3~~ 2.8 secs, Pressure 30 psi

Collect Parent, Dup, MS, MSD for Explosives, Total and dissolved metals, Nitrate/Nitrite, Nitrate, TOC, Perchlorate, and Extra Volume

Sample Date/Time: 083105 / 1055 Sample ID/TR #: CMW18 | 00922

Sampler's signature/date: [signature] 8/31/05

Reviewer's signature/date: [signature] 7SEP05

MP

WELL SAMPLING DATA FORM

Well Number: CMW19 Date: 1-21-99/1-22-99 Time: 1215/1000 TD = 51.21 51.21

Boring Number: ______ Well casing diameter: 2" DTW = 20.11/31.41

Annular space length: 18 Stickup: 2.5' Column: 31.10 19.80

COLUMN OF WATER IN WELL

Gallons per foot of annular space (A.S.)	= .73
Column of water or length of A.S. (whichever is less)	x 18
Volume of annular space	= 13.14
Gallons per foot of casing	= .1632
Column of water	x 31.10
Volume of casing	= 5.08
TOTAL VOLUME (A.S. + Casing)	= 18.22
Number of volumes to be evacuated	= 5
Total volume to be evacuated	= 91.10
TOTAL VOLUME PURGED	= 19 gals.

Method of purging: 2" Submersible Grandfos Pump

Sample date/time: 1-25-99/1030 Sample Number: CMW19/08058

FIELD PARAMETERS	UNITS	1230 1-21 #1	1-22 #2	1-23 #3	1-25 #4	#5		
VOL REMOVED		2 gal.	10 gal.	2 gal.	2 gal			
pH		9.14	8.55	8.45	8.40			
Conductivity		1.62	2.20	2.067	2.74			
Temperature		10.5	9.1	12.1	11.0			
TURBIDITY		339	999	999	999			
DO		1.42	8.62	3.98	4.19			

READING

Sampler's signature/date: ______

Reviewer's signature/date: ______

Eh -1.8 179.5 5.53 5.07

HNu - 0.0 ppm

1/21/99 Start - 1225 - Stop 1240 - Dry after 8 gals

1/22/99 - ≈1 gpm 1055 - 1102 - " " 4 gals Very Cloudy

1/23/99 Start - 1400 - Stop ~~1415~~ - " " 5 gals

1-25-99 - Sampling. We will obtain a 19 gals

Duplicate & split from this locations. Went dry a couple times but sample finally taken.

Sampling Complete

ERM

WELL SAMPLING DATA FORM

Well Number: CMW-24 Date: 10/19/98 Time: 1330 TD = 8.16 ft

Boring Number: ______ Well casing diameter: 2.0 in DTW = 7.79 ft

Annular space length: ______ Stickup: ______ Column: .37 ft

COLUMN OF WATER IN WELL

Gallons per foot of annular space (A.S.)	= .73
Column of water or length of A.S. (whichever is less)	x .37 ft
Volume of annular space	= .27 gal
Gallons per foot of casing	= .1632
Column of water	x .06 gal
Volume of casing	= ~~.33 gal~~ or .01 gal
TOTAL VOLUME (A.S. + Casing)	= .28 gal
Number of volumes to be evacuated	= 5
Total volume to be evacuated	= 1.4 gal
TOTAL VOLUME PURGED	= 0 gal

Method of purging: ______

Sample date/time: ______ Sample Number: ______

FIELD PARAMETERS	UNITS	READING #1	#2	#3	#4	#5		
VOL REMOVED	gal	.15						
pH	—	6.89						
Conductivity	mS/cm	1.09						
Temperature	°C	15.0						
TURBIDITY	ntu	999						
Eh	mV	-48.8						

Sampler's signature/date: [signature] 10/29/98

Reviewer's signature/date: Mindy Norstad 10-29-98

DO mg/L —

Note: Never sampled b/c dry.

ERM

FORT WINGATE DEPOT ACTIVITY WELL SAMPLING DATA FORM

Well Number: CMW21
Start Date: 08/28/05
Start Time: 0950

Well Casing Diameter (in): 2"
Bore Hole Diameter (in): 6"
Annular Space (AS) Length (ft): 18

Well TD = 69.27
Well DTW = 25.03
Water Column = 44.24

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back)	=	~~0.73~~ SED 0.39
Column of water or length of AS (whichever is less)	X	18.0
Volume of water in AS (gal)	=	~~13.~~ SED 7.02
Gallons per foot of casing (from chart on back)	=	0.1632
Column of water	X	44.24
Volume of water in casing (gal)	=	7.22
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	~~7.22~~ SED 14.24
Number of EV to be purged	X	5
TOTAL VOLUME TO BE PURGED (gal)	=	71.2
ACTUAL VOLUME PURGED (gal)	=	20.0

Method of Purging : Poly Bailer

Field Parameters	082805				0829 Reading				083005		
Time	0950	1010	1350	1354	0810	0817	1507	1510	0815	Final	0825
Volume (gal)	0	12	12	14	14	16.5	16.5	18.0	18.0	Sample	20.0
Flow Rate (gpm)	—	—	—	—	—	—	—	—	—	N/A	—
DTW (ft toc)	44.24	dry	N/A	dry	N/A	dry	N/A	dry	N/A	dry	
pH	8.76	6.50	7.11	6.31	8.97	8.68	7.23	6.45	9.45	9.27	
Conductivity (µS/cm)	1095	1016	1039	969	1900	1678	1776	922	1736	886	
Temperature (C)	13.16	13.78	13.26	12.70	11.41	11.65	13.75	12.29	12.15	11.95	
Turbidity (NTU)	650	>1000	>1000	>1000	>1000	>1000	>1000	>1000	>1000	>1000	
Eh/Redox (mV)	99.7	297.7	301.1	348.8	59.2	61.1	290.8	350.8	51.2	60.8	
DO (mg/L)	4.17	5.55	4.00	5.90	5.11	6.33	6.41	7.15	7.33	7.14	

Purging Field Notes:
Collect CMW21 for Explosives, Total and dissolved metals, TOC, nitrate/nitrite, nitrate, perchlorate, and Extra Volume after bailing dry 5 times

Sample Date/Time: 083105/0830 Sample ID/TR #: CMW21/00926

Sampler's signature/date: [signature] /083105

Reviewer's signature/date: [signature] 7SEP05

FORT WINGATE DEPOT ACTIVITY
WELL SAMPLING DATA FORM

Well Number: CMW22
Start Date: 08/27/05
Start Time: 1650

Well Casing Diameter (in): 2.0
Bore Hole Diameter (in): 5.5
Annular Space (AS) Length (ft): 23

Well TD = 120.42
Well DTW = 115.46
Water Column = 4.96

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back) = 0.39
Column of water or length of AS (whichever is less) X 4.96
Volume of water in AS (gal) = 1.93

Gallons per foot of casing (from chart on back) = 0.1632
Column of water X 4.96
Volume of water in casing (gal) = 0.81

ONE EQUIVALENT VOLUME [EV] (AS + casing, gal) = 2.75

Number of EV to be purged X 5

TOTAL VOLUME TO BE PURGED (gal) = 13.7

ACTUAL VOLUME PURGED (gal) = 0.4

Method of Purging : Poly Bailer

Field Parameters	08/27/05	082805	~~082905~~	Reading						Final
Time	1650	1020	1400							Sample
Volume (gal)	1.25	1.33 ~~0.3~~	1.65 ~~0.4~~							
Flow Rate (gpm)	—	—	—							N/A
DTW (ft toc)	Bailed Dry	Bailed dry	Bailed Dry							
pH	7.79	6.60	—							
Conductivity (µS/cm)	549	762	—							
Temperature (C)	14.03	13.62	—							
Turbidity (NTU)	21	380	—							
Eh/Redox (mV)	292.4	266.6	—							
DO (mg/L)	3.58	4.83	—							

Purging Field Notes:
Purged 1.25 gallons 08/27/05
Collected 0.4 gallons 8/28/05
082905 collect Explosives and Perchlorate @ 0825
082905 collect Total Metals
083005 collect Dissolved Metals @ 0810

Sample Date/Time: 083105 / 0830 Sample ID/TR #: CMW21 / 00926

Sampler's signature/date: [signature] / 8/31/05 collected Nitrate, Nitrate/Nitrite, TOC, and Extra Volume 083105 0810

Reviewer's signature/date: [signature] 7/8/905

FORT WINGATE DEPOT ACTIVITY
WELL SAMPLING DATA FORM

Well Number: CMW23
Start Date: 08/28/05
Start Time: 1025

Well Casing Diameter (in): 2"
Bore Hole Diameter (in): 5.5
Annular Space (AS) Length (ft): 23

Well TD = 106.36
Well DTW = 96.92
Water Column = 9.44

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back) = 0.39
Column of water or length of AS (whichever is less) X 9.44
Volume of water in AS (gal) = 3.68

Gallons per foot of casing (from chart on back) = 0.1632
Column of water X 9.44
Volume of water in casing (gal) = 1.54

ONE EQUIVALENT VOLUME [EV] (AS + casing, gal) = 5.2

Number of EV to be purged X 5

TOTAL VOLUME TO BE PURGED (gal) = 26.1

ACTUAL VOLUME PURGED (gal) = 5.75

Method of Purging : Poly Bailer

Field Parameters	082805				0830 Reading				083005		
Time	1025	1030	1410	1415	0837	0842	1525	1528	0756	Final	0801
Volume (gal)	0	3.0	3.0	4.0	4.0	5.0	5.0	5.5	5.5	Sample	5.75
Flow Rate (gpm)	—	—	—	—	—	—	—	—	—	N/A	dry
DTW (ft toc)	96.92	Bailed Dry	—	dry	—	dry	—	dry	—	dry	
pH	6.53	6.76	5.34	6.96	5.48	8.91	7.20	—	9.30	—	
Conductivity (µS/cm)	7300	7431	7099	~~3448~~ 6532	9728	4775	8274	—	6349	—	
Temperature (C)	13.47	13.82	1351	13.40	12.23	12.22	14.05	—	12.30	—	
Turbidity (NTU)	200	71000	70	800	27	71000	71000	—	90	—	
Eh/Redox (mV)	183.3	252.8	255.3	315.8	85.1	81.0	328.0	—	69.9	—	
DO (mg/L)	3.58	7.29	5.55	6.13	5.52	8.09	6.83	—	8.19	—	

Purging Field Notes:
Collected explosives, perchlorate, total metals, dissolved metals, and nitrate/nitrite @ 0750 083105
Collected nitrate/nitrite (finished filling bottle), nitrate, TOC, and extra volume 090105 @ 1100
Bailed well dry 5 times prior to sampling

Sample Date/Time: 083105/0750 Sample ID/TR #: CMW23/00928

Sampler's signature/date: Steph E Deete 08/31/05

Reviewer's signature/date: [signature] 7Sep05

WELL SAMPLING DATA FORM

Well Number: CMW24 Date: 1-28-99 Time: 0945 TD = 262.28

Boring Number: ______ Well casing diameter: 2" DTW = 61.90

Annular space length: 33' Stickup: 1.73' Column: 200.38

Borehole diameter 6.25"

COLUMN OF WATER IN WELL

Gallons per foot of annular space (A.S.)	= .73
Column of water or length of A.S. (whichever is less)	x 33
Volume of annular space	= 24.09
Gallons per foot of casing	= .1632
Column of water	x 200.38
Volume of casing	= 32.70
TOTAL VOLUME (A.S. + Casing)	= 56.79
Number of volumes to be evacuated	= 5
Total volume to be evacuated	= 283.95
TOTAL VOLUME PURGED	= 85 gals.

Method of purging: 2" Submersible Grandfos

Sample date/time: 2-1-99/0925 Sample Number: CMW24 / 08062

FIELD PARAMETERS	UNITS	READING #1 (1-30)	#2	#3	#4	#5	2-1 ↓	
VOL REMOVED		8 gals.	11.0 gals	20 gals	57 gals	75 gals.	85 gals	
pH		8.42	8.39	8.20	8.31	8.32	8.35	
Conductivity		2.87	2.88	2.88	2.87	2.90	2.90	
Temperature		12.0	12.0	11.5	14.3	16.1	11.4	
TURBIDITY		157	95	48	93	167	52	
DO		1.60	2.34	1.19	1.32	1.06	2.89	
Eh		182.6 ~~222.6~~	195.7	182.3	199.0	178.0	216.0	

Sampler's signature/date: ______

Reviewer's signature/date: ______

1-28-99-1035 Start purging. Having to thaw pump. - 1050 - Stop with control box error.
1430 Start purging again! 1440 - Stopped - Control Box @ ac1! / 8 gals. purged!
1505 " " " / 1512 " " " " " ! 10 gals.
1530 " " " / 1536 " " " " 7 gals
1-29-99 - 1138 " " " / 1147 " " " " 17 Total
1-30-99 0913 " " " / 1210 Stopped - Pumped dry! 68 gals, today. Total of 85 gals for 1/28-1/30!
Ready for Sampling!! 2-1-99 Sampled - Complete!

ERM

FORT WINGATE DEPOT ACTIVITY
WELL SAMPLING DATA FORM

Well Number: CMW25
Start Date: 082805
Start Time: 1126

Well Casing Diameter (in): 2"
Bore Hole Diameter (in): 5
Annular Space (AS) Length (ft): 28

Well TD = 98.62
Well DTW = 36.55
Water Column = 62.07

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back) = 0.39
Column of water or length of AS (whichever is less) X 28
Volume of water in AS (gal) = 10.92

Gallons per foot of casing (from chart on back) = 0.1632
Column of water X 62.07
Volume of water in casing (gal) = 10.13

ONE EQUIVALENT VOLUME [EV] (AS + casing, gal) = 21.05

Number of EV to be purged X 5

TOTAL VOLUME TO BE PURGED (gal) = 105.25

ACTUAL VOLUME PURGED (gal) = 67.0

Method of Purging : Poly Bailer

Field Parameters	082805				0829 Reading				083005		
Time	1126	1242	1425	1438	0848	0930	1530	1550	0715	Final	0750
Volume (gal)	0	33	33	37	37	51	51	56.5	56.5	Sample	67.0
Flow Rate (gpm)	—	—	—	—	—	—	—	—	—	N/A	
DTW (ft toc)	36.55	bail dry	N/A	bail dry	N/A	bail dry	N/A	dry	N/A	dry	
pH	7.10	4.70	7.18	3.94	8.49	7.46	5.69	—	8.67	8.94	
Conductivity (µS/cm)	1222	663	1281	1157	2153	2049	2153	—	2052	1837	
Temperature (C)	14.46	16.67	14.22	14.46	13.00	13.79	14.40	—	17.81	12.87	
Turbidity (NTU)	>1000	>1000	>1000	>1000	>1000	>1000	>1000	—	>1000	>1000	
Eh/Redox (mV)	201.6	340.8	290.2	451.9	79.9	137.8	415.0	—	129.0	98.0	
DO (mg/L)	3.82	7.05	7.73	7.38	6.50	7.84	7.41	—	7.45	8.34	

Purging Field Notes:
collected explosives, Total and dissolved metals, nitrate, nitrate/nitrite, TOC, perchlorate, and Extra Volume @ 0725 / 083105 after ~~got~~ bailing well dry 5 times.

Sample Date/Time: 083105 / 0725 Sample ID/TR #: CMW25 / 0929

Sampler's signature/date: [signature] 08/31/05

Reviewer's signature/date: [signature] 7 SEP 05

FORT WINGATE DEPOT ACTIVITY
WELL SAMPLING DATA FORM

Well Number: KMW09
Start Date: 082805
Start Time: 0830

Well Casing Diameter (in): 2.0
Bore Hole Diameter (in): 9.0
Annular Space (AS) Length (ft): 13.0

Well TD = 72.74
Well DTW = 42.13
Water Column = 30.61

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back) = 1.17
Column of water or length of AS (whichever is less) X 13
Volume of water in AS (gal) = 15.21

Gallons per foot of casing (from chart on back) = 0.1632
Column of water X 30.61
Volume of water in casing (gal) = 4.99

ONE EQUIVALENT VOLUME [EV] (AS + casing, gal) = 20.20

Number of EV to be purged X 5

TOTAL VOLUME TO BE PURGED (gal) = 101.0

ACTUAL VOLUME PURGED (gal) = 39.0

Method of Purging :

Field Parameters	082805		082805		0829 Reading				083005		
Time	0830	0910	1320	1328	0735	0755	1447	1500	0853	~~Final~~	0908
Volume (gal)	0	16	16	20	20	30	30	33.5	33.5	Sample	39.0
Flow Rate (gpm)	—	—	—	—	—	—	—	—	—	~~N/A~~	
DTW (ft toc)	42.13	dry	N/A	dry	N/A	dry	N/A	dry	N/A	dry	
pH	8.08	7.93	3.53	2.70	7.92	7.45	6.70	5.98	8.62	8.40	
Conductivity (μS/cm)	3843	3867	3959	3929	7102	7019	7125	7213	6344	6545	
Temperature (C)	11.39	11.87	13.07	11.89	16.96	10.78	13.66	12.77	11.90	11.96	
Turbidity (NTU)	340	>1000	700	>1000	>1000	>1000	380	>1000	>1000	>1000	
Eh/Redox (mV)	100.3	121.4	470.9	444.4	102.7	82.7	329.7	429.9	76.3	114.7	
DO (mg/L)	5.11	3.58	5.58	6.31	7.93	7.90	8.00	8.03	9.38	11.79	

Purging Field Notes:
Collected Explosives, Total and Dissolved metals, Nitrate, Nitrate/Nitrite, TOC, Perchlorate, and Extra Volume after bailing well dry 5 times

Sample Date/Time: 083005 / 1135
Sample ID/TR #: KMW09 / 00930

Sampler's signature/date: [signature] / 08/30/05
Reviewer's signature/date: [signature] 7SEP05

WELL SAMPLING DATA FORM KSE

Well Number: KMW10 Date: 1/22/99 Time: 1445 TD = 170.90

Boring Number: KmW10 Well casing diameter: 2" DTW = 166.82

Annular space length: 13 Stickup: 2.5' Column: 4.08

COLUMN OF WATER IN WELL

Gallons per foot of annular space (A.S.)	= .73		
Column of water or length of A.S. (whichever is less)	x ~~13~~	4.08	
Volume of annular space	= ~~9.49~~	2.98	
Gallons per foot of casing	= ~~.1632~~	0.1632	
Column of water	x ~~4.08~~	4.08	
Volume of casing	= ~~.67~~	0.67	
TOTAL VOLUME (A.S. + Casing)	= ~~10.16~~	3.65	
Number of volumes to be evacuated	= ~~5~~	5	
Total volume to be evacuated	= ~~50.80~~	18.25	
TOTAL VOLUME PURGED	= 4		

Purged only 5.75 gal. on 10/24/98

Method of purging: Disposable Bailer

Sample date/time: 1/25/99 0900 Sample Number: KMW10 / 08065

FIELD PARAMETERS	UNITS	READING #1	#2	#3	#4	#5		
		1453	1520	0930	0945			
VOL REMOVED	Gal	0.25	1.50	1.75	3.50			
pH		7.40	7.56	7.60	7.39			
Conductivity	mS/cm	0.89	0.95	1.01	0.92			
Temperature	°C	10.8	11.8	11.3	10.8			
TURBIDITY	NTU	4	73	16	568			

Sampler's signature/date: Ken S. Eden 1/25/99

Reviewer's signature/date:

Eh mV -141.1 -116.2 -64.9 -65.7

Do mg/l 7.03 6.85 6.54 7.10

1530 1/22/99 Purged Dry @ 2 gallons.

1/23/99 0930 Continue w/ Purging.

0950 Purged Dry @ 2.0 gallons for a total of 4 gallons

ERM

WELL SAMPLING DATA FORM

Well Number: KMW11   Date: 1/25/99   Time: 1120   TD = 57.34

Boring Number: KMW11   Well casing diameter: 2"   DTW = 31.71

Annular space length: 23'   Stickup: 1.8'   Column: 25.63

Borehole diameter 9"

COLUMN OF WATER IN WELL

Gallons per foot of annular space (A.S.)	= ~~.43~~ 1.17
Column of water or length of A.S. (whichever is less)	x 23
Volume of annular space	= ~~16.79~~ 26.91
Gallons per foot of casing	= .1632
Column of water	x 25.63
Volume of casing	= 4.18
TOTAL VOLUME (A.S. + Casing)	= ~~20.97~~ 31.09
Number of volumes to be evacuated	= 5
Total volume to be evacuated	= ~~104.85~~ 155.45
TOTAL VOLUME PURGED	= 82

Method of purging: 2" Submersible Grandfos Pump

Sample date/time: 1/27/99 0845   Sample Number: KMW11 / 08066

FIELD PARAMETERS	UNITS	READING #1 (1135)	#2 (1150)	#3 (1208)	#4 (0856)	#5 (0920)	#6 (0944)	
VOL REMOVED		1.0	22.0	30.0	45.0	62.0	76.0	
pH		8.60	8.84	8.88	8.50	8.60	8.70	
Conductivity		0.96	0.98	1.10	1.05	1.06	0.98	
Temperature		10.9	11.2	12.1	9.5	10.3	11.6	
TURBIDITY		231	363	437	136	141	208	

Sampler's signature/date: Ken S. Elen 1/27/99

Reviewer's signature/date:

Eh	mv	-147.1	-117.1	-102.6	-78.8	-102.9	-108.3
DO	mg/L	0.47	1.60	1.85	3.58	4.83	4.05

1/25/99 1135 Started Purging

1220 Purged dry @ 40.0 gallons

1/27/99 0855 Continue w/ Purge

0953 Purged dry @ 42 gallons

Total Purged 82

ERM

FORT WINGATE DEPOT ACTIVITY
WELL SAMPLING DATA FORM

Well Number: KMW12
Start Date: 082805
Start Time: 0740

Well Casing Diameter (in): 2.0
Bore Hole Diameter (in): 8.75
Annular Space (AS) Length (ft): 23.0

Well TD = 75.30
Well DTW = 48.78
Water Column = 26.52

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back)	= 1.17
Column of water or length of AS (whichever is less)	X 23
Volume of water in AS (gal)	= 26.91
Gallons per foot of casing (from chart on back)	= 0.1632
Column of water	X 26.52
Volume of water in casing (gal)	= 4.33
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	= 31.24
Number of EV to be purged	X 5
TOTAL VOLUME TO BE PURGED (gal)	= 156.2
ACTUAL VOLUME PURGED (gal)	= 34.25

Method of Purging: Poly Bailer

Field Parameters	082805		082805		0829 Reading				083005		
Time	0740	0815	1300	1313	0715	0730	1430	1440	0838	~~Final~~	0850
Volume (gal)	0	15	15	21	21	27	27	30	31	~~Sample~~	34.25
Flow Rate (gpm)	—	—	—	—	—	—	—	—	—	~~N/A~~	—
DTW (ft toc)	48.78	dry	N/A	Dry	N/A	dry	N/A	dry	N/A	dry	
pH	7.55	7.44	4.21	2.98	7.66	7.58	6.07	5.28	8.01	~~6.93~~ SE	8.02
Conductivity (µS/cm)	4393	4455	4591	4374	7620	6237	7761	7550	6974	6950	
Temperature (C)	11.38	11.25	17.55	12.27	11.29	11.08	14.96	12.09	12.17	11.81	
Turbidity (NTU)	75	>1000	800	>1000	600	>1000	700	>1000	240	>1000	
Eh/Redox (mV)	103.0	98.3	391.2	515.2	155.3	120.9	315.2	416.1	89.2	87.7	
DO (mg/L)	4.00	6.62	5.24	5.52	5.59	6.03	5.67	6.98	8.12	8.25	

Purging Field Notes:

Collected Explosives, Total + dissolved metals, nitrate/nitrite, TOC, Nitrate, perchlorate, and Extra Volume @ 1105/083005 after bailing well dry 5 times

Sample Date/Time: 083005/1105   Sample ID/TR #: KMW12 / 00931

Sampler's signature/date: [signature] / 8/30/05

Reviewer's signature/date: [signature] 7SEP05

FORT WINGATE DEPOT ACTIVITY
WELL SAMPLING DATA FORM

Well Number: KMW13
Start Date: 08/27/05
Start Time: 1630

Well Casing Diameter (in): 2"
Bore Hole Diameter (in): 8.75
Annular Space (AS) Length (ft): 23.0

Well TD = 53.74
Well DTW = 52.58
Water Column = 1.16

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back)	=	1.17
Column of water or length of AS (whichever is less)	X	1.16
Volume of water in AS (gal)	=	1.36
Gallons per foot of casing (from chart on back)	=	0.1632
Column of water	X	1.16
Volume of water in casing (gal)	=	0.19
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	0.26
Number of EV to be purged	X	5
TOTAL VOLUME TO BE PURGED (gal)	=	1.29
ACTUAL VOLUME PURGED (gal)	=	0.35

Method of Purging: Poly Bailer

Field Parameters	8/27	8/28		Reading						Final Sample
Time	1630	0920	1335	~~150~~						
Volume (gal)	0.25	0.35	0.35							
Flow Rate (gpm)	—	—	—							N/A
DTW (ft toc)	Bailed dry	N/A	Dry							
pH	6.16	6.89	—							
Conductivity (µS/cm)	3235	1818	—							
Temperature (C)	15.87	12.28	—							
Turbidity (NTU)	16	17	—							
Eh/Redox (mV)	333.4	122.9	—							
DO (mg/L)	9.00	5.64	—							

Purging Field Notes:
Collected 0.25 gallons 8/27/05
Collected 0.10 gallons 8/28/05
082905 @ 0805 collect explosives after bailing well dry 3 times

* Was only able to get 1/4 bottle of explosives filled over 4 days

Sample Date/Time: ~~082405 / 0730~~ SED
08/29/05 / 0805

Sample ID/TR #: ~~CAMW23 / 00928~~ SED
KMW13 / 00932

Sampler's signature/date: ~~Steph~~ E Doster 08/29/05

Reviewer's signature/date: [signature] 7.25.05

FORT WINGATE DEPOT ACTIVITY LOW FLOW WELL SAMPLING DATA FORM	

Well Number: TMW01
Start Date: 4/1/03
Start Time: 1306
Well TD: 61.23
Well DTW: 32.12
Water Column: 29.11
Pump Intake (ft ~~bgs~~ toc): 55'

Well Casing Diameter (in): 2"
Bore Hole Diameter (in): 8"
Annular Space (AS) Length (ft): 18'
Screened Interval (ft bgs): 44.0-59.0

WELL VOLUME CALCULATION

Gallons per foot of annular space (from chart on back)	=	.73
Column of water or length of AS (whichever is less)	X	18
Volume of water in AS (gal)	=	13.14
Gallons per foot of casing (from chart on back)	=	.1632
Column of water	X	29.11
Volume of water in casing (gal)	=	4.75
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	17.89
ACTUAL VOLUME PURGED (gal)	8.325 / 3.785 =	2.199

Method of Purging : Low Flow Bladder Pump

Time	Minutes Elapsed	Flow Rate (mL/min)	Cumulative Volume (L)	DTW (ft toc)	pH	Cond. (µS/cm)	Temp. (C)	Turbidity (NTU)	Redox (mV)	DO (mg/L)
1305	0	0	0	32.25	NM	NM	NM	NM	NM	NM
1310	5	165	.825	32.41	7.33	2850	13.57	45	92.7	.79
1315	10	165	1.65	32.41	7.33	2846	13.51	39	89.4	.92
1320	15	165	2.475	32.41	7.33	2837	13.52	28	87.9	.85
1325	20	170	3.325	32.41	7.33	2813	13.45	30	85.1	.76
1330	25	165	4.15	32.41	7.33	2804	13.47	25	84.0	.68
1335	30	170	5	32.41	7.34	2800	13.45	19	82.7	.67
1340	35	170	5.85	32.41	7.34	2792	13.46	17	80.6	.65
1345	40	170	6.7	32.41	7.34	2791	13.48	18	79.1	.65
1350	45	160	7.5	32.41	7.34	2798	13.43	18	78.1	.63
1355	50	165	8.325	32.41	7.34	2789	13.45	19	78.0	.61
				Δ=0.29 OK	0%	0%	OK	OK	OK	OK

Purging Field Notes: Pump Settings: Fill 10 secs, Discharge 5 secs, Pressure 30 psi

Sampled: Explosives, Nitrate/Nitrite, Total Nitrate, Perchlorate

Sample Date/Time: 4/1/03 1400 Sample ID/TR #: TMW01 00855

Sampler's signature/date: Leonard M. Salazar 4/1/03

Reviewer's signature/date: [signature] 4/24/03

FORT WINGATE DEPOT ACTIVITY
LOW FLOW WELL SAMPLING DATA FORM

Well Number: TMW02
Start Date: 4/3/03 4/4/03
Start Time: 1330 745
Well TD: 84.09
Well DTW: 53.40
Water Column: 30.69
Pump Intake (ft ~~bgs~~ toc): 79'

Well Casing Diameter (in): 2"
Bore Hole Diameter (in): 8"
Annular Space (AS) Length (ft): 18'
Screened Interval (ft bgs): 67.9-81.9

WELL VOLUME CALCULATION

Gallons per foot of annular space (from chart on back) = .73
Column of water or length of AS (whichever is less) X 18
Volume of water in AS (gal) = 13.14
Gallons per foot of casing (from chart on back) = .1632
Column of water X 30.69
Volume of water in casing (gal) = 5.00
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal) = 18.14
ACTUAL VOLUME PURGED (gal) = .8719

Method of Purging : LowFlow Bladder Pump

Time	Minutes Elapsed	Flow Rate (mL/min)	Cumulative Volume (L)	DTW (ft toc)	pH	Cond. (µS/cm)	Temp. (C)	Turbidity (NTU)	Redox (mV)	DO (mg/L)
1350	0	0	0	53.02	NM	NM	NM	NM	NM	NM
1355	5	20	.1	53.48	NM	NM	NM	NM	NM	NM
1400	10	20	.2	53.48	NM	NM	NM	NM	NM	NM
1405	15	20	.3	53.48	NM	NM	NM	NM	NM	NM
1410	20	20	.4	53.48	NM	NM	NM	NM	NM	NM
1415	25	20	.5	53.48	NM	NM	NM	NM	NM	NM
1420	30	20	.6	53.52	NM	NM	NM	NM	NM	NM
1425	35	25	.725	53.52	NM	NM	NM	NM	NM	NM
1430	40	25	.85	53.52	7.92	4606	13.32	NM	45.8	3.43
1435	45	25	.975	53.52	7.90	4542	13.48	NM	50.3	3.32
1440	50	25	1.1	53.52	7.91	4561	14.03	NM	51.4	3.28
	Purge Rate is slow will complete 4/4/03									
4/4/03 745	0	0	1.1	53.46	NM	NM	NM	NM	NM	NM
750	5	40	1.3	53.51	NM	NM	NM	NM	NM	NM
755	10	40	1.5	53.68	8.00	4360	5.20	NM	182.3	6.05
800	15	35	1.675	53.68	7.92	4321	6.65	4.8	182.1	5.58

Purging Field Notes: Pump Settings: Fill 20 secs, Discharge 10 secs, Pressure 40 psi

Sampled: Explosives, Nitrate/Nitrite, Total Nitrate, Perchlorate

Sample Date/Time: 4/4/03 900 Sample ID/TR #: TMW02 00867

Sampler's signature/date: Leonard M. [signature] 4/3/03

Reviewer's signature/date: [signature] 4/24/03

2 of 2

FORT WINGATE DEPOT ACTIVITY
LOW FLOW WELL SAMPLING DATA FORM

Well Number: TMW02
Start Date: 4/3/03 - 4/4/03
Start Time: 1350 745

Well Casing Diameter (in): 2"
Bore Hole Diameter (in): 8"
Annular Space (AS) Length (ft): 18'
Screened Interval (ft bgs): 67.9-81.9'
Well TD: 84.09'
Well DTW: 53.40'
Water Column: 30.69'
Pump Intake (ft ~~bgs~~ toc): 79'

WELL VOLUME CALCULATION

Gallons per foot of annular space (from chart on back)	=	.73
Column of water or length of AS (whichever is less)	X	18
Volume of water in AS (gal)	=	13.14
Gallons per foot of casing (from chart on back)	=	.1632
Column of water	X	30.69
Volume of water in casing (gal)	=	5.0086
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	18.14
ACTUAL VOLUME PURGED (gal) 3.3/3.785	=	.8719

Method of Purging : Low Bladder Pump

Time	Minutes Elapsed	Flow Rate (mL/min)	Cumulative Volume (L)	DTW (ft toc)	pH	Cond (µS/cm)	Temp. (C)	Turbidity (NTU)	Redox (mV)	DO (mg/L)
805	20	30	1.825	53.69	7.89	4421	7.45	5.9	180.5	5.45
810	25	40	2.025	53.69	7.88	4447	7.86	8.9	179.1	5.14
815	30	30	2.175	53.70	7.87	4492	8.27	12	176.5	4.27
820	35	30	2.325	53.70	7.86	4498	8.18	12	175.3	4.16
825	40	30	2.475	53.70	7.85	4501	8.18	11	173.6	3.46
830	45	35	2.65	53.70	7.85	4495	8.24	10	171.7	2.96
835	50	35	2.825	53.70	7.85	4493	8.49	11	170.3	2.58
840	55	35	3	53.70	7.87	4502	8.46	8.0	168.4	2.66
845	60	30	3.15	53.70	7.85	4508	8.32	7.2	167.0	2.40
850	65	30	3.3	53.70	7.85	4508	8.22	6.4	166.3	2.26
				OK	OK	OK	OK	High	OK	High
				ΔH= 0.30						

Purging Field Notes: Pump Settings: Fill 20 secs, Discharge 10 secs, Pressure 40 psi

Sampled: Explosives, Nitrate/Nitrite, Total Nitrate, Perchlorate

Sample Date/Time: 4/4/03 900 Sample ID/TR #: TMW02 00867

Sampler's signature/date: Leonard M Sabatini 4/4/03

Reviewer's signature/date:

FORT WINGATE DEPOT ACTIVITY
LOW FLOW WELL SAMPLING DATA FORM

Well Number: TMW03
Start Date: 4/4/03
Start Time: 0910

Well Casing Diameter (in): 2"
Bore Hole Diameter (in): 8"
Annular Space (AS) Length (ft): 23.7
Screened Interval (ft bgs): 49.8-69.8

Well TD: 72.06
Well DTW: 56.48
Water Column: 15.58
Pump Intake (ft ~~bgs~~ toc): 65'

WELL VOLUME CALCULATION

Gallons per foot of annular space (from chart on back)	=	0.73
Column of water or length of AS (whichever is less)	X	15.58
Volume of water in AS (gal)	=	11.37
Gallons per foot of casing (from chart on back)	=	0.1632
Column of water	X	15.58
Volume of water in casing (gal)	=	2.54
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	17.91
ACTUAL VOLUME PURGED (gal)	=	~~8.~~ 0.8067 gal

Method of Purging : LowFlow Bladder Pump (QED MicroPurge)

Time	Minutes Elapsed	Flow Rate (mL/min)	Cumulative Volume (L)	DTW (ft toc)	pH	Cond. (µS/cm)	Temp. (C)	Turbidity (NTU)	Redox (mV)	DO (mg/L)
920	0	35	0	56.48	NM	NM	NM	NM	NM	NM
925	5	35	0.175	56.52	NM	NM	NM	NM	NM	NM
930	10	35	0.350	56.52	~~NM~~ 5.17	2576	10.57	NM	394.8	5.07
935	15	35	0.525	56.52	7.53	4705	10.91	NM	394.5	4.36
940	20	45	0.750	56.54	7.49	4728	11.11	~~NM~~ 15.5	393.3	2.91
945	25	55	~~0.82~~ 1025	56.54	7.46	4747	11.26	9.41	390.3	1.93
950	30	55	1.300	56.54	7.46	4751	11.39	8.98	389.0	1.71
955	35	50	1.550	56.54	7.45	4761	11.51	7.79	386.0	1.50
1000	40	55	1.825	56.54	7.45	4765	11.61	7.69	385.4	1.45
1005	45	60	2.125	56.54	7.44	4768	11.70	5.82	382.1	1.40
1010	50	60	2.425	56.54	7.45	4773	11.90	5.05	380.2	1.37
1015	55	60	2.725	56.54	7.44	4773	12.10	5.00	378.2	1.36
1020	60	60	3.025	56.54	7.42	4789	12.10	4.72	377.1	1.33
				OK	OK	OK	OK	OK	OK	OK
				ΔH = 0.06ft						

Purging Field Notes: Pump Settings: Fill 26.6 secs, Discharge 3.4 secs, Pressure 85 psi

Sampled: Explosives, Nitrate/Nitrite, Total Nitrate, Perchlorate

Sample Date/Time: 4/4/03 / 1025 Sample ID/TR #: TMW03 00860 Field Duplicate 00861

Sampler's signature/date: [signature] 4/4/03

Reviewer's signature/date: [signature] 4/24/03

FORT WINGATE DEPOT ACTIVITY LOW-FLOW WELL SAMPLING DATA FORM	
Well Number:	TMW04
Start Date:	4/4/03
Start Time:	1150

Well Casing Diameter (in):	2"
Bore Hole Diameter (in):	8"
Annular Space (AS) Length (ft):	23'
Screened Interval (ft bgs):	50-70
Well TD:	72.25'
Well DTW:	55.95'
Water Column:	16.30
Pump Intake (ft ~~bgs~~ toc):	65'

WELL VOLUME CALCULATION

Gallons per foot of annular space (from chart on back)	=	.73
Column of water or length of AS (whichever is less)	X	16.30
Volume of water in AS (gal)	=	11.89
Gallons per foot of casing (from chart on back)	=	.1632
Column of water	X	16.30
Volume of water in casing (gal)	=	2.66
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	14.55
ACTUAL VOLUME PURGED (gal) 3.775 3.785	=	.997

Method of Purging : Low Flow Bladder Pump

Time	Minutes Elapsed	Flow Rate (mL/min)	Cumulative Volume (L)	DTW (ft toc)	pH	Cond. (µS/cm)	Temp. (C)	Turbidity (NTU)	Redox (mV)	DO (mg/L)
1150	0	0	0	56.03	NM	NM	NM	NM	NM	NM
1155	5	20	.1	56.05	NM	NM	NM	NM	NM	NM
1200	10	20	.2	56.03	NM	NM	NM	NM	NM	NM
1205	15	20	.3	56.03	NM	NM	NM	NM	NM	NM
1210	20	20	.4	56.03	7.88	4183	13.21	NM	6.8	4.19
1215	25	20	.5	56.03	7.80	4097	12.79	NM	18.4	3.94
1220	30	50	.75	56.06	7.76	4064	11.84	8.3	26.4	3.26
1225	35	70	1.1	56.06	7.74	4025	12.09	8.4	29.7	2.74
1230	40	70	1.45	56.06	7.75	4013	12.26	4.7	30.7	2.46
1235	45	70	1.8	56.06	7.74	4012	12.33	5.5	31.8	2.25
1240	50	70	2.15	56.06	7.74	4015	12.33	5.6	32.7	2.15
1245	55	65	2.475	56.06	7.73	4003	12.52	4.7	33.5	2.11
1250	60	65	2.8	56.06	7.74	4008	12.64	4.9	34.3	2.06
1255	65	65	3.125	56.06	7.74	4017	12.54	5.3	35.0	2.08
1300	70	65	3.45	56.06	7.74	4013	12.43	4.3	35.9	2.09
1305	75	65	3.775	56.06	7.74	4007	12.57	4.0	36.8	2.05
				OK	OK	OK	OK	High	OK	OK

Purging Field Notes: Pump Settings: Fill 10 secs, Discharge 5 secs, Pressure 35 psi

Smpled: Explosives, Nitrate/Nitrite, Total Nitrate, Perchlorate

Sample Date/Time: 4/4/03 1310 Sample ID/TR #: TMW04 00871

Sampler's signature/date: Lionel M [signature] 4/4/03

Reviewer's signature/date: [signature] 4/24/03

FORT WINGATE DEPOT ACTIVITY
WELL SAMPLING DATA FORM

Well Number: TMW05
Start Date: 03/31/03
Start Time: 1115

Well Casing Diameter (in): 2
Bore Hole Diameter (in): 5.5
Annular Space (AS) Length (ft): 13

Well TD = 37.61
Well DTW = 34.67
Water Column = 2.94

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back)	=	0.39
Column of water or length of AS (whichever is less)	X	2.94
Volume of water in AS (gal)	=	1.15
Gallons per foot of casing (from chart on back)	=	0.1632
Column of water	X	2.94
Volume of water in casing (gal)	=	0.48
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	1.63
Number of EV to be purged	X	5
TOTAL VOLUME TO BE PURGED (gal)	=	8.15
ACTUAL VOLUME PURGED (gal)	=	8.50

Method of Purging : Bailer

Field Parameters	Reading									
Time	1121	1128	1134	1141	1148	1157				Final
Volume (gal)	0.25	1.50	3.0	4.5	6.0	7.5				Sample
Flow Rate (gpm)	0.25	0.25	0.25	0.25	0.25	0.25				N/A
DTW (ft toc)	NM	NM	NM	NM	NM	NM				NM
pH	7.81	7.71	7.61	7.67	7.60	7.60				7.57
Conductivity (μS/cm)	2,369	2,250	2,253	2,229	2,238	2,233				2,233
Temperature (C)	13.95	12.47	12.02	12.36	12.50	12.35				12.21
Turbidity (NTU)	5.01	27.3	25.1	25.1	25.1	25.1				25.3
Eh/Redox (mV)	330.2	331.8	348.8	342.1	343.7	340.3				342.7
DO (mg/L)	7.60	7.90	7.76	7.85	7.89	8.02				7.94

Purging Field Notes: TMW05 sampled for TCL VOCs, Expanded List Explosives, Nitrate/Nitrite-nonspecific, Total Nitrate, Perchlorate, and Extra Volume

Sample Date/Time: 03/31/03 / 1210

Sample ID/TR #: TMW05 / 00872

Sampler's signature/date: [signature] 03/31/03

Reviewer's signature/date: [signature] 4/24/03

FORT WINGATE DEPOT ACTIVITY
LOW FLOW WELL SAMPLING DATA FORM

Well Number: TMW06
Start Date: 4/3/03
Start Time: 810

Well Casing Diameter (in): 2"
Bore Hole Diameter (in): 8.75"
Annular Space (AS) Length (ft): 13
Screened Interval (ft bgs): 45-55

Well TD: 57.24'
Well DTW: 46.53'
Water Column: 10.71
Pump Intake (ft ~~bgs~~ toc): 52'

WELL VOLUME CALCULATION
Gallons per foot of annular space (from chart on back) = .73
Column of water or length of AS (whichever is less) X 10.71
Volume of water in AS (gal) = 7.82
Gallons per foot of casing (from chart on back) = .1632
Column of water X 10.71
Volume of water in casing (gal) = 1.747
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal) = 9.57
ACTUAL VOLUME PURGED (gal) 2.55 / 3.785 = .6737

Method of Purging: Low Flow Bladder Pump

Time	Minutes Elapsed	Flow Rate (mL/min)	Cumulative Volume (L)	DTW (ft toc)	pH,	Cond. (µS/cm)	Temp. (C)	Turbidity (NTU)	Redox (mV)	DO (mg/L)
810	0	0	0	46.42	NM	NM	NM	NM	NM	NM
815	5	0	0	46.53	NM	NM	NM	NM	NM	NM
820	10	0	0	46.55	NM	NM	NM	NM	NM	NM
825	15	0	0	46.54	NM	NM	NM	NM	NM	NM
830	20	0	0	46.54	NM	NM	NM	NM	NM	NM
835	25	0	0	46.53	NM	NM	NM	NM	NM	NM
840	30	0	0	46.53	NM	NM	NM	NM	NM	NM
845	35	0	0	46.54	NM	NM	NM	NM	NM	NM
850	40	0	0	46.54	NM	NM	NM	NM	NM	NM
855	45	0	0	46.55	NM	NM	NM	NM	NM	NM
900	50	0	0	46.58	NM	NM	NM	NM	NM	NM
* 905	55	30	.15	46.58	NM	NM	NM	NM	NM	NM
910	60	35	.325	46.60	NM	NM	NM	NM	NM	NM
915	65	35	.5	46.61	NM	NM	NM	NM	NM	NM
920	70	35	.675	46.59	NM	NM	NM	NM	NM	NM
925	75	35	.85	46.61	NM	NM	NM	NM	NM	NM

Purging Field Notes: Pump Settings: Fill 21 secs, Discharge 9 secs, Pressure 25 psi
Sampled: Explosives, Nitrate/Nitrite, Total Nitrate, Perchlorate
*905 Water began to be pumped.

Sample Date/Time: 4/3/03 1025 Sample ID/TR #: TMW06 00865

RNSW03 Tr# 00862, collecte After decontaminat Pump. Sampled: Ex Nitrate/Nitrite, Total Nitrate, Perchlorate

Sampler's signature/date: Leonard M. Sabatino 4/24/03
Reviewer's signature/date: [signature] 4/24/03

FORT WINGATE DEPOT ACTIVITY
LOW FLOW WELL SAMPLING DATA FORM

Well Number: TMW06
Start Date: 4/3/03
Start Time: 810

Well Casing Diameter (in): 2"
Bore Hole Diameter (in): 8.75"
Annular Space (AS) Length (ft): 13'
Screened Interval (ft bgs): 45 - 55

Well TD: 57.24
Well DTW: 46.53
Water Column: 10.71
Pump Intake (ft ~~bgs~~ toc): 52'

WELL VOLUME CALCULATION

Gallons per foot of annular space (from chart on back)	=	.73
Column of water or length of AS (whichever is less)	X	10.71
Volume of water in AS (gal)	=	7.82
Gallons per foot of casing (from chart on back)	=	.1632
Column of water	X	10.71
Volume of water in casing (gal)	=	1.747
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	9.57
ACTUAL VOLUME PURGED (gal)	2.55/3.785 =	.6737

Method of Purging: Low Flow Bladder Pump

Time	Minutes Elapsed	Flow Rate (mL/min)	Cumulative Volume (L)	DTW (ft toc)	pH	Cond. (µS/cm)	Temp. (C)	Turbidity (NTU)	Redox (mV)	DO (mg/L)
930	80	35	1.025 ~~2.525~~	46.62	NM	NM	NM	NM	NM	NM
935	85	35	1.2 ~~2.7~~	46.68	7.42	4479	9.69	1.9	170.5	3.65
940	90	35	1.375 ~~2.875~~	46.71	7.39	4465	10.33	0.0	169.1	3.13
945	95	30	1.525	46.69	7.39	4533	10.36	0.0	166.2	2.79
950	100	30	1.675	46.69	7.38	4550	10.33	0.0	164.6	2.47
955	105	30	1.825	46.69	7.38	4564	10.29	0.0	162.5	2.35
1000	110	25	1.95	46.68	7.38	4570	10.38	0.0	158.9	2.23
1005	115	30	2.1	46.68	7.38	4581	10.30	0.0	157.6	2.11
1010	120	30	2.25	46.68	7.38	4570	10.45	0.0	155.9	2.09
1015	125	30	2.4	46.68	7.38	4569	10.85	0.0	152.7	2.00
1020	130	30	2.55	46.68	7.38	4586	10.90	0.0	149.3	2.03
				ΔH=0.15 OK	OK	OK	high	OK	OK	OK

Purging Field Notes: Pump Settings: Fill 21 secs, Discharge 9 secs, Pressure 25 psi

Sampled: Explosives, Nitrate/Nitrite, Total Nitrate, Perchlorate

Sample Date/Time: 4/3/03 1025 Sample ID/TR #: TMW06 00865
Sampler's signature/date: Leonard M. Salazar 4/24/03
Reviewer's signature/date: [signature] 4/24/03

FORT WINGATE DEPOT ACTIVITY WELL SAMPLING DATA FORM

Well Number: TMW07
Start Date: 03/31/03
Start Time: 0825

Well Casing Diameter (in): 2
Bore Hole Diameter (in): 5.5
Annular Space (AS) Length (ft): 13

Well TD = 67.37
Well DTW = 48.59
Water Column = 18.78

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back)	=	0.39
Column of water or length of AS (whichever is less)	X	13
Volume of water in AS (gal)	=	5.07
Gallons per foot of casing (from chart on back)	=	0.1632
Column of water	X	18.78
Volume of water in casing (gal)	=	3.06
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	8.13
Number of EV to be purged	X	5
TOTAL VOLUME TO BE PURGED (gal)	=	40.65
ACTUAL VOLUME PURGED (gal)	=	10.25

Method of Purging : Bailer

Field Parameters	03/31/03	03/31	03/31	04/01/03	04/01	Readings 4/3/03					
Time	0845	0857	1424	0850	1344	0806					Final
Volume (gal)	0.25	4.0	5.25	7.25	8.25	10.25					Sample
Flow Rate (gpm)	0.25	0.25	0.25	0.25	0.25	0.15					N/A
DTW (ft toc)	NM	NM	NM	NM	NM	NM					
pH	9.40	8.21	7.94	7.62	7.64	7.75					
Conductivity (μS/cm)	4,763	5,006	5,171	5,091	5,180	2,755					
Temperature (C)	12.35	11.39	14.72	13.25	14.38	12.24					
Turbidity (NTU)	10	9.7	27.9	54.1	51.7	10					
Eh/Redox (mV)	248.5	283.5	351.8	333.3	256.2	233.4					
DO (mg/L)	3.92	4.35	3.80	3.75	4.15	6.78					

Purging Field Notes: Purged dry @ 0857 (03/31/03) after 4.0 gallons. Start purging @ 1410 (03/31/03). Bailed dry @ 1424 (03/31/03) after 5.25 total gallons. Start purging @ 0844 (04/01/03). Bailed dry @ 0850 (04/01/03) after 7.25 total gallons. Start purging @ 1340 (04/01/03). Bailed dry @ 1344 (04/01/03) after 8.25 gallons total.
Collected Explosives, Extra Volume, Nitrate/Nitrite, Nitrate, and perchlorate.

Sample Date/Time: 4/3/03 / 0800 Sample ID/TR #: TMW07 / 00866

Sampler's signature/date: [signature] / 4/3/03

Reviewer's signature/date: [signature] 4/24/03

FORT WINGATE DEPOT ACTIVITY
LOW FLOW WELL SAMPLING DATA FORM

Well Number: TMW08
Start Date: 3/27/03
Start Time: 1001
Well TD: 62.41
Well DTW: 35.61
Water Column: 26.80
Pump Intake (ft bgs): 49 (~51 ft TOC)

Well Casing Diameter (in): 2.0
Bore Hole Diameter (in): 8.75
Annular Space (AS) Length (ft): 83
Screened Interval (ft bgs): 32.41 - 62.41

WELL VOLUME CALCULATION

Gallons per foot of annular space (from chart on back)	= 0.942
Column of water or length of AS (whichever is less)	X 26.80
Volume of water in AS (gal)	= 25.246
Gallons per foot of casing (from chart on back)	= 0.1632
Column of water	X 26.80
Volume of water in casing (gal)	= 4.374
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	= 29.6
ACTUAL VOLUME PURGED (gal)	= 1.5

Method of Purging : QED Micro Purge

Time	Minutes Elapsed	Flow Rate (mL/min)	Cumulative Volume (L)	DTW (ft toc)	pH	Cond. (µS/cm)	Temp. (C)	Turbidity (NTU)	Redox (mV)	DO (mg/L)
1045	0	120	0	35.57	NM	NM	NM	NM	NM	NM
1050	5	120	.60	35.65	7.42	12166	10.10	NM	372.9	2.89
1055	10	120	1.20	~~35.68~~ 35.65	7.08	14488	11.20	5.8	375.2	1.07
1100	15	120	1.80	35.65	7.00	14834	11.52	6.2	369.2	0.51
1105	20	120	2.40	35.65	7.01	14869	11.76	5.0	366.8	0.44
11.10	25	140	3.10	35.65	NM	NM	NM	NM	NM	NM
1115	30	140	3.80	35.65	7.02	14946	11.81	3.5	360.5	0.40
1120	35	140	4.50	35.65	7.02	14,924	11.89	3.1	360.2	0.38
1125	40	140	5.20	35.65	7.02	14908	11.73	2.9	359.2	0.36
1130	45	140	5.90	35.65	7.01	14879	11.70	2.9	358.1	0.35
				OK	OK	OK	OK	OK	OK	OK
				ΔH= 0.04ft						

Purging Field Notes: Pump Settings: Fill 25 secs, Discharge 5.0 secs, Pressure 30 psi

Collected Explosives, SV, VOC, pesticides, perchlorate, nitrate/nitrite, and nitrate.

Sample Date/Time: 3/27/03 / 1130 Sample ID/TR #: TMW08 / 00835

Sampler's signature/date: [signature] 3/27/03

Reviewer's signature/date: [signature] 4/4/03

FORT WINGATE DEPOT ACTIVITY
LOW FLOW WELL SAMPLING DATA FORM

Well Number: TMW10
Start Date: 3/27/03
Start Time: 0830

Well Casing Diameter (in): 2.0
Bore Hole Diameter (in): 8.75
Annular Space (AS) Length (ft): 33.0
Screened Interval (ft bgs): 31.23 - 61.23

Well TD: 61.80
Well DTW: 36.05
Water Column: 25.75
Pump Intake (ft bgs): 45' toc

WELL VOLUME CALCULATION

Gallons per foot of annular space (from chart on back)	=	.942
Column of water or length of AS (whichever is less)	X	25.75
Volume of water in AS (gal)	=	24.25
Gallons per foot of casing (from chart on back)	=	.1632
Column of water	X	25.75
Volume of water in casing (gal)	=	4.2024
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	28.4589
ACTUAL VOLUME PURGED (gal) 4.60 / 3.785	=	1.215

Method of Purging: QED micropurge

Time	Minutes Elapsed	Flow Rate (mL/min)	Cumulative Volume (L)	DTW (ft toc)	pH	Cond. (µS/cm)	Temp. (C)	Turbidity (NTU)	Redox (mV)	DO (mg/L)
0830	0	60	0	36.02	NM	NM	NM	NM	NM	NM
0835	5	60	0.30	36.17	7.04	9,315	7.14	N/M	386.0	3.97
0840	10	60	0.60	36.18	7.04	9,312	7.26	8.2	382.7	3.52
0845	15	60	0.90	36.21	7.06	9,322	7.50	8.9	376.0	2.98
0850	20	90	1.35	36.23	7.08	9245	8.74	N/M	362.0	2.65
0855	25	90	1.80	36.25	7.08	9,283	8.70	9.8	368.1	2.54
0900	30	140	2.50	36.30	7.09	9,288	10.11	10.0	355.1	2.51
0905	35	140	3.20	36.31	7.10	9,255	10.63	9.0	351.0	2.47
0910	40	140	3.90	36.33	7.12	9,286	10.75	9.1	350.9	2.42
0915	45	140	4.60	36.33	7.12	9,289	10.74	9.0	350.7	2.39
				ΔH=0.28ft OK	OK	OK	OK	OK	OK	OK

Purging Field Notes: Pump Settings: Fill 26 secs, Discharge 4.0 secs, Pressure 40 psi

Collected Explosives, EV, VOC, Pesticides, Perchlorate, Nitrate/Nitrite, and Nitrate

Sample Date/Time: ~~[illegible]~~ 3/27/03 / 0915 Sample ID/TR #: TMW10 / 00828

Sampler's signature/date: [signature] / 3/27/03

Reviewer's signature/date: [signature] 4/24/03

FORT WINGATE DEPOT ACTIVITY
LOW FLOW WELL SAMPLING DATA FORM

Well Number: TMW11
Start Date: 4/2/03
Start Time: 835
Well TD: 82.68
Well DTW: 65.22
Water Column: 17.46
Pump Intake (ft ~~bgs~~ toc): 75'

Well Casing Diameter (in): 2"
Bore Hole Diameter (in): 6"
Annular Space (AS) Length (ft): 28'
Screened Interval (ft bgs): 55-80

WELL VOLUME CALCULATION

Gallons per foot of annular space (from chart on back) = .39
Column of water or length of AS (whichever is less) X 17.46
Volume of water in AS (gal) = 6.8094
Gallons per foot of casing (from chart on back) = .1632
Column of water X 17.46
Volume of water in casing (gal) = 2.849
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal) = 9.6584
ACTUAL VOLUME PURGED (gal) 6.875/3.785 = 1.816

Method of Purging : Low Flow Bladder Pump

Time	Minutes Elapsed	Flow Rate (mL/min)	Cumulative Volume (L)	DTW (ft toc)	pH	Cond. (μS/cm)	Temp. (C)	Turbidity (NTU)	Redox (mV)	DO (mg/L)
835	0	0	0	65.23	NM	NM	NM	NM	NM	NM
840	5	155	.775	65.32	NM	NM	NM	NM	NM	NM
845	10	155	1.55	65.44	7.60	2174	13.31	120	116.6	3.96
850	15	140	2.25	65.47	7.56	2210	13.02	110	115.9	3.18
855	20	140	2.95	65.49	7.57	2212	13.05	90	115.6	3.10
900	25	130	3.6	65.49	7.58	2220	13.11	70	114.1	3.28
905	30	135	4.275	65.49	7.58	2222	13.19	50	113.5	3.43
910	35	130	4.925	65.49	7.58	2222	13.22	25	112.3	3.44
915	40	130	5.575	65.49	7.58	2224	13.24	18	111.4	3.23
920	45	130	6.225	65.49	7.59	2226	13.21	18	110.3	3.36
925	50	130	6.875	65.49	7.60	2224	13.24	17	109.4	3.48
				ΔH=0.27ft OK	OK	OK	OK	OK	OK	OK

Purging Field Notes: Pump Settings: Fill 21 secs, Discharge 9 secs, Pressure 39 psi

Sampled: Explosives, Nitrate/Nitrite, Total Nitrate, Perchlorate

Sample Date/Time: 4/2/03 930 Sample ID/TR #: TMW11 00856

Sampler's signature/date: Leonard M. Salintin 4/2/03

Reviewer's signature/date: [signature] 4/24/03

FORT WINGATE DEPOT ACTIVITY
LOW FLOW WELL SAMPLING DATA FORM

Well Number: TMW13
Start Date: 3/27/03
Start Time: 845
Well TD: 73.78'
Well DTW: 59.05'
Water Column: 14.73
Pump Intake (ft ~~bgs~~ toc): 71.0'

Well Casing Diameter (in): 2"
Bore Hole Diameter (in): 8.8"
Annular Space (AS) Length (ft): 16.1'
Screened Interval (ft bgs): 60.7-70.7

WELL VOLUME CALCULATION

Gallons per foot of annular space (from chart on back)	=	.9426
Column of water or length of AS (whichever is less)	X	14.73
Volume of water in AS (gal)	=	13.88
Gallons per foot of casing (from chart on back)	=	.1632
Column of water	X	14.73
Volume of water in casing (gal)	=	2.4039
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	16.2839
ACTUAL VOLUME PURGED (gal) 6.125 / 3.785	=	1.618

Method of Purging : Low Flow Bladder Pump

Time	Minutes Elapsed	Flow Rate (mL/min)	Cumulative Volume (L)	DTW (ft toc)	pH	Cond. (µS/cm)	Temp. (C)	Turbidity (NTU)	Redox (mV)	DO (mg/L)
845	0	0	0	59.11	NM	NM	NM	NM	NM	NM
850	5	100	.5	59.09	NM	NM	NM	NM	NM	NM
855	10	100	1	59.06	7.85	NM	6.99	NM	157.4	5.82
900	15	100	1.5	59.15	7.63	2369	8.11	11	151.2	4.10
905	20	100	2	59.15	7.54	2376	10.14	9.1	146.9	4.17
910	25	100	2.5	59.15	7.50	2379	10.63	7.7	142.9	3.11
915	30	110	3.05	59.15	7.48	2379	10.94	5.1	137.1	2.41
920	35	105	3.575	59.15	7.48	2379	11.12	3.2	134.0	2.47
925	40	100	4.075	59.15	7.49	2381	11.13	1.8	127.6	1.82
930	45	110	4.625	59.15	7.48	2380	11.08	.86	124.6	2.02
935	50	100	5.125	59.15	7.48	2381	11.31	.25	121.0	1.51
940	55	100	5.625	59.15	7.49	2381	11.28	.00	117.6	1.65
945	60	100	6.125	59.15	7.49	2381	11.31	.00	115.8	1.55
				ΔH=0.10						
				OK	OK	OK	OK	OK	OK	OK

Purging Field Notes: Pump Settings: Fill 10 secs, Discharge 5 secs, Pressure 80 psi

Sampled: Explosives, Nitrate/Nitrite Nonspecific, Total Nitrate Perchlorate, Extra Volume

NM = Not Measured

Sample Date/Time: 3/27/03 950 Sample ID/TR #: TMW13 00837

Sampler's signature/date: [signature] 3/27/03

Reviewer's signature/date: [signature] 4/4/03

FORT WINGATE DEPOT ACTIVITY
WELL SAMPLING DATA FORM

Well Number: TMW14A
Start Date: 03/~~26~~ 27/2003 JAH 03/27/2003
Start Time: 1445

Well Casing Diameter (in): 2
Bore Hole Diameter (in): 6
Annular Space (AS) Length (ft): 24.45

Well TD = 112.20
Well DTW = 62.52
Water Column = 49.68

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back)	=	0.39
Column of water or length of AS (whichever is less)	X	24.45
Volume of water in AS (gal)	=	9.54
Gallons per foot of casing (from chart on back)	=	0.1632
Column of water	X	49.68
Volume of water in casing (gal)	=	8.11
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	17.65
Number of EV to be purged	X	5
TOTAL VOLUME TO BE PURGED (gal)	=	88.3
ACTUAL VOLUME PURGED (gal)	=	72.5

Method of Purging: Bailer

Field Parameters	03/27/03	03/27/03	3/31/03	4/01/03		Reading				Final Sample
Time	1508	1600	1612	0847	1600					
Volume (gal)	0.25	13.0	37.5	57.5	72.5					
Flow Rate (gpm)	0.25	0.25	0.25	0.67	0.33					N/A
DTW (ft toc)	NM	NM	NM	NM	NM					
pH	8.43	8.69	8.62	8.71	8.72					
Conductivity (µS/cm)	1,836	1,821	1,854	1,815	1,875					
Temperature (C)	10.60	11.11	14.07	13.19	13.57					
Turbidity (NTU)	>999	>999	>999	out of range	out of range					
Eh/Redox (mV)	-120.2	-101.1	-55.8	17.0	12.1					
DO (mg/L)	2.16	4.47	2.65	2.44	3.72					

Purging Field Notes: Stopped purging @ 1600 (03/27/02) - end of day. Start purging @ 1532 (03/28/03). Bailed dry @ 1605 after 25.0 total gallons. Start purging @ 1535 (03/31/03). Bailed dry @ 1619 (03/31/03) after 40 total gallons.

Collected Explosives, Total and Dissolved Metals, Perchlorate, Nitrate/Nitrite, Nitrate, VOCs and Extra Volume

Sample Date/Time: 4/2/03 / 0915

Sample ID/TR #: TMW14A
00829 Parent
00830 Duplicate
00831 MS
00832 MSD
FBLK01 00834 Field blank

Sampler's signature/date: [signature] 4/2/03

Reviewer's signature/date: [signature] 4/24/03

FORT WINGATE DEPOT ACTIVITY
LOW FLOW WELL SAMPLING DATA FORM

Well Number: TMW15
Start Date: 3/27/03
Start Time: 1205

Well Casing Diameter (in): 2
Bore Hole Diameter (in): 6
Annular Space (AS) Length (ft): 19.3
Screened Interval (ft bgs): 56-71

Well TD: 76.65'
Well DTW: 63.07'
Water Column: 13.58
Pump Intake (ft ~~bgs~~ toc): 70'

WELL VOLUME CALCULATION

Gallons per foot of annular space (from chart on back)	=	.39
Column of water or length of AS (whichever is less)	X	13.58
Volume of water in AS (gal)	=	5.29
Gallons per foot of casing (from chart on back)	=	.1632
Column of water	X	13.58
Volume of water in casing (gal)	=	2.22
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	7.51
ACTUAL VOLUME PURGED (gal) 7.325 / 3.785	=	1.935

Method of Purging : Low Flow Bladder Pump

Time	Minutes Elapsed	Flow Rate (mL/min)	Cumulative Volume (L)	DTW (ft toc)	pH	Cond. (µS/cm)	Temp. (C)	Turbidity (NTU)	Redox (mV)	DO (mg/L)
1205	0	0	0	63.05	NM	NM	NM	NM	NM	NM
1210	5	175	.875	63.15	NM	NM	NM	NM	NM	NM
1215	10	100	1.375	63.16	NM	NM	NM	NM	NM	NM
1220	15	200	2.375	63.19	7.83	2443	10.83	4.8	101.5	6.14
1225	20	125	3.0	63.38	7.56	2455	12.16	4.8	100.8	3.31
1230	25	95	3.475	63.40	7.53	2458	11.73	3.8	99.8	3.13
1235	30	85	3.9	63.39	7.52	2454	11.38	2.7	98.9	2.94
1240	35	110	4.45	63.39	7.52	2458	11.04	2.4	98.6	2.79
1245	40	90	4.9	63.41	7.50	2455	10.69	2.1	97.9	2.84
1250	45	90	5.35	63.40	7.50	2462	10.21	1.4	97.1	2.80
1255	50	110	5.9	63.39	7.50	2450	10.88	.85	95.5	2.62
1300	55	105	6.425	63.42	7.50	2444	11.59	.35	94.2	2.63
1305	60	90	6.875	63.41	7.49	2453	11.63	.25	93.9	2.60
1310	65	90	7.325	63.41	7.49	2456	11.33	.30	93.1	2.62
				ΔH=0.34						
				High	ok	OK	OK	high	ok	OK

Purging Field Notes: Pump Settings: Fill 10 secs, Discharge 10 secs, Pressure 80 ft. H2O

Sampled: Explosives, Nitrate/Nitrite NonSpecific, Total Nitrate, Perchlorate, Extra Volume

NM=Not Measured

Sample Date/Time: 3/27/03 1315 Sample ID/TR #: TMW15 00838

Sampler's signature/date: Leonard M. Sabato 3/27/03

Reviewer's signature/date: [signature] 4/24/03

FORT WINGATE DEPOT ACTIVITY WELL SAMPLING DATA FORM

Well Number: TMW16
Start Date: 3/28/03
Start Time: 1330

Well Casing Diameter (in): 2.0"
Bore Hole Diameter (in): 6.0
Annular Space (AS) Length (ft): 21.3

Well TD = 142.20
Well DTW = 54.08
Water Column = 88.12

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back)	=	0.39
Column of water or length of AS (whichever is less)	X	21.3
Volume of water in AS (gal)	=	8.31
Gallons per foot of casing (from chart on back)	=	0.1632
Column of water	X	88.12
Volume of water in casing (gal)	=	14.4
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	22.71
Number of EV to be purged	X	5
TOTAL VOLUME TO BE PURGED (gal)	=	113.6
ACTUAL VOLUME PURGED (gal)	=	80

Method of Purging: 2" Submersible Pump (Grundfos)

Field Parameters	Readings 3/31/03									
Time	1415	1435	1455	1510	1518	1350	1410	1430	1500	Final
Volume (gal)	0	3	8	17	21	21	26	30	38	Sample
Flow Rate (gpm)	0.22	0.15	0.25	0.53	—	0.25	0.20	0.27		N/A
DTW (ft toc)	51.09	71.35	96.77	129.74	dry	59.25	89.38	107.32	131.20	
pH	8.44	8.06	8.03	8.10	8.28	7.08	8.31	8.35	8.42	
Conductivity (μS/cm)	1832	1817	1822	1822	9	2025	1819	1827	1831	
Temperature (C)	11.94	14.35	16.26	17.44	16.68	13.31	16.08	17.66	18.46	
Turbidity (NTU)	25.0	15.7	15.0	OUT OF RANGE	OUT OF RANGE	236	19.1	19.5	316.0	
Eh/Redox (mV)	182.8	-98.4	-118.4	-106.5	-135.6	132.0	-26.7	-57.8	2.9	
DO (mg/L)	2.86	0.38	0.25	0.33	2.42	1.76	0.12	0.12	0.69	

Purging Field Notes:
Collected: RNSW04 (TR# 00870) for VOC and Perchlorate (4/3/03)

Collected VOC and perchlorate only (4/4/03)

Sample Date/Time: 4/4/03 0805
Sample ID/TR #: TMW16 00839

Sampler's signature/date: [signature] 4/4/03
Reviewer's signature/date: [signature] 4/24/03

**FORT WINGATE DEPOT ACTIVITY
WELL SAMPLING DATA FORM**

Well Number: TMW16
Start Date: 3/28/03
Start Time: 1330

Well Casing Diameter (in): 2.0
Bore Hole Diameter (in): 6.0
Annular Space (AS) Length (ft): 21.3

Well TD = 142.20
Well DTW = 54.08
Water Column = 88.12

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back) = 0.39
Column of water or length of AS (whichever is less) X 21.3
Volume of water in AS (gal) = 8.31

Gallons per foot of casing (from chart on back) = 0.1632
Column of water X 88.12
Volume of water in casing (gal) = 14.4

ONE EQUIVALENT VOLUME [EV] (AS + casing, gal) = 22.71

Number of EV to be purged X 5

TOTAL VOLUME TO BE PURGED (gal) = 113.6

ACTUAL VOLUME PURGED (gal) = 80.0

Method of Purging :

Field Parameters	3/31/03	4/1/03		4/2/03		Readings 4/3/03				Final
Time	15:05	12:15	1240	1405	1435	945	1010	1017		Sample
Volume (gal)	42	42	54	54	67	67	77	80		
Flow Rate (gpm)	off	0.48	off		dry NM			off		N/A
DTW (ft toc)	dry	96.46	dry	89.79	dry	99.71	132.21	dry		
pH	8.37	7.82	8.42	8.61	NM	7.67	8.38	NM		
Conductivity (μS/cm)	1897	1850	NM	2022	NM	1947	1819	NM		
Temperature (C)	18.00	13.47	17.51	13.22	NM	13.07	17.85	NM		
Turbidity (NTU)	NM	52.6	NM	NM	NM	27.5	294	NM		
Eh/Redox (mV)	-49.8	88.9	70.9	68.5	NM	275.6	221.2	NM		
DO (mg/L)	0.62	6.40	2.66	5.22	NM	6.14	3.58	NM		

Purging Field Notes:
Collected FBI (DSW04 (TR#00870) for VOC and perchlorate (4/3/03)

Collected VOC and perchlorate only (4/4/03)

Sample Date/Time: 4/4/03 / 0805
Sample ID/TR #: TMW16/00839

Sampler's signature/date: [signature] 4/4/03
Reviewer's signature/date: [signature] 4/24/03

FORT WINGATE DEPOT ACTIVITY
WELL SAMPLING DATA FORM

Well Number: TMW17
Start Date: 3/28/03
Start Time: 1017

Well Casing Diameter (in): 2.0
Bore Hole Diameter (in): 6.0
Annular Space (AS) Length (ft): 23

Well TD = 130.45
Well DTW = 61.10
Water Column = 69.35

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back)	=	0.39
Column of water or length of AS (whichever is less)	X	23.0
Volume of water in AS (gal)	=	8.97
Gallons per foot of casing (from chart on back)	=	0.1632
Column of water	X	69.35
Volume of water in casing (gal)	=	11.32
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	20.29
Number of EV to be purged	X	5
TOTAL VOLUME TO BE PURGED (gal)	=	100 gals
ACTUAL VOLUME PURGED (gal)	=	86.5

Method of Purging: Bailer (2" Poly)

Field Parameters	3/28/03				Reading		3/31/03			
Time	1100	1120	1140	1200	1220	1240	1045	1115	1145	Final
Volume (gal)	0	5	9	13	17	20	20	26.5	32.0	Sample
Flow Rate (gpm)	0.25	~~0.08~~	0.20	0.20	0.20	0.15	0.22	0.18	~~0.16~~ 0.17	N/A
DTW (ft toc)	61.10	Bailing	Bailing	Bailing	Bailing	Bailing	61.32	Bailing	Bailing	
pH	10.87	10.44	10.36	10.35	10.85	11.01	9.88	9.92	10.06	
Conductivity (µS/cm)	1849	1752	1744	1,662	1,867	2047	2208	2151	2104	
Temperature (C)	13.39	12.67	12.55	13.56	12.94	12.82	13.47	14.34	15.16	
Turbidity (NTU)	60.0	19.0	25.6	OUT OF RANGE	OUT OF RANGE	OUT OF RANGE	45.0	125.0	316	
Eh/Redox (mV)	33.7	120.8	127.4	164.2	166.8	146.0	74.1	72.9	77.5	
DO (mg/L)	1.48	2.48	3.57	2.46	2.18	1.75	3.72	4.67	5.34	

Purging Field Notes: Sampled: Perchlorate, TCL VOC's

Sample Date/Time: 4/1/03 826

Sample ID/TR #: TMW17 00840

Sampler's signature/date: [signature] 4/1/03

Reviewer's signature/date: [signature] 4/24/03

FORT WINGATE DEPOT ACTIVITY
WELL SAMPLING DATA FORM

Well Number: TMW17
Start Date: 3/28/03
Start Time: 1017

Well Casing Diameter (in): 2.0
Bore Hole Diameter (in): 6.0
Annular Space (AS) Length (ft): 23

Well TD = 130.45
Well DTW = 61.10
Water Column = 69.35

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back)	=	.39
Column of water or length of AS (whichever is less)	X	23.0
Volume of water in AS (gal)	=	8.97
Gallons per foot of casing (from chart on back)	=	0.1632
Column of water	X	
Volume of water in casing (gal)	=	11.32
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	20.29
Number of EV to be purged	X	5
TOTAL VOLUME TO BE PURGED (gal)	=	100 gals
ACTUAL VOLUME PURGED (gal)	=	86.5

Method of Purging: Bailer

Field Parameters	3/31/03		4/01/03/~~[illegible]~~	Reading					
Time	1215	1230	1102						Final
Volume (gal)	37.0	40.5	53.5						Sample
Flow Rate (gpm)	0.23	0	0.12						N/A
DTW (ft toc)	Bailing	Dry	Dry						
pH	9.97	11.5	9.65						
Conductivity (μS/cm)	2006	1394	1930						
Temperature (C)	15.45	14.45	14.88						
Turbidity (NTU)	664	out of range	770						
Eh/Redox (mV)	86.9	31.8	42.1						
DO (mg/L)	4.29	5.38	5.93						

Purging Field Notes:
Purged 15 gals @ 1600 4/2/03.
Purged 18 gals @ 1615 4/3/03

Collected TMW17 for VOC and perchlorate (4/4/03)

Sample Date/Time: 4/4/03 / ~~0805~~ 0825 Sample ID/TR #: TMW17 / 00840

Sampler's signature/date: [signature] 4/4/03

Reviewer's signature/date: [signature] 4/24/07

FORT WINGATE DEPOT ACTIVITY
WELL SAMPLING DATA FORM

Well Number: TMW18
Start Date: 3/28/03
Start Time: 0759

Well Casing Diameter (in): 2.0
Bore Hole Diameter (in): 6.0
Annular Space (AS) Length (ft): 16.8

Well TD = 160.70
Well DTW = 52.75
Water Column = 107.95

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back)	= 0.39
Column of water or length of AS (whichever is less)	X 16.8
Volume of water in AS (gal)	= 6.55
Gallons per foot of casing (from chart on back)	= 0.1632
Column of water	X 107.95
Volume of water in casing (gal)	= 17.62
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	= 24.17
Number of EV to be purged	X 5
TOTAL VOLUME TO BE PURGED (gal)	= 120.9
ACTUAL VOLUME PURGED (gal)	= 29.0

Method of Purging: 2" Submersible Pump (Grundfos)

Field Parameters	Reading							3/31/03		
Time	0850	905	920	935	950	1005	1008	1320	13:33	Final
Volume (gal)	0	3.0	7.0	11.0	14.5	17.0	17.5	17.5	22.5	Sample
Flow Rate (gpm)	0.28	0.20	0.27	0.27	0.23	0.17	off	0.54	off	N/A
DTW (ft toc)	49.02	70.30	89.30	110.00	136.05	153.5	dry	171.63	dry	
pH	12.08	12.16	12.13	12.12	12.06	12.02	12.01	12.24	12.02	
Conductivity (µS/cm)	7826	6700	6708	6680	6517	6161	6093	6174	5160	
Temperature (C)	12.50	14.39	15.50	16.14	17.84	19.47	18.64	13.33	18.26	
Turbidity (NTU)	10	2.7	2.8	2.7	4.3	2.8	nm	3.17	nm	
Eh/Redox (mV)	109.1	-16.9	-81.0	-121.8	-138.6	-140.1	-138.9	-27.9	-121.9	
DO (mg/L)	0.97	0.19	0.13	0.15	0.33	0.35	0.31	3.91	1.78	

Purging Field Notes:
Sampled: Perchlorate

Sample Date/Time: 4/4/03 758
Sample ID/TR #: TMW18 00841

Sampler's signature/date: [signature] / 4/4/03
Reviewer's signature/date: [signature] / 4/24/03

FORT WINGATE DEPOT ACTIVITY
WELL SAMPLING DATA FORM

Well Number: TMW18
Start Date: 3/28/03
Start Time: 0759

Well Casing Diameter (in): 2.0
Bore Hole Diameter (in): 6.0
Annular Space (AS) Length (ft): 16.8

Well TD = 160.70
Well DTW = 52.75
Water Column = 107.95

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back)	=	0.39
Column of water or length of AS (whichever is less)	X	16.8
Volume of water in AS (gal)	=	6.55
Gallons per foot of casing (from chart on back)	=	0.1632
Column of water	X	107.95
Volume of water in casing (gal)	=	17.62
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	24.17
Number of EV to be purged	X	5
TOTAL VOLUME TO BE PURGED (gal)	=	120.9
ACTUAL VOLUME PURGED (gal)	=	29.0

Method of Purging: 2" Grundfos Submersible Pump

Field Parameters	4/1/03		4/2/03		Reading						Final
Time	1150	1157	1340	1350							Sample
Volume (gal)	23.5	25.5	25.5	27.5							
Flow Rate (gpm)	0.29 on	off	0.20	off							N/A
DTW (ft toc)	149.23	dry	148.60	dry							
pH	11.81	NM	12.10	NM							
Conductivity (µS/cm)	5398	NM	3879	NM							
Temperature (C)	14.77	NM	16.04	NM							
Turbidity (NTU)	NM	NM	16.0	NM							
Eh/Redox (mV)	-65.1	NM	-167.6	NM							
DO (mg/L)	1.15	NM	4.37	NM							

Purging Field Notes:
4/3/03 - purged ~1.5 gals @ 1405, purged dry
Collected TMW18 for perchlorate only

Sample Date/Time: 4/4/03 / 0758
Sample ID/TR #: TMW18 / 00841

Sampler's signature/date: A Deeter 4/4/03
Reviewer's signature/date: A Deeter 4/24/03

**FORT WINGATE DEPOT ACTIVITY
WELL SAMPLING DATA FORM**

Well Number: TMW19
Start Date: 3/27/03
Start Time: 1300

Well Casing Diameter (in): 2.0
Bore Hole Diameter (in): 6.0
Annular Space (AS) Length (ft): 22.8

Well TD = 187.97
Well DTW = 40.35
Water Column = 147.62

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back)	=	0.39
Column of water or length of AS (whichever is less)	X	22.8
Volume of water in AS (gal)	=	8.89
Gallons per foot of casing (from chart on back)	=	0.1632
Column of water	X	147.62
Volume of water in casing (gal)	=	24.09
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	32.98
Number of EV to be purged	X	5
TOTAL VOLUME TO BE PURGED (gal)	=	164.9
ACTUAL VOLUME PURGED (gal)	=	145.0

Method of Purging: 2" Submersible Grundfos

Field Parameters	Reading 3/27/03							3/30/03		
Time	1330	1340	1400	1420	1440	1500	1510	0920	0945	Final
Volume (gal)	0	0.5	7.0	14.0	19.0	26.0	31.0	31.0	41.0	Sample
Flow Rate (gpm)	0.04	0.4	0.5	0.35	0.25	0.35	0.6	0.42	0.4	N/A
DTW (ft toc)	35.87	44.88	77.05	103.62	130.63	150.90	172.33	35.80	90.55	
pH	5.99	7.49	7.80	7.83	7.87	7.90	7.93	7.12	8.31	
Conductivity (μS/cm)	3026	2850	2830	2836	2825	2826	2812	3027	2823	
Temperature (C)	10.82	12.21	14.38	15.01	16.84	18.49	20.05	12.97	14.52	
Turbidity (NTU)	6.4	12	11.	9.1	10	15	80	129	14.6	
Eh/Redox (mV)	188.5	88.2	-41.6	-66.0	-84.5	-97.6	-113.0	-131.7	-123.2	
DO (mg/L)	1.06	0.46	0.11	0.11	0.10	0.10	0.10	0.39	0.16	

Purging Field Notes:
1st Pump Set at 172 ft bgs; water has definite odor
2nd Pump Set at 184 ft TOC.
Collected Perchlorate only.

Sample Date/Time: 4/4/03 0741
Sample ID/TR #: TMW19 00842

Sampler's signature/date: [signature] 4/4/03
Reviewer's signature/date: [signature] 4/24/03

FORT WINGATE DEPOT ACTIVITY
WELL SAMPLING DATA FORM

Well Number: TMW 19
Start Date: 3/27/03
Start Time: 1300

Well Casing Diameter (in): 2.0
Bore Hole Diameter (in): 6.0
Annular Space (AS) Length (ft): 22.8

Well TD = 187.97
Well DTW = 40.35
Water Column = 147.62

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back)	=	0.39
Column of water or length of AS (whichever is less)	X	22.8
Volume of water in AS (gal)	=	8.89
Gallons per foot of casing (from chart on back)	=	0.1632
Column of water	X	147.62
Volume of water in casing (gal)	=	24.09
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	32.98
Number of EV to be purged	X	5
TOTAL VOLUME TO BE PURGED (gal)	=	164.9
ACTUAL VOLUME PURGED (gal)	=	145.0

Method of Purging: 2" Submersible (Grundfos)

Field Parameters	3/31/03	4/1/03			4/2 Reading			4/3/03		
Time	1010	1323	1400	1505	1227	1300	1327	1220	1338	Final
Volume (gal)	50.0	50.0	60.0	84.0	84.0	102.0	114.0	114.0	145.0	Sample
Flow Rate (gpm)	off	0.27	0.37	off	0.55	0.44	dry	0.40	off	N/A
DTW (ft toc)	N/A	43.21	97.91	dry	46.75	144.30	178.0	45.08	dry	
pH	—	5.54	8.35	8.28	5.72	8.41	8.32	6.71	8.32	
Conductivity (µS/cm)	—	3037	2848	3066	3062	2862	3083	3049	2928	
Temperature (C)	—	13.03	15.34	18.01	13.24	17.24	18.05	12.63	19.20	
Turbidity (NTU)	—	OUT OF RANGE	21.9	OUT OF RANGE	OUT OF RANGE	36.7	NM	77.3	OUT OF RANGE	
Eh/Redox (mV)	—	-29.4	-178.0	-204.0	230.8	59.0	-11.3	362.8	199.3	
DO (mg/L)	—	0.74	0.11	0.14	1.75	2.05	1.15	2.25	1.53	

Purging Field Notes:
1010 - pump UCI code
3RD Pump Set at 185 ft TOC

Collected TMW19 for perchlorate only

Sample Date/Time: 4/4/03 / 0741
Sample ID/TR #: TMW19 / 00842

Sampler's signature/date: [signature] / 4/4/03
Reviewer's signature/date: [signature] / 4/24/03

FORT WINGATE DEPOT ACTIVITY
LOW FLOW WELL SAMPLING DATA FORM

Well Number: TMW21
Start Date: 4/2/03
Start Time: 1150

Well Casing Diameter (in): 2"
Bore Hole Diameter (in): 8"
Annular Space (AS) Length (ft): 12.0'
Screened Interval (ft bgs): 48-58

Well TD: 61.31'
Well DTW: 49.87'
Water Column: 11.44
Pump Intake (ft ~~bgs~~ toc): ~~56'~~ 58'

WELL VOLUME CALCULATION

Gallons per foot of annular space (from chart on back)	=	.73
Column of water or length of AS (whichever is less)	X	11.44
Volume of water in AS (gal)	=	8.35
Gallons per foot of casing (from chart on back)	=	.1632
Column of water	X	11.44
Volume of water in casing (gal)	=	1.87
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	10.22
ACTUAL VOLUME PURGED (gal)	=	.67

Method of Purging : Low Flow Bladder Pump

Time	Minutes Elapsed	Flow Rate (mL/min)	Cumulative Volume (L)	DTW (ft toc)	pH	Cond. (µS/cm)	Temp. (C)	Turbidity (NTU)	Redox (mV)	DO (mg/L)
1150	0	0	0	50.29	NM	NM	NM	NM	NM	NM
1155	5	20	.10	50.46	7.76	2468	15.49	120	64.3	1.65
1200	10	20	.20	50.48	7.71	2481	16.16	150	63.8	1.38
1205	15	100	.70	50.65	7.69	2483	14.36	140	65.3	1.21
1210	20	60	1	51.05	7.70	2464	14.4	130	65.6	.96
1215	25	65	1.325	51.05	7.71	2468	14.53	140	65.0	.91
1220	30	50	1.575	51.05	7.68	2471	15.21	130	64.2	.85
1225	35	50	1.825	51.05	7.71	2466	15.45	130	64.1	.81
1230	40	50	2.075	51.05	7.70	2469	15.79	110	62.8	.78
1235	45	46	2.3	51.06	7.69	2459	15.07	100	63.8	.73
1240	50	50	2.65	51.05	7.68	2456	15.28	90	64.5	.70
				ΔH=1.18ft						
				v. High	OK	OK	high	high	OK	high

Purging Field Notes: Pump Settings: Fill 25 secs, Discharge 5 secs, Pressure 30 psi

Sampled: Explosives, TCL VOC's, TAL Total Metals, TAL Dissolved Metals, Nitrate/Nitrite, Total Nitrate, Perchlorate

RNSW01 collected After Pump decon Sampled: Explosives TCL VOC's TAL Total Metals, Nitrate/Nitrite

Sample Date/Time: 4/2/03 1245 Sample ID/TR #: TMW21 00857

Sampler's signature/date: Leonard McDonald 4/2/03

Reviewer's signature/date: [signature] 4/24/03

FORT WINGATE DEPOT ACTIVITY
WELL SAMPLING DATA FORM

Well Number: TMW22
Start Date: 03/28/2003
Start Time: 1125

Well Casing Diameter (in): 2
Bore Hole Diameter (in): 8
Annular Space (AS) Length (ft): 12

Well TD = 65.23
Well DTW = 49.80
Water Column = 15.43

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back)	=	0.73
Column of water or length of AS (whichever is less)	X	12
Volume of water in AS (gal)	=	8.76
Gallons per foot of casing (from chart on back)	=	0.1632
Column of water	X	15.43
Volume of water in casing (gal)	=	2.52
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	11.28
Number of EV to be purged	X	5
TOTAL VOLUME TO BE PURGED (gal)	=	56.4
ACTUAL VOLUME PURGED (gal)	=	13.5

Method of Purging: Bailer

Field Parameters	03/28/03	03/28	03/28	03/31/03	03/31 Reading	04/01				Final
Time	1132	1142	1514	0945	1505	0830				Final
Volume (gal)	0.25	3.75	5.5	9.25	11.0	13.5				Sample
Flow Rate (gpm)	0.25	0.25	0.25	0.25	0.25	0.25				N/A
DTW (ft toc)	NM	NM	NM	NM	NM	NM				NM
pH	7.91	7.90	7.98	7.95	7.93	7.87				7.87
Conductivity (µS/cm)	3,077	3,227	3,163	3,113	3,113	3,001				3,028
Temperature (C)	11.87	11.20	10.89	12.65	13.06	12.52				14.72
Turbidity (NTU)	>999	>999	>999	>999	>999	>999				>999
Eh/Redox (mV)	60.7	28.3	173.3	332.7	333.3	313.6				288.2
DO (mg/L)	4.63	6.80	6.87	6.30	7.68	6.13				5.58

Purging Field Notes: Purged dry @ 1146 after 4.0 gallons. Start purging @ 1505 (03/28/03). Bailed dry after 5.5 total gallons @ 1514 (03/28/03). Start purging @ 0935 (03/31/03). Bailed dry @ 0949 (03/31/03) after 9.5 total gallons. Start purging @ 1457 (03/31/03). Bailed dry @ 1505 (03/31/03) after 11.0 gallons total. Start purging @ 0823 (04/01/03). Bailed dry @ 0830 (04/01/03) after 13.5 total gallons. Sampled for Expanded List Explosives, TCL VOCs, ~~TCL P~~ Total and Dissolved TAL Metals, Total Nitrate, Nitrate/Nitrite-nonspecific, perchlorate, and Extra Volume.

Sample Date/Time: 04/01/03/1130
Sample ID/TR #: TMW22/00864

Sampler's signature/date: [signature] /04/01/03

Reviewer's signature/date: [signature] / 4/24/03

FORT WINGATE DEPOT ACTIVITY WELL SAMPLING DATA FORM

Well Number: TMW23
Start Date: 03/28/03
Start Time: 0920

Well Casing Diameter (in): 2
Bore Hole Diameter (in): 8
Annular Space (AS) Length (ft): 12

Well TD = 59.57
Well DTW = 46.62
Water Column = 12.95

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back)	=	0.73
Column of water or length of AS (whichever is less)	X	12
Volume of water in AS (gal)	=	8.76
Gallons per foot of casing (from chart on back)	=	0.1632
Column of water	X	12.95
Volume of water in casing (gal)	=	2.11
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	10.87
Number of EV to be purged	X	5
TOTAL VOLUME TO BE PURGED (gal)	=	54.35
ACTUAL VOLUME PURGED (gal)	=	12.5

Method of Purging : Bailer

Field Parameters	03/28/03	03/28	03/28	03/31/03	03/31 Reading	04/01				
Time	0922	0933	1455	0920	1445	0807				Final
Volume (gal)	0.25	3.0	5.0	8.0	10.0	12.5				Sample
Flow Rate (gpm)	0.25	0.25	0.25	0.25	0.25	0.25				N/A
DTW (ft toc)	NM	NM	NM	NM	NM	NM				
pH	7.88	7.83	7.94	7.89	7.93	7.77				
Conductivity (μS/cm)	3,034	3,147	3,073	3,123	3,143	3,144				
Temperature (C)	11.23	11.11	11.63	12.31	14.12	12.60				
Turbidity (NTU)	>999	>999	>999	>999	>999	>999				
Eh/Redox (mV)	266.8	262.5	165.1	285.8	340.7	306.8				
DO (mg/L)	~~266.8~~ 4.05	4.50	5.76	5.80	6.76	5.63				

Purging Field Notes: Bailed dry @ 0936 (03/28/03) after 3.75 gallons. Start purging @ 1450 (03/28/03). Bailed dry at 1455 (03/28/03) after 5.0 gallons total. Start purging @ 0910 (03/31/03). Purged dry @ 0920 (03/31/03) after total of 8.0 gallons. Start purging @ 1435 (03/31/03). Bailed dry @ 1445 (03/31/03) after 10.0 total gallons. Start purging @ 0800 (04/01/03). Bailed dry @ 0807 (04/01/03) after a total of 12.5 gallons. Sampled for Expanded List Explosives, TCL VOCs, TCL Pesticides, Total and Dissolved TAL Metals, Nitrate/Nitrite-nonspecific, Total Nitrate, Perchlorate, Extra Volume

Sample Date/Time: 04/01/03 / 1245

Sample ID/TR #: TMW23/00858 - Parent
TMW23/00859 - Duplicate
TMW23/00860 - Matrix Spike
TMW23/00861 - Matrix Spike Duplicate
FBLK02/00863 - Field Blank

Sampler's signature/date: [signature] 4/1/03

Reviewer's signature/date: [signature] 4/24/03

FORT WINGATE DEPOT ACTIVITY
WELL SAMPLING DATA FORM

Well Number: TMW24
Start Date: 03/26/2003
Start Time: 1240

Well Casing Diameter (in): 2
Bore Hole Diameter (in): 8
Annular Space (AS) Length (ft): 12.0

Well TD = 57.41
Well DTW = 41.88
Water Column = 15.53

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back)	=	0.73
Column of water or length of AS (whichever is less)	X	12.0
Volume of water in AS (gal)	=	8.76
Gallons per foot of casing (from chart on back)	=	0.1632
Column of water	X	15.53
Volume of water in casing (gal)	=	2.53
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	11.29
Number of EV to be purged	X	5
TOTAL VOLUME TO BE PURGED (gal)	=	56.5
ACTUAL VOLUME PURGED (gal)	=	14.0

Method of Purging : Disposable bailer

Field Parameters	03/26/03	03/26/03	03/27/03	03/27/03	03/28 Reading					Final Sample
Time	1253	1310	0933	1410	0856					
Volume (gal)	0.50	6.0	10.0	11.75	13.5					
Flow Rate (gpm)	0.25	0.30	0.2	0.2	0.2					N/A
DTW (ft toc)	NM	NM	NM	NM	NM					NM
pH	7.76	7.70	7.81	7.83	7.89					7.86
Conductivity (µS/cm)	3,724	3,692	3,875	3,927	3,989					3,918
Temperature (C)	12.43	12.05	10.00	11.32	10.64					11.07
Turbidity (NTU)	NM	NM	NM	510	473					671
Eh/Redox (mV)	103.3	-4.3	194.9	142.1	245.7					166.5
DO (mg/L)	2.55	3.65	5.36	4.12	6.21					5.52

Purging Field Notes:
Start purging @ 0920 (03/27/03). JAH
Purged dry @ 1310 (03/26/03) after removing 6.0 gallons. ~~Start purging @ 1442 (03/26)~~.
Purged dry @ 0933 (03/27/03) after total of 10.0 gallons. Start purging @ 1405 (03/27/03). Purged dry @
1415 (03/27/03) after total of 12.0 gallons. Start purging @ 0850 (03/28/03). Purged dry @ 0856 after 13.5 gal (total)
Sampled for Expanded list explosives, TCL VOCs, TCL Pesticides, Total and Dissolved TAL Metals,
Total Nitrate, Nitrate/Nitrite-nonspecific, perchlorate, and Extra Volume

Sample Date/Time: 03/28/03/1420
Sample ID/TR #: TMW24/#00826

Sampler's signature/date: [signature] 03/28/2003
Reviewer's signature/date: [signature] 04/28/03

FORT WINGATE DEPOT ACTIVITY
LOW FLOW WELL SAMPLING DATA FORM

Well Number: TMW25
Start Date: 3/26/03
Start Time: 943

Well Casing Diameter (in): 2
Bore Hole Diameter (in): 8
Annular Space (AS) Length (ft): 12.5
Screened Interval (ft bgs): 42.5-52.5

Well TD: 55.25
Well DTW: 40.06 ft
Water Column: 15.19
Pump Intake (ft bgs): 50.0

WELL VOLUME CALCULATION

Gallons per foot of annular space (from chart on back) = 0.73
Column of water or length of AS (whichever is less) X 12.5
Volume of water in AS (gal) = 9.13
Gallons per foot of casing (from chart on back) = 0.1632
Column of water X 15.19
Volume of water in casing (gal) = 2.48
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal) = 11.61
ACTUAL VOLUME PURGED (gal) = .44

Method of Purging : QED Micro Purge

Time	Minutes Elapsed	Flow Rate (mL/min)	Cumulative Volume (L)	DTW (ft toc)	pH	Cond. (μS/cm)	Temp. (C)	Turbidity (NTU)	Redox (mV)	DO (mg/L)
10:35	0	30	0	39.80	NM	NM	NM	NM	NM	NM
10:40	5	30	0.15	40.10	NM	NM	NM	NM	NM	NM
1045	10	30	0.30	40.14	NM	NM	NM	NM	NM	NM
1050	15	30	0.45	40.43	7.58	4,360	14.61	NM	267.8	4.12
1055	20	30	0.60	40.46	NM	NM	NM	NM	NM	NM
1105	30	30	0.9	40.70	7.46	4,260	14.61	5.3	269.7	1.49
1110	35	30	1.050	40.70	7.46	4,221	15.32	4.9	263.5	1.04
1120	45	30	1.350	40.70	7.48	4,221	15.83	4.1	261.3	0.83
1125	50	30	1.50	40.70	7.46	4,231	15.61	3.4	261.0	0.72
1130	55	30	1.65	40.73	7.45	4,212	15.40	3.1	260.9	0.66
1135	60	30	1.80	40.75	7.44	4,217	14.90	3.0	260.6	0.62
11:40	65	30	1.95	40.75	7.44	4,176	15.33	9.2	260.8	0.57
				DH=0.69						
				V. High	OK	OK	OK	High	OK	High

Purging Field Notes: Pump Settings: Fill 27.6 secs, Discharge 2.4 secs, Pressure 30 psi

Collected Explosives, TAL Metals (Dissolved + Total), Nitrate/Nitrite, Nitrate, VOC, ~~and~~ Pesticides, Perchlorate, and EV. (Note: Should not LF this well)

Sample Date/Time: 3/26/03 / 11:45 Sample ID/TR #: TMW25 / 00827

Sampler's signature/date: [signature] 3/27/03

Reviewer's signature/date: [signature] 4/24/03

FORT WINGATE DEPOT ACTIVITY
WELL SAMPLING DATA FORM

Well Number: TMW26
Start Date: 03/26/2003
Start Time: 0928

Well Casing Diameter (in): 2
Bore Hole Diameter (in): 8
Annular Space (AS) Length (ft): 12

Well TD = 58.24
Well DTW = 26.92
Water Column = 31.32

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back)	=	0.73
Column of water or length of AS (whichever is less)	X	12
Volume of water in AS (gal)	=	8.76
Gallons per foot of casing (from chart on back)	=	0.1632
Column of water	X	31.32
Volume of water in casing (gal)	=	5.11
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	13.87
Number of EV to be purged	X	5
TOTAL VOLUME TO BE PURGED (gal)	=	69.4
ACTUAL VOLUME PURGED (gal)	=	~~28~~ 29.0 JAH 03/28/2003

Method of Purging: Bailer

Field Parameters	03/26/03	03/26	03/26	03/27	03/27 Reading	03/27				Final Sample
Time	0930	0955	1450	0827	1140	0911				
Volume (gal)	0.25	8.0	13.0	18.5	21.5	28.0				
Flow Rate (gpm)	0.20	0.20	0.4	0.8	0.8	1.0				N/A
DTW (ft toc)	29.95	54.10	54.32	54.21	54.30	58.01				NM
pH	6.86	7.72	7.06	7.44	7.77	7.79				7.97
Conductivity (µS/cm)	4,523	4,850	4,424	4,439	4,413	4,547				4,268
Temperature (C)	11.99	13.55	13.42	12.29	12.46	10.08				11.54
Turbidity (NTU)	NM	NM	NM	NM	NM	NM				837
Eh/Redox (mV)	146.5	27.5	46.0	154.4	276.9	219.6				148.2
DO (mg/L)	0.80	0.24	1.69	2.81	7.00	3.31				6.36

Purging Field Notes:
Purged dry @ 0957 after 8.0 gallons. Start purging @ 1442 (03/26/03). Purged dry @ 1451 after 13.0 gallons total. Start purging @ 0820 (03/27/03). Purged dry @ 0827 (03/27/03) after 18.5 gallons total. Start purging @ 1136 (03/27/03). Purged dry @ 1140 (03/27/03) after 21.5 gallons total. Start purging @ 0909 (03/28/03). Purged dry @ 0915 after 29 gallons total. Sampled for Explosives, Pesticides, VOCs, Total & Dissolved TAL Metals, total nitrate, nitrate/nitrite nonspecific, perchlorate, extra volume

Sample Date/Time: 03/28/03 / 1225
Sample ID/TR #: TMW26 / 00824

Sampler's signature/date: [signature] / 03/28/2003
Reviewer's signature/date: [signature] 4/24/03

FORT WINGATE DEPOT ACTIVITY
LOW FLOW WELL SAMPLING DATA FORM

Well Number: TMW 27
Start Date: 3/26/03
Start Time: 850

Well Casing Diameter (in): 2
Bore Hole Diameter (in): 8
Annular Space (AS) Length (ft): 14.0'
Screened Interval (ft bgs): 60-70

Well TD: 73.26'
Well DTW: 28.74'
Water Column: 44.52'
Pump Intake (ft ~~bgs~~ toc): 73'

WELL VOLUME CALCULATION

Gallons per foot of annular space (from chart on back)	=	.73
Column of water or length of AS (whichever is less)	X	14
Volume of water in AS (gal)	=	10.22
Gallons per foot of casing (from chart on back)	=	.1632
Column of water	X	44.52
Volume of water in casing (gal)	=	7.26
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	17.48
ACTUAL VOLUME PURGED (gal)	=	1.17

Method of Purging : Low Flow Bladder Pump

Time	Minutes Elapsed	Flow Rate (mL/min)	Cumulative Volume (L)	DTW (ft toc)	pH	Cond. (µS/cm)	Temp. (C)	Turbidity (NTU)	Redox (mV)	DO (mg/L)
850	0	0	0	28.70	NM	NM	NM	NM	NM	NM
900	10	0	0	28.70	NM	NM	NM	NM	NM	NM
905	15	0	0	28.78	NM	NM	NM	NM	NM	NM
910	20	0	0	28.76	NM	NM	NM	NM	NM	NM
915	25	0	0	28.75	NM	NM	NM	NM	NM	NM
920	30	0	0	28.80	NM	NM	NM	NM	NM	NM
925	35	0	0	28.80	NM	NM	NM	NM	NM	NM
930	40	0	0	28.81	NM	NM	NM	NM	NM	NM
935	45	0	0	28.83	7.78	1609	12.31	NM	44.5	4.54
940	50	0	0	28.82	7.76	1585	14.58	NM	33.1	4.65
* 945	55	~~0~~ 5 ml/min	.15 ~~0.54~~	28.82	7.75	1599	12.89	NM	34.6	3.45
950	60	108	.275	28.84	7.74	1599	12.72	7.4	32.3	2.78
955	65	95	.815 1.29	29.20	7.70	1589	12.87	18	22.7	1.83
1000	70	95	1.765	29.22	7.69	1582	13.52	22	16.8	1.10
1005	75	95	2.24	29.22	7.69	1590	13.46	22	15.9	.83
1010	80	80	2.64	29.22	7.70	1587	13.42	21	18.0	.67

*Pressure Increase to Increase Flow Rate

Purging Field Notes: Pump Settings: Fill 25 secs, Discharge 5 secs, Pressure 40 psi

Sampled: Explosives, TCL VOC's, TAL Total Metals, TAL Dissolved Metals Nitrate/Nitrite Nonspecific, Total Nitrate, Perchlorate, Extra Volume

NM=not measured

Sample Date/Time: 3/26/03 1040 Sample ID/TR #: TMW 27 00823

Sampler's signature/date: Leonard M. [illegible] 3/26/03

Reviewer's signature/date: [illegible] 4/24/03

PMC Environmental

FORT WINGATE DEPOT ACTIVITY
LOW FLOW WELL SAMPLING DATA FORM

Well Number: TMW27
Start Date: 3/26/03
Start Time: 850

Well Casing Diameter (in): 2"
Bore Hole Diameter (in): 8"
Annular Space (AS) Length (ft): 14
Screened Interval (ft bgs): 60-70

Well TD: 73.26
Well DTW: 28.74
Water Column: 44.52
Pump Intake (ft ~~bgs~~ toc): 68'

WELL VOLUME CALCULATION

Gallons per foot of annular space (from chart on back)	=	.73
Column of water or length of AS (whichever is less)	X	14
Volume of water in AS (gal)	=	10.22
Gallons per foot of casing (from chart on back)	=	.1632
Column of water	X	44.52
Volume of water in casing (gal)	=	7.26
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	17.48
ACTUAL VOLUME PURGED (gal) 4.44/3.785	=	1.1731

Method of Purging : Low Flow Bladder Pump

Time	Minutes Elapsed	Flow Rate (mL/min)	Cumulative Volume (L)	DTW (ft toc)	pH	Cond. (µS/cm)	Temp. (C)	Turbidity (NTU)	Redox (mV)	DO (mg/L)
1015	85	80	3.04	29.22	7.69	1574	13.40	20	17.0	.58
1020	90	60	3.34	29.22	7.70	1567	13.72	20	24.7	.53
1025	95	70	3.69	29.08	7.72	1575	13.71	19	52.3	.41
1030	100	75	4.065	29.11	7.70	1577	13.11	18	34.8	.41
1035	105	75	4.44	29.09	7.70	1567	12.99	20	21.9	.42
				Δ=0.35						
				high	OK	OK	high	OK	v. high	ok

Purging Field Notes: Pump Settings: Fill 25 secs, Discharge 5 secs, Pressure 40 psi

Sampled: Explosives, TCL VOC's, TAL Total Metals, TAL Dissolved Metals
Nitrate/Nitrite Nonspecific, Total Nitrate, Perchlorate,

Sample Date/Time: 3/26/03 1040 Sample ID/TR #: TMW27 00823

Sampler's signature/date: Leonard M. Salvato 3/26/03

Reviewer's signature/date: [signature] 4/24/03

PMC Environmental

FORT WINGATE DEPOT ACTIVITY
WELL SAMPLING DATA FORM

Well Number: TMW28
Start Date: 03/25/2003
Start Time: 1100

Well Casing Diameter (in): 2
Bore Hole Diameter (in): 8
Annular Space (AS) Length (ft): 12

Well TD = 50.30
Well DTW = 17.56
Water Column = 32.74

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back) = ~~0.1632~~ 0.73
Column of water or length of AS (whichever is less) X ~~32.74~~ 12.0
Volume of water in AS (gal) = ~~5~~ 8.76

Gallons per foot of casing (from chart on back) = 0.1632
Column of water X 32.74
Volume of water in casing (gal) = 5.34

ONE EQUIVALENT VOLUME [EV] (AS + casing, gal) = 14.1

Number of EV to be purged X 5

TOTAL VOLUME TO BE PURGED (gal) = 70.5

ACTUAL VOLUME PURGED (gal) = 75.7

slowed pump ↓ to sample

Method of Purging: QED Bladder Pump

Field Parameters	03/25/03	03/25/03	03/25/03	03/25/03	03/25 Reading	03/25	3/26	3/26	3/26	3/26
Time	1207	1338	1410	1456	1530	1615	0800	0815	0844	Final
Volume (gal)	0	5	14	30	45	60	60	65.6	75.7	Sample
Flow Rate (gpm)	–	0.17	0.35	0.40	0.45	0.35	0.37	0.34	0.35	N/A
DTW (ft toc)	17.29	21.50	25.25	28.78	29.08	29.15	17.08	24.57	21.20	20.03
pH	–	7.31	7.32	7.38	7.47	8.20	6.85	7.00	7.16	7.12
Conductivity (µS/cm)	–	1332	1,265	1,263	1,225	1,200	1,337	1,329	1,329	1,323
Temperature (C)	–	11.52	11.45	11.47	11.42	11.38	11.04	11.13	10.95	11.01
Turbidity (NTU)	–	50	20	10	9.1	8.7	180	27	100	13
Eh/Redox (mV)	–	66.2	54.6	47.5	53.5	20.1	131.2	146.5	71.7	79.3
DO (mg/L)	–	0.20	0.28	0.16	0.16	0.16	0.32	0.33	0.21	0.26

Purging Field Notes:
Start purging w/ QED Bladder pump. ~~Not able to sustain high enough flow~~ GAH (03/25/03)
Pump settings: Discharge = 2.0 sec, Refill = 2.5 sec, Pressure = 65 psi
Stop purging @ 1615 on 03/25/2003.
Problem w/ Pump @ 0820 3/26/03 – would quit pumping

Sample Date/Time: 3/26/03 / 0845 Sample ID/TR #: TMW28/00822

Sampler's signature/date: [signature] 3/26/03

Reviewer's signature/date: [signature] 4/24/03

FORT WINGATE DEPOT ACTIVITY WELL SAMPLING DATA FORM

Well Number: TMW29
Start Date: 03/27/2003
Start Time: 1040

Well Casing Diameter (in): 2
Bore Hole Diameter (in): 8
Annular Space (AS) Length (ft): 12

Well TD = 61.65
Well DTW = 56.78
Water Column = 4.87

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back)	=	0.73
Column of water or length of AS (whichever is less)	X	4.87
Volume of water in AS (gal)	=	3.6
Gallons per foot of casing (from chart on back)	=	0.1632
Column of water	X	4.87
Volume of water in casing (gal)	=	0.8
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	4.4
Number of EV to be purged	X	5
TOTAL VOLUME TO BE PURGED (gal)	=	22
ACTUAL VOLUME PURGED (gal)	=	7.0

Method of Purging : Bailer

Field Parameters	03/27/03	03/27	03/27	03/28/03	03/28 Reading					
Time	1038	1308	1435	0835	0956					Final
Volume (gal)	0.25	2.75	4.25	5.25	6.25					Sample
Flow Rate (gpm)	0.25	0.25	0.25	0.25	0.33					N/A
DTW (ft toc)	NM	NM	NM	NM	NM					NM
pH	8.83	8.45	8.42	8.31	8.34					8.26
Conductivity (μS/cm)	2,020	2,070	2,093	2,147	2,110					2,219
Temperature (C)	11.19	11.47	11.63	11.32	10.20					12.43
Turbidity (NTU)	>999	100	89	97	88					137
Eh/Redox (mV)	182.0	190.5	173.9	205.0	266.5					162.1
DO (mg/L)	4.58	3.96.	4.97	4.80	5.89					6.70

Purging Field Notes: Purged dry at 1046 (03/27/03) after 1.75 gallons. Start purging @ 1300 (03/27). Purged dry @ 1340 (03/27) after 3.0 total gallons. Start purging @ 1430 (03/27/03). Purged dry @ 1435 (03/27) after 4.25 gallons total. Start purging @ 0830 (03/28/03). Purged dry @ 0838 (03/28/03) after 6.0 gallons total. Start purging @ 0953 (03/28/03). Purged dry @ 1000 (03/28/03) after 6.75 total gallons. Sampled for expanded list explosives, TCL VOCs, Total and dissolved TAL Metals, Total nitrate, nitrate/nitrite-nonspecific, perchlorate, and Extra Volume

Sample Date/Time: 03/28/03/1315
Sample ID/TR #: TMW29/TR# 00836

Sampler's signature/date: [signature] 03/28/2003

Reviewer's signature/date: [signature] 4/24/03

FORT WINGATE DEPOT ACTIVITY
WELL SAMPLING DATA FORM

Well Number: FW10
Start Date: 03/31/03
Start Time: 1000

Well Casing Diameter (in): 4
Bore Hole Diameter (in): 10
Annular Space (AS) Length (ft): 42 (Approx)

Well TD = 50.91
Well DTW = 48.88
Water Column = 2.03

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back)	=	1.03
Column of water or length of AS (whichever is less)	X	2.03
Volume of water in AS (gal)	=	2.10
Gallons per foot of casing (from chart on back)	=	0.6528
Column of water	X	2.03
Volume of water in casing (gal)	=	1.27
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	3.37
Number of EV to be purged	X	5
TOTAL VOLUME TO BE PURGED (gal)	=	16.85
ACTUAL VOLUME PURGED (gal)	=	1.75

Method of Purging : Bailer

Field Parameters	03/31	Reading								
Time	1010	1019								Final Sample
Volume (gal)	0.2	1.5								
Flow Rate (gpm)	0.2	0.2								N/A
DTW (ft toc)	NM	NM								
pH	7.42	7.43								
Conductivity (μS/cm)	7,039	7,290								
Temperature (C)	13.69	13.19								
Turbidity (NTU)	7.83	11.1								
Eh/Redox (mV)	319.2	337.1								
DO (mg/L)	5.64	6.43								

Purging Field Notes: Bailed dry @ 1020 (03/31/03) after 1.75 gallons.
1515 (03/31/03) - Not enough water to bail.

Collected 1/2 liter for explosives 4/3/03, only ~6" H_2O in well.
Collected Remaining volume for explosives 4/3/03
Collected 1/2 - 250ml perchlorate 4/4/03.

Sample Date/Time: 4/3/03/0830

Sample ID/TR #: FW10/00854

Sampler's signature/date: A Deeter 4/3/03

Reviewer's signature/date: A Deeter 4/24/03

WELL SAMPLING DATA FORM

Well Number: FW38 Date: 2/7/97 Time: 1440 TD = 15 ?

Boring Number: FW38 Well casing diameter: ______ DTW = 7.23

Annular space length: ______ Stickup: ______ Column: ______

COLUMN OF WATER IN WELL

Gallons per foot of annular space (A.S.)	= 0.73
Column of water or length of A.S. (whichever is less)	x 7.7
Volume of annular space	= 5.6
Gallons per foot of casing	= 0.1632
Column of water	x 7.7
Volume of casing	= 1.2
TOTAL VOLUME (A.S. + Casing)	= 6.8
Number of volumes to be evacuated	= 5
Total volume to be evacuated	= 34
TOTAL VOLUME PURGED	= 2gallons

Method of purging: Disposible bailer

Sample date/time: 2/10/97 1730 Explosives Sample Number: FW3802 5011

FIELD PARAMETERS	UNITS	READING #1	#2	#3	#4	#5		
VOL REMOVED	GAL	.25	1					
pH		7.12	7.10					
Conductivity	µMHOS	1500	1500					
Temperature	°C	6.6	7.8					
TURBIDITY	NTU	>200	115					

Sampler's signature/date: Kathleen E Hoffman 2/18/97 (EL, MV, 52, 73.7, 00)

Reviewer's signature/date: ______

2/7 1440 Dry (Bail) .75gal

2/8 1150 Dry 1.25gal

2/10 1730 Collect 2 1l explosives

2/10 1045 Collect TDS

ERM

FORT WINGATE DEPOT ACTIVITY
LOW FLOW WELL SAMPLING DATA FORM

Well Number: MW1
Start Date: 4/1/03
Start Time: 810

Well Casing Diameter (in): 4.0"
Bore Hole Diameter (in): 10.5"
Annular Space (AS) Length (ft): ~22'
Screened Interval (ft bgs): 33.6-53.6
Well TD: 54.66
Well DTW: 39.70
Water Column: 14.96
Pump Intake (ft ~~bgs~~ toc): 48'

WELL VOLUME CALCULATION

Gallons per foot of annular space (from chart on back) = 1.03
Column of water or length of AS (whichever is less) X 14.96
Volume of water in AS (gal) = 15.41
Gallons per foot of casing (from chart on back) = .6528
Column of water X 14.96
Volume of water in casing (gal) = 9.765
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal) = 25.175
ACTUAL VOLUME PURGED (gal) 2.6/3.785 = .6869

Method of Purging : Low Flow Bladder Pump

Time	Minutes Elapsed	Flow Rate (mL/min)	Cumulative Volume (L)	DTW (ft toc)	pH	Cond. (µS/cm)	Temp. (C)	Turbidity (NTU)	Redox (mV)	DO (mg/L)
810	0	0	0	39.19	NM	NM	NM	NM	NM	NM
815	5	100	.5	40.35	7.48	3773	15.87	75	73.2	3.08
820	10	45	.725	41.49	7.33	3842	15.17	75	77.0	1.69
825	15	55	1	41.41	7.33	3839	15.04	70	76.9	1.70
830	20	40	1.2	41.49	7.33	3832	14.92	70	77.7	1.63
835	25	45	1.425	41.49	7.33	3829	14.98	80	77.5	1.61
840	30	40	1.625	41.51	7.34	3823	15.06	140	78.6	1.47
845	35	40	1.825	41.45	7.34	3823	15.16	190	79.3	1.42
850	40	45	2.05	41.41	7.34	3821	15.21	210	78.8	1.42
855	45	35	2.225	41.41	7.35	3821	15.22	210	79.6	1.36
900	50	35	2.4	41.41	7.36	3820	15.27	210	79.5	1.38
905	55	40	2.6	41.41	7.36	3820	15.33	170	80.0	1.36
				ΔH=1.71 ft						
				V. High	OK	OK	OK	High	OK	OK

Purging Field Notes: Pump Settings: Fill 55 secs, Discharge 5 secs, Pressure 27 psi

Sampled: TCL VOC's, TCL Pesticides, Nitrate/Nitrite, Total Nitrate
Perchlorate
NM = Not Measured

Sample Date/Time: 4/1/03 910 Sample ID/TR #: MW1 0085I

Sampler's signature/date: [signature] 4/1/03

Reviewer's signature/date: [signature] 4/26/03

FORT WINGATE DEPOT ACTIVITY
LOW FLOW WELL SAMPLING DATA FORM

Well Number: MW2
Start Date: 4/1/03
Start Time: 1035
Well TD: 49.33
Well DTW: 35.47
Water Column: 13.86
Pump Intake (ft ~~bgs~~ toc): 45'

Well Casing Diameter (in): 2"
Bore Hole Diameter (in): 10.5"
Annular Space (AS) Length (ft): ~12'
Screened Interval (ft bgs): 37-47

WELL VOLUME CALCULATION

Gallons per foot of annular space (from chart on back) = 1.17
Column of water or length of AS (whichever is less) X 12
Volume of water in AS (gal) = 14.04
Gallons per foot of casing (from chart on back) = .1632
Column of water X 13.86
Volume of water in casing (gal) = 2.26
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal) = 16.3
ACTUAL VOLUME PURGED (gal) 3.1/3.785 = = .819

Method of Purging : Low Flow Bladder Pump

Time	Minutes Elapsed	Flow Rate (mL/min)	Cumulative Volume (L)	DTW (ft toc)	pH	Cond. (μS/cm)	Temp. (C)	Turbidity (NTU)	Redox (mV)	DO (mg/L)
1035	0	0	0	35.04	NM	NM	NM	NM	NM	NM
1040	5	90	.45	37.39	6.83	2001	15.17	130	19.7	1.23
1045	10	55	.725	37.45	6.77	2007	15.23	90	36.0	1.04
1050	15	55	1	37.45	6.77	2014	15.05	95	49.8	1.06
1055	20	60	1.3	37.45	6.77	2010	15.06	85	56.9	.99
1100	25	60	1.6	37.45	6.76	2008	15.08	75	61.1	.97
1105	30	65	1.925	37.45	6.76	2007	15.15	70	64.1	.94
1110	35	55	2.2	37.45	6.77	2007	15.27	56	62.8	.92
1115	40	60	2.5	37.45	6.77	2009	15.29	33	59.3	.92
1120	45	60	2.8	37.45	6.77	1999	15.36	29	42.2	.89
1125	50	60	3.1	37.45	6.78	1998	15.43	25	24.7	.89
				Δft=1.98ft						
				V High	OK	OK	OK	high	V. High	OK

Purging Field Notes: Pump Settings: Fill 53 secs, Discharge 7 secs, Pressure 27 psi

Sampled: TCL VOC's, TCL Pesticides, Nitrate/Nitrite, Total Nitrate
Perchlorate

Sample Date/Time: 4/1/03 1130 Sample ID/TR#: MW2 60852

Sampler's signature/date: Leonard M. Dalton 4/1/03

Reviewer's signature/date: [signature] 4/24/03

FORT WINGATE DEPOT ACTIVITY
LOW FLOW WELL SAMPLING DATA FORM

Well Number: MW3
Start Date: 3/31/03
Start Time: 1320
Well TD: 56.11
Well DTW: 45.02
Water Column: 11.09
Pump Intake (ft ~~bgs~~ toc): 54'

Well Casing Diameter (in): 2
Bore Hole Diameter (in): 10.5
Annular Space (AS) Length (ft): ~ 12
Screened Interval (ft bgs): 43-53

WELL VOLUME CALCULATION

Gallons per foot of annular space (from chart on back)	=	1.17
Column of water or length of AS (whichever is less)	X	11.09
Volume of water in AS (gal)	=	12.98
Gallons per foot of casing (from chart on back)	=	.1632
Column of water	X	11.09
Volume of water in casing (gal)	=	1.81
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	14.79
ACTUAL VOLUME PURGED (gal) 3.775	=	.997

Method of Purging: Low Flow Bladder Pump

Time	Minutes Elapsed	Flow Rate (mL/min)	Cumulative Volume (L)	DTW (ft toc)	pH	Cond. (µS/cm)	Temp. (C)	Turbidity (NTU)	Redox (mV)	DO (mg/L)
1320	0	0	0	45.20	NM	NM	NM	NM	NM	NM
1325	5	85	.425	45.16	7.21	4907	17.26	150	54.7	3.69
1330	10	75	.8	45.21	7.10	5141	15.73	800	64.1	2.21
1335	15	85	1.225	45.19	7.09	5122	15.90	550	64.1	1.44
1340	20	70	1.575	45.19	7.09	5124	15.82	320	63.7	1.21
1345	25	75	1.95	45.15	7.09	5041	15.99	160	61.9	1.15
1350	30	75	2.325	45.15	7.11	5033	15.96	110	61.4	1.11
1355	35	75	2.7	45.14	7.11	5029	15.68	60	61.4	1.06
1400	40	70	3.05	45.14	7.11	5002	15.58	50	61.1	1.05
1405	45	70	3.4	45.14	7.11	4944	15.67	39	60.7	1.04
1410	50	75	3.775	45.14	7.12	4927	15.53	36	60.7	1.0
				ΔH=0.12						
				OK	OK	OK	OK	high	OK	OK

Purging Field Notes: Pump Settings: Fill 11 secs, Discharge 9 secs, Pressure 25 psi

Sampled: TCL VOC's, TCL Pesticides, Nitrate/Nitrite, Total Nitrate Perchlorate

Sample Date/Time: 3/31/03 1415 Sample ID/TR #: MW3 00853

Sampler's signature/date: Leonard M. Haldeu 3/31/03

Reviewer's signature/date: A Deetz 4/24/03

PMC Environmental

FORT WINGATE DEPOT ACTIVITY
LOW FLOW WELL SAMPLING DATA FORM

Well Number: MW18D
Start Date: 3/28/03
Start Time: 800
Well TD: 59.90
Well DTW: 41.09
Water Column: 18.81
Pump Intake (ft ~~bgs~~ toc): 55'

Well Casing Diameter (in): 2"
Bore Hole Diameter (in): 8"
Annular Space (AS) Length (ft): 13'
Screened Interval (ft bgs):

WELL VOLUME CALCULATION
Gallons per foot of annular space (from chart on back) = .73
Column of water or length of AS (whichever is less) X 13
Volume of water in AS (gal) = 9.49
Gallons per foot of casing (from chart on back) = .1632
Column of water X 18.81
Volume of water in casing (gal) = 3.0697
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal) = 12.55
ACTUAL VOLUME PURGED (gal) 2.975/3.785 = .78599

Method of Purging : Low Flow Bladder Pump

Time	Minutes Elapsed	Flow Rate (mL/min)	Cumulative Volume (L)	DTW (ft toc)	pH	Cond. (µS/cm)	Temp. (C)	Turbidity (NTU)	Redox (mV)	DO (mg/L)
800	0	0	0	41.69	NM	NM	NM	NM	NM	NM
805	5	190	.95	41.91	NM	NM	NM	NM	NM	NM
810	10	190	1.9	42.49	7.28	8382	10.43	9.9	204.8	4.02
815	15	0	1.9	43.29	7.23	8709	11.60	NM	201.4	2.47
820	20	30	2.05	43.31	7.25	8851	9.40	7.3	196.4	2.25
825	25	20	2.15	43.39	7.23	8752	8.13	7.4	194.4	2.13
830	30	20	2.25	43.38	7.24	8845	6.95	6.5	192.3	1.88
835	35	15	2.325	43.38	7.24	8687	6.45	6.1	190.5	1.79
840	40	20	2.425	43.38	7.24	8670	6.12	5.7	188.5	1.75
845	45	10	2.475	43.42	7.25	8611	6.32	5.2	185.7	1.75
850	50	20	2.575	43.42	7.27	8657	6.06	5.5	184.2	1.71
855	55	20	2.675	43.43	7.26	8572	6.19	5.0	182.2	1.66
900	60	20	2.775	43.43	7.27	8517	6.41	5.7	180.1	1.69
905	65	20	2.875	43.43	7.27	8500	6.51	NM	178.6	1.64
910	70	20	2.975	43.44	7.27	8435	6.97	5.2	176.3	1.61
				ΔH= 2.354 v. High	OK	OK	high	OK	OK	OK

Purging Field Notes: Pump Settings: Fill 20 secs, Discharge 10 secs, Pressure 30 psi

Sampled: TCL VOC's, TCL Pesticides, Nitrate/Nitrite, Total Nitrate, Perchl

Flow Rate may have been higher some leak through top of YSI NM=Not Measured

Sample Date/Time: 3/28/03 915 Sample ID/TR #: MW18D

Sampler's signature/date: Leonard W. [signature] 3/28/03

Reviewer's signature/date: S Dett 4/24/03

Parent 00844
Field Duplicate 00845
Matrix Spike 00846
Matrix Spike Duplicate 00847
RNSW0200848

FORT WINGATE DEPOT ACTIVITY
LOW FLOW WELL SAMPLING DATA FORM

Well Number: MW-20
Start Date: 3/28/03 3/31/03 PU 755
Start Time: 0713

Well Casing Diameter (in): 2.0
Bore Hole Diameter (in): 8"
Annular Space (AS) Length (ft): 13
Screened Interval (ft bgs): 49.38-59.38

Well TD: 59.40
Well DTW: 44.19
Water Column: 15.21
Pump Intake (ft bgs): 52.5 ft (55 ft TOC)

WELL VOLUME CALCULATION

Gallons per foot of annular space (from chart on back)	=	.73
Column of water or length of AS (whichever is less)	X	13
Volume of water in AS (gal)	=	9.49
Gallons per foot of casing (from chart on back)	=	.1632
Column of water	X	15.21
Volume of water in casing (gal)	=	2.48
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	11.97
ACTUAL VOLUME PURGED (gal) 3.325 / 3.785	=	.87846

Method of Purging : QED MicroPurge Low Stress

Time	Minutes Elapsed	Flow Rate (mL/min)	Cumulative Volume (L)	DTW (ft toc)	pH	Cond. (µS/cm)	Temp. (C)	Turbidity (NTU)	Redox (mV)	DO (mg/L)
755	0	0	0	44.28	NM	NM	NM	NM	NM	NM
800	5	20	.10	44.22	NM	NM	NM	NM	NM	NM
805	10	20	.20	44.21	NM	NM	NM	NM	NM	NM
810	15	20	.30	44.22	NM	NM	NM	NM	NM	NM
815	20	20	.40	44.21	NM	NM	NM	NM	NM	NM
820	25	50	.65	44.31	6.93	19318	9.86	NM	171.1	4.18
825	30	55	.925	44.32	6.83	19632	11.19	7.0	171.1	4.02
830	35	55	1.2	44.32	6.79	19929	11.90	3.2	169.5	3.70
835	40	40	1.4	44.32	6.79	20111	12.34	1.7	167.9	3.56
840	45	65	1.725	44.32	6.78	20241	12.48	.90	166.6	3.43
845	50	60	2.025	44.32	6.79	20171	12.73	.75	165.3	3.36
850	55	65	2.35	44.32	6.79	20184	12.90	.45	163.6	3.16
855	60	65	2.675	44.32	6.79	20229	12.93	.05	162.3	3.13
900	65	65	3	44.32	6.79	20246	12.98	.20	161.1	3.05
905	70	65	3.325	44.32	6.79	20251	13.08	.25	160.0	3.05
LS ~~910~~	~~75~~			DH=0.13 ok	ok	ok	ok	high	ok	ok

Purging Field Notes: Pump Settings: Fill 25 secs, Discharge 5 secs, Pressure 70 Ft H2O ~~psi~~

Sampled: TCL VOC's, TCL Pesticides, Nitrate/Nitrite, Total Nitrate Perchlorate

Sample Date/Time: 3/31/03 910 Sample ID/TR #: MW20 00843

Sampler's signature/date: [signature] 3/28/03

Reviewer's signature/date: [signature] 4/24/03

FORT WINGATE DEPOT ACTIVITY
LOW FLOW WELL SAMPLING DATA FORM

Well Number: MW22D
Start Date: 3/31/03
Start Time: 1040

Well Casing Diameter (in): 2
Bore Hole Diameter (in): 8
Annular Space (AS) Length (ft): 13
Screened Interval (ft bgs): 47-57
Well TD: 58.62'
Well DTW: 40.52'
Water Column: 18.1
Pump Intake (ft ~~bgs~~ toc): 54'

WELL VOLUME CALCULATION

Gallons per foot of annular space (from chart on back)	=	.73
Column of water or length of AS (whichever is less)	X	13
Volume of water in AS (gal)	=	9.49
Gallons per foot of casing (from chart on back)	=	.1632
Column of water	X	18.1
Volume of water in casing (gal)	=	2.95
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	12.44
ACTUAL VOLUME PURGED (gal) 9.675/3.785	=	2.556

Method of Purging: Low Flow Bladder Pump

Time	Minutes Elapsed	Flow Rate (mL/min)	Cumulative Volume (L)	DTW (ft toc)	pH	Cond. (µS/cm)	Temp. (C)	Turbidity (NTU)	Redox (mV)	DO (mg/L)
1040	0	0	0	40.61	NM	NM	NM	NM	NM	NM
1045	5	100	.5	40.50	NM	NM	NM	NM	NM	NM
1050	10	160	1.3	40.66	7.21	5691	15.36	29	99.9	3.51
1055	15	140	2	40.65	7.03	6991	15.36	55	103.0	1.84
1100	20	145	2.725	40.65	7.03	6969	15.38	50	102.5	1.64
1105	25	140	3.425	40.65	7.03	6704	15.37	37	100.7	1.54
1110	30	135	4.1	40.65	7.04	6350	15.38	36	98.4	1.42
1115	35	140	4.8	40.65	7.04	6224	15.37	35	98.6	1.37
1120	40	145	5.525	40.65	7.05	6087	15.33	30	97.2	1.35
1125	45	140	6.225	40.66	7.06	5872	15.33	28	95.3	1.26
1130	50	140	6.925	40.66	7.06	5778	15.32	25	95.1	1.23
1135	55	135	7.6	40.66	7.06	5669	15.32	18	94.3	1.25
1140	60	140	8.3	40.66	7.06	5612	15.38	16	94.2	1.23
1145	65	135	8.975	40.66	7.07	5551	15.41	13	93.2	1.22
1150	70	140	9.675	40.[illegible]	7.07	5508	15.40	12	93.0	1.21
				ΔH=0.14 ft OK	OK	OK	OK	high	OK	OK

Purging Field Notes: Pump Settings: Fill 11 secs, Discharge 4 secs, Pressure 30 psi

Sampled: TCL VOL's, TCL Pesticides, Nitrate/Nitrite, Total Nitrate, Perchlorate

Sample Date/Time: 3/31/03 1200 Sample ID/TR #: MW22D 00850

Sampler's signature/date: [signature] 3/31/03

Reviewer's signature/date: [signature] 4/24/03

PMC Environmental

FORT WINGATE DEPOT ACTIVITY WELL SAMPLING DATA FORM

Well Number: MW22S
Start Date: 03/31/03
Start Time: 1050

Well Casing Diameter (in): 2
Bore Hole Diameter (in): 8
Annular Space (AS) Length (ft): 13

Well TD = 43.54
Well DTW = 40.48
Water Column = 3.06

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back)	=	0.73
Column of water or length of AS (whichever is less)	X	3.06
Volume of water in AS (gal)	=	2.23
Gallons per foot of casing (from chart on back)	=	0.1632
Column of water	X	3.06
Volume of water in casing (gal)	=	0.50
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	2.73
Number of EV to be purged	X	5
TOTAL VOLUME TO BE PURGED (gal)	=	13.65
ACTUAL VOLUME PURGED (gal)	=	6.25

Method of Purging : Bailer

Field Parameters	03/31/03	03/31	03/31	04/01/03	Reading					
Time	1332	1349	1554	0920						Final
Volume (gal)	0.25	1.5	2.5	3.75						Sample
Flow Rate (gpm)	0.25	0.25	0.25	0.25						N/A
DTW (ft toc)	NM	NM	NM	NM						
pH	7.12	7.32	7.32	7.06						
Conductivity (μS/cm)	3,830	3,892	3,993	4,082						
Temperature (C)	16.26	14.85	15.38	14.51						
Turbidity (NTU)	11.1	125	107	115						
Eh/Redox (mV)	377.9	343.5	336.5	349.4						
DO (mg/L)	3.93	5.83	5.93	5.67						

Purging Field Notes: Purged dry @ 1349 (03/31) after 1.5 gallons. Start purging @ 1549 (03/31/03). Purged dry @ 1554 (03/31/03) after 2.5 total gallons. Start purging @ 0915 (04/01/03). Bailed dry @ 0920 (04/01/03) after 3.75 total gallons. Start purging @ 1605 (04/01/03). Bailed dry @ 1610 (04/01/03) after a total of 4.75 gallons.
Bailed Dry after ~1.50 gals on 4/2/03 @ 1615
Collected VOCs, Pesticides, Nitrate/Nitrite, Nitrate, and perchlorate.

Sample Date/Time: 4/3/03 / 855
Sample ID/TR #: MW22S / 00849

Sampler's signature/date: [signature] 4/3/03

Reviewer's signature/date: [signature] 4/24/03

FORT WINGATE DEPOT ACTIVITY
LOW FLOW WELL SAMPLING DATA FORM

Well Number: SMW01
Start Date: 3/26/03
Start Time: 1250
Well Casing Diameter (in): 2
Bore Hole Diameter (in): 8
Annular Space (AS) Length (ft): 23.31
Screened Interval (ft bgs): 29.9- 49.9
Well TD: 52.15
Well DTW: 30.20
Water Column: 21.95
Pump Intake (ft ~~bgs~~ toc): 40'

WELL VOLUME CALCULATION

Gallons per foot of annular space (from chart on back)	=	.73
Column of water or length of AS (whichever is less)	X	8
Volume of water in AS (gal)	=	5.84
Gallons per foot of casing (from chart on back)	=	.1632
Column of water	X	21.95
Volume of water in casing (gal)	=	3.58
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	9.42
ACTUAL VOLUME PURGED (gal) 8.2/3.785	=	2.16

Method of Purging : Low Flow Bladder Pump

Time	Minutes Elapsed	Flow Rate (mL/min)	Cumulative Volume (L)	DTW (ft toc)	pH	Cond. (µS/cm)	Temp. (C)	Turbidity (NTU)	Redox (mV)	DO (mg/L)
1250	0	0	0	30.11	NM	NM	NM	NM	NM	NM
1255	5	145	.725	30.11	7.66	2319	14.22	1.5	99.6	4.94
1300	10	125	1.35	30.11	7.62	2378	13.41	1.3	75.8	1.10
1305	15	170	2.2	30.11	7.62	2399	13.24	.90	83.8	1.74
1310	20	145	2.925	30.11	7.63	2407	13.33	.90	92.0	1.88
1315	25	165	3.75	30.11	7.65	2427	12.97	.40	92.9	2.12
1320	30	160	4.55	30.11	7.65	2426	12.95	.35	94.2	2.04
1325	35	165	5.375	30.11	7.65	2436	12.90	.35	97.2	1.96
1330	40	165	6.2	30.11	7.65	2425	13.05	.40	98.2	1.80
1335	45	160	7	30.11	7.66	2408	13.00	.65	98.4	1.75
1340	50	40 NM LS	7.2	NM	NM	NM	NM	NM	NM	NM
1350	60	40	7.4	32.12	7.67	2401	14.03	.80	95.1	1.58
1355	65	40	7.6	32.03	7.68	2400	14.71	.25	102.2	1.51
1400	70	40	7.8	32.03	7.69	2397	15.07	.05	102.1	1.53
1405	75	40	8	31.90	7.68	2398	15.30	.00	101.8	1.52
1410	80	40	8.2	31.85	7.67	2394	15.48	.00	104.4	1.21

WATER LEVEL Meter Working inappropriately. •Pump Set in Screen, Water drips on Meter

Purging Field Notes: Δt=1.655 v. High 24 OK OK OK 26 LS OK high
Pump Settings: Fill ~~12~~ 24 secs, Discharge ~~24~~ 6 secs, Pressure ~~25~~ psi 25 PSI

Sampled: Pesticides, Nitrate/Nitrite, Total Nitrate, Perchlorate

Sample Date/Time: 3/26/03 1415 Sample ID/TR #: SMW01 00825
Sampler's signature/date: Leonard M... 3/26/03
Reviewer's signature/date: A Delta 4/24/03

PMC Environmental

FORT WINGATE DEPOT ACTIVITY
WELL SAMPLING DATA FORM

Well Number: Wingate 89
Start Date: 3/25/03
Start Time: 1030

Well Casing Diameter (in): 12.8''
Bore Hole Diameter (in): 12.8"
Annular Space (AS) Length (ft): NA

Well TD = 102.43
Well DTW = 15.37
Water Column = 87.06

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back) = NA
Column of water or length of AS (whichever is less) X 87.06
Volume of water in AS (gal) = NA

Gallons per foot of casing (from chart on back) = 5.8748
Column of water X 87.06
Volume of water in casing (gal) = 511.4600

ONE EQUIVALENT VOLUME [EV] (AS + casing, gal) = 511.46

Number of EV to be purged X 3

TOTAL VOLUME TO BE PURGED (gal) = 1534.38

ACTUAL VOLUME PURGED (gal) = 1580

Method of Purging: 2" Grunfos

Field Parameters	Reading			*					Final Sample
Time	1030	1050	1120	1150	1220	1250	1320		
Volume (gal)	0	200	500	800	1100	1340	1580		
Flow Rate (gpm)	10	10	10	10	8	8	off		N/A
DTW (ft toc)	15.26	32.80	48.0	56.50	61.75	62.0	62.40		
pH	8.16	8.08	7.98	7.99	8.14	7.94	7.91		7.93
Conductivity (μS/cm)	1339	1324	1316	1320	1199	1307	1333		1190
Temperature (C)	14.25	14.27	15.77	16.52	17.90	15.44	15.15		14.67
Turbidity (NTU)	45	56	45	28	32	26	45		65
Eh/Redox (mV)	-110.7	-122.4	-91.4	-62.7	-160.6	-52.5	-33.4		-22.7
DO (mg/L)	2.90	1.63	4.30	1.39	.99	1.18	1.46		2.44

Purging Field Notes: Pump Intake 97.0'
Sampled: Explosives, TCL VOC's, TAL total Metals, TAL Dissolved Me
Nitrate/Nitrite Non Specific, Total Nitrate, Perchlorate, Extra Volum
* Pump was pulled up to 64' at 1220

Sample Date/Time: 3/25/03
Sample ID/TR #: Wingate 89 00821

Sampler's signature/date: Leonard M. [signature] 3/25/03

Reviewer's signature/date: S. Dette 4/24/03

FORT WINGATE DEPOT ACTIVITY
WELL SAMPLING DATA FORM

Well Number: Wingate 90
Start Date: 10/31/02
Start Time: 825

Well Casing Diameter (in): 8.6
Bore Hole Diameter (in): ND
Annular Space (AS) Length (ft): N/A

Well TD = 99.14 ft toc.
Well DTW = 14.04 ft toc.
Water Column = 85.10 ft
PumpIntake; 92

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back)	=	NA
Column of water or length of AS (whichever is less)	X	85.10
Volume of water in AS (gal)	=	NA
Gallons per foot of casing (from chart on back)	=	2.6110
Column of water	X	85.10
Volume of water in casing (gal)	=	222.19
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	~~215~~
Number of EV to be purged	X	5
TOTAL VOLUME TO BE PURGED (gal)	=	1110.98
ACTUAL VOLUME PURGED (gal)	=	1215

Method of Purging : 4" Grundfos Pump

Field Parameters	Reading 915									
Time	825	835	845	855	905	915	925	935	945	Final
Volume (gal)	15	165	315	465	615	765	915	1065	1215	Sample
Flow Rate (gpm)	15	15	15	15	15	15	15	15	15	N/A.
DTW (ft toc)	22.10	23.84	24.19	24.95	24.81	25.01	25.08	25.36	25.49	25.53
pH	8.43	8.12	8.29	8.14	8.30	8.29	7.99	8.04	8.25	8.25
Conductivity (µS/cm)	1245	1234	1236	1238	1225	1237	1236	1236	1243	1234
Temperature (C)	11.38	12.13	12.17	11.93	12.12	12.02	11.72	12.27	12.11	12.52
Turbidity (NTU)	10	650	95	85	65	55	45	30	28	40
Eh/Redox (mV)	108.7	14.3	-16.9	2.4	-43.6	-17.9	20.2	19.6	19.6	19.0
DO (mg/L)	6.73	7.86	6.90	5.99	7.37	7.82	7.76	7.66	8.50	8.46

Purging Field Notes: PumpIntake: 92'

Parameters:
TEL Explosive
TCL VOC's
TAL Total Met
Nitrate/Nitrite
Total Nitrate
Perchlorat
ExtraVolum

Sample Date/Time: 10/31/02 1000
Sample ID/TR #: OWingate90, 00734
00727 FD
00728 MS
00729 MSD

Sampler's signature/date: Leonard M. [signature] 10/31/02

Reviewer's signature/date: [signature] 11/21/02

FORT WINGATE DEPOT ACTIVITY
WELL SAMPLING DATA FORM

Well Number: Wingate 91
Start Date: 3/24/03
Start Time: 1150

Well Casing Diameter (in): 12"
Bore Hole Diameter (in): —
Annular Space (AS) Length (ft): N/A

Well TD = 113.12 ft.
Well DTW = 14.39 ft.
Water Column = 98.73 Ft

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back)	=	NA
Column of water or length of AS (whichever is less)	X	98.73
Volume of water in AS (gal)	=	NA
Gallons per foot of casing (from chart on back)	=	5.8748
Column of water	X	98.73 ~~ft~~
Volume of water in casing (gal)	=	580.019
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	580.019
Number of EV to be purged	X	~~5~~ 3
TOTAL VOLUME TO BE PURGED (gal)	=	1740
ACTUAL VOLUME PURGED (gal)	=	1870

Method of Purging : 2" Grundfos Pump

Field Parameters	Reading									
Time	1153	1203	1223	1243	1253	1313	1323	1343	1353	Final
Volume (gal)	0	40	120	200	280	420	490	610	670	Sample
Flow Rate (gpm)	4	4	4	8	7	7	6	6	4	N/A
DTW (ft toc)	15.50	20.61	29.45	39.80	47.15	63.30	69.10	79.70	84.40	
pH	8.90	8.87	8.85	8.82	8.80	8.72	8.69	8.61	8.57	
Conductivity (µS/cm)	1251	1250	1273	1256	1257	1255	1259	1262	1259	
Temperature (C)	13.51	13.32	13.36	13.26	12.91	13.10	12.40	12.92	12.80	
Turbidity (NTU)	28	22	18	17	18	14	14	12	12	
Eh/Redox (mV)	35.2	26.9	-22.1	-9.4	11.7	29.7	35.7	40.4	36.4	
DO (mg/L)	1.18	5.99	4.31	1.74	1.73	1.85	2.58	1.73	1.79	

Purging Field Notes:
Pump Intake 98'

Sampled: Explosives, TCL VOC's, TAL Total Metals, TAL Dissolved Metals, Nitrate/Nitrite Total Nitrate, Perchlorate

Sample Date/Time: 3/25/03 900 Sample ID/TR #: Wingate 91 00820

Sampler's signature/date: Leonard M. Salazar 3/25/03

Reviewer's signature/date: [signature] 4/23/03

FORT WINGATE DEPOT ACTIVITY
WELL SAMPLING DATA FORM

Well Number: Wingate [redacted] 91
Start Date: 3/24/03
Start Time: 1150

Well Casing Diameter (in):	12[redacted]
Bore Hole Diameter (in):	[redacted]
Annular Space (AS) Length (ft):	N/A

Well TD =	113.12
Well DTW =	14.39
Water Column =	98.73

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back)	=	NA
Column of water or length of AS (whichever is less)	X	98.73
Volume of water in AS (gal)	=	NA
Gallons per foot of casing (from chart on back)	=	5.8748
Column of water	X	98.73
Volume of water in casing (gal)	=	580.019
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	580.019
Number of EV to be purged	X	3
TOTAL VOLUME TO BE PURGED (gal)	=	1740
ACTUAL VOLUME PURGED (gal)	=	1870

Method of Purging: 2" Grundfos Pump

Field Parameters	Reading				3/25					
Time	1413	1433	1453	1523	1543	731	741	801	811	Final
Volume (gal)	750	830	910	1030	1090	1090	1210	1450	1570	Sample
Flow Rate (gpm)	4	4	4	3	off	12	12	12	10	N/A
DTW (ft toc)	87.40	89.90	91.30	92.70	93.50	14.51	29.80	53.20	68.05	
pH	8.49	8.37	8.26	8.24	8.16	8.18	8.04	8.05	8.08	
Conductivity (µS/cm)	1259	1259	1259	1246	1259	1240	1255	1252	1248	
Temperature (C)	13.08	12.90	13.12	13.56	13.18	12.62	12.66	13.16	13.25	
Turbidity (NTU)	7.5	6.3	4.5	3.5	3.8	.75	.60	2.5	4.6	
Eh/Redox (mV)	36.1	31.8	32.8	40.7	39.0	25.0	25.9	27.7	40.2	
DO (mg/L)	1.51	2.16	1.86	2.02	1.20	1.86	1.59	4.26	2.26	

Purging Field Notes:
Pump Intake: 98' Continued pumping at 731 on 3/25/03

Sampled: Explosives, TCL VOC's, TAL Total Metals, TAL Dissolved Metals, Nitrate/Nitrite, Total Nitrate, Perchlorate

Sample Date/Time: 3/25/03 900 Sample ID/TR #: Wingate[redacted]91 00820

Sampler's signature/date: Leonard M. Salazar 3/25/03

Reviewer's signature/date: [signature] 4/24/03

FORT WINGATE DEPOT ACTIVITY
WELL SAMPLING DATA FORM

Well Number: Wingate 91
Start Date: 3/24/03
Start Time: 1150

Well Casing Diameter (in): 12
Bore Hole Diameter (in): —
Annular Space (AS) Length (ft): N/A

Well TD = 113.12
Well DTW = 14.39
Water Column = 98.73

PURGE VOLUME CALCUATION

Gallons per foot of annular space (from chart on back)	=	NA
Column of water or length of AS (whichever is less)	X	98.73
Volume of water in AS (gal)	=	NA
Gallons per foot of casing (from chart on back)	=	5.8748
Column of water	X	98.73
Volume of water in casing (gal)	=	580.019
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal)	=	580.019
Number of EV to be purged	X	5
TOTAL VOLUME TO BE PURGED (gal)	=	1740
ACTUAL VOLUME PURGED (gal)	=	1870

Method of Purging : 2" GrunFos

Field Parameters	Reading									Final Sample
Time	821	831	841	921						
Volume (gal)	1670	1770	1870	1870						
Flow Rate (gpm)	10	10	10	—						N/A
DTW (ft toc)	77.65	90.30	98.0	—						—
pH	8.11	8.13	8.13	8.21						8.21
Conductivity (µS/cm)	1247	1246	1240	1249						1249
Temperature (C)	13.25	14.36	13.78	12.96						12.96
Turbidity (NTU)	7.7	7.3	23	24						24
Eh/Redox (mV)	44.4	49.5	46.7	59.0						59.0
DO (mg/L)	2.89	1.37	3.15	4.23						4.23

Purging Field Notes: Tubing Came Out. Oil smell on tubing Pump Intake: 98'
Sampled: Explosives, TCL VOC's. TAL Total Metals, TAL Dissolved Met
Nitrate/Nitrite, Total Nitrate, Perchlorate

Sample Date/Time: 3/25/03 900 Sample ID/TR #: Wingate91 00820

Sampler's signature/date: Leonard W. [signature] 3/25/03

Reviewer's signature/date: [signature] 4/24/03

C-2
ANALYTICAL DATA

APPENDIX D
SITE SAFETY AND HEALTH PLAN

SITE SAFETY AND HEALTH PLAN INTERIM FACILITY WIDE GROUND WATER MONITORING AND INTERIM MEASURES OFF—SITE WATER SUPPLY WELL SAMPLING

FORT WINGATE DEPOT ACTIVITY
McKinley County, New Mexico

28 March 2008

Contract No. W9126G-06-D-0016
Task Order No. 0002

Prepared for:

U.S. Army Corps of Engineers
Fort Worth, Texas

Prepared by:

TerranearPMC

222 Valley Creek Blvd.
Suite 210
Exton, PA 19341

Requests for this document must be referred to:
Commander, U.S. Army Corps of Engineers
Fort Worth District
Attn: CESWF-PER-DI (Beverly Post)
819 Taylor Street
Room 3A12
Fort Worth, TX 76112

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1.0 INTRODUCTION

This Site Safety and Health Plan (SSHP) has been prepared as an attachment to both the Interim Facility-Wide Ground Water Monitoring Plan (GWMP) and the Interim Measure Work Plan (IMWP) for Off-Site Water Supply Well Sampling (referred to as “the Plans” in this SSHP) for activities related to ground water characterization at Fort Wingate Depot Activity (FWDA).

This document was prepared by TerranearPMC, LLC (TPMC) of Exton, Pennsylvania, in partial fulfillment of the requirements of Task Order No. 0001 under Contract W9126G-06-D-0016. Contracting Officer’s Representative and technical oversight responsibilities for the tasks described in this document were provided by the U.S. Army Corps of Engineers (USACE), Fort Worth District.

This SSHP has been developed to meet U.S. Army requirements as outlined in the Section 01.A.09 of USACE Engineering Manual (EM) 385-1-1, Safety Manual. EM 385-1-1 is the primary safety guidance document to which all site activities conducted at FWDA will adhere. TPMC and all subcontractors will be responsible for complying with EM 385-1-1, followed by this SSHP, which is intended to supplement EM 385-1-1.

1.1 GENERAL

The use of all feasible hazard controls is required when there is a potential for personnel exposure to chemical, physical, or biological hazards. To implement this policy, TPMC has developed and implements a comprehensive Corporate Environmental Safety and Health Program (CESHP). The TPMC CESHP was developed to comply with the requirements of the Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) standards found in 29 Code of Federal Regulations (CFR) 1910.120 and 29 CFR 1926.65. The TPMC CESHP not only meets the requisite OSHA requirements, but also meets the applicable requirements of the standards, regulations, and references listed below in Section 1.5.

1.2 SITE SAFETY AND HEALTH PLAN

1.2.1 Scope

TPMC has developed this SSHP as an attachment to the Plans for activities related to ground water characterization at FWDA.

The SSHP addresses the requirements of 29 CFR 1910.120(b)(4)(ii), 29 CFR 1926.65(b)(4)(ii), EM 385-1-1, Engineering Regulation (ER) 385-1-95, and any other applicable Federal, state, and local safety and health requirements. The level of detail required in the SSHP has been tailored to the type of work, complexity of operations to be accomplished, and the hazards anticipated. The SSHP addresses those elements, which are specific to the site and TPMC’s scope of work, and have the potential for negative effects on the safety and health of workers, the environment and the public.

1.2.2 Objective

The primary objective of this SSHP is to provide TPMC with an effective tool for the anticipation, identification, evaluation, control, and/or elimination of recognized safety and health hazards anticipated for the operations conducted at FWDA. The secondary objective of this SSHP is to provide TPMC with an effective communication medium for providing site personnel task-specific and site-specific hazard information, as well as hazard control information they will use to mitigate or eliminate the risks of exposure to site and task hazards. For those emergencies that may reasonably occur, contingency plans and emergency response procedures have been developed and are presented in this SSHP.

1.2.3 SSHP Approval and Compliance by Site Personnel

All TPMC, subcontractor, and Government personnel involved in this project shall carefully read this document prior to participation in any on-site tasks that involve potential exposure to safety or health hazards. Questions related to the information in this SSHP will be addressed to, and resolved by, the TPMC Site Safety and Health Officer (SSHO), with consultation from the Corporate Environmental Safety and Health Manager (CESHM) if needed.

After reading this SSHP, site personnel will complete the SSHP Review and Approval Form located in Attachment 1 of this document, indicating their understanding of, and willingness to comply with, the requirements in this SSHP. All site personnel will exercise reasonable caution at all times and shall immediately report to the SSHO any site conditions which may pose a safety or health hazard to site personnel.

It is the responsibility of each manager, supervisor, individual employee, and subcontractor to take notice of any unsafe situations and report them immediately so that proper action can be taken to eliminate them. Additionally, it is the responsibility of each employee to keep their personal safety and the safety of all site personnel uppermost in their mind at all times. Unsafe working habits, horseplay, etc., which could endanger the health and safety of others, will not be tolerated. Disciplinary action up to and including termination will result from such actions.

1.2.4 Changes to the Approved SSHP

The levels of personal protective equipment (PPE) and the safe work practices (SWPs) specified in this plan are based on the best available information, archival data, anticipated site conditions, and professional experience gained from operations TPMC has performed previously at FWDA and similar sites. It is understood that this SSHP is a living document, and the actual on-site implementation of site tasks may facilitate changes in PPE, monitoring, SWPs, or other elements of the SSHP.

As such, this SSHP includes provisions for changing the levels/types of PPE used and monitoring procedures. These pre-approved changes are based upon anticipated site conditions and will be used only if applicable action levels and conditions are met and documented. Requests to downgrade or upgrade PPE or monitoring requirements will be made by the SSHO to the CESHM and may be implemented once the TPMC CESHM has provided written approval.

If a previously un-assessed task is identified, or a proposed change requires a written revision of the SSHP, the TPMC Project Manager (PM) will submit a written request for change to the CESHM, along with attached documentation. Approved changes to the SSHP and the modified pages of the SSHP will be forwarded to the PM upon approval by the CESHM. Notification and update pages will also be sent to the FWDA BRAC Environmental Coordinator (BEC) and USACE Technical Manager by the PM. If a proposed change involves the addition of a previously un-assessed task or significantly impacts the safety of on-site personnel, off-site personnel, or the environment, a written request for approval will be submitted. Changes of this nature will not be allowed until written approval from the FWDA BEC and/or USACE Technical Manager has been received and any necessary changes have been made to the Work Plan or SSHP.

1.2.5 Regulations and References

The applicable regulations and references listed below will be used in conjunction with this SSHP to ensure the safety and health of on-site personnel and the local community.

- USACE EM 385-1-1 Safety Manual (most current version).
- Current versions of the OSHA General Industry (29 CFR 1910) and Construction Standards (29 CFR 1926).
- National Institute of Occupational Safety and Health (NIOSH) Occupational Safety and Health Guidance for Hazardous Waste Site Activities, U.S. Department of Health and Human Services, , October 1985.
- American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs®) and Biological Exposure Indices (BEIs®), 2005.
- NIOSH Pocket Guide to Chemical Hazards, No. 97-140, Current edition.
- The TPMC CESHP (this document will be on site and available to site personnel during the project).
- USACE ER 385-1-92, Safety and Occupational Health Requirements for Hazardous, Toxic and Radioactive Waste (HTRW) Activities, July 2003.
- USACE ER 385-1-95, Safety and Health Requirements for Ordnance and Explosives (OE) Operations, 16 June 2003.

2.0 SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION

A detailed description of FWDA and the project sites is contained in the Plans. However, relevant information about FWDA and the project sites, as it pertains to safety and health, is presented below.

2.1 SITE DESCRIPTION

FWDA is situated in northwestern New Mexico, in McKinley County. As shown in Figure 1, the installation is located 8 miles east of Gallup, and approximately 130 miles west of Albuquerque on U.S. Route 66. As part of planned property transfer to the U.S. Department of Interior (DOI), the installation has been divided into parcels (see Figure 2). The Plans focus on ground water characterization activities to be conducted at the Open Burning/Open Detonation (OB/OD) Areas and the northern portion of FWDA, as well as off-site locations. Site maps showing well locations and other significant features are provided as Figures 3, 4, 5, and 6.

2.1.1 Site History

FWDA is an inactive U.S. Army depot whose former mission was to receive, store, maintain, and ship assigned materials (primarily explosives and military munitions), and to dispose of obsolete or deteriorated explosives and military munitions. Since 1975, the installation has been under the administrative command of Tooele Army Depot (TEAD), located near Salt Lake City, Utah. The active mission of FWDA ceased and the installation closed in January 1993, as a result of the Defense Authorization Amendments and Base Realignment and Closure (BRAC) Act of 1988. In 2002, the Army reassigned many functions at FWDA to the BRAC Division (BRACD), including property disposal, caretaker duties, management of caretaker staff, and performance of environmental restoration and compliance activities. TEAD retained command and control responsibilities, and continues to provide support services to FWDA.

FWDA currently occupies approximately 24 square miles (approximately 15,277 acres) of land in northwestern New Mexico, in McKinley County. FWDA contains facilities formerly used to operate a reserve storage activity providing for the care, preservation, and minor maintenance of assigned commodities, primarily conventional military munitions. The installation mission included the disassembly and demilitarization of unserviceable and obsolete military munitions. Ammunition maintenance facilities existed for the clipping, linking, and repackaging of small arms ammunition.

FWDA has been undergoing environmental restoration prior to property transfer/reuse. As part of planned property transfer to DOI, the installation has been divided into reuse parcels (Figure 2). Parcels transferred to date include Parcels 1, 15, and 17.

2.1.2 Site Topography

Ground surface elevations vary from approximately 6,660 feet Above Mean Seal Level (AMSL) near the northern property boundary to 7,700 feet AMSL in the OB/OD Area. Generally, the northern portion of FWDA is gently sloping with some bedrock ridges.

2.1.3 Site Climate

Northwestern New Mexico is characterized by a semiarid continental climate. Most precipitation occurs from May through October as localized and brief summer storms. Spring and fall droughts characterize the area.

Mean annual rainfall for the area ranges between 10 and 16 inches, while the recorded average annual precipitation for FWDA is 11 inches. Depending on local elevations, mean annual rainfall fluctuates between 8 and 20 inches. Most of the precipitation occurs as rain or hail in summer thunderstorms, and the remainder results from light winter snow accumulations.

The average seasonal temperatures for the area vary with elevation and topographic features. During winter, daily temperatures fluctuate as much as 50 to 70 degrees Fahrenheit (°°F) in a 24-hour period. In summer, daily high temperatures are between 85° ºF and 95°°F. Average temperatures in winter are about 27°°F and in summer 70°°F; extreme temperatures are as low as -30°°F in winter and as high as 100°°F in summer. There are 100 to 150 frost-free days during the year from the middle of May to the middle of October.

The area has generally sunny weather, with the sun shining more than 3,000 hours annually. Average relative humidity varies from 50 to 15 percent (%), during the wet season (fall) and the dry season (spring), respectively. During spring, the area experiences strong winds from the west and southwest, with an average wind speed of 12 miles per hour (mph). Strong winds, high temperatures, and low relative humidities in the area contribute to high evaporation rates.

2.2 DESCRIPTION OF WORK TO BE PERFORMED

Ground water sampling will be conducted during site activities. The detailed technical approach and operational sequence for this task is presented in the Plans. The following general activities will be performed:

- Establishment of site control and work zones;
- Sampling of ground water monitoring wells within FWDA;
- Sampling of off-site water supply wells, and
- Sample management (packaging and shipment).

The hazards associated with this task will include those listed below. Site personnel performing activities for these tasks will use the SSHP and information provided in the daily safety briefings to safeguard themselves from these hazards.

- Exposure to high noise sources;
- Munitions and explosives of concern (MEC) hazards;
- Potential exposure to contaminants within ground water;
- Potential exposure to sample preservatives (acids/bases);
- Physical strain and lifting hazards;
- Slip, trip, and fall hazards from uneven surfaces;
- Thermal (heat or cold) stress and other inclement weather;
- Biological hazards; and
- Hazards from use of hand or power tools.

The hazards listed for this task are discussed in greater detail in Section 3.0 of this SSHP. For each hazard listed site personnel will utilize the procedures, SWPs, and PPE described in this SSHP to control or eliminate the hazards.

2.3 CONTAMINATION CHARACTERIZATION

Information from previous investigations conducted at FWDA has given TPMC a means of compiling a summary of hazardous substances and other contaminants that may be encountered during site operations.

2.3.1 Hazardous Substance Contamination

Hazardous substances are those materials that can threaten human health and/or environmental well being if the substance has been improperly disposed of or uncontrollably released into the environment. This phrase is used to describe chemical contaminants to which site personnel may be exposed as a result of the release of hazardous constituents capable of causing harm to site personnel if encountered during site operations.

As detailed in the Plans, detected concentrations of constituents in ground water exceed ground water cleanup levels in some locations within FWDA. These contaminants include: explosives, metals, nitrate, nitrite, volatile organic compounds (VOCs), and perchlorate. In addition, semi-volatile organic compounds (SVOCs), pesticides, and herbicides have also been detected in soil and ground water in some locations within FWDA.

Additional information related to the risks of exposure to hazardous substances is presented in Section 3.0 of this SSHP; PPE and other control measures are discussed in Sections 6.0 and 10.0, respectively.

2.3.2 MEC Contamination

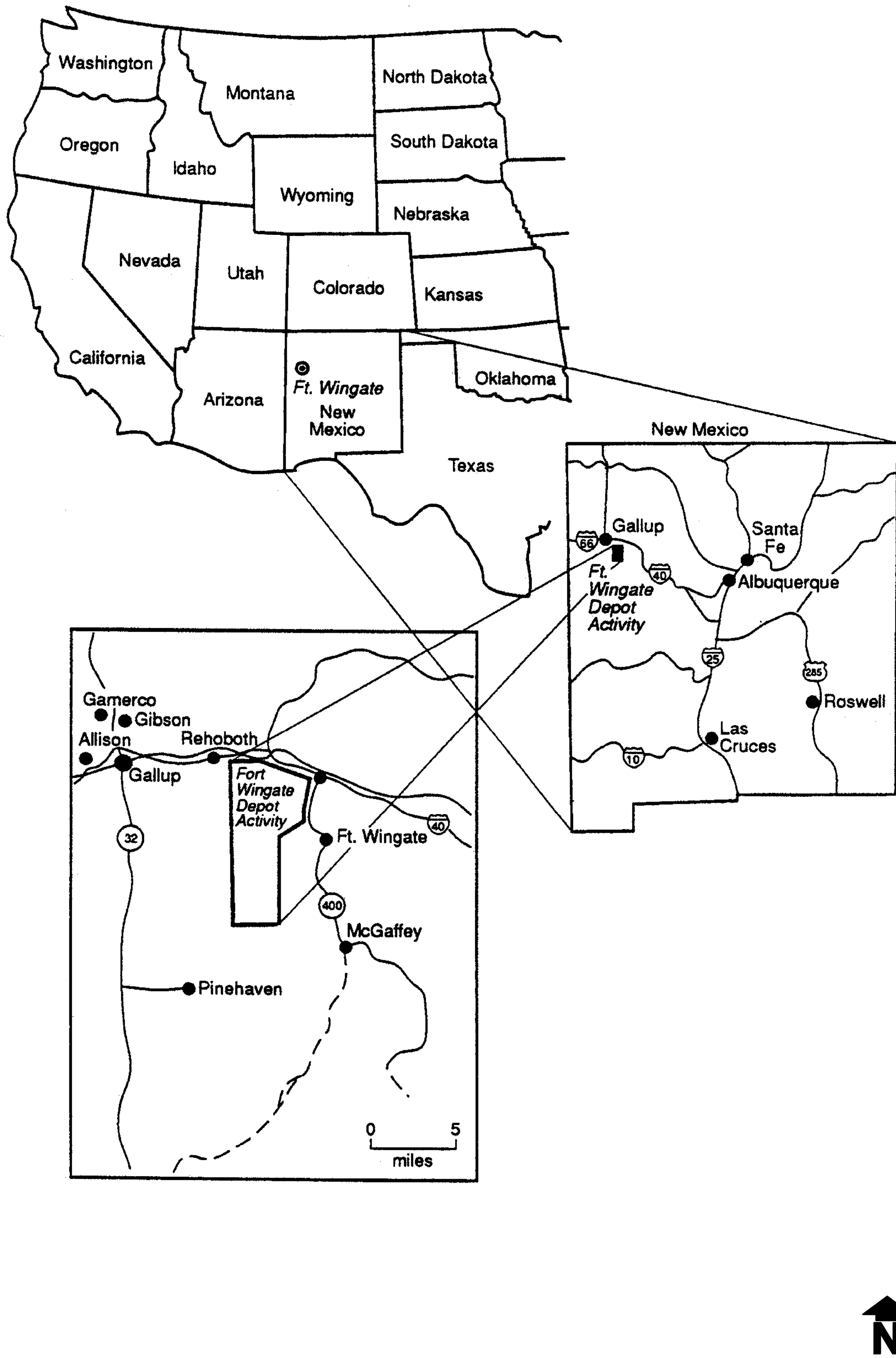
As noted in Section 2.1.1, historical operations performed at FWDA included maintenance, renovation, or demilitarization of military munitions. MEC investigations and removal actions have been performed in portions of FWDA.

The potential for encountering MEC items in the OB/OD Areas is high. MEC items are readily apparent on the ground surface in many places within the OB/OD Areas.

The remaining areas of FWDA and off-site locations have a low potential for encountering MEC.

Additional discussion related to MEC hazards and their assessment is presented in Section 3.2.

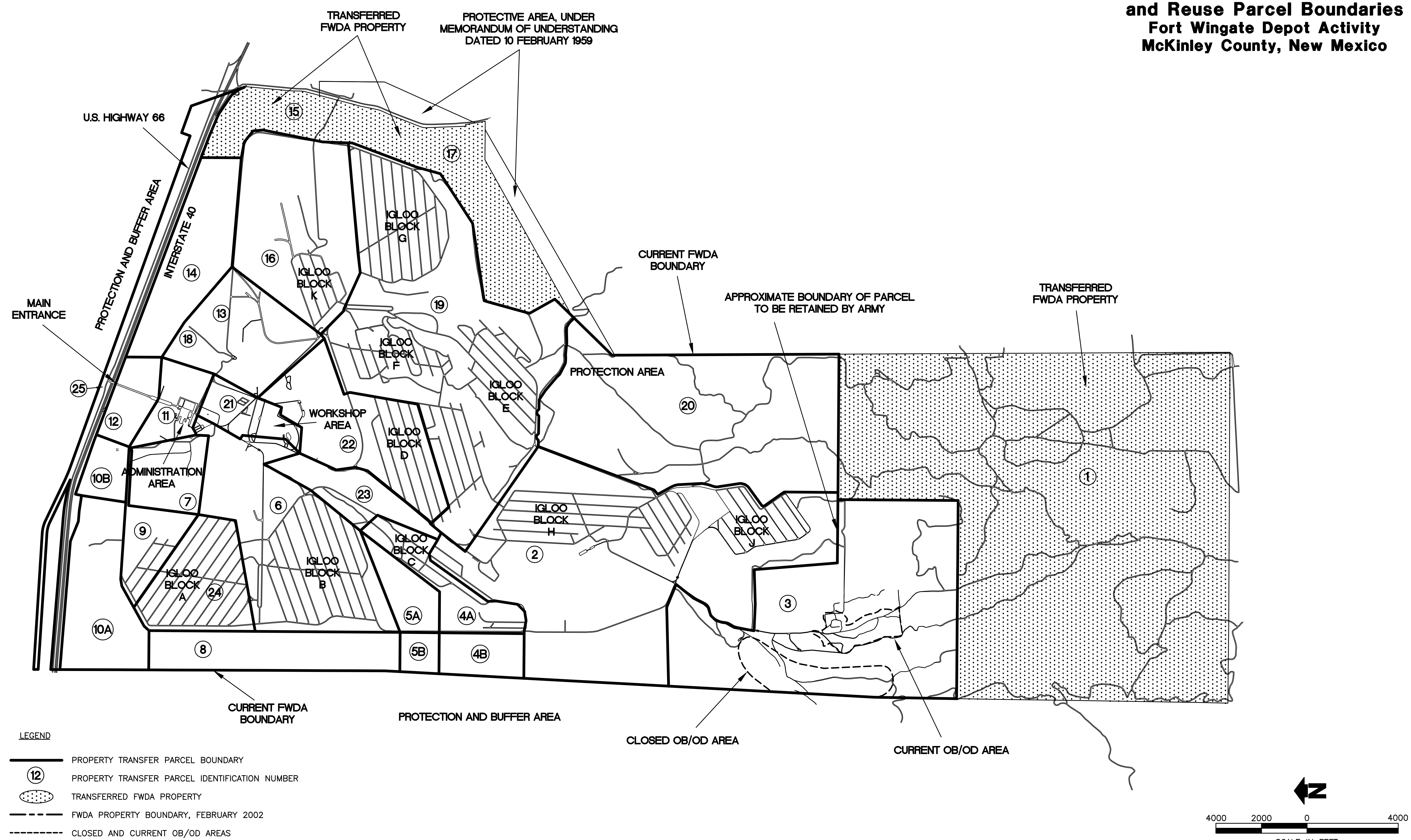
Figure 1
Installation Location
Fort Wingate Depot Activity
McKinley County, New Mexico



SOURCE: "MASTER ENVIRONMENTAL PLAN: WINGATE DEPOT ACTIVITY, GALLUP, NEW MEXICO," DECEMBER 1990.

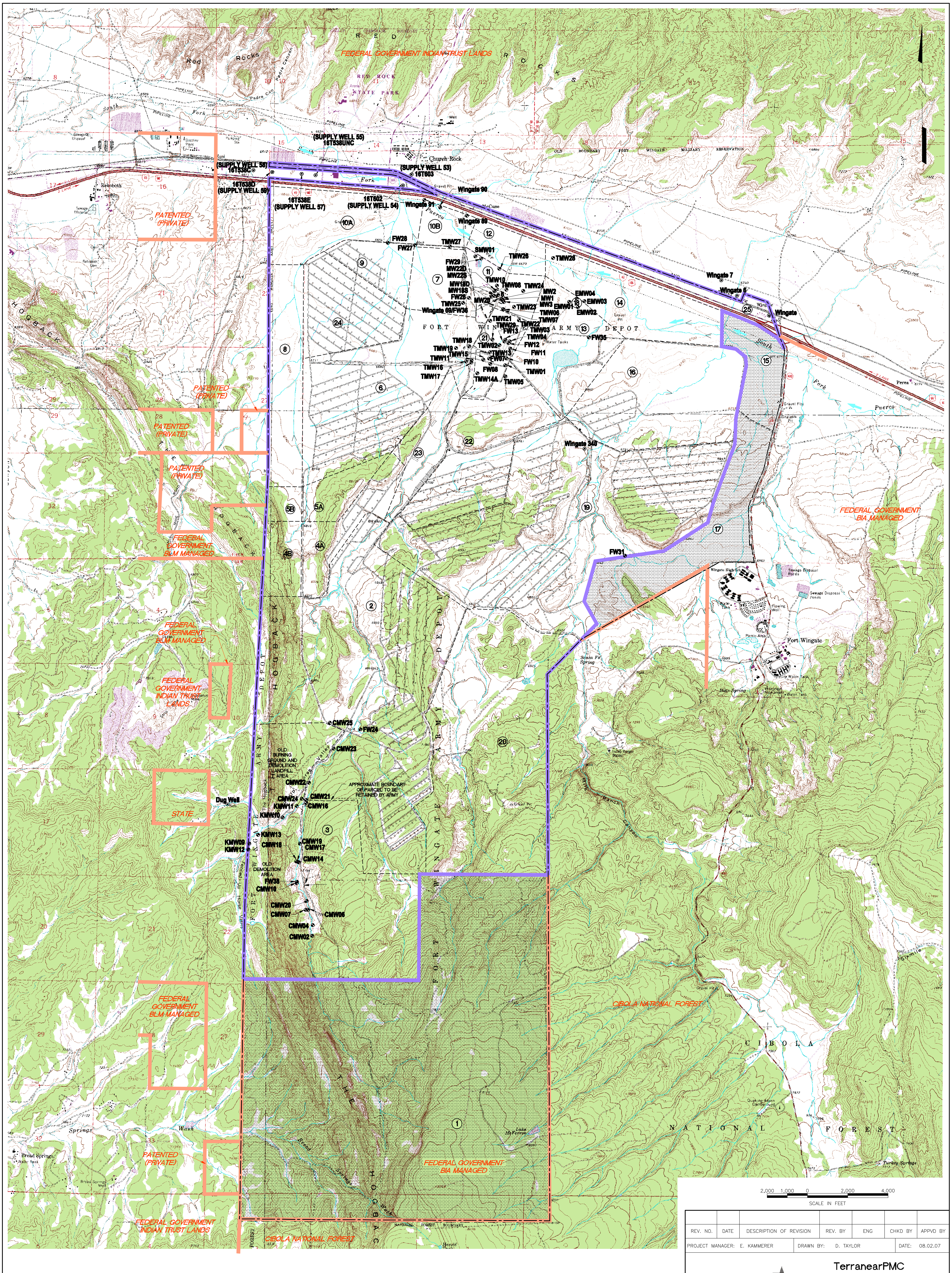
NOT TO SCALE

Figure 2
Historical Land Use and Reuse Parcel Boundaries
Fort Wingate Depot Activity
McKinley County, New Mexico



TerranearPMC, LLC

33202.60/08.02.07–DST/03.20.08–DST/A201 –1B



LEGEND

- MONITORING WELL LOCATION
- SUPPLY WELL LOCATION
- DIRECTION OF FLOW FOR THE SOUTH FORK OF THE SOUTH PUERCO RIVER
- PROPERTY TRANSFER PARCEL BOUNDARY
- 14 PROPERTY TRANSFER PARCEL IDENTIFICATION NUMBER
- TRANSFERRED FWDA PROPERTY
- FWDA PROPERTY BOUNDARY, FEBRUARY 2002
- ADJOINING PROPERTY BOUNDARY

REV. NO.	DATE	DESCRIPTION OF REVISION	REV. BY	ENG	CHKD BY	APPVD BY

PROJECT MANAGER: E. KAMMERER | DRAWN BY: D. TAYLOR | DATE: 08.02.07

TerranearPMC
222 VALLEY CREEK BLVD.
SUITE 210
EXTON, PA 19341-2843
(610) 862-5000 PHONE
(610) 862-5050 FAX

Figure 3
Well Locations - Site Wide

Fort Wingate Depot Activity
McKinley County, New Mexico

PROJECT NO.	FILE NO.	CHKD:	DRAWING NUMBER	REV. NO.
33202		ENG.	60A401	0
		APPVD:	SCALE: 1" = 2,000'	

NOTES: 1. ADJACENT PROPERTY INFORMATION PROVIDED BY DWIGHT HEMPEL, DEPARTMENT OF INTERIOR, TEAM LEAD, FORT WINGATE TRANSFER, MAY 2003.
2. CONTOUR INTERVAL EQUALS 20 FEET.

SOURCE: USGS 7.5 MINUTE SERIES (TOPOGRAPHIC) QUADRANGLES FOR MCKINLEY COUNTY, NEW MEXICO INCLUDING: GALLUP EAST, BREAD SPRINGS, CHURCH ROCK, FORT WINGATE, PINEHAVEN, AND UPPER NUTRIA

TerranearPMC, LLC
222 VALLEY CREEK BLVD., SUITE 210
EXTON, PA 19341-2843
(610) 862-5000 PHONE
(610) 862-5050 FAX
PROJECT MANAGER: E. KAMMERER
DRAWN BY: D. TAYLOR
DATE: 03.21.08
Figure 4
Monitoring Well Locations
OB/OD Areas
Fort Wingate Depot Activity
McKinley County, New Mexico
PROJECT NO. 33202
DRAWING NUMBER 601402-1C
REV. NO. 0
SCALE: 1" = 400'
KEY MAP
LEGEND
APPROXIMATE BOUNDARY OF GEOPHYSICAL ANOMALY/SURFACE DEBRIS/RESIDUE PILE
INTERPRETED SUBSURFACE RESIDUE/DEBRIS PILE AREA
APPROXIMATE LOCATION OF FORMER OPEN DETONATION CRATER
APPROXIMATE LOCATION OF EXISTING OPEN DETONATION CRATER
APPROXIMATE BOUNDARY OF BURNING GROUND AREA
APPROXIMATE BOUNDARY OF OB/OD UNIT
6-FOOT CHAIN LINK SECURITY FENCE WITH 3-STRANDBARBED WIRE TOP
5-STRAND BARBED WIRE FENCE
100-YEAR FLOODPLAIN
ARROYOS
PROPERTY TRANSFER PARCEL BOUNDARIES
FWDA PROPERTY BOUNDARY, FEBRUARY 2002
ADJOINING PROPERTY BOUNDARY
SWMU 14 SWMUs OR AOCs THAT REQUIRE CORRECTIVE ACTION
PROPERTY TRANSFER PARCEL IDENTIFICATION NUMBER
SWMU/AOC LOCATION
PROPOSED GROUND WATER SAMPLE LOCATION
ALLUVIAL MONITORING WELL
MANCOS SHALE FORMATION MONITORING WELL
DAKOTA SANDSTONE FORMATION MONITORING WELL
ENTRADA SANDSTONE FORMATION MONITORING WELL
PAINTED DESERT MEMBER MONITORING WELL
SONSELA SANDSTONE MEMBER MONITORING WELL
FEDERAL GOVERNMENT BLM MANAGED
FEDERAL GOVERNMENT INDIAN TRUST LANDS
FEDERAL GOVERNMENT BIA MANAGED
AOC 76 FEATURE 19 ON THE 1973 AERIAL PHOTO API-5
AOC 89 FEATURES 30 AND 34 ON THE 1973 AERIAL PHOTO API-5
AOC 36 IGLOO BLOCK J (INCLUDES MISSILE LAUNCH PAD USED BY MDA)
SWMU 14 OLD BURNING GROUND AND DEMOLITION LANDFILL AREA (INCLUDES KGA-3, KGA-4, KGA-5, KP-2, KP-3, KP-4, ARROYO IN FENCED-UP HORSE VALLEY, AND DUMP PILE)
SWMU 15 OLD DEMOLITION AREA (INCLUDES INACTIVE EOD AREA, KGA-1, KGA-2, OLD OB/OD AND BURIED PHOSPHORUS ROUNDS, AND THREE MOUNDS IN FENCED-UP HORSE VALLEY)
SWMU 33 WASTE PILE KP1
AOC 92 FEATURE 31 ON THE 1973 AERIAL PHOTO API-5 AND FEATURE 21 ON THE 1978 AERIAL PHOTO API-7
SWMU 74 AREA 16 OR SITE 16 (PROPOSED BURNING GROUND)
AOC 90 FEATURE 36 ON THE 1973 AERIAL PHOTO API-5
AOC 91 FEATURE 41 ON THE 1973 AERIAL PHOTO API-5 AND FEATURE 27 ON THE 1978 AERIAL PHOTO API-7
THE HOGBACK
CLOSED OB/OD AREA
CURRENT OB/OD AREA
HWMU OB/OD UNIT
BURNING GROUND AREA
WESTERN SECURITY FENCE WITH WARNING SIGNS OWNED BY ARMY (EXTENDS NORTH TO NORTHERN BOUNDARY OF FWDA)
MAIN INSTALLATION SECURITY FENCE MAINTAINED BY BMDO
APPROXIMATE BOUNDARY OF PARCEL TO BE RETAINED BY ARMY
GATE 209
GATE 209A
GATE 209B
BUILDING 601 BREAK ROOM
BUILDING 604 CONTROL SHELTER AND TRUCK BARRICADE
OPEN-SIDED STORAGE SHED
OLD BURNING GROUND AND DEMOLITION LANDFILL AREA
OLD DEMOLITION AREA
FENCED-UP HORSE VALLEY
ESTIMATED EXTENT OF BURIED, BURNED SMOKE CANISTERS FOUND IN 1993
IGLOO BLOCK H
IGLOO BLOCK J
EASTERN SECURITY FENCE OWNED BY BMDO (EXTENDS EAST TO FWDA BOUNDARY FENCE)
EASTERN SECURITY FENCE WITH WARNING SIGNS OWNED BY ARMY
CURRENT OB/OD AREA SECURITY FENCE OWNED BY ARMY
SOUTHERN SECURITY FENCE OWNED BY ARMY
SOUTHERN BOUNDARY FENCE WITH WARNING SIGNS OWNED BY ARMY
WESTERN SECURITY FENCE WITH WARNING SIGNS OWNED BY ARMY
GATE (NO ID.)
CMW25
FW24
CMW23
CMW22
CMW24
CMW21
CMW16
KMW11
KMW10
KMW13
KMW09
KMW12
CMW19
CMW18
CMW17
CMW14
FW38
CMW10
CMW20
CMW07
CMW08
CMW04
CMW02
1
2
3
20
N
BY PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHS TAKEN SEPTEMBER 28, 1995
400 200 0 400 800
SCALE IN FEET
NOTE:
THERE ARE NO INJECTION OR WITHDRAWAL WELLS WITHIN 1,000 FEET OF THE PARCEL TO BE RETAINED BY THE ARMY.

REV. NO.	DATE	DESCRIPTION OF REVISION	REV. BY	ENG	CHKD BY	APPVD BY

PROJECT MANAGER: E. KAMMERER | DRAWN BY: D. TAYLOR | DATE: 03.21.08

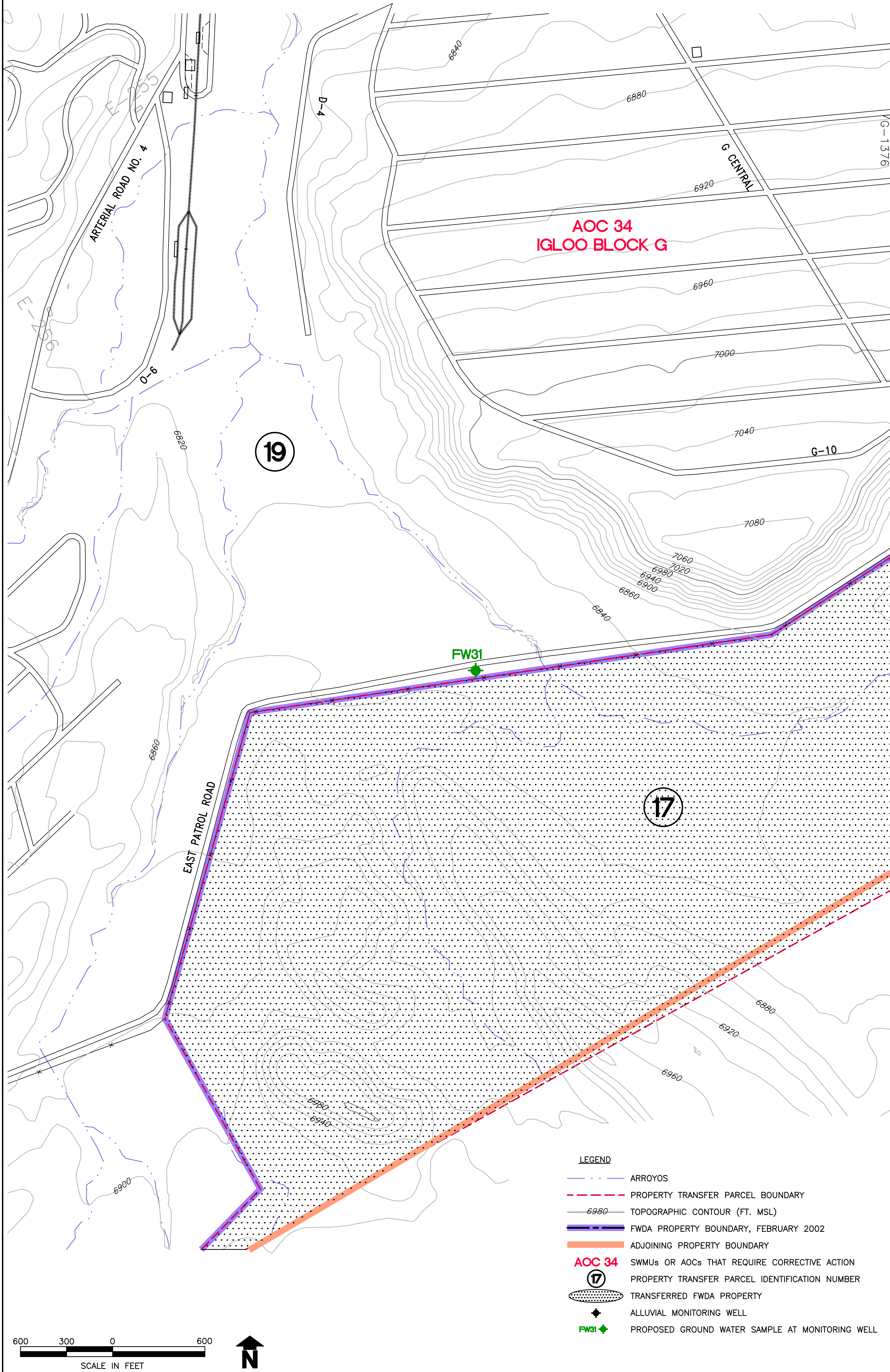
TerranearPMC
222 VALLEY CREEK BLVD, SUITE 210
EXTON, PA 19341-2843
(610) 862-5000 PHONE
(610) 862-5050 FAX

Figure 5
Monitoring Well Locations
Northern FWDA

Fort Wingate Depot Activity
McKinley County, New Mexico

PROJECT NO.	FILE NO.	CHKD:	DRAWING NUMBER	REV. NO.
33202		ENG.	601401	0
		APPVD:	SCALE: 1" = 600'	

Figure 6
Monitoring Well FW31 Location Map
Fort Wingate Depot Activity
McKinley County, New Mexico



TerranearPMC, LLC

33202.60/03.21.08-DST/1201-1C

3.0 HAZARD/RISK ANALYSIS

To ensure the safety and health of site personnel and the public, and to comply with the hazard assessment requirements of the OSHA PPE standard (29 CFR 1910.132(d)), TPMC has performed an Activity Hazard Assessment (AHA) for each site task with a potential for exposure to site hazards that will require the use of engineering controls, administrative controls, or PPE to minimize or reduce worker exposure. AHA forms for this project are presented in Attachment 2 of this SSHP. These AHA forms will be used by the SSHO to brief site personnel on the type and degree of hazard to be expected during site operations and the means site personnel will use to safeguard themselves from the hazards.

While the hazard analyses and risk assessments presented in this SSHP have been made using the best available data, all site personnel must understand that the evaluation of site characteristics and hazards is an ongoing process that will continue throughout the duration of the project and in which site personnel play a major role. All site personnel shall be vigilant in recognizing workplace hazards and bringing them to the attention of the SSHO, and/or the PM. If changes occur in the level or types of hazards present for a currently evaluated task, or if a new task is added to the Plans, the SSHO will inform theTPMC CESHM of the change. If needed, a new AHA will be completed to outline the hazards, control methods, and PPE for the task. Any additions to the approved SSHP will be reviewed and approved by the responsible TPMC personnel and submitted to the FWDA BEC and USACE Tehcnical Manager for final approval. Once approved, the changes will be added to the SSHP.

3.1 CHEMICAL HAZARDS

3.1.1 On-Site Chemical Contaminants

As discussed in Section 2.3.1, exposure to contaminants with a potential for causing an occupational exposure situation may be possible during performance of ground water sampling under the Plans.

Potential for limited exposure may occur during tasks that require the handling of potentially contaminated ground water. Potential chemicals of concern historically used at FWDA and historically detected during previous investigations include: explosives, metals, nitrate, nitrite, perchlorate, VOCs, SVOCs, pesticides, and herbicides. These chemicals may present both acute and long term exposure hazards, although the potential for exposure during tasks as currently panned is low. Information on the hazardous constituents that may present potential exposure hazards is presented in Table 3-1.

The SWPs and PPE outlined in this SSHP will be used as necessary to reduce or eliminate the potential for personnel exposure to these hazardous constituents. If site activities are modified, or evidence of environmental contamination is found, the potential for chemical exposure will be re-evaluated.

Table 3-1: Occupational Exposure and Toxicological Properties for Contaminants with Occupational Health Concerns

Contaminant	OSHA PEL	NIOSH REL	ACGIH TLV	OSHA/ ACGIH STEL	NIOSH IDLH	Exposure Route	Symptoms	Target Organs
Gasoline	ND	ND	ND	ND	ND	INH, ABS, ING, CON	Irritation eyes, skin, mucous membrane; dermatitis; headache, lassitude (weakness, exhaustion), blurred vision, dizziness, slurred speech, confusion, convulsions; chemical pneumonitis (aspiration liquid); possible liver, kidney damage; [potential occupational carcinogen]	Eyes, skin, respiratory system, central nervous system, liver, kidneys
Fuel Oil #1	ND	100 mg/m^3 TWA	ND	ND	100 ppm	INH, ING, CON	Irritation eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid)	Eyes, skin, respiratory system, central nervous system
Toluene	200 ppm TWA, 300 ppm CEILING, 500 ppm 10 minute MAXIMUM PEAK	100 ppm (375 mg/m^3) TWA	50 ppm (188 mg/m^3) TWA [skin]	150 ppm (560 mg/m^3) STEL	500 ppm	INH, ABS, ING, CON	Irritation eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage	Eyes, skin, respiratory system, central nervous system, liver, kidneys
Benzene	TWA 1 ppm	TWA 0.1 ppm, STEL 1 ppm	10 ppm (32 mg/m3) TWA	5 ppm	500 ppm	INH, ABS, ING, CON	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]	Eyes, skin, respiratory system, blood, central nervous system, bone marrow
Cadmium	0.005 mg/m3 TWA	ND	0.01 mg/m3 (total dust) TWA, 0.002 mg/m3 (respirable dust) TWA	ND	9 mg/m^3	INH, ING	Pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]	Respiratory system, kidneys, prostate, blood

Contaminant	OSHA PEL	NIOSH REL	ACGIH TLV	OSHA/ ACGIH STEL	NIOSH IDLH	Exposure Route	Symptoms	Target Organs
Chromium	1 mg/m^3 TWA	0.5 mg/m^3 TWA	0.5 mg/m^3 TWA	ND	250 mg/m^3	INH, ING, CON	Irritation eyes, skin; lung fibrosis (histologic)	Eyes, skin, respiratory system

Notes:

ABS - Absorption
ACGIH - American Conference of Governmental Industrial Hygienists
CON - Contact
IDLH - Immediately Dangerous to Life and Health
ING - Ingestion
INH - Inhalation
mg/m3 - milligram per cubic meter of air
ND - no data
NIOSH - National Institute for Occupational Safety and Health
OSHA - Occupational Safety and Health Administration
PEL - Permissible Exposure Limit
ppm - part per million
REL - recommended exposure limits
STEL - short-term exposure limits
TLV - threshold limit value
TWA - time weighted average

3.1.2 Risk of Exposure from Task-Related Chemicals

Potential for exposure may occur during tasks that require the use of products that contain hazardous constituents. The products that may be used and contain hazardous constituents include: gasoline and two stroke engine oil/gasoline mixtures.

During the use of products with hazardous constituents, personnel exposures will be controlled and minimized based on the limited quantities that will be used at any one time and because the products will be used in well-ventilated conditions. Additionally, the SWPs and PPE outlined in this SSHP will be used as necessary to further reduce or eliminate the potential for personnel exposure to these hazardous constituents. If site activities are modified, or evidence of environmental contamination is found, the potential for chemical exposure will be re-evaluated.

3.2 MEC HAZARDS

As noted in Section 2.3.2, MEC investigations and removal actions have been performed in selected locations within FWDA. The potential for encountering MEC items in the OB/OD Area is high. The safety and health procedures that will be used for reducing the hazards associated with MEC during activities under the Plans are discussed in Section 10.16 of this SSHP.

3.3 PHYSICAL HAZARDS

Based on the nature of the planned site operations, the potential and risk for exposure to physical hazards is high for this project. Physical hazards that may be encountered during site operations include:

- Flammable/explosive materials to include gasoline;
- Material lifting hazards such as back strain, pulled muscles and tendons, pinched/crushed fingers and toes;
- Hazards associated with the operation of hand and power tools, including cuts/lacerations, electrocution, and flying objects and debris;
- Slip, trip and fall hazards associated with exposed tree/brush stumps, uneven terrain, rocks, vegetation growth;
- Inclement weather such as snow, hail, heavy rain, thunder/lightning storms, and tornados;
- Exposure to temperature extremes;
- Use of powered hand tools
- Sharp objects that may cause cut, scrape, puncture, splinter or laceration injuries; and

- Excessive noise from the operation of sampling equipment.

For those physical hazards associated with operating equipment and tools, personnel will receive appropriate instruction and training on the equipment use, maintenance and hazard control as specified in Section 5.0. Additionally, site personnel will be instructed to remain alert to the presence of potential physical hazards and to immediately report the observance of any previously unidentified physical hazards to the SSHO. The SSHO shall be responsible for thoroughly evaluating each day's field operations with respect to potential physical hazards. Any suspect or known physical hazards, and the specific procedures to control them, shall be reviewed during the daily safety briefing. General procedures for reducing or eliminating the physical hazards are discussed in Section 10.0 of this SSHP.

3.4 INCLEMENT WEATHER

Inclement weather such as severe thunder/lightning storms and high winds can have a significant impact on personnel safety and the safe performance of site operations. Site personnel will be briefed each morning to inform them of any potential weather hazards that may be present during the day and will remain alert to the onset of inclement weather. The hazards associated with inclement weather include:

- **Heavy Rain**: Heavy rain can create working and driving hazards of which site personnel should be aware. This includes the increase in slip and fall hazards due to slick walking surfaces, and reduction in visibility. Additionally, heavy rains can cause flash flooding in low-lying areas and creek and river areas. In the event that heavy rains occur while personnel are outside, the SSHO will advise the teams to halt operations and instruct personnel to seek shelter. The determination to re-start operations will be the responsibility of the PM, who will consult with the SSHO to ensure site conditions are safe for re-entry and continuation of operations.

- **Thunderstorms**: Thunderstorms, with their associated lightning, present a significant hazard to site personnel. A severe thunderstorm watch indicates that severe thunderstorms are possible in and close to the watch area. A severe thunderstorm warning indicates that a severe thunderstorm has been spotted and is going to move through the area soon. Work may continue at the work site during severe thunderstorm watches; however, site work shall cease and the work zone (WZ) will be evacuated during a thunderstorm or severe thunderstorm warning. Additionally, work will be halted by the SSHO if lightning is detected within ten miles of the team locations.

- **High Winds**: High winds can create conditions that threaten the safety and health of site personnel, and if coupled with low humidity, can create a static electricity hazard. High winds can cut visibility by creating dust clouds and can cause trees and tree limbs to fall. The SSHO will determine when wind levels present a hazard to site personnel and will call for the evacuation of the work areas if deemed necessary. The determination to restart operations will be the responsibility of the PM in consultation with the SSHO to ensure site conditions are safe for re-entry and continuation of operations.

- **Tornados**: Tornados with their associated high winds, rain, and potentially damaging hail can create serious threats to personnel on site. If a tornado watch is reported, conditions are favorable over a large area for severe thunderstorms and tornadoes to develop, and the SSHO will notify all personnel of the danger. In the event that a tornado watch is upgraded to a tornado warning, a tornado has been detected or seen, is on the ground, moving, and is expected to move through the effected area soon. If a tornado warning is sounded, the SSHO will instruct personnel to evacuate the site immediately and take cover. Environmental clues to look for include: dark, often greenish sky; large hail; a wall of clouds; and a loud roar, similar to a freight train.

3.5 HEAT STRESS

3.5.1 Introduction to Heat Stress and Strain

During activities conducted at FWDA, hot environmental conditions can create serious safety and health threats to site workers. Heat stress is one of the most common (and potentially serious) illnesses that can affect site personnel during spring, summer and fall weather conditions. Factors that may predispose a worker or increase susceptibility to heat stress include:

- Environmental factors such as air temperature,
- Humidity, and radiant heat;
- Lack of physical fitness and lack of acclimatization to hot environments;
- Degree of hydration before and during work in hot environments;
- Level of obesity;
- Current health status (i.e., having an infection, chronic disease, diarrhea, etc.); alcohol or drug use; and
- The worker's age and sex.

3.5.2 Heat Stress

Heat stress is the net heat load to which a worker may be exposed from the combined contributions of metabolic cost of work, environmental factors (i.e., air temperature, humidity, air movement, and radiant heat exchange), and clothing requirements. A mild or moderate heat stress may cause discomfort and may adversely affect performance and safety, but is not acutely harmful to health. As the heat stress approaches human tolerance limits, the risk of personnel experiencing acute heath affects increases.

3.5.3 Heat Strain

Heat strain is the overall physiological response resulting from heat stress. The physiological adjustments are dedicated to dissipating excess heat from the body. Acclimatization is the gradual physiological adaptation that improves an individual's ability to tolerate heat stress.

3.5.4 Heat Stress Ailments

The greatest cause of heat related ailments is inadequate employee acclimatization and lack of adequate hydration, both of which can easily occur during project tasks. This section presents information related to the most common heat stress ailments that could adversely affect site personnel.

3.5.4.1 Heat Rash

Heat rash is caused by continuous exposure to heat and humid air and is aggravated by wet chafing clothes. This condition can decrease a worker's ability to tolerate hot environments. Symptoms include a mild red rash, especially in areas of the body that sweat heavily. Treatments for heat rash include decreasing the amount of time in protective gear and use of powder, such as cornstarch or baby powder to help absorb moisture and decrease chafing. Personnel should maintain good personal hygiene standards and change into dry clothes if needed.

3.5.4.2 Heat Syncope (Fainting)

Heat syncope (fainting) occurs when blood flow to the brain is temporarily reduced resulting in unconsciousness. Heat syncope typically results from a combination of factors related to exposure to heat stress. First, heat stress causes the blood vessels in the skin area to dilate in order to increase blood flow to the skin where cooling of the blood should take place. This reduces blood flow to the brain that can result in loss of consciousness. Second, standing stationary for a long period in a hot environment may also allow for "pooling" of blood in the legs, thereby reducing the blood flow to the brain which again may cause fainting. Inadequate fluid replacement leading to dehydration may significantly contribute to this problem. Reduced blood flow to the brain results in faintness, dizziness, headache, nausea, vomiting, and possibly even fainting. Once the person has fainted, they will usually regain consciousness quickly. The fainted person should be laid down in a shaded area, elevate the feet, and if conscious, give fluids, particularly an electrolyte replacement fluid. The effected person should be allowed to rest until recovered and re-hydrated, and should not be allowed to engage in vigorous physical activity for the remainder of the day.

3.5.4.3 Heat Cramps

Heat cramps are caused by a rate of perspiration that is not balanced by adequate fluid and electrolyte intake. Heat cramps can be caused by both too much and too little salt, but the primary cause is lack of water replenishment. The occurrence of heat related cramps is an indication that heat exhaustion or heat stroke may occur soon. Symptoms include acute, painful spasms of voluntary muscles such as the back, abdomen and extremities. Treatments for heat cramps include removing the victim to a cool area, loosening restrictive clothing, and stretching and massaging affected muscles to increase blood flow to the area. The effected person should drink one to two cups of liquids immediately and then again every twenty minutes until recovered. Consultation with a physician is recommended if the condition does not improve. An electrolyte replacement solution should be taken along with water during break periods to replace lost electrolytes. Consumption of carbonated drinks will not be adequate and may aggravate the condition.

3.5.4.4 Heat Exhaustion

Heat exhaustion is a state of very definite weakness or exhaustion caused by excessive loss of fluids from the body. This condition leads to inadequate blood supply to working muscles and cardiac insufficiency. Fortunately, this condition responds readily to prompt treatment. Due to restriction in blood flow, this state of exhaustion can lead to muscle failure during times of physical stress. This can then lead to a personal injury accident. Additionally, if allowed to go untreated, heat exhaustion can quickly develop into heat stroke or cause heat collapse (fainting). Fainting can be very dangerous if the victim is operating machinery, and the victim may be injured when he or she faints. Symptoms of heat exhaustion include pale or flushed, clammy, moist skin, profuse perspiration, and extreme weakness. The body temperature is normal or slightly elevated, the pulse is weak and rapid, and breathing is shallow. The individual may have a headache, be dizzy, or be nauseated. Treatment will include removal of the individual to a cool, air-conditioned place; increased hydration; elevating the feet; and rest. The effected person should drink one to two cups of liquids immediately, and every twenty minutes thereafter until recovered. If the signs and symptoms of heat exhaustion do not subside or become more severe, immediately seek medical attention for the affected person.

3.5.4.5 Heat Stroke

Heat stroke is an acute and dangerous condition caused by the failure of the body heat regulating mechanisms. This failure causes the perspiration system to stop working correctly, and the body core temperature can rise very rapidly to a point (105+°F) where brain damage and death can result if the person is not cooled quickly. Symptoms include the victim having hot skin that may or may not be red and dry. Wetness may remain on the individual from sweat produced earlier before entering heat stroke. The person may be nauseated, dizzy, confused, delirious, unconscious, or comatose with extremely high body temperatures and rapid respiratory and pulse rates. Treatment for a heat stroke victim should concentrate on cooling the person's body immediately. If the body temperature is not brought down quickly, permanent brain damage or death may result. The victim should be cooled as soon as possible by either sponging or immersing the victim in very cool water to reduce the core temperature to a safe level (<102° F). If conscious, the victim should be given cool liquids to drink.

The victim should remain under observation and immediate medical attention should be sought. Do not give the victim caffeine or alcoholic beverages.

3.5.5 Heat Stress and Strain Evaluation and Control

Control of heat stress is generally maintained through proper acclimatization, adequate hydration and by conducting personnel monitoring when conditions are such that monitoring is required. Heat stress evaluation will be initiated when ambient temperatures are expected to exceed 78.8°F for acclimatized workers, 72.5°F for unacclimatized workers, and 70.0°F for workers using impermeable or semiimpermeable clothing. Additionally, the requirements for heat stress monitoring are discussed in Sections 8.5 and 9.0 of this SSHP.

3.6 COLD STRESS

3.6.1 Introduction

Since site operations could extend into winter months, there will be a potential for site personnel to be exposed to cold stress. The effects experienced by site personnel when working in cold environments depend upon environmental and personal factors, such as air temperature, wind speed, time of exposure, protective clothing and equipment worn, type of work conducted, level of physical effort, and health status of the worker. In cold environments, overexposure can cause significant stress on the body that can lead to serious, and potentially permanent, injury. Presented below is information about the most common cold stress disorders, their signs, symptoms, and effects.

3.6.1.1 Immersion Foot

These two cold injuries occur as a result of exposure to cool or cold weather and persistent dampness or immersion in water. Immersion foot usually results from prolonged exposure when air temperatures are above freezing, whereas trench foot normally occurs from shorter exposure at temperatures near freezing. The symptoms for each disorder are similar and include tingling, itching, swelling, pain and/or numbness, lack of sweating, and blisters.

3.6.1.2 Frost Bite

Frostbite occurs when there is actual freezing of the water contained in the body tissues. This usually occurs when temperatures are below freezing, but excessive wind can result in frostbite even when ambient temperatures are above freezing. Frostbite can occur from several types of cold exposure, including exposure of bare skin to cold and wind; exposure to extremely cold ambient temperatures; skin contact with rapidly evaporative liquids (gasoline, alcohol, or cleaning solvents) at temperatures below 39.2°F; or skin contact with metallic objects whose temperatures are below freezing. The extremities are usually affected first since the body's initial response to cold stress involves decreasing the blood flow to the extremities, thereby reducing heat loss. The tissue damage caused by frostbite can be superficial, near the surface of the skin, or extend deep into body tissues that can cause severe tissue damage.

During the initial stages of frostbite, the skin may have a prickly or tingling sensation and will later become numb with cold. The appearance of the affected skin may range from superficial redness of the skin to white, hard, frozen-looking tissues.

3.6.1.3 Hypothermia

Hypothermia results when the body loses heat faster than it can be produced. When this occurs, the blood vessels in the skin and extremities constrict, reducing the flow of warm blood to those areas that have a high surface area-to-volume relation. This reduction in blood flow reduces heat loss and usually affects the peripheral extremities first. Ears, fingers, and toes begin to experience chilling, pain, and then numbness due to loss of both blood flow and heat. Shivering begins as the body's core temperature begins to drop, and the body uses the shivering to compensate and create metabolic heat. Shivering is often the first sign of hypothermia. The pain and numbness in the extremities is an indication that the heat loss is increasing, but when shivering becomes severe and uncontrollable, the heat loss in the body core has become extreme. Further heat loss produces speech difficulty, reduced mental alertness, forgetfulness, loss of manual dexterity, collapse, unconsciousness, and finally death.

3.6.2 Cold Stress Treatment and Prevention

The requirements for cold stress treatment and prevention, to include monitoring, work-rest cycles and additional controls are discussed in the Section 9.0. Depending on weather conditions and the need to perform operations in areas being sprayed with cool water, TPMC personnel will read this SSHP and will be given periodic briefs related to cold stress prevention.

The intent of all cold stress treatment is to bring the deep body core temperature back to its normal temperature of about 98.6ºF. Work performed in cold environments should be discontinued temporarily for any worker who exhibits the signs or symptoms associated with hypothermia or frost bite. Workers exhibiting cold stress symptoms should be brought to a warm area and allowed to rest and warm-up. If a worker's clothing becomes wet, which reduces its insulation affect, it should be removed and replaced by dry clothing, or allowed to dry before resuming work. Warm, sweet, non-alcohol, decaffeinated drinks (not coffee) or soup should be given to increase the body core temperature, and re-warming should be gradual.

For frostbite, the victim should be sheltered from the wind and cold and given warm drinks. If the frostbite is superficial, the frozen area(s) should be covered with extra clothing or blankets, or warmed against the body. Do not use direct heat, and do not pour hot water over or rub the affected area. Warming should be gentle and gradual. Failure to do this could lead to bleeding in the tissues and increase the possibility of infection. If the frostbite is deep, (i.e. the affected area is frozen and hard to the touch), immediate medical attention should be obtained. The safe thawing of deep frostbite is beyond the expertise and facilities found on site.

Guidance for the monitoring of cold stress will commense once the ambient air temperature reaches 60.8ºF. Whenever the air temperature onsite falls below 30.2ºF, the temperature shall be measured and recorded at least once every two hours, unless sudden drops in the temperature are expected or noted, then it will be recorded once each hour. Additionally, whenever the air temperature on site falls below 30.2ºF, the wind speed shall be measured and recorded together with the air temperature. The equivalent wind chill temperature shall be obtained and recorded.

During work in cold environments, the SSHO will use the tailgate safety briefing to inform site personnel of the temperature and wind conditions anticipated for the day's site activities. The SSHO will also advise site personnel of the general practices, which should be utilized in the prevention and control of cold stress. Adequate, appropriately layered clothing, including a water repellant outer layer if precipitation is forecasted, shall be worn to prevent cold stress.

3.7 BIOLOGICAL HAZARDS

The FWDA location in the desert southwest presents several hazards associated with indigenous biological species. The SSHO will inform site personnel during tailgate safety briefings as to the potential biological hazards that may be encountered. Employee awareness and the SWPs outlined in Section 10.0 of this SSHP will be used to reduce or eliminate the risks associated with these hazards.

3.7.1 Poison Oak and Ivy

Personnel entering densely vegetated areas may encounter poison oak and ivy. Both plant species can cause red irritability blisters that form within 48 hours of skin contact. Personnel should become familiar with the characteristics of these plants and avoid contact with them. Personnel should wash the areas coming in contact with the leaves or stems of these plants with soap and water as soon as possible after exposure.

3.7.2 Animal Hazards

Several poisonous invertebrates and reptiles are found within FWDA. These include scorpions (which live under rocks and debris), fire ants (which live in large mounds of dirt or sand on the land surface), and rattlesnakes (which may be found in burrows, heavy brush, and under rocks, logs or debris). To avoid these animals, field personnel will be instructed to not pick up or roll boulders or logs with hands or feet. Personnel will also be instructed to stay away from large mounds of dirt or sand (potential fire ant hills). Similarly, reaching into burrows, heavy brush or other debris where these animals hide will not be permitted. If the investigation requires entering areas where these animals could live or be hiding, caution should be used to prevent bites or stings.

Mammals such as mountain lions, feral dogs, and other wildlife are also present and may pose a potential threat to personnel under certain conditions. Efforts should be made to avoid wildlife on the site to avoid aggressive acts by the animals.

3.7.3 Ticks

Ticks can transmit Rocky Mountain Spotted Fever and are prevalent in the spring and summer. Personnel should wear light colored clothing if they must enter densely vegetated areas. Personnel should periodically check for ticks during the workday, and complete a thorough check at the end of the day.

3.7.4 Hantavirus

Hantavirus is a disease of the respiratory system, which was first identified in the southwestern United States in 1993. A number of cases of the disease have been diagnosed in the area surrounding FWDA. The disease is a response to inhalation of rodent saliva, urine and feces in an aerosol form. Disease transmission may also occur when these dried materials are ingested, contacted with the eyes, or absorbed through cuts and breaks in the skin. The disease results in fever, muscle pain, coughing, and acute respiratory distress. Approximately 100 cases have been confirmed in 12 states since the disease was first identified in 1993. Of this number, at least 26 infected individuals died. This virus has been classified as a biosafety level four (the maximum level) agent for viral growth research.

Personnel may also come in contact with rodents and their excrement in buildings, toolboxes, and vehicles. Personnel will not attempt to pick up or capture rodents to reduce the risk of being bitten. Rodent nests and droppings in buildings should be disinfected with a commercial disinfectant containing hypochlorite, detergent, or ethyl alcohol. Personnel will minimize dust generation and will not dry sweep or vaccum in areas of suspected rodent activity.

3.8 ACTION LEVELS AND METHODS TO MITIGATE HAZARDS

3.8.1 Upgrades/Downgrades of PPE

The provisions for the upgrading and downgrading of PPE levels are based upon the potential for personnel exposure to chemical or physical hazards. For those chemical or physical hazards for which real-time monitoring are available, those monitoring limits presented in Table 8-1 will drive the upgrading and downgrading of PPE. For those physical hazards for which upgrading and downgrading of PPE are based on the potential for physical contact, the upgrading and downgrading requirements are spelled out in Section 6.0 of this SSHP and the AHA forms in Attachment 2.

3.8.2 Work Stoppage and/or Emergency Evacuation

All TPMC personnel are empowered with the ability to call a halt to site operations for a known or perceived health and safety threat. In the event that this occurs, the emergency evacuation procedures outlined in Section 15.0 of this SSHP will be utilized. These evacuation procedures will be also be used if site personnel must be evacuated due to an emergency conditions such as winds exceeding 40 miles per hour, rain which obscures visibility (as decided upon by the SSHO), the threat of a tornado, or unsafe winter weather conditions.

4.0 STAFF ORGANIZATION, QUALIFICATIONS, AND RESPONSIBILITIES

4.1 GENERAL STAFF INFORMATION

All personnel who may be exposed to on-site safety or health hazards are subject to and will comply with this SSHP. At no time will site personnel conduct tasks or operations in a manner that conflicts with the safety, health, or environmental precautions expressed in this SSHP. TPMC staffs all projects with highly skilled and trained personnel who are intimately familiar with the anticipated hazards and the measures needed to protect resources from those hazards. Ensuring site safety is a joint effort promoted by all site personnel. However, the personnel listed in this section have been given key safety-related responsibilities and are involved with the on-site safety and health chain of command.

4.2 PROJECT MANAGER

The PM for this project will be Mr Eric Kammerer, P.E., who is responsible for the successful performance of the project. To achieve success, this project must be completed in a safe and healthful manner. Therefore, as related to safety and health, the PM will:

- Manage and provide the funding, man power, and equipment resources needed to safely conduct site operations.
- Review this SSHP and have a thorough understanding of its requirements.
- Furnish copies of the Work Plan and SSHP to site personnel for their review.
- Coordinate with the CESHM to ensure that all anticipated project-specific safety and health issues have been addressed in this SSHP.
- Coordinate the assignment of subcontractors and ensure that subcontractor personnel and equipment meet the requirements of the SSHP.
- Provide consultation and support to the TPMC SSHO regarding safety and health issues.
- Coordinate with the CESHM to ensure site compliance with the SSHP and the CESHP.

4.3 CORPORATE ENVIRONMENTAL SAFETY AND HEALTH MANAGER

The CESHM is Mr. Jeffrey Case, who has more than 20 years of environmental safety and hazardous waste operationsexperience. Mr. Case has completed the OSHA HAZWOPER site worker and supervisor training requirements in accordance with 29 CFR 1910.120, and will provide occupational safety and health technical support to the Site Safety and Heath Officer (SSHO) and other project personnel. As the CESHM, he will:

- Report directly to the TPMC President regarding safety and health issues.
- Develop and approve this SSHP.
- Coordinate with the TPMC SSHO for field implementation of this SSHP.
- Communicate and consult with the PM and SSHO.
- Evaluate and authorize any changes to this SSHP.
- Conduct, or assist in the presentation of, site, task, and hazard-specific training.
- Conduct periodic site safety and health audits.
- Ensure site and personnel compliance with the TPMC CESHP.

4.4 SITE SAFETY AND HEALTH OFFICER

Mr. Stephen Deeter will be the SSHO for this project. The SSHO will be responsible for the on-site implementation of the safety and health requirements presented in this SSHP. The SSHO will have completed the OSHA 40-hour HAZWOPER site worker and refresher training, and the 8-hour Supervisor/Manager training requirements IAW 29 CFR 1910.120. To ensure on-site safety and health, the SSHO will:

- Ensure that all work is conducted safely and in accordance with this SSHP
- Conduct daily safety briefings.
- Conduct and document site training related to site-specific hazards.
- Evaluate PPE requirements and ensure that applicable PPE is issued to and used by all employees.
- Implement and enforce the TPMC Alcohol/Drug Abuse Policy.
- Investigate injuries, illnesses, accidents, incidents, and near misses.
- Conduct visitor orientation, daily safety inspections, and weekly safety audits.
- Ensure field implementation of the CESHP.

4.5 SENIOR UXO SUPERVISOR

During the conduct of operations potentially involving MEC, TPMC will field a Senior UXO Supervisor (SUXOS) to provide oversight. Mr. Robert Diekmann will be the SUXOS for this project. The SUXOS will be responsible for the on-site implementation of the Plans and the safety and health requirements presented in this SSHP. The SUXOS will have completed the OSHA 40-hour HAZWOPER site worker and refresher training, and the 8-hour Supervisor/Manager training requirements IAW 29 CFR 1910.120 and will meet the personnel requirements of DDESB TP-18, *Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel.* To ensure on-site safety and health during MEC operations, the SUXOS will implement the responsibilities outlined of the SSHO above and will :

- Review the Work Plan and SSHP to ensure the MEC, safety, and health issues have been adequately addressed and controlled.
- Act as the lead technical consultant for all on-site MEC-related safety matters.
- Assist in the conduct of site training and briefings as they relate to MEC and other safety issues.
- Ensure, and when necessary, enforce compliance with the Plans and SSHP.

4.6 GENERAL SITE PERSONNEL

Even though specific personnel have been given distinct responsibilities for site safety, ensuring the safe and healthful conduct of site operations is the responsibility of all personnel assigned to the site. Therefore, all project personnel involved in site activities will:

- Comply with the safety and health provisions of this SSHP and all other required safety and health guidelines.
- Take all necessary precautions to protect themselves and fellow site personnel.
- Remain alert to the presence of potentially harmful conditions/situations and immediately inform the SSHO of the hazard.
- Perform only those tasks that they can do safely and for which they have received appropriate training.
- Notify the SSHO of any special medical conditions (i.e., allergies, contact lenses, diabetes) or medications, which could affect their ability to safely perform site operations.
- Prevent the spillage and splashing of environmentally hazardous materials.
- Practice good housekeeping by keeping the work area neat, clean, and orderly.
- Immediately report all injuries, no matter how minor, to the SSHO.
- Maintain equipment in working order and report defects to the SSHO.
- Properly inspect and use the PPE required by the SSHP or the SSHO.

Report to the PM and/or the SSHO any injuries requiring first aid procedures or higher for treatment, and any exposures to chemical, physical or biological hazards.

5.0 TRAINING

5.1 GENERAL INFORMATION

All personnel assigned to, or regularly entering the project site, shall receive the training required in this section prior to participation in assigned site activities that pose a potential for exposure to safety or health hazards. Site personnel shall also receive the training outlined in this section as applicable to their assigned duties. Documentation of relevant training will be maintained at the TPMC corporate office and the TPMC FWDA field office.

5.2 MEC TRAINING REQUIREMENTS

Personnel involved in oversight of field investigations where MEC may be encountered shall meet one of the prerequisites listed below:

- Graduate of the Naval Explosive Ordnance School, Indian Head, Maryland or Eglin AFB, FL.
- Graduate of the U.S. Army Bomb Disposal School, Aberdeen Proving Grounds, Maryland
- Graduate of the EOD Assistant's Course, Redstone Arsenal, Alabama, with a minimum of five years of military EOD and/or commercial MEC experience
- Graduate of the EOD Assistant's Course, Eglin Air Force Base, Florida, with a minimum of five years of military EOD and/or commercial MEC experience.

5.3 CFR 1910.120 TRAINING REQUIREMENT

5.3.1 40-Hour General Site Worker Training

All TPMC and subcontractor personnel with the potential for exposure to hazardous substances or other safety and health hazards during the course of this project must obtain 40-hours of off-site HAZWOPER training. This training must be completed, and documentation presented, before personnel are to participate in site activities involving exposure to site hazards.

5.3.2 24-Hour Occasional Site Worker Training

This type of training will not be applicable to personnel participating in field activities associated with the Work Plan for this project.

5.3.3 Three-Day On-Site Training

All TPMC on-site and subcontractor personnel shall be given a minimum of three days of actual on-site field experience/training under the direct supervision of a trained, experienced supervisor. This training will be used to familiarize site personnel with the site-specific organization, PPE, and emergency response procedures. The three-day on-site training is site-specific and shall be documented using the Three-day On-site Training Form (Attachment 1). The SSHO will generate and maintain this form and will ensure that all personnel receive this training and sign the form.

5.3.4 8-Hour Annual Refresher Training

All TPMC and subcontractor personnel, to include management/supervisory personnel, shall receive a minimum of eight-hours of refresher training annually. This training will cover relevant topics from the 40-hour HAZWOPER and the eight-hour management/supervisor courses, as well as critiques of any incidents that have occurred in the past year and any other related topics.

5.3.5 Supervisor and Management Training

Managers and other personnel who are directly responsible for the performance of hazardous waste operations, or who directly supervise on-site personnel, shall have eight additional hours of specialized supervisory training as specified in 29 CFR 1910.120(e).

5.4 SITE-SPECIFIC AND HAZARD INFORMATION TRAINING

5.4.1 Site-Specific Information Training

Site-specific information training shall be used to provide site personnel with important information related to site operations. This training shall apply to the three-day on-site training requirements outlined in Section 5.3.3, and cover site-specific training topics listed below.

- Site history and background.
- Site organization and chain of command.
- Proper use, maintenance and cleaning of required PPE.
- Emergency response procedures, assignments, and contacts.
- Facility-specific requirements.

Additionally, all site related personnel will sign a Safety Indoctrination Form acknowledging that they have received safety indoctrination training and a SSHP Review Form acknowledging that they have read and understood the SSHP.

5.4.2 Hazard-Specific Information Training

Hazard-specific information training shall be presented utilizing the TPMC Hazard Information Program that meets the requirements specified in 29 CFR 1910.120 (i). This training shall be presented to all personnel involved in site operations and shall be used to inform personnel as to the degree, nature, and level of exposure likely to occur as a result of participation in site activities. This training, as a minimum, will cover the following topics.

- A complete description of physical and toxicological properties of any hazardous materials expected to be found on-site.

- A complete description of the physical hazards associated with site operations, including those hazards listed for the site tasks as associated with this SSHP.

- A description of the biological hazards which may be encountered on site, to include identification and protective methods, and what to do if exposure occurs.

- The SWPs or other hazard control techniques that will be used to minimize exposure.

5.5 VISITOR TRAINING

Site visitors are defined as persons who: (1) are not employed at the project site; (2) do not routinely enter restricted work areas; and (3) spend short periods at the site (i.e., 1 to 2 days per visit). Site visitors may include client personnel, TPMC personnel, auditors or inspectors from Federal, state, or local regulatory agencies, or political representatives. It is the responsibility of all site personnel to maintain, whenever possible, a watch for visitors approaching the site and to immediately notify the PM or SSHO of the presence of the visitor. Visitors shall be required to comply with the general requirements listed in Section 5.4.1 and shall meet the appropriate requirements as specified below depending upon the part of the site they will be visiting.

5.5.1 General Requirements for All Site Visitors

Regardless of the purpose of the site visit or the control zones to be entered, the following requirements shall apply to all site visitors prior to their entry into the site.

- The PM and SSHO shall be notified of the nature/duration of the visit.

- Visitors shall sign the Visitor Log and shall record their names, date of visit, and the name of the company or agency represented.

- Site visitors shall be escorted by an TPMC representative while in the area.

- Visitors shall comply with the safety/health requirements described below.

5.5.2 Visitors Remaining Outside the EZ

Visitors wishing to observe site activities from outside the Exclusion Zone (EZ) shall receive general hazard information training, which incorporates the following topics.

- Location and description of potential hazards and risks.

- A short briefing about the chemical hazards found on-site.

- Areas of the site that are closed to visitors.
- The site evacuation plan and emergency procedures.
- Other topics as deemed appropriate.

5.5.3 Visitors Entering the EZ

Any visitors requesting entry into the EZ shall be subject to the same site-specific and hazard information training as specified in Section 5.4.2 of this SSHP. This training shall be conducted prior to the visitor entering the EZ. Visitors requesting entry to an EZ shall also be required to present documentation of OSHA HAZWOPER training and medical surveillance, consistent with the requirements for the general site employees. Visitors must be escorted by TPMC personnel while in the EZ, and no more than two visitors will be permitted in the EZ at any given time. All operations with the potential for encountering MEC shall cease whenever visitors enter the EZ.

5.6 MEC RECOGNITION TRAINING

All non-UXO-qualified personnel who will be involved in on-site operations will be given MEC Recognition Training. This training will be used to familiarize non-UXO-qualified personnel with the appearance and components associated with MEC that may be found on site. This training will include TPMC's "No Touch" policy, which states that non-UXO-qualified personnel will not touch any MEC-related items unless they have been inspected by UXO-qualified personnel and deemed to be explosive-free.

5.7 MEC REFRESHER TRAINING

All UXO-qualified site personnel shall receive site-specific MEC training that covers the ordnance items that are known, or expected, to be on site. The topics to be covered in the MEC refresher training shall include: type of MEC, hazards, and handling and disposal procedures.

5.8 FIRST AID AND CARDIOPULMONARY RESUSCITATION TRAINING

At least two full-time TPMC site employees shall be trained and certified in first aid and cardiopulmonary resuscitation (CPR). Whenever possible, the SSHO will be one of the two site personnel so trained. The training shall be equivalent to that provided by the American Red Cross. Once trained, these employees will be tasked with the responsibility of initial first aid response to injured employees whenever other medical support personnel are not immediately available on site.

5.9 BLOODBORNE PATHOGEN TRAINING

The TPMC first aid-trained personnel will primarily be responsible for rendering aid in the event of an injury or accident. The first aid/CPR trained personnel who have a potential for occupational exposure to blood or other potentially infectious body fluids shall receive training as outlined in the 29 CFR 1910.1030(g)(2) and the TPMC Bloodborne Pathogens (BBP) Exposure Control Plan. Whenever feasible, all on-site TPMC personnel will receive the same level of BBP training as specified above.

5.10 PPE TRAINING

A detailed discussion related to the training required prior to personnel using PPE is presented in Section 6.0 of this SSHP. It is essential that all site personnel fully understand the need for the PPE, as well as the limitations and proper care of the PPE.

5.11 HAZARD COMMUNICATION TRAINING

In order to comply with the requirements of the OSHA Hazard Communication (HAZCOM) Standard, 29 CFR 1910.1200, HAZCOM training shall be provided for all site personnel who will use products containing hazardous substances. This training shall be provided upon initial assignment to the site and prior to use of the product. Supplemental HAZCOM training shall be scheduled and presented whenever a new hazardous substance is introduced into the work area or an employee changes job location where new products are encountered.

5.12 FIRE EXTINGUISHER TRAINING

All TPMC site personnel will be trained in the general principles of fire extinguisher selection and use, and the hazards associated with incipient-stage fire fighting (i.e., fighting a fire that has just begun). This training will be provided initially and annually thereafter.

5.13 CONTROL OF HAZARDOUS ENERGY TRAINING (LOCKOUT/TAGOUT)

All site personnel involved in the use of lockout/tagout (LO/TO) devices for the control of hazardous energy will receive training in the proper implementation of the LO/TO prior to arrival onsite. All training will comply with 29 CFR 1910.147.

5.14 DAILY SAFETY MEETINGS

5.14.1 Daily Task and Safety Briefing

Prior to commencing operations each day, all TPMC, contractor, and subcontractor personnel who will conduct operations within the EZ will be given a Daily Task and Safety briefing by the SSHO. This briefing shall identify the anticipated site activities and the potential hazards that could be encountered and review the following: weather conditions and weather-related hazards; use of safety equipment; emergency notification, evacuation and medical procedures; accident prevention; relevant Work Plan/SSHP topics, lessons learned, and near misses. Documentation related to the Daily Task and Safety Briefing topics and attendance shall be maintained on-site.

5.15 ADDITIONALLY REQUIRED OSHA TRAINING

Additional OSHA-required training as deemed necessary by the CESHM or SSHO shall be provided as needed. Such training may include training related to specific chemical contaminants (such as lead, etc.) or task-specific hazards such as heavy equipment, hand-tool operation, specialized PPE, etc.

5.16 DOCUMENTATION OF OSHA TRAINING

All on-site and management/supervisory personnel shall present documentation or certification of training completion prior to participating in site activities. Without appropriate documentation, personnel shall be prohibited from entering hazardous areas or engaging in hazardous site activities.

6.0 PERSONAL PROTECTIVE EQUIPMENT

6.1 USE OF ENGINEERING CONTROLS

According to OSHA 1910.120(g), 1910.132, and 1910.134, whenever occupational exposures to chemical or physical hazards exist at levels in excess of established action levels; the primary objective will be to apply accepted engineering controls. However, when feasible engineering controls are not available, a reasonable combination of administrative controls (i.e., written SWPs) and PPE will be used.

For site operations during this project, the feasible engineering controls to be used include machinery guards. Machinery guards are installed on equipment or tools by the manufacturer. Guards of this nature will be removed only for the purposes of conducting equipment maintenance and will be replaced prior to operation of the equipment or machinery.

6.2 GENERAL REQUIREMENTS

All personnel performing operations on site shall be required to use the appropriate level of PPE, as specified below and in the AHA forms in Attachment 2. This SSHP makes provisions for use of Modified Level D and Level D PPE, according to the hazards associated with the work task.

The PPE levels presented in this section will be reassessed and the CESHM contacted if any of the following events occur.

1. Appearance of previously unidentified chemicals or conditions.

2. Changes in ambient weather conditions which impact the use of assigned PPE.

3. Introduction of new task or expansion of a previously assigned/evaluated task.

6.3 SPECIAL CONSIDERATIONS

Personnel using/dispensing products that contain chemicals with a skin contact hazard will wear chemical-resistant gloves as defined in the AHA forms.

6.4 HAZARD-SPECIFIC AND TASK-SPECIFIC PPE SELECTION

Table 6-1 presents a listing of the primary tasks, and when applicable the sub-tasks, that are anticipated for this project. Next to each planned task/sub-task is listed the initial level of PPE that will be worn during task performance. Revisions to this table will only be made upon approval of the TPMC CESHM.

Table 6-1: Task-Specific PPE Assignments

Task to be Performed	Level of PPE
Ground water sampling	D/Mod D

6.5 PPE ASSOCIATED WITH VARIOUS PPE LEVELS

6.5.1 Level D PPE

The Level D PPE to be used will consist of the following:

- Work clothes or coveralls (cotton);
- Leather work gloves (to be used whenever hands require protection from cuts and abrasions);
- Hard hat (Required when working around heavy equipment or and anywhere an overhead hazard exits);
- Safety-toed work boots;
- Safety glasses (to be used whenever an eye impact hazard exists); and
- Ear plugs or muffs (as required for working in areas of high noise)

6.5.2 Modified Level D PPE

The following PPE will be worn for those tasks requiring Modified Level D PPE:

- Same as Level "D", but with the following additions
- Tyvek™ suit, chemical over gloves and boots as deemed necessary by the SSHO

6.6 PPE TRAINING

As specified by 29 CFR 1910.132, all site personnel who are required to use PPE shall be given training in the use, care, and limitations of the PPE they are to use. Prior to PPE use, the affected personnel shall demonstrate an understanding of the training and their ability to properly use the assigned PPE. Upon completion of this training, affected personnel will be retrained if the level or type of PPE being used changes. PPE training shall address the following topics:

- PPE selection decisions and when and what PPE is needed;
- How to properly don, doff, adjust, and wear PPE;
- The limitations of specific pieces/types of PPE; and

- The proper care, maintenance, limitations, and disposal of PPE.

6.7 PPE INSPECTION, MAINTENANCE AND STORAGE

Site personnel using PPE will keep their PPE in clean, good working condition. TPMC shall provide cleansing wipes, wash sprays and clothes, towelettes, or equivalent cleaning supplies to allow personnel to surface clean PPE. Additionally, TPMC will establish and maintain a PPE storage area where field personnel may store their PPE during non-use. All site personnel will be responsible for daily inspections of their PPE to ensure that it is maintained in safe working order. PPE that is worn-out or defective will be brought to the attention of the SSHO. PPE that can be made effective through replacement of specific parts (i.e., replacement of scratched lenses on safety glasses) will be maintained in accordance with manufacturer instructions, or replaced as needed. PPE that cannot be restored to operational condition will be discarded and replaced as needed.

6.8 EMERGENCY RESPONSE EQUIPMENT

For this project, no additional or special levels of PPE are being specified for emergency situations. For all site operations, approved first aid and emergency response supplies will be available on-site. Each field team will have and maintain first aid supplies consisting of:

- A 16-Unit (or 25-person) first aid kit with at least two BBP protection kits;
- Portable eye wash bottles;
- Burn kit with bandages;
- Trauma bandages;
- A fire blanket; and
- Fire extinguisher

Additional first aid and emergency response supplies will be maintained on site as required by Section 14.0 of this SSHP. With the exception of fire extinguishers that require a monthly inspection, all emergency response and first aid equipment will be inspected initially and then weekly thereafter to ensure adequate supplies and proper operational condition. Additional information related to fire extinguisher types and sizes and spill response equipment that must be available is presented in Section 14.0 of this SSHP. No safety showers will be required because there is no potential for personnel being drenched with hazardous substances that can pose a threat to the skin.

7.0 MEDICAL SURVEILLANCE

7.1 PURPOSE AND SCOPE

As part of the CESHP, TPMC has established a comprehensive Medical Surveillance Program (MSP) designed to assist in the prevention, diagnosis, and treatment of occupational illnesses and injuries sustained during operations on hazardous waste sites. The medical surveillance requirements of this section shall apply to all site personnel with exposure potential to significant safety and health hazards.

7.2 GENERAL REQUIREMENTS

Medical examinations of personnel as required by the MSP shall be conducted by, or under the supervision of, a licensed physician, who is board-certified in occupational medicine or has had extensive experience in the recognition, evaluation, and treatment of occupational diseases.

7.3 PHYSICIANS STATEMENT

Upon completion of a health assessment, the physician shall provide the results of the examination to the employee, and a written physician's statement shall be provided to TPMC. The physician's statement shall, as a minimum, include the following: 1) the employee's name and social security number; 2) a statement that the employee is qualified to participate HTRW-related site activities; 3) the physician's recommended limitations upon the employee's assigned work, if any; and 4) any supplemental or follow-up examinations or tests which the physician believes are required to complete the assessment

7.4 MEDICAL SURVEILLANCE EXAMINATIONS

7.4.1 Pre-Assignment Health Assessment

The pre-assignment health assessment shall be conducted prior to personnel participation in site activities involving potential exposure to chemical or physical hazards. The pre-assignment health assessment shall have been conducted within the past 12 months and will meet the requirements of the MSP presented in the CESHP.

7.4.2 Supplemental Examination

Any site worker who has been injured, received a health impairment, developed signs or symptoms from possible overexposure, or received an overexposure without the use of respiratory protection, shall undergo a supplemental examination. The physician will determine the contents of this examination and shall certify the employee’s fitness to return to work prior to reassignment. The physician shall specify in writing any work restrictions required.

7.4.3 Follow-up Health Assessments

The physician will notify TPMC, and the employee, if a work-related condition is detected during an examination that requires additional testing or assessment. Upon conclusion of the follow-up health assessment, a statement regarding the employee's fitness for work will be provided.

7.4.4 Task-Specific Medical Examinations

No site or task-specific medical examinations or tests are anticipated for the sites tasks associated with this contract. In the event that the CESHM identifies any specific contaminants that require biological assessment and monitoring, this section will be modified and the modified section submitted to USACE for approval.

7.5 EMERGENCY AND NON-EMERGENCY MEDICAL TREATMENT

Prompt and effective non-emergency and emergency medical treatment will be provided for site personnel who require medical attention resulting from injuries or illnesses occurring during site operations. The treatment requirements of this section are not designed to provide for the diagnosis or treatment of non-occupational injuries or illnesses, unless immediate medical attention is needed to prevent loss of life, relieve suffering, or preclude permanent injury which would result if treatment were delayed. Route maps and instructions to the facilities identified in this section are included in Section 15.15 of this SSHP.

7.5.1 Treatment of Minor Injuries

For minor injuries, the two on-site TPMC personnel with first aid/CPR training will provide the initial first aid response. If additional/advanced medical treatment is required, the SSHO will determine if the injured person should be transported using a site vehicle or if an ambulance is required. If the SSHO determines that a site vehicle may be used, a first aid-trained attendant will accompany the driver and injured person for the trip to the hospital designated for non-critical injuries. Primary treatment for illnesses or injuries which could occur on site will be provided by Rehoboth McKinley Christian Health Care Services, located at 1901 Redrock Drive in Gallup, New Mexico.

7.5.2 Treatment of Serious Injuries

If ambulance service is required, the FWDA BEC and/or the FWDA Caretakers are to be contacted via radio and they will summon emergency medical service (EMS). For injuries requiring ambulance transportation, an on-board Emergency Medical Technician (EMT) will provide care as required by the nature of the injury.

In the event that the SSHO requests EMS, the on-site first aid personnel will provide initial support in an effort to stabilize the injured person while the ambulance service is summoned. Once on site, the EMT personnel will not only provide emergency medical services, but will also determine which hospital the injured party will be transported, as well as the mode of transportation. EMT personnel may elect to use ground transportation or summon helicopter air ambulance service for transporting the injured person to a trauma center. Rehoboth McKinley Christian Health Care Services, located at 1901 Redrock Drive in Gallup, New Mexico, will be the first choice for serious injuries, unless decided upon differently by the medical response personnel. Additional information related to emergency response is contained in Section 15.0 of this SSHP.

8.0 EXPOSURE MONITORING/AIR SAMPLING PROGRAM

8.1 GENERAL

On-site monitoring will be conducted during specified site activities to evaluate potential hazards that may be encountered. The on-site monitoring will assist in determining the effectiveness of control measures, the need for upgrading or downgrading PPE requirements, and the effectiveness of SWPs. Direct-reading, real-time instruments will be used whenever possible, or required, to detect and qualify site hazards. If a reading is achieved which exceeds the action levels specified in the following sections, the SSHO shall take the steps outlined in this section, or other referenced sections, to correct the situation or minimize the exposure.

8.2 PERSONAL MONITORING REQUIREMENTS

8.2.1 Real-Time Direct-Reading Monitoring

Monitoring frequency may be escalated or reduced by the CESHM based upon the results of previous monitoring or the detection of factors that indicate a potential for exposure. The monitoring equipment to be used during this project will include:

1. Flame-Ionization Detector/Photo-Ionization Detector (FID/PID) – An FID or PID (or combination FID/PID) will be used to measure volatile organic compounds in the breathing zone.

2. Digital ambient air thermometer - Used to assess heat and cold stress effects in accordance with Section 9.0 of this SSHP.

8.3 MONITORING SCHEDULE AND FREQUENCY

Exposure monitoring will focus on the potential for exposure to physical and chemical hazards during site operations. The type of monitoring equipment to be used, the frequency at which the monitoring will be conducted, monitoring method to be employed, action level, and the action to be taken if the action level is exceeded are specified in the following sections.

8.4 BREATHING ZONE MONITORING

The breathing zone will be monitored continuously during sampling activities. This monitoring will be conducted by, or at the direction of, the SSHO and will be used to minimize physiological effects in the event that VOCs are emitted during site activities. Table 8-1 presents action levels for contaminants that could potentially be encountered during site activities.

Table 8-1: Site Monitoring Schedule and Action Levels

Hazard	Equipment	Monitoring Frequency/Location	
Heat Stress	Digital Thermometer	Daily when ambient temperatures are expected to exceed 78.8°F for acclimatized workers, 72.5°F for unacclimatized workers, and 70.0°F for workers using impermeable or semi-impermeable clothing	
		Action Level	**Action to be Taken**
		Above ACGIH criteria as outlined in Section 9.0	Institute physiological monitoring and appropriate controls as outlined in Section 9.0
Hazard	**Equipment**	**Monitoring Frequency/Location**	
Cold Stress	Digital Thermometer	Every four hours once ambient temperature becomes less than 60.8 ºF	
		Action Level	**Action to be Taken**
		Above ACGIH guidelines as presented in Section 9.0	See Section 9.0
Hazard	**Equipment**	**Monitoring Frequency/Location**	
VOCs	PID/FID	Continuous breathing zone monitoring during sampling, well installation, and development	
		Action Level	**Action to be Taken**
		Greater than 1 ppm above background for 5 minute period	Upgrade to Level C PPE with fullface respirators

Monitoring of VOCs will be conducted during each work day. At the initiation of each field activity or work period, the SSHO (or qualified designee) will measure and record the background levels of total VOCs in the ambient airspace. Additionally, relevant meteorologic data will be estimated and recorded in the project field book (i.e., wind speed and direction and ambient air temperature). The potential for volatilization of VOCs will be assessed based upon the activity to be performed (intrusive versus non-intrusive), and the meteorologic conditions existing at the time the activity is to take place.

Air monitoring will be continuously performed at each sampling location and each drilling location during the well installation and well development. A commercially available FID or PID will be utilized to monitor the breathing zone in the workspace surrounding the well location. The FID or PID will also be used to monitor the annular space of the well borehole and soil samples (examined upon their retrieval). Similar monitoring of any fluids generated during well installation/development will also be conducted, as directed by the SSHO. The results will be recorded in the project field book.

If a sustained PID/FID reading of 1 parts per million (ppm) (based on benzene, as shown in Table 3-1) or greater is detected for 3 to 5 minutes above background and in the breathing zone (12 inches from the face), work will be halted. The PM and SSHO will be notified of any sustained readings over 1 ppm. The PM will contact the FWDA BEC and USACE Technical Manager and, in coordination with the SSHO, determine a course of action (e.g., upgrading to Level C PPE).

8.5 TEMPERATURE EXTREME MONITORING

Heat and cold stress monitoring will be conducted in accordance with the guidelines presented in Section 9.0. This monitoring will be conducted at the direction of the SSHO, or another designated qualified person, and will be used to minimize physiological effects in the event that temperature extremes are experienced during site operations.

8.6 NOISE MONITORING PROCEDURES

High noise levels are anticipated during the operation of sampling equipment. Exposures above 85 decibels as recorded in the A-weighted sound level (dBA) will likely be experienced during sampling activities. Noise levels will therefore not be monitored. In place of monitoring, a general hearing protection requirement around this equipment will be enforced.

Personnel within within 25 feet of generators and compressors during ground water sampling activities will be required to wear hearing protection rated for at least a 25dB (decibels) noise reduction rating (NRR).

8.7 MONITORING EQUIPMENT CALIBRATION AND MAINTENANCE

All sampling and monitoring instrumentation used on site will be calibrated and/or response-checked in accordance with the manufacturer's specifications before and after use each day. If an instrument fails to calibrate or respond correctly, it will bemoved from service until it can be repaired in accordance with manufacturer's specifications.

9.0 HEAT AND COLD STRESS

If weather conditions exceed the temperatures outlined in the following sections, the SSHO will implement the monitoring and personnel controls as outlined.

9.1 HEAT STRESS

The following should be used as guidelines in controlling heat stress. The Site Safety Officer has the responsibility to monitor heat stress throughout each day and to make work/rest recommendations as appropriate. All workers are expected to follow the work/rest cycles.

Heat stress decisions will be based mostly on physiological measurements (pulse rate, skin temperature) and environmental measurements by the Wet Bulb Globe Temperature (WBGT) monitors. All equipment necessary to monitor WBGT will be maintained on-site in the event it is required. Additional environmental data will also be recorded daily and considered in heat stress evaluations.

Initially, work/rest cycles will be established using pulse rates and the following guidelines. This work/rest schedule may be modified at the discretion of the Site Safety Officer. The work/rest schedule is based upon guidance set by the American Conference of Governmental Industrial Hygienists (ACGIH) along with the professional judgement of the responsible Project Safety Supervisor. The WBGT reading in Table 9-1 are actual readings – no additional factors should be added:

Table 9-1: Work/Rest Schedule

WBGT (^oC)			
LEVEL C&B	MOD C	LEVEL D	WORK/REST
<22.5	<24	<25.8	NORMAL
22.5-24.4	24-25.9	25.8-27.5	60-15
24.5-26.4	26-27.9	27.6-29.6	45-15
26.5-29.4	28-30.9	29.7-32.5	30-30
29.5-30.4	31-31.9	32.6-33.5	15-45
30.5-32	32-33.5	33.6-35.2	15-60
>32	>33.5	>35.2	CEASE WORK

9.2 DAILY PROTOCOL

WBGT Readings will be taken:

- at the beginning of the work day
- mid-morning
- noon
- mid-afternoon
- at the end of the work day

WBGT readings will be taken at least at each drilling rig, other major work areas and at outside rest stations.

Employee body weights (semi-nude) will be taken immediately before work and at the end of the work day. If the weight loss exceeds 1.5 percent, the worker should be told to drink more liquids during that evening and the following work days. The worker will also be monitored during the next few work days to insure the weight loss does not continue at an unacceptable rate.

Pulse rates will be monitored routinely throughout the workday, frequency depending upon WBGT readings. At minimum, the most active member of each work crew will be monitored during the first two breaks in the morning and the first break after lunch. Pulse rate recovery criteria is presented in Table 9-2.

Pulse rates will be taken as follows:

- at the end of a cycle of work, the worker goes to a nearby location and sits on a stool or straight chair. At the moment she is seated the observer starts a stopwatch. At 30 seconds the observer begins a pulse count, having previously palpate the radial pulse. This count is continued until one minute. The 30-second count is multiplied by 2 and recorded as "P1"
- if P1 exceeds 120, an additional pulse will be taken starting at 2 minutes, 30 seconds to 3 minutes; multiplied by 2 and recorded as P3.
- Pulse rates readings:
- 120 and below (P1) – Worker will be allowed to continue the scheduled work/rest cycle.
- Exceeding 120 (P1) – Worker will remain in the rest area until pulse rate returns to 90, or below; additional monitoring will depend upon the pulse rate recovery.

Table 9-2: Pulse Rate Recovery – for Individual with P_1 Greater than 120

Patterns	P_3	P_1 -P_3
Satisfactory (S)	<90	-
High (H)	^{3}90	^{3}10
No Recovery (N)	^{3}90	<10

Satisfactory patterns need no further comment.

- High recovery patterns indicate work at a high metabolic level with little or no accumulated body heat. Individuals showing this condition should be monitored during the next breaks while work periods are reduced until P1 is 120 or below.
- No recovery patterns indicate too much personal stress. Individuals showing "no recovery" heart rate patterns return to the decon trailers and rest for a period no less than one hour. The Site Safety Officer must monitor the workers and determine if additional medical assistance is needed.

Fluid intake should be encouraged for workers throughout the day. Workers should frequently drink small amounts; the equivalent of one cup every 15-20 minutes. Workers should also be encouraged to salt their food abundantly.

Acclimatization to heat involves a series of physiological and psychological adjustments that occur in an individual; during the first week of exposure to hot environments. For the reason, the work schedule presented in Table 9-3 applies for workers new to the site when conditions are such that controlled work/rest cycles are being used.

Table 9-3: Acclimatization

	Suggested MaximumWork
Day 1	2 hours
Day 2	3 hours
Day 3	4 hours
Day 4	6 hours
Day 5	8 hours

Deviation from this schedule may be done based on evaluations by the SSHO.

9.3 HEAT STRESS

Effects of heat stress can occur as either heat exhaustion, or the more dangerous condition of heat stroke. Signs of heat exhaustion include pale, clammy skin, profuse perspiration, and extreme fatigue. There may be headache or vomiting. The body temperature will appear normal. Effects of heat stroke include hot, flushed or red, dry skin with extremely high body temperature, up to 41^{o}C (106^{o}F). The victim may experience dizziness, nausea, headache, rapid pulse or unconsciousness.

9.4 COLD EXPOSURE

Personnel working outdoors in low temperatures are subject to cold exposure. Toes, fingers, ears, cheeks, and the nose are especially vulnerable to cold exposure.

Factors influencing the development of a cold injury include ambient temperature, wind velocity, humidity, type of exposure, and duration of exposure. Frostbite and hypothermia are two cold injuries which may occur.

Frostbite is a local injury resulting from cold exposure. It is characterized by a white or pale coloring of the skin. Its symptoms are exhibited in the following stages:

- Just before frostbite occurs, the affected skin may be slightly flushed;
- The skin changes to white or grayish-white in appearance;
- Pain is sometimes felt early but subsides later (often there is no pain)
- Blisters may appear later;
- The affected part feels intensely cold and numb; and
- The victim frequently is not aware of frostbite.

The objectives of first aid are to protect the frozen area from further injury, to warm the affected area rapidly, and to maintain respiration.

Hypothermia is an overall cooling of the body. Its symptoms are usually exhibited in five stages.

- Shivering;
- Apathy, listlessness, sleepiness;
- Unconsciousness, glassy stare, slow pulse, and slow respiratory rate;
- Freezing of the extremities; and
- Death.

To avoid cold exposure injuries, personnel should dress in layers, removing clothing as they generate heat from working. The buddy system must be instituted to ensure signs of frost bite or hypothermia will be noted as soon as possible. Generally, it is easier for someone else to see these signs before the person who is exhibiting them will notice. A work/rest regimen, designated by the SSHO should be implemented early to avoid personnel casualties. If any cold exposure injuries are detected, the SSHO must be notified immediately.

10.0 STANDARD OPERATING SAFETY PROCEDURES, ENGINEERING CONTROLS, AND WORK PRACTICES

10.1 GENERAL

This section outlines the engineering controls, SWPs, and Standing Site Orders which will be followed by all site personnel to eliminate, or reduce, the risk of exposure to recognized site hazards. These control measures are presented as a working guide for site personnel and are not intended to cover all TPMC, OSHA, or USACE compliance issues. For reference, a copy of the CESHP will be available on-site. As a rule, all site personnel will comply with the following guidelines:

1. The applicable regulatory requirements of 29 CFR 1910 and 29 CFR 1926 shall be followed during all site activities.

2. All site personnel shall immediately report to the SSHO any conditions that do not comply with, or are not addressed by this SSHP.

3. Site personnel shall immediately report to the SSHO and PM any deviations from the plans or equipment that has been approved to ensure an evaluation of the hazards is conducted.

4. Site personnel will wear the PPE as specified in Section 6.0 and the AHA forms presented in Attachment 2.

5. Any bites or stings received from wildlife will be reported to the SSHO, who will then determine the appropriate course of action to be taken to treat the bite.

6. Personnel in vegetated or wooded areas will wear long-sleeve shirts with the sleeves rolled down to reduce contact with, and injury from, hazardous or poisonous plants.

7. Personnel handling and sampling ground water will wear protective chemical-resistant gloves to reduce exposure to potential contaminants within these media.

8. Site personnel shall inform the SSHO of any known medical conditions that may cause, or result in, an adverse health condition. This includes hypersensitive allergic reactions to stinging and biting insects or contact with poisonous plants; diabetes; high blood pressure; skin or eye sensitivity to sunlight and UV radiation; chronic illness; and acute illnesses, such as a cold, the flu, or stomach/intestinal disorders. Persons with known hypersensitive allergic reactions to stinging/biting insects or toxic plants shall carry appropriate emergency medical antidotes on their person at all times when on site.

9. Site personnel shall not participate in horseplay or other prohibited acts that could cause harm or injury to site personnel, property, or the environment.

10.2 ENGINEERING CONTROLS

When personnel exposure to site hazards is unavoidable, OSHA regulations specify that engineering controls to be used whenever feasible to remove the potential for personnel exposure. During project activities, the feasible engineering controls listed below will be used.

1. All guards located on equipment will be maintained in place unless removal is needed for maintenance. Removal of guards for maintenance will require assessment by the SSHO for potential application of LO/TO procedures.

2. All powered hand tools will be operated with the manufacturer's guards in place.

10.3 SITE RULES / PROHIBITIONS

10.3.1 Buddy System Procedures

All work conducted within a work zone shall be performed using the buddy system, and at no time will personnel work alone.

10.3.2 Eating, Drinking and Smoking Restrictions

Eating and smoking during on-site operations will be conducted only in designated areas, at designated break times, and only after personnel have washed their face and hands using available towelettes or other sanitary means. At no time will personnel smoke while conducting any operations within the EZ.

10.3.3 Standing Site Rules

To maintain safety and health awareness, a list of standing site rules has been developed which outlines the practices that must be followed at all times. These standing orders will be enforced by the SSHO, and personnel violating these orders may be subject to disciplinary action. The general standing orders for the site are listed in Tables 10-1 and 10-2**.**

1 **Table 10-1: General Site Rules and Prohibitions**

1. Running and horseplay are prohibited in all areas of the site.
2. Ignition of flammable materials in any work area is prohibited, unless approved by the SSHO.
3. Buddy system procedures will be enforced during all site operations.
4. The number of personnel in any work area will be the minimum number necessary to perform work tasks in a safe and efficient manner.
5. Site personnel will check in with the SSHO prior to leaving the site and again upon returning to the site.
6. Site visitors are to be escorted by TPMC personnel at all times.
7. Site personnel will perform only those tasks they are qualified to perform.
8. Site personnel will remain aware of site conditions at all times and will alert the SSHO to any changes that could pose a hazard to site personnel, the environment, or the public.
9. Vehicle operators must have a valid state driver’s license.
10. Alcoholic beverages and non-prescription drugs are not allowed at FWDA.
11. All site personnel are cautioned not to walk, kneel or sit on any surface with potential leaks, spills of contamination.
12. All personnel will immediately report to the SSHO any injury, illness or exposure associated with the performance of work.

2 **Table 10-2: Work Zone Rules and Prohibitions**

1. No matches, lighters, or spark sources are allowed in any designated WZ.
2. No personnel will enter a WZ without authorization from the SSHO.
3. No eating, drinking, or other hand to mouth/face activity will be permitted in a WZ unless proper hygiene has been performed, and then only in designated areas of the WZ.
4. Drinking of fluids in the WZ will only be allowed after hands and face have been washed or wiped with a disposable towelette.
5. Always have your buddy with you in this zone, and follow the buddy system procedures.
6. No personnel will be allowed in the WZ without appropriate training, medical surveillance and PPE as specified by the SSHP.
7. Remain alert to site conditions and report any changes or unusual occurrences to the SSHO.
8. Verbal communication shall be immediately available at all times between the WZ and off-site emergency resources.
9. Remember: Site Safety and Health Are Everyone's Responsibility.

10.4 MATERIAL HANDLING PROCEDURES

Site personnel will exercise care in lifting and handling heavy or bulky items. Materials being lifted either mechanically or manually will not be moved, or suspended, over personnel unless positive precautions have been made to protect the personnel from falling objects. Whenever heavy or bulky material is to be moved manually, the size, shape, and weight of the object and the distance and path of movement must be considered to prevent joint and back injuries. The following hierarchy shall be followed in selecting a means for material handling:

1. Movement of the material by mechanical device (i.e., lift truck, crane, etc.)

2. Movement by manual means using mechanical aid (i.e., dolly or cart)

3. Movement manually with protective equipment (i.e., lifting belt or lifting monitor)

Site personnel will follow good lifting practices at all time. The personal lifting limitation of 50 pounds will be followed at all times.

10.5 DRUM/CONTAINER HANDLING PROCEDURES AND PRECAUTIONS

All drums used on site will meet Department of Transportation (DOT) requirements for the type of waste to be stored in the drums. Drums for project wastes will be located in accordance with the requirements in the Work Plan and all site personnel involved with the handling of waste drums will be trained in the procedures to be used for the handling and movement of the drums. Movement of full or partially full drums will be conducted through the use of a drum dolly or some other mechanical means such as a drum grapple.

10.6 HOT WORK AND FIRE PROTECTION/PREVENTION

10.6.1 Hot Work Practices

Hot work is not anticipated during the activities described in the Plans.

10.6.2 Causes of Fires and Explosions

Although fires and explosions may arise spontaneously, they are more commonly the result of carelessness during the conduct of site activities. Potential causes of explosions/fires include:

- Ignition of explosive/flammable gases or vapors by external ignition sources.

- Agitation of shock or friction-sensitive compounds.

- Sudden release of materials under pressure.

- Combustion of grass or brush due to contact with the hot exhaust system when site vehicles are parked in dry brushy/grassy areas.

- Brush and/or wildfires caused by lightning and/or off-site unknown sources.

10.6.3 Fire Prevention

Explosions and fires not only pose the obvious hazards of intense heat, open flames, smoke inhalation, and flying objects, but may also cause the release of toxic chemicals into the environment. Site personnel involved with potentially flammable material or operations shall follow the guidelines listed in Sections 15.9.1 and 15.9.2 if a fire should arise.

10.6.4 Fire Protection

To ensure adequate fire protection, the SSHO will inspect the site to ensure that all flammable and combustible materials are being safely stored in appropriately configured storage areas and containers. The SSHO will also ensure that no flammable or combustible materials are stored near any sources of ignition and that sources of ignition are removed a safe distance from storage areas. Portable fire extinguishers shall be located on site in accordance with the requirements in Section 14.0 of this SSHP. Additional information on fire protection can be found in Section 15.9 of this SSHP.

10.7 ELECTRICAL SAFETY PROCEDURES

For this project, no electrical wiring installation is anticipated. However, the use of electrical tools and apparatus will be conducted in accordance with OSHA Standard 29 CFR 1910.137(2). These requirements include, but are not limited to:

- All electrical equipment will be of a type listed by Underwriters Laboratories (UL) or Factory Mutual Engineering Corp. (FM) for the specific application.
- Flexible cord passing through work areas will be covered or elevated to protect it from damage by foot traffic, vehicles, sharp corners, or pinching.
- Patched, oil-soaked, worn, or frayed electric cords or cables will not be used.
- Extension cords or cables will not be fastened with staples, hung from nails, or suspended by wire.
- Portable and semi-portable electrical tools and equipment will be grounded by a multi-conductor cord having an identified grounding conductor and a multi-contact polarized plug-in receptacle.
- Semi-portable equipment, floodlights, and work lights will be grounded, and the protective ground will maintained during moving unless supply circuits are de-energized.
- Tools protected by an approved system of double insulation, or its equivalent, need not be grounded.

- UL listed ground fault circuit interrupters (GFCIs), calibrated to trip within the threshold values of 5 milliamperes (ma) $\pm$ 1 ma, are required on all circuits used for portable electric tools.

- Flexible cord sets will be UL listed, contain the number of conductors required for the service plus an equipment ground wire and will be classified as hard usage or extra hard usage (identified by "outdoor" or "WA" printed on the jacket).

10.8 MACHINERY GUARDING

In order to protect site personnel from unguarded moving machinery and equipment surfaces, the requirements found in Subpart O of 29 CFR 1910, Section 16B of USACE EM 385-1-1, and the general provisions listed below will be followed:

- All reciprocating, rotating or moving parts of machinery or equipment shall be guarded in accordance with manufacturer's specifications if they create a hazard through contact with personnel.

- All hot surfaces of equipment shall be guarded or insulated to prevent injury and fire.

- No guard, safety appliance, or device shall be removed from machinery or equipment or made ineffective except when making immediate repairs, lubrication, or adjustments, and then only after the power has been shut off.

- All guards or safety appliances removed for repair, lubrication, or adjustments will be replaced immediately upon completion of said activity and before the power is restored.

10.9 HAZARD COMMUNICATION

In order to comply with the requirements of the OSHA HAZCOM Standard, 29 CFR 1910.1200 and the requirements of EM 385-1-1, Section 01.B.04, the SSHO will ensure personnel receive HAZCOM training at the time of initial site assignment or when they begin working with hazardous substances. Subcontractors will also comply with the requirements presented above and will supply the SSHO with copies of the MSDSs for any materials brought on-site by the subcontractor which contain hazardous substances.

10.10 ILLUMINATION

In order to control the potential for injury or illness involved with situations where site personnel have limited visibility, TPMC personnel, as a general rule, will conduct on-site operations during the time period from 30 minutes after sunrise to 30 minutes before sunset. All office and storage facilities will be supplied with adequate artificial or ambient light so as to ensure the safe performance of operations within the facility.

10.11 POWER AND HAND-TOOL OPERATION

To control the hazards associated with power tool operation, personnel will follow the requirements outlined in 29 CFR 1910, Subpart P, 29 CFR 1926, Subpart I.

Power tools have great capability for inflicting serious injury upon personnel if they are not used and maintained properly. To control the hazards associated with power tool operation, the safe work practices listed below shall be observed when using power tools:

- Operation of power tools shall be conducted by authorized personnel familiar with the tool, its operation, and safety precautions;
- Power tools shall be inspected prior to use, and defective equipment shall be removed from service until repaired;
- Power tools designed to accommodate guards shall have such guards properly in place;
- Loose fitting clothing or long hair shall not be permitted around moving parts;
- Hands, feet, etc., shall be kept away from all moving parts;
- Maintenance and/or adjustments to equipment shall not be conducted while it is in operation or connected to a power source;
- An adequate operating area shall be provided, allowing sufficient clearance for operation;
- Electrical tools shall be operated in accordance with the specifications outlined in Section 10.7; and
- Good housekeeping practices shall be followed at all times.

Use of improper or defective tools can contribute significantly to the occurrence of onsite accidents. Therefore, the work practices listed below shall be observed when using hand tools:

1. Hand tools shall be inspected for defects prior to each use;
2. Defective hand tools shall be removed from service and repaired or properly discarded;
3. Tools shall be selected and used in the manner for which they were designed;
4. Be sure of footing and grip before using any tool;
5. Do not use tools that have split handles, mushroom heads, worn jaws, or other defects;

6. Gloves shall be worn to increase gripping ability and/or if cut, laceration or puncture hazards exist during the use of the tool;

7. Safety glasses or a face shield shall be used if use of tools presents an eye/face hazard;

8. Do not use makeshift tools or other improper tools;

9. When working overhead, tools shall be secured to prevent them from falling;

10. Use non-sparking tools in the presence of explosive vapors, gases, or residue;

11. If hand tools become contaminated they must be properly decontaminated, bagged, marked and held for disposition by COE On-Site Coordinator; and

12. Tools used in the EZ which have porous surfaces, such as wooden or rubber coated handles, shall be discarded as contaminated upon termination of site activities, unless testing can prove the absence of contamination.

10.12 BIOLOGICAL HAZARDS

This project is scheduled to start in late spring and extend into the summer months. Therefore, site personnel will experience potential exposure to biological hazards such as: stinging insects like bees, wasps and hornets; biting arthropods such as spiders, ticks and chiggers; and snakes as described in Section 3.7. The SSHO will be responsible for providing briefings and identifying the requisite controls for any biological hazards identified. Employee awareness should reduce the risk associated with these hazards.

10.13 USE OF PRODUCTS CONTAINING HAZARDOUS MATERIALS

Because of the nature of products used on site and the manner in which they will be used, it is not anticipated that there will be a potential for airborne exposure to the hazardous materials used on site. However, some products used have the potential for skin contact hazards. To help ensure personnel safety from hazardous materials, site personnel will follow the SWPs listed below:

- To determine the chemical properties of the hazardous materials and the protective measures to be used, all site personnel who use shall personally review the MSDS for each product used.

- All products with airborne exposure hazards (i.e., gasoline and other fuels, spray paints, etc.) will be used outdoors or in well-ventilated areas, and personnel will stand upwind of the dispensing point when dispensing the product.

- When using or dispensing a product with a skin contact hazard, personnel will utilize protective gloves, as identified in Section 6.0 of this SSHP

- Only those personnel, who have received appropriate HAZCOM training, as outlined in Section 5.10 of this SSHP, shall use a product containing hazardous materials.

- Personnel shall immediately wash any affected skin that accidentally comes in contact with a hazardous material identified as being a skin contact hazard.

10.14 MEC HAZARDS

10.14.1 General MEC Site SWPs

For all site activities potentially involving MEC, the procedures and practices listed below shall be strictly enforced.

- All MEC will be identified by the UXO-qualified technicians.

- Only the minimum number of personnel required to perform a given MEC-related activity will be involved in the operation.

- Movement and handling of MEC will be not be permitted at any time.

- Only UXO-qualified personnel will be involved in the investigation, identification, and marking of known or potential MEC items and explosive materials.

- No smoking, or possession or use of open flame or spark sources will be allowed in the EZ, unless approved by the SSHO or team leader, and then only in designated areas.

10.14.2 MEC SWPs for Non-UXO-Qualified Personnel

Non-UXO-qualified personnel on site shall follow the SWPs listed below when on site:

- Non-UXO-qualified personnel shall receive site-specific MEC recognition training prior to participation in site activities.

- Non-UXO-qualified personnel shall not touch or disturb any object that could potentially be MEC-related and shall immediately notify the nearest UXO-qualified person of the presence of the object.

11.0 SITE CONTROL MEASURES

11.1 CENTER OF OPERATIONS

An existing building in the Administration Area of FWDA, currently Building T-16, will be used as a field office. In the event of a site accident involving the total evacuation of site personnel, the gate to the Administration Area (Gate 109) will act as the primary staging area for accountability, with the field office at Building T-16 serving as a secondary assembly area for the final. The SZ will be located so as to minimize the potential for contaminants to migrate into these locations.

11.2 SECURITY PROCEDURES

11.2.1 Project Site Access and Security

Project site access and security will be via existing access roads and fences/gates, and augmented as needed with the use of signs and barricades.

For site operations TPMC will establish work zones as described below. These work zones will endure that personnel are properly attired in PPE to mitigate the hazards associated with the site and that only those personnel with the experience and training are permitted in the areas where exposures to site hazards could exist.

11.2.2 Work Zones

To reduce the migration of contaminants from those sites where hazardous substances have been have been identified, TPMC will utilize the work zones outlined below.

11.2.2.1 Exclusion Zone

The EZ is a work area where the greatest hazard potential for exposure to safety and health hazards may be, or is known to exist. EZ entry and exit control points will be established to regulate the flow of personnel and equipment into and out of the EZ. This will ensure that personnel and equipment are protected and that contamination located inside the EZ is properly contained. The entry/exit control points will be established up wind from the EZ to prevent airborne contaminants from migrating into "clean" areas. The site's prevailing wind direction will be used to select the entry/exit control points, but alternate entry/exit points need to be available in the event that the wind direction changes or an emergency arises which precludes the use of the primary entry/exit point. No tobacco product use, eating, drinking application of cosmetics or other hand to face activities are allowed in this area unless strictly specified in the SSHP.

It may become necessary, during hot weather conditions, to modify the restrictions on drinking in the EZ. This may be accomplished by establishing a break area inside the EZ, upwind from the work site, which is accessed through a scaled down version of the personal decontamination station. Personnel would be allowed to enter this area to drink cool fluids and rest. This modification may be implemented only if the potential for contamination is low, if proper procedures are established, and if approved by the CESHM.

11.2.2.2 Support Zone

The SZ is the area outside the EZ and is the location of the administrative and other support functions required to keep the operations in the EZ functioning smoothly. The SZ includes facilities such as the change area, lunch and break areas, office trailer, and supply storage areas. Personnel in the SZ can wear normal work clothes since this area is designated as the clean area and contaminated equipment and clothing must be left in the EZ. The SZ is designated as the tobacco product use, eating, and drinking area. The location of the support facilities inside the SZ should be selected through careful consideration of the following:

- Site layout, including topography, open spaces and available access roads;
- Location of utilities, such as power, telephones and water;
- Line-of-sight to all activities in the EZ;
- Wind direction (the SZ should be located up-wind from the PDS); and
- Distance from the EZ (i.e. not more than 100 meters to the SZ if possible).

11.3 EQUIPMENT STORAGE AND SECURITY

During non-working periods, all project equipment used on-site, to include hand tools, will be stored, in designated storage facilities located at the site.

11.4 SITE MAPS

Prior to initiation of site activities, a site map will be available which will detail the following information: site size and shape; restricted areas; designated assembly points; the site access routes; staging areas; and any other information deemed necessary by the SSHO. The site map will be used by the SSHO during site safety training and the daily safety briefings.

11.5 SITE COMMUNICATIONS

Effective on-site and off-site communication is an integral part of site control and will be established prior to initiation of site activities. On-site communication will be used to coordinate site operations; maintain site control; pass along safety information, coordinate work/rest periods, etc.; and alert site personnel to emergency situations. Means of communicating with off-site resources will be available at all times to ensure effective communication with off-site management personnel and emergency response services. All site personnel will be familiar with the different methods of both on-site and off-site communication. The methods TPMC will use for on- and off-site communication will include:

1. On-site communications consisting of portable radios, as well as air horns, bullhorns, sirens or hand signals as needed for communications.

2. Off-site communications will be accomplished using the office hard line phone or cellular telephones. Each team will have two means of communication for summoning off-site support.

11.6 BUDDY SYSTEM

An important element in controlling personnel exposure to site hazards is the implementation of buddy system procedures. These procedures ensure that no site personnel are allowed to work without another qualified worker present to provide assistance. At all times buddies should:

1. Observe their buddy for signs of exposure to site hazards or stresses;

2. Observe the site area in which they are working for hazards;

3. Remain within verbal or visual contact with their buddy at all times; and

4. Notify the team leader and/or field office if emergency assistance is needed.

12.0 PERSONAL HYGIENE AND DECONTAMINATION

12.1 WATER SUPPLY

An adequate supply of potable (drinkable) water shall be provided on site at all times and will be supplied as per the following provisions:

- Containers will be clearly marked, be capable of being tightly closed, equipped with a tap, maintained in a sanitary manner, and cleaned at least weekly.
- Separate sanitary containers will be provided for the storage of the unused cups and for the disposal of the used cups where single service cups are provided.
- Water or other supplied beverages shall not be dipped from the container by any means, and use of a common cup shall not be allowed.
- Use of non-potable water is anticipated; containers of such water will be conspicuously labeled "Caution: water unfit for drinking, washing, or cooking."

12.2 SITE HOUSEKEEPING

All work areas will be maintained in a clean/neat fashion, free of loose debris and scrap. Any materials/equipment not being used will be removed and stored or disposed of accordingly. Trash will either be removed from the site daily or emptied daily into an on-site central storage container that will be tightly closed each night prior to departure from the site.

Ground water investigation-derived waste (IDW) will be properly containerized and disposed of in accordance with the waste disposal procedures presented in the Plans.

13.0 EQUIPMENT DECONTAMINATION

Equipment used in the field, to include PPE, shall be cleaned and inspected at the end of each workday to ensure that the equipment is maintained in safe operating condition. Any equipment found to be defective would be brought to the attention of the PM or SSHO. Tools and equipment used in the EZ will be kept free of accumulations of soil and other debris and will be cleaned prior to their removal from the EZ. Hand equipment will be decontaminated using an equipment decontamination station. Any wash and rinse solutions and debris associated with the equipment decontamination will be containerized and disposed of in accordance with the waste disposal procedures outlined in the Plans. Prior to the start of operations where equipment could become contaminated, the SSHO will ensure that equipment decontamination stations are established and ready to use.

14.0 EMERGENCY EQUIPMENT AND FIRST AID

For this project, no additional or special levels of PPE are being specified for emergency situations. For all site operations, approved first aid and emergency response supplies will be available on-site. Each field team that functions away from the field office will have and maintain first aid supplies consisting of:

- A 16-Unit or 25-person first aid kit with added BBP kits capable of protecting two first aid providers;
- Portable eye wash bottles;
- Burn kit with bandages;
- Trauma bandages;
- A fire blanket; and
- 5 lb – 10 lb Fire extinguisher

Additional first aid and emergency response supplies will be maintained on site as required in Table 14-1 of this SSHP. With the exception of fire extinguishers that require a monthly physical inspection, all emergency response and first aid equipment will be inspected initially and then weekly thereafter to ensure proper operational condition. Each team will have a fire extinguisher in the site vehicle and additional fire extinguishers will be used for any temporary fuel storage areas established. No safety showers will be required since there is no potential for personnel being drenched with hazardous substances that can pose a threat to the skin.

1 **Table 14-1: Emergency Equipment Requirements**

Emergency Equipment	No. Per Location	Area Where Item(s) Will Be Stored	Operation Requiring Specified Equipment
First Aid/Burn Kit/Burn Blanket/CPR Mask	1 ea.	Each team within the WZ	All operations
Portable Eye Wash Kit	1 ea.	Each team within the WZ	Operations involving hazardous materials that could splash
Biohazard Kit	2 ea.	Each team within the WZ and in the SSHO vehicle	All operations
Large Medical Kit with Trauma Supplies	1 ea.	1 in SSHO vehicle	All operations
Portable Stretcher	1 ea.	1 in SSHO vehicle	All operations
Air Horn	1 ea.	Each team within the WZ	All operations
Spill Containment/ Cleanup Supplies	1 ea.	1 in SSHO vehicle	Operations involving hazardous materials
Fire Extinguisher	1 ea. (5-10 lb)	Each team, vehicle, and flammable storage area	All operations
Cellular Phone	1 ea.	SSHO	All operations

15.0 EMERGENCY RESPONSE AND CONTINGENCY PROCEDURES

15.1 INTRODUCTION

Thorough pre-planning, proper design, and implementation of the required emergency response contingencies can dramatically reduce the frequency and severity of emergencies. If an emergency does occur, quick, decisive action will be required since even short delays can create or escalate life-threatening situations. To ensure rapid, effective response to a site emergency, the procedures and contingency plans outlined in this section shall be implemented prior to and during the conduct of any site activities involving exposure to safety and health hazards.

15.2 PRE-EMERGENCY PLANNING

Prior to the conduct of site operations, site personnel will have contacted and met with appropriate local authorities to inform them of the site activities to be performed under this SSHP and the potential hazards that these activities pose to site personnel, the environment, and the public. The PM and SSHO will confirm information from the local authorities related to the type of emergency services available, including any contact phone numbers or procedures needed to summon the services. The SSHO will be responsible for ensuring that the telephone numbers and procedures for contacting local emergency services are posted as requirement in this section.

15.3 IDENTIFICATION OF POTENTIAL EMERGENCIES

During the development of this SSHP, great attention was given to identifying potential safety and health hazards associated with the planned site activities. These hazards were then assessed to determine nature and type of emergency they could cause. Contingency plans for responding to the potential emergencies have been developed and are included in this section. The potential emergencies that may result during the conduct of site activities are as follows:

- Personal injury associated with the operation of hand and power tools, including cuts/lacerations, and flying objects and debris;
- Personal injury associated with sharp objects that may cause cut, scrape, puncture, splinter or laceration injuries;
- Personal injury associated with MEC that have the potential for explosion;
- Injury or illness associated with site activities and on-site chemical, physical or biological hazards;
- Fire; and/or
- Inclement weather.

15.4 IDENTIFICATION/COORDINATION OF EMERGENCY SERVICES

Prior to the initiation of site activities, the SSHO will contact local emergency services to verify the availability of requisite services and to confirm the means used to summon the services. It will be the responsibility of the PM to ensure that off-site communications are available at all times. Site operations shall not be conducted unless means of off-site communications are established. The telephone numbers for all emergency services and contacts are presented in this plan and will be posted in the office and in all site vehicles. All site personnel shall be aware of the procedures for notifying emergency services.

15.5 INITIAL INCIDENT REPORTING PROCEDURES

Once an emergency has occurred, team members will sound the air horn alarm and the respective team leader will establish radio contact with the SSHO. This will initiate site evacuation and mobilization of TPMC first aid/CPR response personnel. Once informed of the emergency, the SSHO will ensure notification to the FWDA BEC, and the SSHO will summon emergency responders as necessary. The SSHO will ensure that all teams are cognizant of the situation and are involved in the proper response procedures.

15.6 PERSONNEL ROLES, AUTHORITY AND COMMUNICATIONS

15.6.1 SSHO

Upon notification of an emergency situation, the SSHO will assume the role of the On-Site Incident Commander. As the On-Site Incident Commander, the SSHO will have overall responsibility for coordinating the efforts of the on-site response actions, as well as the off-site emergency response agencies. Additionally, the SSHO shall ensure that required off-site emergency services have been summoned and will also be responsible for notifying and coordinating all relevant Federal, state and local regulatory and response agencies. In the event that the SSHO is incapacitated, the designated site personnel will assume the duties of the SSHO.

15.6.2 On-Site Emergency Response Personnel

During site activities, site personnel will act, to the greatest extent possible, in the role of on-site emergency response personnel. The SSHO will designate the personnel assigned to emergency response tasks prior to initiation of site activities involving the potential for an on-site emergency. On-site emergency response personnel will receive training in the response actions that they will be authorized to, and may be directed to, perform during a site emergency.

15.6.3 Off-site Emergency Response Services

The primary means of obtaining off-site emergency services will be through the phone notification of the emergency services and contacts listed in Table 15-1. It must be noted that all contact with off-site emergency services will be coordinated through the SSHO.

Table 15-1: Emergency Telephone Numbers

Service/Contact	Agency/Position	Telephone Number
General Emergency Contact	FWDA Caretakers/FWDA BRAC Environmental Coordinator	Via radio communication Or Phone (505) 488-5411
Land or Air Ambulance	Med Star	911
Emergency Hospital Care	Rehoboth McKinley Christian Medical Center	(505) 863-7000 (General) (505) 863-7141 (Em. Room)
Minor Injuries	Rehoboth McKinley Christian Medical Center	(505) 863-7000 (General) (505) 863-7141 (Em. Room)
Police	McKinley County Sheriff's Office	911 (505) 722-7205
Police	New Mexico State Police	911 (505) 863-9353
Fire	Fort Wingate Fire Department	911 (505) 488-5261
Mark Patterson	FWDA BRAC Environmental Coordinator	(505) 488-5411
Steven Smith	USACE Project Manager	(817) 886-1879
Harmon Slappy	USACE Military Munitions Safety Specialist	(817) 886-1885
David Holladay	USACE Military Munitions Safety Specialist	(505) 342-3463
Martin Eastridge	Missile Defense Agency (MDA) Caretaker	(505) 649-0352
Eric Kammerer	TPMC Project Manager	Office (610) 862-5065 Cellular (610) 659-5763
Stephen Deeter	TPMC SSHO	Office (610) 862-5043 Cellular (610) 308-4060 or (610) 517-3997
Jeffrey Case	TPMC CESHM	Office (610) 862-5064 Cellular (610) 517-8997

15.7 COMMUNICATIONS

Emergency communications will be available and maintained during all on-site operations. As previously discussed, radio and cellular phone communications will be used between the field teams and the field office. Site personnel will have radio and cellular phone communication to FWDA caretakers at Building 34, as well as the TPMC FWDA project office. In the event of an emergency, Building 34 (FWDA Caretakers) will be contacted to summon off-site emergency services.

15.8 POSTED INSTRUCTIONS AND EMERGENCY CONTACTS

Evacuation routes, assembly points, emergency and site control procedures, hospital routes, and emergency numbers will be discussed each day at the daily safety briefing to ensure all site personnel are familiar with this information. A hospital route map and the list of emergency contacts presented in Table 15-1 will be posted in all TPMC office and storage areas and maintained in all site vehicles. All site personnel will be familiar with the location of these lists and maps, and will be aware of the location of the closest telephone and/or radio communications.

15.9 EMERGENCY RECOGNITION AND PREVENTION

15.9.1 Small Fires

A small fire is defined as a fire that can be extinguished with a 4A:20B:C fire extinguisher. In the event of a small fire, site personnel will take the following actions:

1. Site personnel will immediately notify the SSHO.

2. The FWDA BEC will be immediately notified of the occurrence of the fire by the SSHO.

3. All unnecessary personnel shall be evacuated to an upwind location.

4. Under the initial direction of the SSHO, site personnel will extinguish the fire from an upwind location.

5. The SSHO shall summon the local fire department and any other emergency response services (police, ambulance, hospital, etc.) as needed for the treatment of injuries or exposures.

6. Site personnel will not attempt to extinguish a fire, even a small one, if explosives are involved, and all site personnel will evacuate the site if explosives are involved.

7. After the fire is extinguished, an investigation will be initiated to determine the cause of the fire and to identify any operational changes that may be required to prevent future fires.

15.9.2 Large Fires

In the event that a large fire occurs, or if a small fire cannot be extinguished and develops into a large fire, the following actions shall be taken:

1. Site personnel will immediately notify the SSHO.
2. The FWDA BEC will be immediately notified of the occurrence of the fire by the SSHO.
3. All unnecessary personnel shall be evacuated to an upwind assembly point.
4. The SSHO shall summon the local fire department and any other emergency response services (police, ambulance, hospital, etc.) as needed for the treatment of injuries or exposures.
5. To the extent that it can be safely accomplished, the SSHO will direct site personnel to move vital equipment/supplies from the fire's path.
6. To the safest extent possible, and with available resources, site personnel will fight the fire from an upwind location.
7. At no time shall attempts be made to extinguish a fire involving explosives and all personnel will evacuate the site if the fire involves explosives.
8. After the fire is extinguished, an investigation will be initiated to determine the cause of the fire and to identify any operational changes that may be required to prevent future fires.
9. Resumption of activities after a large fire would require approval from the FWDA BEC.

15.9.3 Explosion

In the event of an explosion, all personnel shall evacuate and help secure the site and the SSHO will immediately be notified of the situation. The SSHO shall request the required support equipment and personnel. If personnel injuries have occurred, the SSHO shall direct and coordinate the treatment of the affected personnel. After an explosion, it is essential that the site be evacuated and that no one is allowed to re-enter the area, except to possibly save a life, for at least 30 minutes after the explosion. The SSHO, in conjunction with the PM, will determine what actions will be taken to resolve the situation, and once resolved, the SSHO will initiate an investigation to determine the cause of the explosion. Any changes to the SSHP will be made and approved prior to the resumption of site activities.

15.9.4 Inclement Weather

In the event of inclement weather, such as heavy precipitation, electrical storms, high winds, snowstorms, dense fog, or extremely cold weather, it may be necessary to cease site operations and evacuate the site. The SSHO shall be responsible for obtaining the local weather on a daily basis and advising the site personnel of the forecast. If necessary, the weather service will be contacted on a more frequent basis. If inclement weather occurs, the procedures outlined below will be followed until the inclement weather passes.

- **Heavy Precipitation**: In the event that heavy precipitation is imminent, or occurs suddenly, site operations may have to be halted if in the heavy precipitation will, in the opinion of the SSHO, cause unsafe conditions. If so determined, equipment will be secured, and site personnel will retreat to shelter. The determination to re-start operations will be the responsibility of the SSHO to ensure site conditions are safe for re-entry and continuation of operations.

- **Thunderstorms**: Thunderstorms, with their associated lightning, present a significant hazard to site personnel. A severe thunderstorm watch announcement on the radio or television indicates that a severe thunderstorm is possible. A severe thunderstorm warning signifies that a severe thunderstorm has been sighted, or detected by radar, and may be approaching. Work may continue at the work site during severe thunderstorm watches; however, site work shall cease and the EZ will be evacuated during a thunderstorm or severe thunderstorm warning that is reported in the site area.

- **High Winds**: High winds can create conditions that threaten the safety and health of site personnel. If the SSHO determines that the wind levels on site present a hazard to site personnel, site operations will be halted and site personnel will assemble in the field office area. If wind levels are high enough, the SSHO may even require the evacuation of the entire site until such time as conditions improve. The determination to restart operations will be the responsibility of the SSHO, in conjunction with the PM, to ensure site conditions are safe for re-entry and continuation of operations.

15.10 CRITERIA AND PROCEDURES FOR SITE EVACUATION

15.10.1 Emergency Alerting Procedures

It is the responsibility of the SSHO to ensure that off-site communications are available at all times for respective operations. Site operations shall not be conducted unless means of off-site communications are established. The telephone numbers for all emergency services and contacts are listed in Table 15-1. These phone numbers shall be posted in the office/break area and all field vehcles, and all site personnel shall be aware of the procedures for obtaining off-site emergency services.

15.10.2 Employee Alarm System

To alert on-site team members, each work team and the SSHO will have an air horn (or as an alternative an automobile horn) that will be sounded to inform personnel in the immediate area of the occurrence of an emergency. The effectiveness of the air horn and automobile horn will be tested during initial site activities to ensure that all site personnel can clearly perceive the alarm above operational noise levels. If operational noise levels prevent site personnel from detecting the air horn alarm, other means of notification will be implemented.

To alert WZ personnel of the occurrence of an emergency, one long blast on the air horn will be the signal to evacuate the site immediately. The initial assembly point for each WZ will be located in a safe area as identified during the daily safety briefing each morning. Once WZ personnel are assembled, the SSHO will conduct a head count of all team personnel. Once accounted for, WZ personnel await instructions from the SSHO, which may include: further evacuation from the site, emergency response instructions; or any other instructions deemed necessary.

15.10.3 Evacuation Routes and Assembly Points

Prior to the initiation of site operations, the SSHO will identify the evacuation routes and assembly points for the various areas on the site. These routes and assembly points will be identified on the site map and will be communicated each morning to site personnel during the daily safety briefing.

15.11 SITE SECURITY AND CONTROL DURING EMERGENCIES

During an emergency, site security and control will be paramount to controlling the possible negative effects of the emergency. Upon notification of an emergency, each team leader will initially be responsible for locating, assembling, counting, and controlling their team personnel. If the team leader is unable to perform this role, the duty will be passed to another team member. Once the team has evacuated the site to the given assembly point, each team leader will maintain control over their team's personnel until the SSHO takes control of the personnel and verbally informs the team leader that the control has been transferred. This level of personnel control is needed to ensure no personnel are forgotten and that no personnel attempt any response action on their own without the knowledge of the SSHO.

Site personnel as directed to do so by the On-Site Incident Commander will initially conduct site access control and security. If site personnel are needed for other response actions, the On-Site Incident Commander will request assistance from the local law enforcement agencies.

15.12 TREATMENT OF INJURED PERSONNEL

15.12.1 Assessing the Emergency

A key element to the successful treatment of an injured worker is the effective assessment of the emergency prior to the initiation of action. If on-site TPMC or off-site emergency personnel are to enter the site in response to the emergency, the On-Site Incident Commander shall assess the incident to identify and record vital information about the site and situation. This data will be passed on to response personnel and will include, to the extent possible, the items listed below.

- What happened (i.e., type of incident; cause of incident; the time the incident occurred; extent of chemical release; including route of migration; and extent of damage to structures, equipment, and terrain).
- Where on the project site the incident has occurred.
- Personnel/casualties involved, such as number, location, and condition of victims, treatment that may be required and missing personnel.
- What could happen from this point (i.e., potential for fire or explosion, coupled with release of hazardous materials; location of all personnel in relation to hazardous areas; and potential for emergency affecting the general public or the environment).
- Steps needed to resolve the situation such as equipment and personnel needed for rescue and hazard mitigation; number of uninjured personnel available for response; resources available on site; resources available from off-site response groups and agencies; time needed for off site response resources to reach the site; and hazards involved in rescue and response.

15.12.2 Rescue and Response Actions

At no time will site personnel attempt an emergency response or rescue until the situation has been assessed and the appropriate response outlined by the SSHO. Ensuring that the incident has been properly assessed and that the appropriate actions have been selected will ensure that further injuries do not occur due to poor response planning. Based on the information collected during the emergency assessment, the SSHO will select the relevant response and rescue actions that will be taken. The rescue actions that may be needed are listed below, with some actions possibly being performed concurrently and some of the actions not being required as determined by the scope of the incident. In the event that the care required is beyond the scope of the site personnel, professional rescuers, EMTs, and transportation will be summoned. The first aid personnel will provide only those services for which they have been trained and will assist as needed.

- Personnel evacuation to a safe location upwind of the incident.

- Enforce the buddy system and allow no one to enter the site unattended.
- Survey casualties to locate all victims, assess their condition to the greatest extent possible, and determine as best as possible the resources needed for casualty stabilization and transportation.
- Assess existing and potential hazards and decide whether and how to respond.
- Request aid by contacting the required off-site personnel or facilities, such as ambulance, fire department, police, etc.
- Allocate personnel and equipment to rescue and initiate incident response operations.
- Control the situation and use measures to prevent the situation from migrating further.
- Extricate victims and assist them from the area if it is safe to do so and if no further injury to the victim will be sustained by the action.
- Stabilize injured personnel to the greatest extent possible and administer any first aid procedures that may be required before the victims can be moved.
- Transport the affected personnel via the predetermined mode as determined by their injury.
- Document to whom the incident occurred, the time it occurred, and the destination and condition of the casualty at the time of transport.
- Document disposition, condition, and location of all personnel affected by the emergency.

15.12.3 Treatment of Injured/Ill Personnel

In the event of an emergency involving personal injury or illness, immediate, appropriate response will be the key to preventing further injury/illness and providing comfort to the affected party. If any site personnel are injured, or if they are overcome by illness, the applicable procedures listed below will be followed.

- Upon notification of the occurrence and the nature of the injury/illness, the SSHO will respond to the location where the injury/illness has occurred.
- The severity of the injury/illness will be accessed, the required first aid support will be provided, and the SSHO will initiate the procedures needed to ensure rapid, efficient transportation of the affected person to appropriate medical support, if required.
- If immediate transportation to a medical facility is required, the SSHO shall immediately summon emergency services. If deemed necessary by the

emergency service operator, an air ambulance may be summoned to transport the affected party.

- If additional medical attention is required, but Advanced Life Support (ALS) is not required, the SSHO, or a designated person, may transport the affected person to the designated medical facility. However, in this situation, ambulance service with basic life support may be requested and used if the injuries are such that additional medical attention would be needed during the transportation phase.

15.13 POST-EMERGENCY FOLLOW-UP

Before normal site activities can resume, the site and personnel must be prepared and equipped to handle another emergency. It is also imperative that all U.S. and local regulatory agencies be notified of the emergency. Therefore, the following activities must be conducted prior to restart of site activities:

1. Notify all appropriate governmental agencies as required (i.e., OSHA must be notified if there have been any fatalities or three or more personnel hospitalized).

2. Restock and clean all equipment and supplies utilized or damaged in the emergency. Items to be cleaned will be only those durable items that can be safely cleaned and reused. Any durable items that have come in contact with blood or body fluids will be cleaned and disinfected in accordance with the BBP Control Plan. Non-durable items will be discarded accordingly with any items that have contacted blood or body fluids being discarded in appropriate bio-hazard waste containers as outlined in the BBP Control.

3. The CESHM in conjunction with the SSHO shall conduct an accident investigation to determine the cause of the emergency and what preventative measures shall be taken to ensure the emergency does not occur again.

4. The CESHM, in conjunction with the SSHO shall conduct an emergency response critique to assess the effectiveness of the emergency response procedures and to identify any areas requiring improvement.

5. Complete the TPMC and U.S. Army required accident forms.

6. Review and revise, as needed, the site operational and emergency response procedures, and, if necessary, update the SSHP to reflect the new procedures.

15.14 DOCUMENTATION

Documentation related to the emergency shall be recorded in an accurate, authentic and complete fashion. Documentation shall be recorded as soon as possible after the emergency to ensure it is recorded while the events are vivid in the minds of the personnel involved. The information recorded will include:

1. A listing of the personnel involved, including personnel on site, site personnel who responded, personnel in charge, and off-site groups or agencies that responded

2. A chronological record of events

3. A listing of the actions taken to minimize the effects of or mitigate the emergency

4. The results from any air monitoring conducted during the emergency, and if applicable, results of environmental samples

5. An assessment of the potential exposures received by site personnel and the surrounding public

6. A recording of the injuries or illnesses which occurred as a result of the emergency

15.15 ROUTE MAPS TO MEDICAL TREATMENT FACILITIES

15.15.1 General Instructions

During the daily safety briefing, the SSHO will review the instructions for obtaining medical attention and transporting site personnel to the designated medical facilities. All site vehicles shall be provided with copies of the site map generated by the SSHO and the directions provided in this Section along with the hospital route map (Figure 7). Not all on-site injuries will require EMS and ambulance transportation to the hospital. If the SSHO determines that an injured party can be transported to medical attention using a site vehicle, the directions presented below and the Hospital Route Map (Figure 7) will be used to transport the injured party to Rehoboth McKinley Christian Medical Center in Gallup, NM. Prior to the initiation of site activities, and periodically thereafter, the hospital route will be driven by the SSHO to ensure that the route to the hospital is free of unanticipated delays.

15.15.2 Directions to the Designated Medical Facility

- Depart FWDA through the main entrance (north);
- Turn left (west) on U.S. Highway 66;
- Continue westbound on U.S. Highway 66 for approximately7.5 miles to intersection with Boardman Avenue;
- Turn left (south) on Boardman Ave;
- Continue on Boardman Avenue for approximately 2.6 miles to intersection with College Drive;
- Turn right (north) on College Drive;

- Continue on College Drive for approximately 0.3 miles to Hospital Drive
- Turn right on Hospital Drive;
- Continue on Hospital Drive for approximately 0.1 miles to Redrock Drive;
- Turn right on Redrock Drive and proceed to Emergency Entrance on left (east) side of street.

15.16 COMMUNITY ALERT PROGRAM

It is not anticipated that any on-site operations will result in a potential emergency that would require TPMC to implement a community alert program. However, in the event that an unplanned on-site event affects the local community, the SSHO will notify the FWDA BEC of the potential hazard. The FWDA BEC will then contact local law enforcement for assistance.

15.17 SPILL CONTAINMENT

15.17.1 Spill Response Supplies

A portable spill response kit containing oil/solvent absorbent pillows/pads, non-sparking shovel, PPE and disposal supplies shall be maintained in a readily accessible location where environmentally harmful materials are stored on site. Upon notification of a spill, the SSHO, or a party designated by the SSHO, will transport this kit to the spill site for use by TPMC personnel in the cleanup of the spilled materials.

15.17.2 Spill Response

During site operations at each site, small containers (5 gallons or less) of gasoline stored on site will be used for servicing equipment. If material from these containers is spilled, TPMC personnel will follow these steps:

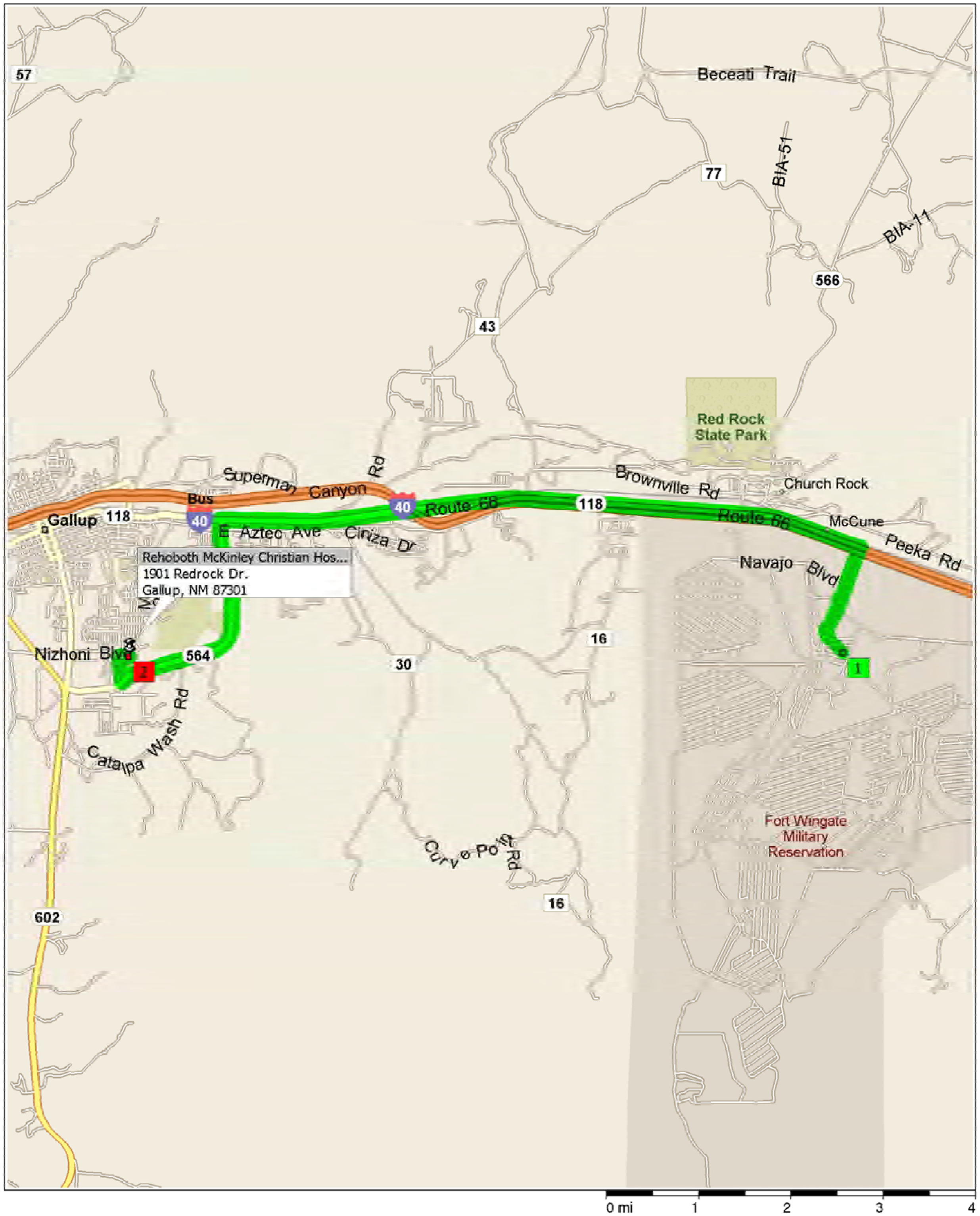
1. The immediate area will be evacuated, ignition sources will be extinguished, and the SSHO will be notified of the spill.
2. The SSHO will evaluate the situation to ensure it is safe for personnel to begin cleanup operations.
3. The SSHO will assign the level of protection to be worn by the spill response personnel.
4. All required supplies will be assembled and positioned such that they are readily available to the spill response personnel.
5. Spill response personnel will take measures to stop the spill and will, if applicable, use an absorbent or adsorbent to collect the spilled material.
6. Using non-sparking tools, TPMC personnel will collect the contaminated soil, place it in a plastic bag, and place the bag in an approved container.

7. The SSHO will notify the USACE Technical Manager and the FWDA BEC that the spill occurred and will brief them as to the cleanup actions that were taken by TPMC personnel.

The SSHO will notify the PM who will contact the FWDA BEC and USACE Technical Manager who will provide guidance on disposal of the contaminants and other actions that must be taken.

Figure 7
Hospital Route Map
Fort Wingate Depot Activity
McKinley County, New Mexico

11.5 miles; 22 minutes



16.0 LOGS, REPORTS, AND RECORDKEEPING

All Safety Logs, Accident Reports, Training Logs, Visitor Logs, Inspection Reports, and other forms can be found in Attachment 1.

16.1 SAFETY LOG

The SSHO shall maintain a Safety Log and shall be responsible for ensuring that all safety- and health-related activities and events are recorded in the log each day. At a minimum, the Safety Log should include: a reference to the conduct of the daily safety briefing; details of any accidents, injuries, illnesses, or near misses; details related to the conduct and outcome of internal and external audits; the reason for, and duration of, safety-related "stop work" orders; and any other issues pertaining to site or personnel safety or health.

16.2 INJURY/ILLNESS/ACCIDENT REPORTS

In the event that a reportable accident/incident occurs at the job site, the TPMC Accident, Near Miss Reporting form shall be completed and forwarded the same day the accident/incident occurs to the CESHM, the PM and TPMC President. In addition, if USACE Form 3394 must be completed, the SSHO will complete the form and forward it to the CESHM and the TPMC PM for review prior to dissemination to USACE. If a near miss occurs, the SSHO shall investigate the incident and report the results of the investigation using the TPMC Accident and Near Miss Report form. This form will be forwarded to the CESHM to be reviewed by the CESHM and PM.

16.3 TRAINING LOG

The SSHO is responsible for ensuring that all safety- and health-related training conducted is documented in the Training Log and/or on the appropriate training forms. This log will include the initial site-specific training conducted prior to the start of site activities, the Daily/Weekly Safety Briefings, hazard-specific training, MEC refresher and recognition training, emergency response exercises, etc. The SSHO shall maintain this log and any associated training forms on site.

16.4 VISITOR LOG

The SSHO shall be responsible for maintaining the visitor log, which will be used to record the entry and exit of all visitors, including TPMC; contractor visitors; or Federal, state, or local officials who visit the site. This log shall utilize the TPMC Site Visitors Log. All information required by the form will be completed by the site visitor and the SSHO. No visitors will be allowed to enter the project site or WZs without completing the required information.

ATTACHMENT 1
BLANK FORMS

SSHP REVIEW FORM

All site personnel shall sign this form after having read the SSHP, and will do so prior to being allowed to perform operations on site involving known or potential exposures to safety of health hazards.

EMPLOYEE STATEMENT

My signature below indicates that I have read the SSHP and have received answers to any questions that I had related to the SSHP. My signature further indicates my willingness to comply with the provisions and requirements of the SSHP.

Project Name/Location: Interim Facility-Wide GWMP and IMWP for Off-Site Water Supply Well Sampling, Fort Wingate Depot Activity

Date:	Organization	Printed Name	Signature

3-DAY ON-SITE TRAINING & SITE HAZARD INFORMATION TRAINING LOG

Site Name & Location: Interim Facility-Wide GWMP and IMWP for Off-Site Water Supply Well Sampling, Fort Wingate Depot Activity

Contract No.:	**Task Order Number:**
Site Manager or SUXOS:	**SSHO:**

The site personnel listed below have received Site Hazard Information Training as specified in 29 CFR 1910.120(i) and have participated in three-days of supervised on-site training as required by 29 CFR 1910.120(e)(3)(i). The Site Hazard Information Training included information related to the nature, level, and degree of exposure likely to result during participation in site operations. The 3-Day Training has included: a description of the site chain-of-command; use/care/maintenance of PPE; personnel and equipment decon procedures; safe work practices; medical/training requirements; and emergency response procedures.

Name (printed)	Signature	Organization	Date Started	Date Completed

SITE ACCESS LOG

Site Name & Location: Interim Facility-Wide GWMP and IMWP for Off-Site Water Supply Well Sampling, Fort Wingate Depot Activity	
Contract No.:	**Task Order Number:**
Site Manager or SUXOS:	**SSHO:**

Date	Name	Representing	Equipment and PPE Level	Time	
				In	Out

SAFETY TRAINING ATTENDANCE LOG

Date:	Instructor(s):	Time:	Log No.:
Site Name & Location: Interim Facility-Wide GWMP and IMWP for Off-Site Water Supply Well Sampling, Fort Wingate Depot Activity		Contract Number:	

Training Provided: Initial Site Hazard Training Daily Safety Briefing Other: ______________________
Weekly Safety Training Task/Hazard-specific Training ______________________

I. TRAINING TOPICS COVERED

	Planned Site Activities		Chemical Hazards		Respirator Use
	Physical Safety Hazards		Routes of Chemical Exposure		Decontamination Procedures
	Biological Hazards		Chemical Exposure Symptoms		Emergency Procedures
	Heat or Cold Stress		Level of PPE		First Aid Procedures
	Site Controls		Types of PPE		Buddy Team Procedures

Other Topics: ____

____

____

II. TRAINING COURSE ATTENDEES

Name (printed)	Signature	Organization

III. TRAINING VERIFICATION

I certify that the personnel listed on this roster (to include the second page if needed) have received the safety training described above.

______________________________ ______________________________

Site Safety and Health Officer Sr. UXO Supervisor or Site Supervisor

ACCIDENT/INCIDENT/NEAR-MISS REPORTING FORM

SECTION 1 - GENERAL INFORMATION

Name:	SSN:		
Job Title:	D.O.B.:	Sex:	Age:
Site Name:	Safety Officer:		
Date of Report:	Date of Incident:	Time of Incident:	
Task/Operation Being Conducted:			
PPE Worn:			

CONDITIONS AT TIME OF INCIDENT

Temperature: ______________ Humidity: ______________ Cloud Cover: ______________
Wind Speed: ______________ Direction: ______________ Precipitation: ______________ Other: ______________

Type of Incident: Personal Injury Personal Illness Chemical Exposure
Motor Vehicle Property Damage Near Miss

If chemical exposure, what material(s) was(were) involved: ______________
What was the nature of exposure (contact, inhalation, etc.): ______________

Other Individual(s) Involved: ______________

SECTION 2 - PERSONAL INJURY/ILLNESS INFORMATION

Nature/Type of Injury/Illness (laceration, strain, etc.): ______________

Cause of Injury/Illness: ______________

Body Part(s) Affected: Primary: ______________ Secondary: ______________

Injury/Illness Required: On Site First Aid Treatment Emergency Room Treatment Hospitalization

Injury/Illness Resulted In: Loss of Work Time Limitation of Duties Fatality
Other: (Explain): ______________

Status at Time of Report: Returned to Work: (Date: ________) Hospitalized: (Anticipated Stay: ________)
Convalescing: (Anticipated Length of Convalescence: ______________)
Other: ______________

On-site First Aid Treatment Given (use additional paper if needed): ______________

Off-site Medical Treatment (attach documentation, including Physician statement): ______________

ACCIDENT/INCIDENT/NEAR-MISS REPORTING FORM

SECTION 3 - MOTOR VEHICLE ACCIDENT		
Type of Vehicle/Equipment	**Type of Collision**	**Seat Belt Use**
Automobile Van/Truck Bush Hog Other:	Side Swipe Rear End Backing Head on Broadside Roll	Front Seat Yes No Back Seat Yes No
Property/Material/Items Involved		
Name of Item	**Owner**	**$ Amount of Damage**

Accident Description (Use additional paper if needed): ____________________

____

____

____

SECTION 4 - POST ACCIDENT/INCIDENT REVIEW

Has the Home Office been notified? Yes No, If Yes, When? By Whom?

Were operations conducted using approved SHP or a SSHP?

Yes Reference: ____________________

No Explain: ____________________

SSHO's Comments (use additional paper if needed): ____________________

____

____

Employee Comments (use additional paper if needed): ____________________

____

____

Corrective Actions Taken (use additional paper if needed): ____________________

____

____

Witnesses		
Name	**Organization**	**Phone Number**

SECTION 5 - SIGNATURES

Employee Signature: ____________________ Date: __________

SSO Signature: ____________________ Date: __________

Corrective Actions Completed By: ____________________ Date: __________

Corp. Review By: ____________________ Date: __________

ATTACHMENT 2
ACTIVITY HAZARD ASSESSMENT FORMS

ACTIVITY HAZARD ANALYSIS

Job: Equipment Decontamination **Date Prepared: 9 October 2006**

Project: Interim Facility-Wide GWMP and IMWP for Off-Site Water Supply Well Sampling

Prepared By: S. Deeter Reviewed By: E. Kammerer

Recommended Protective Clothing and Equipment
Level D (modified) - Nitrile Inner Gloves; Leather outer gloves; Steel toed leather boots; Hard hat if overhead hazards exist; Safety glasses; Chemical protective clothing; Hearing Protection, Splash shield Level D – Nitrile inner gloves; Leather outer gloves; Hard hat if overhead hazards exist; Steel toed leather boots; Chemical protective clothing; Safety Glasses

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	EM-385-1-1 (PARA REF)
SMALL EQUIPMENT 1. Use solutions of phosphate-free detergent and water to thoroughly wash small sampling equipment in plastic tubs or buckets 1. Rinse cleaned equipment with laboratory-supplied deionized water 2. Allow decontaminated equipment to air dry and wrap with aluminum foil 3. Containerize fluids for management as IDW	General	Site personnel will be given task-specific briefings daily regarding the hazards associated with the task and the procedures used to control/mitigate the hazards. All personnel conducting decontamination activities will wear a minimum of Level D PPE. All TPMC subcontractors will be required to read the portions of the SSHP that apply to their operations, and sign off to signify that they have done so.	01.B.05
	Site access control	Site personnel will maintain a constant watch for intrusion of unauthorized personnel. Positive site access control will be established prior to on-site operations using barricades, signs or other methods to ensure that unauthorized access during tasks that could cause exposure to ES&H hazards.	28.A.02 (10)
	Explosion, fire, and over pressure	Personnel will ensure that all combustible materials are properly stored and that vegetation is removed from areas that will be used for vehicle staging.	26.D
	Chemical	Personnel conducting decontamination activities will wear the appropriate PPE as specified under PPE above.	6.A.01
	Heat Stress	If ambient temperatures exceed 75°F, TPMC will implement the heat stress prevention outlined in the SSHP. Personnel will be monitored for heat stress and will maintain adequate hydration.	06.J.02 – 06.J.04
	Cold Stress	If ambient temperatures drop below 61°F, TPMC will implement the cold stress prevention outlined in the SSHP, and personnel will be monitored for cold stress.	06.J.05 – 06.J.10b

ACTIVITY HAZARD ANALYSIS

	Adverse Weather	When there are warnings or indications of impending sever weather, conditions will be monitored and appropriate precautions taken to protect personnel and property as specified in the SSHP.	06.J.01
	Slips, trips and falls	All personnel will utilize good house keeping procedures and maintain clean work areas to remove trip hazards. Personnel will also be aware of uneven walking and working surfaces.	14.C
	Physical Strain	Personnel will be cautioned about physical strain associated with strenuous activities that may be conducted at the site. Personnel will use caution to not over exert themselves or overstrain muscles and joints. Proper lifting techniques will be emphasized.	01.C.01
	Use of Hand and Power Tools	Hand and power tools will be selected to ensure that the right tool is being used for the right job and being used in the manner in which it was intended to be used. All hand and power tools will be inspected daily prior to use and any defective tools will be tagged and removed from service immediately. Personnel will follow the other requirements of the hand and power tool safety as outlined in the SSHP to ensure proper use of the hand and power tools anticipated for this project.	11.C.05 & 13.A
	Cuts and Lacerations	Level D PPE with leather gloves will be used per the SSHP for all tasks with a potential for cuts or lacerations. Personnel will be trained in the proper use and selection of the equipment and tools they must use to complete their tasks and the hazards of exposed metal and other cut hazards.	05.A.01
	Biological	Biological hazards that may be encountered include stinging and biting insects, hazardous plants, and snakes. Insect repellant will be used by site personnel as needed to repel hazardous insects. Site personnel will report to the SSHO and their team leader the presence of any hazardous animals, insects, or plants.	06.D.01 – 06.D.03
	UV Radiation	Site personnel will be cautioned about the possibility of sunburns and will be use sunscreen with a minimum SPF 30 on exposed skin.	06.J.13 & 05.B.07
	Manual lifting of heavy objects	Personnel will use safe lifting procedures and lift with their legs and not their backs.	14.A.04
	Finger crush, back injury, toe crush and other drum handling hazards.	Personnel will utilize safe drum handling procedures and mechanical lifting techniques when ever possible to minimize personnel having to handle drums. Additionally, personnel will be aware of pinch points of heavy equipment.	14.A

ACTIVITY HAZARD ANALYSIS

Equipment To Be Used	Inspections Required	Training Required
1. Hand Tools	Daily inspection of hand tools and equipment Daily inspection of the decontamination pad (if used)	40-Hour HAZWOPER
		8-Hour Refresher
		Initial Site / Task Hazard Training
		PPE Training
		All personnel operating hand tools will be trained in proper inspection, maintenance, and use of the hand tools.

Certification Of Activity Hazard Analysis			
The signature below certifies that the above mentioned persons have assessed and reviewed this task to ascertain the potential hazards associated with its conduct, and to determine the control techniques and PPE which will be required to safeguard site personnel from the identified hazards.			
Signature of Analyst:	Date:	Signature of Reviewer:	Date:

ACTIVITY HAZARD ANALYSIS

Job: Ground Water Sampling **Date Prepared: 12 October 2006**

Project: Interim Facility-Wide GWMP and IMWP for Off-Site Water Supply Well Sampling

Prepared By: S. Deeter Reviewed By: E. Kammerer

Recommended Protective Clothing and Equipment
Level D – Nitrile inner gloves; Hard hat if overhead hazards exist; Steel toed leather boots; Chemical protective clothing as required; Safety Glasses; Hearing protection as required

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	EM-385-1-1 (PARA REF)
1. Inspect and calibrate sampling equipment and instrumentation as necessary 2. Open monitoring well and screen headspace for VOCs using a PID/FID 3. Purge and sample monitoring well using appropriate equipment 4. Fill sample containers and place containers into cooler	General	Site personnel will be given task-specific briefings daily regarding the hazards associated with the task and the procedures used to control/mitigate the hazards. All personnel inside the EZ will wear a minimum of Level D. All TPMC subcontractors will be required to read the portions of the SSHP that apply to their operations, and sign off to signify that they have done so.	01.B.05
	Site access control	Site personnel will maintain a constant watch for intrusion of unauthorized personnel. Positive site access control will be established prior to on-site operations using barricades, signs or other methods to ensure that unauthorized access during tasks that could cause exposure to ES&H hazards.	28.A.02 (10)
	Explosion, fire and over pressure	Personnel will ensure that all combustible materials are properly stored and that vegetation is removed from areas that will be used for vehicle staging.	26.D
	Chemical	Personnel will wear chemical resistant gloves (nitrile), as specified under PPE above.	6.A.01
	Heat Stress	If ambient temperatures exceed 75°F, TPMC will implement the heat stress prevention outlined in the SSHP. Personnel will be monitored for heat stress and will maintain adequate hydration.	06.J.02 – 06.J.04
	Cold Stress	If ambient temperatures drop below 61°F, TPMC will implement the cold stress prevention outlined in the SSHP, and personnel will be monitored for cold stress.	06.J.05 – 06.J.10b
	Adverse Weather	When there are warnings or indications of impending severe weather, conditions will be monitored and appropriate precautions taken to protect personnel and property as specified in the SSHP.	06.J.01

ACTIVITY HAZARD ANALYSIS

	Slips, trips and falls	All personnel will utilize good house keeping procedures and maintain clean work areas to remove trip hazards. Personnel will also be aware of uneven walking and working surfaces.	14.C
	Physical Strain	Personnel will be cautioned about physical strain associated with strenuous activities that may be conducted at the site. Personnel will use caution to not over exert themselves or overstrain muscles and joints. Proper lifting techniques will be emphasized.	01.C.01
	Use of Hand and Power Tools	Hand and power tools will be selected to ensure that the right tool is being used for the right job and being used in the manner in which it was intended to be used. All hand and power tools will be inspected daily prior to use and any defective tools will be tagged and removed from service immediately. Personnel will follow the other requirements of the hand and power tool safety as outlined in the SSHP to ensure proper use of the hand and power tools anticipated for this project.	11.C.05 & 13.A
	Cuts and Lacerations	Level D PPE with leather gloves will be used per the SSHP for all tasks with a potential for cuts or lacerations. Personnel will be trained in the proper use and selection of the equipment and tools they must use to complete their tasks and the hazards of exposed metal and other cut hazards.	05.A.01
	Biological	Biological hazards that may be encountered include stinging and biting insects, hazardous plants, and snakes. Insect repellant will be used by site personnel as needed to repel hazardous insects. Site personnel will report to the SSHO and their team leader the presence of any hazardous animals, insects, or plants.	06.D.01 – 06.D.03
	UV Radiation	Site personnel will be cautioned about the possibility of sunburns and will be use sunscreen with a minimum SPF 30 on exposed skin.	06.J.13 & 05.B.07
	Manual lifting of heavy objects	Personnel will use safe lifting procedures and lift with their legs and not their backs.	14.A.04
	Finger crush, back injury, toe crush and other drum handling hazards.	Personnel will utilize safe drum handling procedures and mechanical lifting techniques when ever possible to minimize personnel having to handle drums.	14.A

ACTIVITY HAZARD ANALYSIS

Equipment To Be Used	Inspections Required	Training Required
1. Hand Tools 2. Ground Water Sampling Equipment	Daily inspection of hand tools Calibration of sampling equipment	40-Hour HAZWOPER 8-Hour Refresher Initial Site / Task Hazard Training PPE Training All personnel operating hand tools will be trained in proper inspection, maintenance and use of the hand tools.

Certification Of Activity Hazard Analysis			
The signature below certifies that the above mentioned persons have assessed and reviewed this task to ascertain the potential hazards associated with its conduct, and to determine the control techniques and PPE which will be required to safeguard site personnel from the identified hazards.			
Signature of Analyst:	Date:	Signature of Reviewer:	Date:

ACTIVITY HAZARD ANALYSIS

Job: Investigation Derived Waste Management **Date Prepared: 12 October 2006**

Project: Interim Facility-Wide GWMP and IMWP for Off-Site Water Supply Well Sampling

Prepared By: S. Deeter Reviewed By: E. Kammerer

Recommended Protective Clothing and Equipment
Level D – Nitrile inner gloves; Leather outer gloves; Hard hat if overhead hazards exist; Steel toed leather boots; Chemical protective clothing as required; Safety Glasses; Hearing protection as required

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	EM-385-1-1 (PARA REF)
1. Load and transport full containers of IDW to Less than 90 Day Storage Area in Building 5	General	Site personnel will be given task-specific briefings daily regarding the hazards associated with the task and the procedures used to control/mitigate the hazards. All personnel inside the EZ will wear a minimum of Level D PPE. All TPMC subcontractors will be required to read the portions of the SSHP that apply to their operations, and sign off to signify that they have done so.	01.B.05
	Site access control	Site personnel will maintain a constant watch for intrusion of unauthorized personnel. Positive site access control will be established prior to on-site operations using barricades, signs or other methods to ensure that unauthorized access during tasks that could cause exposure to ES&H hazards.	28.A.02 (10)
	Explosion, fire, and over pressure	Personnel will ensure that all combustible materials are properly stored and that vegetation is removed from areas that will be used for vehicle staging.	26.D
	Chemical	Personnel will wear chemical resistant gloves (nitrile), as specified under PPE above.	6.A.01
	Heat Stress	If ambient temperatures exceed 75°F, TPMC will implement the heat stress prevention outlined in the SSHP. Personnel will be monitored for heat stress and will maintain adequate hydration.	06.J.02 – 06.J.04
	Cold Stress	If ambient temperatures drop below 61°F, TPMC will implement the cold stress prevention outlined in the SSHP, and personnel will be monitored for cold stress.	06.J.05 – 06.J.10b
	Adverse Weather	When there are warnings or indications of impending severe weather, conditions will be monitored and appropriate precautions taken to protect personnel and property as specified in the SSHP.	06.J.01

ACTIVITY HAZARD ANALYSIS

	Slips, trips and falls	All personnel will utilize good house keeping procedures and maintain clean work areas to remove trip hazards. Personnel will also be aware of uneven walking and working surfaces.	14.C
	Physical Strain	Personnel will be cautioned about physical strain associated with strenuous activities that may be conducted at the site. Personnel will use caution to not over exert themselves or overstrain muscles and joints. Proper lifting techniques will be emphasized.	01.C.01
	Use of Hand and Power Tools	Hand and power tools will be selected to ensure that the right tool is being used for the right job and being used in the manner in which it was intended to be used. All hand and power tools will be inspected daily prior to use and any defective tools will be tagged and removed from service immediately. Personnel will follow the other requirements of the hand and power tool safety as outlined in the SSHP to ensure proper use of the hand and power tools anticipated for this project.	11.C.05 & 13.A
	Cuts and Lacerations	Level D PPE with leather gloves will be used per the SSHP for all tasks with a potential for cuts or lacerations. Personnel will be trained in the proper use and selection of the equipment and tools they must use to complete their tasks and the hazards of exposed metal and other cut hazards.	05.A.01
	Biological	Biological hazards that may be encountered include stinging and biting insects, hazardous plants, and snakes. Insect repellant will be used by site personnel as needed to repel hazardous insects. Site personnel will report to the SSHO and their team leader the presence of any hazardous animals, insects, or plants.	06.D.01 – 06.D.03
	UV Radiation	Site personnel will be cautioned about the possibility of sunburns and will be use sunscreen with a minimum SPF 30 on exposed skin.	06.J.13 & 05.B.07
	Manual lifting of heavy objects	Personnel will use safe lifting procedures and lift with their legs and not their backs.	14.A.04
	Finger crush, back injury, toe crush and other drum handling hazards.	Personnel will utilize safe drum handling procedures and mechanical lifting techniques when ever possible to minimize personnel having to handle drums. Additionally, personnel will be aware of pinch points of heavy equipment.	14.A

Equipment To Be Used	**Inspections Required**	**Training Required**
1. Hand Tools 2. Heavy Equipment	Daily inspection of hand tools and heavy equipment	40-Hour HAZWOPER 8-Hour Refresher

ACTIVITY HAZARD ANALYSIS

		Initial Site / Task Hazard Training
		PPE Training
		All personnel operating hand tools will be trained in proper inspection, maintenance, and use of the hand tools.
		Heavy equipment operators are required to be trained in the operation, inspection, and maintenance of heavy equipment

Certification Of Activity Hazard Analysis			
The signature below certifies that the above mentioned persons have assessed and reviewed this task to ascertain the potential hazards associated with its conduct, and to determine the control techniques and PPE which will be required to safeguard site personnel from the identified hazards.			
Signature of Analyst:	Date:	Signature of Reviewer:	Date:

APPENDIX E
BLANK FORMS

FORT WINGATE
CARETAKERS
90-DAY FACILITY CHECK SHEET

CONT. NUMBER	NOMENCLATURE DESCRIPTION	START DATE	CHARACTERIZATION STATUS

CARETAKER SIGNATURE:______________________________ DATE:______________

Ground Water Elevation Survey Data Form
Fort Wingate Depot Activity
McKinley County, New Mexico

Well ID	FWDA Parcel	Northing	Easting	Ground Surface Elevation (ft AMSL)	Top of Casing Elevation (ft AMSL)	Date Elevation Collected	Time Elevation Collected	Measured Depth to Water (ft TOC)	Measured Total Depth of Well (ft TOC)	Calculated Ground Water Elevation (ft AMSL)
OB/OD AREA										
CMW02	3	1612192.54	2489293.48	7256.61	7258.29					
CMW04	3	1612725.21	2489318.83	7249.50	7251.21					
CMW06	3	1613477.48	2489087.84	7214.13	7216.05					
CMW07	3	1613480.48	2488966.63	7233.61	7235.50					
CMW10	3	1614801.00	2488526.03	7177.71	7179.59					
CMW14	3	1615834.07	2488638.27	7151.56	7153.57					
CMW16	3	1618788.98	2488995.95	7082.17	7084.23					
CMW17	3	1615859.71	2488582.77	7143.72	7145.39					
CMW18	3	1615884.92	2488504.36	7156.63	7158.58					
CMW19	3	1616765.47	2488680.89	7128.11	7130.19					
CMW20	3	1613921.11	2489020.65	7193.14	7194.98					
CMW21	2	1618931.33	2488996.93	7083.66	7085.16					
CMW22	2	1619789.76	2489134.45	7077.48	7078.98					
CMW23	2	1621476.93	2490358.70	7030.22	7032.42					
CMW24	3	1618994.16	2488774.57	7094.94	7096.67					
CMW25	2	1622766.19	2490167.82	7002.19	7004.52					
KMW09	3	1616770.94	2486174.10	7186.54	7188.38					
KMW10	3	1618066.38	2487828.13	7129.65	7131.73					
KMW11	3	1618633.16	2488523.98	7107.25	7109.04					
KMW12	3	1616474.97	2486128.70	7188.48	7190.23					
KMW13	3	1617202.52	2486607.02	7163.82	7165.62					
FW24	2	1622438.23	2491682.83	6991.91	6993.91					
FW31	19	1631055.13	2504816.16	6825.71	6827.71					
FW38	3	1614874.93	2488534.12	7169.43	7172.35					

Ground Water Elevation Survey Data Form
Fort Wingate Depot Activity
McKinley County, New Mexico

Well ID	FWDA Parcel	Northing	Easting	Ground Surface Elevation (ft AMSL)	Top of Casing Elevation (ft AMSL)	Date Elevation Collected	Time Elevation Collected	Measured Depth to Water (ft TOC)	Measured Total Depth of Well (ft TOC)	Calculated Ground Water Elevation (ft AMSL)
NORTHERN AREAS										
TMW01	21	1640504.39	2498871.88	6710.64	6712.41					
TMW02	21	1641503.24	2498583.98	6704.69	6706.15					
TMW03	21	1641773.52	2498882.55	6701.20	6702.92					
TMW04	21	1641690.26	2499094.96	6699.63	6701.33					
TMW05	22	1639949.55	2498884.35	6713.78	6715.30					
TMW06	11	1643285.74	2498783.72	6689.65	6691.09					
TMW07	11	1643289.23	2498772.27	6689.60	6691.11					
TMW08	11	1644255.12	2498929.83	6679.44	6680.84					
TMW10	11	1644455.60	2498459.70	6678.78	6680.66					
TMW11	6	1640758.22	2497201.35	6717.17	6718.92					
TMW13	21	1641150.46	2498112.14	6706.64	6708.13					
TMW14A	21	1640105.79	2497489.27	6722.36	6724.54					
TMW15	21	1640779.66	2497787.27	6711.61	6714.53					
TMW16	6	1640687.67	2496941.05	6712.67	6715.15					
TMW17	6	1640639.83	2497193.43	6718.39	6720.94					
TMW18	6	1641437.85	2497082.86	6711.65	6714.36					
TMW19	6	1641357.27	2496432.95	6698.93	6701.54					
TMW21	21	1642714.98	2498127.88	6694.01	6696.07					
TMW22	21	1642741.13	2499552.16	6690.52	6692.36					
TMW23	11	1643402.32	2499309.51	6686.28	6688.38					
TMW24	11	1644192.07	2499766.28	6679.08	6680.71					
TMW25	7	1643598.10	2496776.41	6671.39	6672.97					
TMW26	11	1645294.74	2498581.83	6675.65	6678.21					
TMW27	9	1646399.76	2496126.43	6666.58	6668.63					
TMW28	14	1645827.16	2501250.03	6687.89	6690.09					

Ground Water Elevation Survey Data Form
Fort Wingate Depot Activity
McKinley County, New Mexico

Well ID	FWDA Parcel	Northing	Easting	Ground Surface Elevation (ft AMSL)	Top of Casing Elevation (ft AMSL)	Date Elevation Collected	Time Elevation Collected	Measured Depth to Water (ft TOC)	Measured Total Depth of Well (ft TOC)	Calculated Ground Water Elevation (ft AMSL)
TMW29	21	1641786.09	2498235.59	6701.62	6703.97					
EMW01	18	1643653.28	2502047.57	6715.16	6717.61					
EMW02	18	1643388.64	2502478.93	6699.14	6701.57					
EMW03	18	1643684.94	2502802.90	6697.69	6700.21					
EMW04	18	1643812.62	2502421.78	6704.84	6707.51					
FW07	21	1640839.18	2498075.06	6709.87	6712.51					
FW08	21	1640572.38	2498132.10	6713.32	6715.29					
FW10	21	1640849.19	2498936.81	6707.39	6708.93					
FW11	21	1641334.02	2499124.16	6701.24	6703.48					
FW12	21	1641609.82	2499038.13	6699.98	6702.00					
FW13	21	1641688.40	2498830.01	6701.24	6702.31					
FW26	7	1643853.34	2497067.39	6672.17	6674.38					
FW27	9	1646461.36	2494395.53	6656.17	6657.32					
FW28	9	1646582.65	2493051.26	6655.83	6657.39					
FW29	11	1645804.27	2497681.64	6669.44	6671.50					
FW35	13	1641888.56	2503025.66	6709.47	6711.41					
MW01	11	1643726.92	2498748.42	6687.00	6686.65					
MW02	11	1643783.37	2498712.09	6685.60	6685.09					
MW03	11	1643644.43	2498801.92	6688.18	6690.53					
MW18D	11	1643948.21	2498331.29	6685.26	6686.94					
MW18S	11	1643948.21	2498331.29	6685.26	6687.21					
MW20	11	1643922.32	2498193.54	6686.03	6688.19					
MW22D	11	1644178.44	2498343.27	6683.29	6685.17					
MW22S	11	1644178.57	2498343.05	6683.29	6685.11					
Wingate 89*	10B	1647927.37	2496971.13	6664.00	6664.34					
Wingate 90*	10B	1648334.82	2495645.93	6656.61	6657.72					

Ground Water Elevation Survey Data Form
Fort Wingate Depot Activity
McKinley County, New Mexico

Well ID	FWDA Parcel	Northing	Easting	Ground Surface Elevation (ft AMSL)	Top of Casing Elevation (ft AMSL)	Date Elevation Collected	Time Elevation Collected	Measured Depth to Water (ft TOC)	Measured Total Depth of Well (ft TOC)	Calculated Ground Water Elevation (ft AMSL)
Wingate 91*	10B	1648707.16	2494862.49	6655.32	6656.18					
SMW01	11	1645906.92	2497393.00	6668.54	6670.01					

Notes:

ft AMSL = Feet Above Mean Sea Level
ft TOC = Feet Below Top of Casing

Calculated Ground Water Elevations = Top of Casing Elevation (ft AMSL) - Measured Depth to Water (ft TOC):

FORT WINGATE DEPOT ACTIVITY
LOW FLOW WELL SAMPLING DATA FORM

Well Number: ____________________
Start Date: ____________________
Start Time: ____________________

Well Casing Diameter (in): ____________
Bore Hole Diameter (in): ____________
Annular Space (AS) Length (ft): ____________
Screened Interval (ft bgs): ____________

Well TD: ____________
Well DTW: ____________
Water Column: ____________
Pump Intake (ft bgs): ____________

WELL VOLUME CALCUATION

Gallons per foot of annular space (from chart on back) = ____________
Column of water or length of AS (whichever is less) X ____________
Volume of water in AS (gal) = ____________
Gallons per foot of casing (from chart on back) = ____________
Column of water X ____________
Volume of water in casing (gal) = ____________
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal) = ____________
ACTUAL VOLUME PURGED (gal) = ____________

Method of Purging : ______________________________

Time	Minutes Elapsed	Flow Rate (mL/min)	Cumulative Volume (L)	DTW (ft toc)	pH	Cond. (µS/cm)	Temp. (C)	Turbidity (NTU)	Redox (mV)	DO (mg/L)

Purging Field Notes:

____

____

Sample Date/Time: ____________ Sample ID/TR #: ____________________

Sampler's signature/date: ______________________________

Reviewer's signature/date: ______________________________

GALLONS PER FOOT OF ANNULAR SPACE
(assuming 30% porosity)

Well Casing Diameter (in)	Bore-hole Diameter (in)				
	4	**6**	**8**	**10**	**12**
2	0.15	0.39	0.73	1.17	1.71
4		0.24	0.59	1.03	1.57
6			0.34	0.78	1.32

GALLONS PER LINEAR FOOT OF CASING

Well Casing Diameter (in)	Gallons per foot
2	0.1632
3	0.3672
4	0.6528
5	1.0200
6	1.4688
8	2.6110
10	4.0797
12	5.8748

STABILIZATION RANGES

Dissolved Oxygen (+/- 10%)
Turbidity (+/- 10%)
Specific Conductance (+/- 3%)
Temperature (+/- 10%)
pH (+/- 0.5 unit)
Redox Potential (+/- 10 mV)

WELL SAMPLING DATA FORM

Well Number: ______________________
Start Date: ______________________
Start Time: ______________________

Well Casing Diameter (in): ______________
Bore Hole Diameter (in): ______________
Annular Space (AS) Length (ft): ______________
Screened Interval (ft bgs): ______________

Well TD: ______________
Well DTW: ______________
Water Column: ______________
Pump Intake (ft bgs) ______________

WELL VOLUME CALCUATION

Gallons per foot of annular space (from chart on back) = ______________
Column of water or length of AS (whichever is less) X ______________
Volume of water in AS (gal) = ______________
Gallons per foot of casing (from chart on back) = ______________
Column of water X ______________
Volume of water in casing (gal) = ______________
ONE EQUIVALENT VOLUME [EV] (AS + casing, gal) = ______________
Number of EV to be purged X ______________
TOTAL VOLUME TO BE PURGED (gal) = ______________
ACTUAL VOLUME PURGED (gal) = ______________

Method of Purging : ______________________________

Field Parameters	**Reading**								
Time									**Final Sample**
Volume (gal)									
Flow Rate (gpm)									N/A
DTW (ft toc)									
pH									
Conductivity (ųS/cm)									
Temperature (ºC)									
Turbidity (NTU)									
Eh/Redox (mV)									
DO (mg/L)									

Purging Field Notes:

____

____

____

Sample Date/Time: ______________
Sampler's signature/date: ______________
Reviewer's signature/date: ______________

Sample ID/TR #: ______________

GALLONS PER FOOT OF ANNULAR SPACE
(assuming 30% porosity)

Well Casing Diameter (in)	Bore-hole Diameter (in)				
	4	**6**	**8**	**10**	**12**
2	0.15	0.39	0.73	1.17	1.71
4		0.24	0.59	1.03	1.57
6			0.34	0.78	1.32

GALLONS PER LINEAR FOOT OF CASING

Well Casing Diameter (in)	Gallons per foot
2	0.1632
3	0.3672
4	0.6528
5	1.0200
6	1.4688
8	2.6110
10	4.0797
12	5.8748

APPENDIX F
TARGET COMPOUND LISTS

United States Environmental Protection Agency | Office of Solid Waste and Emergency Response | OSWER Document 540-F-05-008
EPA Publication 9240.1-50FS
January 2006

EPA

Multi-Media, Multi-Concentration, Organic Analytical Service for Superfund (SOM01.1)

Office of Superfund Remediation and Technology Innovation (OSRTI)
Analytical Services Branch (ASB) (5102G)
Quick Reference Fact Sheet

Under the legislative authority granted to the U.S. Environmental Protection Agency (EPA) under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA), EPA develops standardized analytical methods for the measurement of various pollutants in environmental samples from known or suspected hazardous waste sites. Among the pollutants that are of concern to the EPA at such sites are a series of volatile, semivolatile, pesticide, and Aroclor compounds that are analyzed using gas chromatography coupled with mass spectrometry (GC/MS) and gas chromatography with an electron capture detector (GC/ECD). The Analytical Services Branch (ASB) of the Office of Superfund Remediation and Technology Innovation (OSRTI) offers an analytical service that provides data from the analysis of water and soil/sediment samples for organic compounds for use in the Superfund decision-making process. Through a series of standardized procedures and a strict chain-of-custody, the organic analytical service produces data of known and documented quality. This service is available through the Superfund Contract Laboratory Program (CLP).

DESCRIPTION OF SERVICES

This new organic analytical service provides a technical and contractual framework for laboratories to apply EPA/CLP analytical methods for the isolation, detection, and quantitative measurement of 52 volatile, 67 semivolatile, 21 pesticide, and 9 Aroclor target compounds in water and soil/sediment environmental samples. The CLP provides the methods to be used and the specific technical, reporting, and contractual requirements, including Quality Assurance (QA), Quality Control (QC), and Standard Operating Procedures (SOPs), by which EPA evaluates the data. This service uses GC/MS and GC/ECD methods to analyze the target compounds.

Three data delivery turnarounds are available to CLP customers: 7-day, 14-day, and 21-day turnaround after laboratory receipt of the last sample in the set. In addition, there are 48-hour (for trace volatiles and volatiles) and 72-hour (for semivolatiles, pesticides, and Aroclors) preliminary data submission options available. Changes to the organic method include the separation of pesticide and Aroclor methods, the inclusion of Selected Ion Monitoring (SIM) analysis, and the incorporation of the Staged Electronic Data Deliverable (SEDD) requirement for Electronic Data Deliverables (EDDs) in Extensible Markup Language (XML) format. Options under this service include a closed system purge-and-trap method for low-level volatile soil analysis and methanol preservation for medium-level volatile soil analysis. In addition, data users may request modifications to the SOW that may include, but are not limited to, additional compounds, sample matrices other than soil/sediment or water, lower quantitation limits, and other requirements to enhance method performance.

DATA USES

This analytical service provides data which EPA uses for a variety of purposes, such as determining the nature and extent of contamination at a hazardous waste site, assessing priorities for response based on risks to human health and the environment, determining appropriate cleanup actions, and determining when remedial actions are complete. The data may be used in all stages in the investigation of a hazardous waste site including, but not limited to: site inspections; Hazard Ranking System (HRS) scoring; remedial investigations/Feasibility Studies (FSs); remedial design; treatability studies; and removal actions. In addition, this service provides data that will be available for use in Superfund enforcement/litigation activities.

TARGET COMPOUNDS

Table 1 lists the compounds for which this service is applicable and the corresponding quantitation limits. Specific quantitation limits are highly matrix-dependent.

Table 1. Target Compound List (TCL) and Contract Required Quantitation Limits (CRQLs) for SOM01.1*

	Quantitation Limits				
	Trace Water by SIM (µg/L)	Trace Water (µg/L)	Low Water (µg/L)	Low Soil (µg/kg)	Med. Soil (µg/kg)
VOLATILES					
1. Dichlorodifluoromethane		0.50	5.0	5.0	250
2. Chloromethane		0.50	5.0	5.0	250
3. Vinyl Chloride		0.50	5.0	5.0	250
4. Bromomethane		0.50	5.0	5.0	250
5. Chloroethane		0.50	5.0	5.0	250
6. Trichlorofluoromethane		0.50	5.0	5.0	250
7. 1,1-Dicholoroethene		0.50	5.0	5.0	250
8. 1,1,2-Trichloro-1,2,2-trifluoroethane		0.50	5.0	5.0	250
9. Acetone		5.0	10	10	500
10. Carbon Disulfide		0.50	5.0	5.0	250
11. Methyl acetate		0.50	5.0	5.0	250
12. Methylene chloride		0.50	5.0	5.0	250
13. trans-1,2-Dichloroethene		0.50	5.0	5.0	250
14. Methyl tert-butyl ether		0.50	5.0	5.0	250
15. 1,1-Dichloroethane		0.50	5.0	5.0	250
16. cis-1,2-Dichloroethene		0.50	5.0	5.0	250
17. 2-Butanone		5.0	10	10	500
18. Bromochloromethane		0.50	5.0	5.0	250
19. Chloroform		0.50	5.0	5.0	250
20. 1,1,1-Trichloroethane		0.50	5.0	5.0	250
21. Cyclohexane		0.50	5.0	5.0	250
22. Carbon tetrachloride		0.50	5.0	5.0	250
23. Benzene		0.50	5.0	5.0	250
24. 1,2-Dichloroethane		0.50	5.0	5.0	250
25. 1,4-Dioxane	2.0	20	100	100	5000
26. Trichloroethene		0.50	5.0	5.0	250
27. Methylcyclohexane		0.50	5.0	5.0	250
28. 1,2-Dichloropropane		0.50	5.0	5.0	250
29. Bromodichloromethane		0.50	5.0	5.0	250
30. cis-1,3-Dichloropropene		0.50	5.0	5.0	250
31. 4-Methyl-2-pentanone		5.0	10	10	500
32. Toluene		0.50	5.0	5.0	250
33. trans-1,3-Dichloropropene		0.50	5.0	5.0	250
34. 1,1,2-Trichloroethane		0.50	5.0	5.0	250
35. Tetrachloroethene		0.50	5.0	5.0	250
36. 2-Hexanone		5.0	10	10	500
37. Dibromochloromethane		0.50	5.0	5.0	250
38. 1,2-Dibromoethane	0.050	0.50	5.0	5.0	250
39. Chlorobenzene		0.50	5.0	5.0	250

	Quantitation Limits				
	Trace Water by SIM (µg/L)	Trace Water (µg/L)	Low Water (µg/L)	Low Soil (µg/kg)	Med. Soil (µg/kg)
VOLATILES (CON'T)					
40. Ethylbenzene		0.50	5.0	5.0	250
41. o-Xylene		0.50	5.0	5.0	250
42. m, p-Xylene		0.50	5.0	5.0	250
43. Styrene		0.50	5.0	5.0	250
44. Bromoform		0.50	5.0	5.0	250
45. Isopropylbenzene		0.50	5.0	5.0	250
46. 1,1,2,2-Tetrachloroethane		0.50	5.0	5.0	250
47. 1,3-Dichlorobenzene		0.50	5.0	5.0	250
48. 1,4-Dichlorobenzene		0.50	5.0	5.0	250
49. 1,2-Dichlorobenzene		0.50	5.0	5.0	250
50. 1,2-Dibromo-3-chloropropane	0.050	0.50	5.0	5.0	250
51. 1,2,4-Trichlorobenzene		0.50	5.0	5.0	250
52. 1,2,3-Trichlorobenzene		0.50	5.0	5.0	250

SEMIVOLATILES	Low Water by SIM (µg/L)	Low Water (µg/L)	Low Soil by SIM (µg/kg)	Low Soil (µg/kg)	Med. Soil (µg/kg)
53. Benzaldehyde		5.0		170	5000
54. Phenol		5.0		170	5000
55. bis-(2-chloroethyl) ether		5.0		170	5000
56. 2-Chlorophenol		5.0		170	5000
57. 2-Methylphenol		5.0		170	5000
58. 2,2'-Oxybis (1-chloropropane)		5.0		170	5000
59. Acetophenone		5.0		170	5000
60. 4-Methylphenol		5.0		170	5000
61. N-Nitroso-di-n propylamine		5.0		170	5000
62. Hexachloroethane		5.0		170	5000
63. Nitrobenzene		5.0		170	5000
64. Isophorone		5.0		170	5000
65. 2-Nitrophenol		5.0		170	5000
66. 2,4-Dimethylphenol		5.0		170	5000
67. Bis (2-chloroethoxy) methane		5.0		170	5000
68. 2,4-Dichlorophenol		5.0		170	5000
69. Napthalene	0.10	5.0	3.3	170	5000
70. 4-Chloroaniline		5.0		170	5000
71. Hexachlorobutadiene		5.0		170	5000
72. Caprolactam		5.0		170	5000
73. 4-Chloro-3-methylphenol		5.0		170	5000
74. 2-Methylnapthalene	0.10	5.0	3.3	170	5000
75. Hexachlorocyclopentadiene		5.0		170	5000
76. 2,4,6-Trichlorophenol		5.0		170	5000
77. 2,4,5-Trichlorophenol		5.0		170	5000

* For volatiles, quantitation limits for medium soils are approximately 50 times the quantitation limits for low soils. For semivolatile medium soils, quantitation limits are approximately 50 times the quantitation limits for low soils.

Table 1. Target Compound List (TCL) and Contract Required Quantitation Limits (CRQLs) for SOM01.1* (Con't)

	Quantitation Limits				
	Low Water by SIM (µg/L)	Low Water (µg/L)	Low Soil by SIM (µg/kg)	Low Soil (µg/kg)	Med. Soil (µg/kg)
SEMIVOLATILES (CON'T)					
78. 1,1'-Biphenyl		5.0		170	5000
79. 2-Chloronapthalene		5.0		170	5000
80. 2-Nitroaniline		10		330	10000
81. Dimethylphthalate		5.0		170	5000
82. 2,6-Dinitrotoluene		5.0		170	5000
83. Acenaphthylene	0.10	5.0	3.3	170	5000
84. 3-Nitroaniline		10		330	10000
85. Acenaphthene	0.10	5.0	3.3	170	5000
86. 2,4-Dinitrophenol		10		330	10000
87. 4-Nitrophenol		10		330	10000
88. Dibenzofuran		5.0		170	5000
89. 2,4-Dinitrotoluene		5.0		170	5000
90. Diethylphthalate		5.0		170	5000
91. Fluorene	0.10	5.0	3.3	170	5000
92. 4-Chlorophenyl phenyl ether		5.0		170	5000
93. 4-Nitroaniline		10		330	10000
94. 4,6-Dinitro-2-methylphenol		10		330	10000
95. N-Nitrosodiphenylamine		5.0		170	5000
96. 1,2,4,5-Tetrachlorobenzene		5.0		170	5000
97. 4-Bromophenyl phenyl ether		5.0		170	5000
98. Hexachlorobenzene		5.0		170	5000
99. Atrazine		5.0		170	5000
100. Pentachlorophenol	0.20	10	6.7	330	10000
101. Phenanthrene	0.10	5.0	3.3	170	5000
102. Anthracene	0.10	5.0	3.3	170	5000
103. Carbazole		5.0		170	5000
104. Di-n-butylphthalate		5.0		170	5000
105. Fluoranthene	0.10	5.0	3.3	170	5000
106. Pyrene	0.10	5.0	3.3	170	5000
107. Butylbenzylphthalate		5.0		170	5000
108. 3,3'-Dichlorobenzidine		5.0		170	5000
109. Benzo(a)anthracene	0.10	5.0	3.3	170	5000
110. Chrysene	0.10	5.0	3.3	170	5000
111. Bis(2-ethylhexyl)phthalate		5.0		170	5000
112. Di-n-octylphthalate		5.0		170	5000
113. Benzo(b)fluoroanthene	0.10	5.0	3.3	170	5000
114. Benzo(k)fluoroanthene	0.10	5.0	3.3	170	5000

	Quantitation Limits				
	Low Water by SIM (µg/L)	Low Water (µg/L)	Low Soil by SIM (µg/kg)	Low Soil (µg/kg)	Med. Soil (µg/kg)
SEMIVOLATILES (CON'T)					
115. Benzo(a)pyrene	0.10	5.0	3.3	170	5000
116. Indeno(1,2,3-cd)pyrene	0.10	5.0	3.3	170	5000
117. Dibenzo(a,h)anthracene	0.10	5.0	3.3	170	5000
118. Benzo(g,h,i)perylene	0.10	5.0	3.3	170	5000
119. 2,3,4,6-Tetrachlorophenol		5.0		170	5000

PESTICIDES	**Water (µg/L)**	**Soil (µg/kg)**
120. alpha-BHC	0.050	1.7
121. beta-BHC	0.050	1.7
122. delta-BHC	0.050	1.7
123. gamma-BHC (Lindane)	0.050	1.7
124. Heptachlor	0.050	1.7
125. Aldrin	0.050	1.7
126. Heptachlor epoxide	0.050	1.7
127. Endosulfan I	0.050	1.7
128. Dieldrin	0.10	3.3
129. 4,4'-DDE	0.10	3.3
130. Endrin	0.10	3.3
131. Endosulfan II	0.10	3.3
132. 4-4'-DDD	0.10	3.3
133. Endosulfan sulfate	0.10	3.3
134. 4-4'-DDT	0.10	3.3
135. Methoxychlor	0.50	17
136. Endrin ketone	0.10	3.3
137. Endrin aldehyde	0.10	3.3
138. alpha-Chlordane	0.050	1.7
139. gamma-Chlordane	0.050	1.7
140. Toxaphene	5.0	170

AROCLORS	**Water (µg/L)**	**Soil (µg/kg)**
141. Aroclor-1016	1.0	33
142. Aroclor-1221	1.0	33
143. Aroclor-1232	1.0	33
144. Aroclor-1242	1.0	33
145. Aroclor-1248	1.0	33
146. Aroclor-1254	1.0	33
147. Aroclor-1260	1.0	33
148. Aroclor-1262	1.0	33
149. Aroclor-1268	1.0	33

* For volatiles, quantitation limits for medium soils are approximately 50 times the quantitation limits for low soils. For semivolatile medium soils, quantitation limits are approximately 30 times the quantitation limits for low soils.

The TCL for this service was originally derived from the EPA Priority Pollutant List of 129 compounds. In the years since inception of the CLP, compounds have been added to and removed from the TCL, based on advances in analytical methods, evaluation of method performance data, and the needs of the Superfund program. The SOM analytical service combines the previous OLM and OLC services into one method. For example, drinking water and ground water type samples may be analyzed using the Trace Volatiles method in SOM.

METHODS AND INSTRUMENTATION

For trace volatile water samples, 25 mL of water sample is added to a purge-and-trap device and purged with an inert gas at room temperature. For low/medium volatile water samples, 5 mL of water sample is added to a purge-and-trap device and purged with an inert gas at room temperature. Higher purge temperatures may be used for both trace and low/medium volatile analyses if all technical acceptance criteria is met for all standards, samples, and blanks. For low-level volatile soil samples, organic compounds are generally determined by analyzing approximately 5 g of sample in a closed-system purge-and-trap device at 40°C. For a medium-level soil sample, a soil sample of 5 g is collected, preserved, and/or extracted with methanol and an aliquot of methanol extract is added to 5 mL reagent water and purged at room temperature. For water and soil samples, the volatiles purged from the sample are trapped on a solid sorbent. The purged volatiles are subsequently desorbed by rapidly heating and backflushing with helium, and then introduced into a GC/MS system.

For semivolatile, pesticide, and Aroclor water samples, a 1 L aliquot of sample is extracted with methylene chloride using a continuous liquid-liquid extractor or separatory funnel (for pesticides and Aroclors only). For low-level semivolatile, pesticide, and Aroclor soil samples, a 30 g soil/sediment sample is extracted with methylene chloride/acetone using sonication, automated Soxhlet/Dean-Stark (SDS) extraction, or pressurized fluid extraction techniques. For medium-level semivolatile soil samples, a 1g aliquot is extracted with methylene chloride using the techniques mentioned above for low-level soil samples. For both water and soil samples, the extract is concentrated, subjected to fraction-specific cleanup procedures, and analyzed by GC/MS for semivolatiles or GC/ECD for pesticides and Aroclors. **Table 2** summarizes the methods and instruments used in this analytical service.

DATA DELIVERABLES

Data deliverables for this service include hardcopy data reporting forms and supporting raw data. In addition to the hardcopy deliverable, contract laboratories must also submit the same data electronically. The laboratory must submit data to EPA within 7, 14, or 21-days after laboratory receipt of the last sample in set [or preliminary data within 48 hours (for trace volatiles and volatiles) or 72 hours (for semivolatiles, pesticides, and Aroclors) after laboratory receipt of each sample. EPA then processes the data through an automated Data Assessment Tool (DAT). DAT provides EPA Regions with PC-compatible reports, spreadsheets, and electronic files within 24-48 hours from the receipt of the data for use in data validation. This automated tool also facilitates the transfer of analytical data into Regional databases. In addition to the Regional electronic reports, the CLP laboratories are provided with a data assessment report that documents the instances of noncompliance. The laboratory has 6 business days to reconcile defective data and resubmit the data to EPA. EPA then reviews the data for noncompliance and sends a final data assessment report to the CLP laboratory and the Region.

QUALITY ASSURANCE (QA)

The QA process consists of management review and oversight at the planning, implementation, and completion stages of the environmental data collection activity. This process ensures that the data provided are of known and documented quality.

During the implementation of the data collection effort, QA activities ensure that the Quality Control (QC) system is functioning effectively and that the deficiencies uncovered by the QC system are corrected. After environmental data are collected, QA activities focus on assessing the quality of data to determine its suitability to support enforcement or remedial decisions.

Each contract laboratory prepares a Quality Assurance Plan (QAP) with the objective of providing sound analytical chemical measurements. The QAP must specify the policies, organization, objectives, and functional guidelines, as well as the QA and QC activities designed to achieve the data quality requirements in the contract.

QUALITY CONTROL (QC)

The QC process includes those activities required during analytical data collection to produce data of known and documented quality. The analytical data acquired from QC procedures are used to estimate and evaluate the analytical results and to determine the necessity for, or the effect of, corrective action procedures. The QC procedures required for this analytical service are provided in **Table 3.**

Table 2. Methods and Instruments

Fraction	Water	Soil
Trace Volatiles	Purge-and-trap followed by GC/MS analysis	N/A
Volatiles	Purge-and-trap followed by GC/MS analysis	Purge-and-trap or closed-system purge-and-trap followed by GC/MS analysis
Semivolatiles	Continuous liquid-liquid extraction (CLLE) followed by GC/MS analysis	Sonication, automated SDS extraction, or pressurized fluid extraction followed by GC/MS analysis
Pesticides	CLLE or separatory funnel extraction followed by dual column GC/ECD analysis	Sonication, automated SDS extraction or pressurized fluid extraction followed by dual column GC/ECD analysis
Aroclors	CLLE or separatory funnel extraction followed by dual column GC/ECD analysis	Sonication, automated SDS extraction or pressurized fluid extraction followed by dual column GC/ECD analysis

Table 3. Quality Control (QC)

QC Operation	Frequency
Deuterated Monitoring Compounds (DMCs) (trace volatiles, volatiles, and semivolatiles)	Added to each sample, standard, and blank
Surrogates (pesticides and Aroclors)	Added to each sample, standard, and blank
Method Blanks (trace volatiles and volatiles)	Analyzed at least every 12 hours for each matrix and level
Method Blanks (semivolatiles, pesticides, and Aroclors)	Prepared with each group of 20 samples or less of same matrix and level, or each time samples are extracted by the same procedure
Instrument Blank (trace volatiles and volatiles)	Analyzed after a sample which contains compounds at concentrations greater than the calibration range
Instrument Blank (pesticides and Aroclors)	Every 12 hours on each GC column used for analysis
Storage Blanks (trace volatiles and volatiles)	Prepared and stored with each set of samples
GC/MS Mass Calibration and Ion Abundance Patterns (trace volatiles, volatiles, and semivolatiles)	Every 12 hours for each instrument used for analysis
GC Resolution Check (pesticides)	Prior to initial calibration, on each instrument used for analysis
Initial Calibration	Upon initial set up of each instrument, and each time continuing calibration fails to meet the acceptance criteria
Continuing Calibration	Every 12 hours for each instrument used for analysis
Internal Standards (trace volatiles, volatiles, and semivolatiles)	Added to each sample, standard, and blank
Matrix Spike and Matrix Spike Duplicate (MS/MSD)	Once every 20 or fewer samples of same fraction, matrix, and level in a Sample Delivery Group (SDG)
Laboratory Control Samples (LCSs) (pesticides and Aroclors)	Once every 20 or fewer samples of same fraction, matrix, and level in an SDG
Method Detection Limit (MDL)	Determined annually, per matrix and level

PERFORMANCE MONITORING ACTIVITIES

Laboratory performance monitoring activities are provided primarily by ASB and the Regions to ensure that contract laboratories are producing data of the appropriate quality. EPA performs on-site laboratory audits, data package audits, GC/MS and/or GC/ECD tape audits, and evaluates laboratory performance through the use of blind Performance Evaluation (PE) samples.

CONTACTING EPA

For more information, or for suggestions to improve this analytical service, please contact:

Anand Mudambi
Organic Program Manager
USEPA/ASB
Ariel Rios Building (5102G)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
703-603-8796
FAX: 703-603-9116

EXHIBIT C

TARGET COMPOUND LIST AND CONTRACT REQUIRED QUANTITATION LIMITS

NOTE: Specific quantitation limits are highly matrix-dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

The Contract Required Quantitation Limit (CRQL) values listed on the following pages are based on the analysis of samples according to the specifications given in Exhibit D.

For soil samples, the moisture content of the samples must be used to adjust the CRQL values appropriately.

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1.0 VOLATILES TARGET COMPOUND LIST AND CONTRACT REQUIRED QUANTITATION LIMITS

	Volatiles	CAS Number	Quantitation Limits: Trace Water By SIM µg/L	Trace Water µg/L	Low Water µg/L	Low Soil µg/kg	Med. Soil µg/kg
1.	Dichlorodifluoromethane	75-71-8		0.50	5.0	5.0	250
2.	Chloromethane	74-87-3		0.50	5.0	5.0	250
3.	Vinyl chloride	75-01-4		0.50	5.0	5.0	250
4.	Bromomethane	74-83-9		0.50	5.0	5.0	250
5.	Chloroethane	75-00-3		0.50	5.0	5.0	250
6.	Trichlorofluoromethane	75-69-4		0.50	5.0	5.0	250
7.	1,1-Dichloroethene	75-35-4		0.50	5.0	5.0	250
8.	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1		0.50	5.0	5.0	250
9.	Acetone	67-64-1		5.0	10	10	500
10.	Carbon disulfide	75-15-0		0.50	5.0	5.0	250
11.	Methyl acetate	79-20-9		0.50	5.0	5.0	250
12.	Methylene chloride	75-09-2		0.50	5.0	5.0	250
13.	trans-1,2-Dichloroethene	156-60-5		0.50	5.0	5.0	250
14.	Methyl tert-butyl ether	1634-04-4		0.50	5.0	5.0	250
15.	1,1-Dichloroethane	75-34-3		0.50	5.0	5.0	250
16.	cis-1,2-Dichloroethene	156-59-2		0.50	5.0	5.0	250
17.	2-Butanone	78-93-3		5.0	10	10	500
18.	Bromochloromethane	74-97-5		0.50	5.0	5.0	250
19.	Chloroform	67-66-3		0.50	5.0	5.0	250
20.	1,1,1-Trichloroethane	71-55-6		0.50	5.0	5.0	250
21.	Cyclohexane	110-82-7		0.50	5.0	5.0	250
22.	Carbon tetrachloride	56-23-5		0.50	5.0	5.0	250
23.	Benzene	71-43-2		0.50	5.0	5.0	250
24.	1,2-Dichloroethane	107-06-2		0.50	5.0	5.0	250
25.	1,4-Dioxane	123-91-1	2.0	20	100	100	5000
26.	Trichloroethene	79-01-6		0.50	5.0	5.0	250
27.	Methylcyclohexane	108-87-2		0.50	5.0	5.0	250
28.	1,2-Dichloropropane	78-87-5		0.50	5.0	5.0	250
29.	Bromodichloromethane	75-27-4		0.50	5.0	5.0	250
30.	cis-1,3-Dichloropropene	10061-01-5		0.50	5.0	5.0	250
31.	4-Methyl-2-pentanone	108-10-1		5.0	10	10	500
32.	Toluene	108-88-3		0.50	5.0	5.0	250
33.	trans-1,3-Dichloropropene	10061-02-6		0.50	5.0	5.0	250
34.	1,1,2-Trichloroethane	79-00-5		0.50	5.0	5.0	250
35.	Tetrachloroethene	127-18-4		0.50	5.0	5.0	250

1.0 VOLATILES TARGET COMPOUND LIST AND CONTRACT REQUIRED QUANTITATION LIMITS (Con't)

			Quantitation Limits				
			Trace Water By SIM	Trace Water	Low Water	Low Soil	Med. Soil
	Volatiles	CAS Number	µg/L	µg/L	µg/L	µg/kg	µg/kg
36.	2-Hexanone	591-78-6		5.0	10	10	500
37.	Dibromochloromethane	124-48-1		0.50	5.0	5.0	250
38.	1,2-Dibromoethane	106-93-4	0.050	0.50	5.0	5.0	250
39.	Chlorobenzene	108-90-7		0.50	5.0	5.0	250
40.	Ethylbenzene	100-41-4		0.50	5.0	5.0	250
41.	o-Xylene	95-47-6		0.50	5.0	5.0	250
42.	m,p-Xylene	179601-23-1		0.50	5.0	5.0	250
43.	Styrene	100-42-5		0.50	5.0	5.0	250
44.	Bromoform	75-25-2		0.50	5.0	5.0	250
45.	Isopropylbenzene	98-82-8		0.50	5.0	5.0	250
46.	1,1,2,2-Tetrachloroethane	79-34-5		0.50	5.0	5.0	250
47.	1,3-Dichlorobenzene	541-73-1		0.50	5.0	5.0	250
48.	1,4-Dichlorobenzene	106-46-7		0.50	5.0	5.0	250
49.	1,2-Dichlorobenzene	95-50-1		0.50	5.0	5.0	250
50.	1,2-Dibromo-3-chloropropane	96-12-8	0.050	0.50	5.0	5.0	250
51.	1,2,4-Trichlorobenzene	120-82-1		0.50	5.0	5.0	250
52.	1,2,3-Trichlorobenzene	87-61-6		0.50	5.0	5.0	250

2.0 SEMIVOLATILES TARGET COMPOUND LIST AND CONTRACT REQUIRED QUANTITATION LIMITS

			Quantitation Limits				
			Low Water By SIM[1]	Low Water	Low Soil By SIM[1]	Low Soil	Med. Soil
	Semivolatiles	CAS Number	µg/L	µg/L	µg/kg	µg/kg	µg/kg
53.	Benzaldehyde	100-52-7		5.0		170	5000
54.	Phenol	108-95-2		5.0		170	5000
55.	Bis(2-chloroethyl) ether	111-44-4		5.0		170	5000
56.	2-Chlorophenol	95-57-8		5.0		170	5000
57.	2-Methylphenol	95-48-7		5.0		170	5000
58.	2,2'-Oxybis(1-chloropropane)[2]	108-60-1		5.0		170	5000
59.	Acetophenone	98-86-2		5.0		170	5000
60.	4-Methylphenol	106-44-5		5.0		170	5000
61.	N-Nitroso-di-n propylamine	621-64-7		5.0		170	5000
62.	Hexachloroethane	67-72-1		5.0		170	5000
63.	Nitrobenzene	98-95-3		5.0		170	5000
64.	Isophorone	78-59-1		5.0		170	5000
65.	2-Nitrophenol	88-75-5		5.0		170	5000
66.	2,4-Dimethylphenol	105-67-9		5.0		170	5000
67.	Bis(2-chloroethoxy) methane	111-91-1		5.0		170	5000
68.	2,4-Dichlorophenol	120-83-2		5.0		170	5000
69.	Naphthalene	91-20-3	0.10	5.0	3.3	170	5000
70.	4-Chloroaniline	106-47-8		5.0		170	5000
71.	Hexachlorobutadiene	87-68-3		5.0		170	5000
72.	Caprolactam	105-60-2		5.0		170	5000
73.	4-Chloro-3-methylphenol	59-50-7		5.0		170	5000
74.	2-Methylnaphthalene	91-57-6	0.10	5.0	3.3	170	5000
75.	Hexachlorocyclo-pentadiene	77-47-4		5.0		170	5000
76.	2,4,6-Trichlorophenol	88-06-2		5.0		170	5000
77.	2,4,5-Trichlorophenol	95-95-4		5.0		170	5000
78.	1,1'-Biphenyl	92-52-4		5.0		170	5000

[1]CRQLs for optional analysis of water and soil samples using SIM technique for PAHs and phenols.

[2]Previously known as Bis(2-chloroisopropyl)ether.

2.0 SEMIVOLATILES TARGET COMPOUND LIST AND CONTRACT REQUIRED QUANTITATION LIMITS (Con't)

			Quantitation Limits				
			Low Water By SIM[1]	Low Water	Low Soil By SIM[1]	Low Soil	Med. Soil
	Semivolatiles	CAS Number	µg/L	µg/L	µg/kg	µg/kg	µg/kg
79.	2-Chloronaphthalene	91-58-7		5.0		170	5000
80.	2-Nitroaniline	88-74-4		10		330	10000
81.	Dimethylphthalate	131-11-3		5.0		170	5000
82.	2,6-Dinitrotoluene	606-20-2		5.0		170	5000
83.	Acenaphthylene	208-96-8	0.10	5.0	3.3	170	5000
84.	3-Nitroaniline	99-09-2		10		330	10000
85.	Acenaphthene	83-32-9	0.10	5.0	3.3	170	5000
86.	2,4-Dinitrophenol	51-28-5		10		330	10000
87.	4-Nitrophenol	100-02-7		10		330	10000
88.	Dibenzofuran	132-64-9		5.0		170	5000
89.	2,4-Dinitrotoluene	121-14-2		5.0		170	5000
90.	Diethylphthalate	84-66-2		5.0		170	5000
91.	Fluorene	86-73-7	0.10	5.0	3.3	170	5000
92.	4-Chlorophenyl-phenyl ether	7005-72-3		5.0		170	5000
93.	4-Nitroaniline	100-01-6		10		330	10000
94.	4,6-Dinitro-2-methylphenol	534-52-1		10		330	10000
95.	N-Nitrosodiphenylamine	86-30-6		5.0		170	5000
96.	1,2,4,5-Tetra chlorobenzene	95-94-3		5.0		170	5000
97.	4-Bromophenyl-phenylether	101-55-3		5.0		170	5000
98.	Hexachlorobenzene	118-74-1		5.0		170	5000
99.	Atrazine	1912-24-9		5.0		170	5000
100.	Pentachlorophenol	87-86-5	0.20	10	6.7	330	10000
101.	Phenanthrene	85-01-8	0.10	5.0	3.3	170	5000
102.	Anthracene	120-12-7	0.10	5.0	3.3	170	5000
103.	Carbazole	86-74-8		5.0		170	5000
104.	Di-n-butylphthalate	84-74-2		5.0		170	5000
105.	Fluoranthene	206-44-0	0.10	5.0	3.3	170	5000
106.	Pyrene	129-00-0	0.10	5.0	3.3	170	5000
107.	Butylbenzylphthalate	85-68-7		5.0		170	5000

[1]CRQLs for optional analysis of water and soil samples using SIM technique for PAHs and phenols.

2.0 SEMIVOLATILES TARGET COMPOUND LIST AND CONTRACT REQUIRED QUANTITATION LIMITS (Con't)

		Quantitation Limits				
		Low Water By SIM[1]	Low Water	Low Soil By SIM[1]	Low Soil	Med. Soil
Semivolatiles	CAS Number	µg/L	µg/L	µg/kg	µg/kg	µg/kg
108. 3,3'-Dichlorobenzidine	91-94-1		5.0		170	5000
109. Benzo(a)anthracene	56-55-3	0.10	5.0	3.3	170	5000
110. Chrysene	218-01-9	0.10	5.0	3.3	170	5000
111. Bis(2-ethylhexyl) phthalate	117-81-7		5.0		170	5000
112. Di-n-octylphthalate	117-84-0		5.0		170	5000
113. Benzo(b)fluoranthene	205-99-2	0.10	5.0	3.3	170	5000
114. Benzo(k)fluoranthene	207-08-9	0.10	5.0	3.3	170	5000
115. Benzo(a)pyrene	50-32-8	0.10	5.0	3.3	170	5000
116. Indeno(1,2,3-cd) pyrene	193-39-5	0.10	5.0	3.3	170	5000
117. Dibenzo(a,h)anthracene	53-70-3	0.10	5.0	3.3	170	5000
118. Benzo(g,h,i)perylene	191-24-2	0.10	5.0	3.3	170	5000
119. 2,3,4,6-Tetrachlorophenol	58-90-2		5.0		170	5000

[1]CRQLs for optional analysis of water and soil samples using SIM technique for PAHs and pentachlorophenol.

3.0 PESTICIDES TARGET COMPOUND LIST AND CONTRACT REQUIRED QUANTITATION LIMITS[1]

			Quantitation Limits	
			Water	Soil
Pesticides		CAS Number	µg/L	µg/kg
120.	alpha-BHC	319-84-6	0.050	1.7
121.	beta-BHC	319-85-7	0.050	1.7
122.	delta-BHC	319-86-8	0.050	1.7
123.	gamma-BHC (Lindane)	58-89-9	0.050	1.7
124.	Heptachlor	76-44-8	0.050	1.7
125.	Aldrin	309-00-2	0.050	1.7
126.	Heptachlor epoxide[2]	1024-57-3	0.050	1.7
127.	Endosulfan I	959-98-8	0.050	1.7
128.	Dieldrin	60-57-1	0.10	3.3
129.	4,4'-DDE	72-55-9	0.10	3.3
130.	Endrin	72-20-8	0.10	3.3
131.	Endosulfan II	33213-65-9	0.10	3.3
132.	4,4'-DDD	72-54-8	0.10	3.3
133.	Endosulfan sulfate	1031-07-8	0.10	3.3
134.	4,4'-DDT	50-29-3	0.10	3.3
135.	Methoxychlor	72-43-5	0.50	17
136.	Endrin ketone	53494-70-5	0.10	3.3
137.	Endrin aldehyde	7421-93-4	0.10	3.3
138.	alpha-Chlordane	5103-71-9	0.050	1.7
139.	gamma-Chlordane	5103-74-2	0.050	1.7
140.	Toxaphene	8001-35-2	5.0	170

[1]There is no differentiation between the preparation of low and medium soil samples in this method for the analysis of pesticides.

[2]Only the exo-epoxy isomer (isomer B) of heptachlor epoxide is reported on the data reporting forms (Exhibit B).

4.0 AROCLORS TARGET COMPOUND LIST AND CONTRACT REQUIRED QUANTITATION LIMITS[1]

		Quantitation Limits	
		Water	Soil
Aroclors	CAS Number	µg/L	µg/kg
141. Aroclor-1016	12674-11-2	1.0	33
142. Aroclor-1221	11104-28-2	1.0	33
143. Aroclor-1232	11141-16-5	1.0	33
144. Aroclor-1242	53469-21-9	1.0	33
145. Aroclor-1248	12672-29-6	1.0	33
146. Aroclor-1254	11097-69-1	1.0	33
147. Aroclor-1260	11096-82-5	1.0	33
148. Aroclor-1262	37324-23-5	1.0	33
149. Aroclor-1268	11100-14-4	1.0	33

[1]There is no differentiation between the preparation of low and medium soil samples in this method for the analysis of Aroclors.

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APPENDIX G
TARGET REPORTING LIMITS

Method Detection and Reporting Limit Study

Method SW8260B
Matrix Water
Date 6/7/2007

Parameter	MDL - ug/L	RL-ug/L
1,1,1,2-Tetrachloroethane	3.1	5
1,1,1-Trichloroethane	2.7	5
1,1,2,2-Tetrachloroethane	2.4	5
1,1,2-Trichloroethane	1.5	5
1,1-Dichloroethane	2	5
1,1-Dichloroethene	2.8	5
1,1-Dichloropropene	2.5	5
1,2,3-Trichlorobenzene	2.7	5
1,2,3-Trichloropropane	2.7	5
1,2,4-Trichlorobenzene	2.7	5
1,2,4-Trimethylbenzene	2.4	5
1,2-Dichlorobenzene	1.8	5
1,2-Dichloroethane	1.8	5
1,2-Dichloropropane	2.3	5
1,3,5-trimethylbenzene	2.9	5
1,3-Dichlorobenzene	2.2	5
1,3-Dichloropropane	1.9	5
1,4-Dichlorobenzene	2.4	5
1-Chlorohexane	3	5
2,2-Dichloropropane	3.2	5
2-Butanone	4.7	10
2-Chloro-1,3-Butadiene	3.9	5
2-Chloroethyl Vinyl Ether	9.1	20
2-Chlorotoluene	3	5
2-Hexanone	3.9	10
4-Chlorotoluene	2.1	5
4-Isopropyltoluene	2.8	5
4-Methyl-2-Pentanone	1.2	10
Acetone	3.8	10
Acetonitrile	29	50
Acrolein	19	25
Acrylonitrile	17	50
Allyl Chloride (3-Chloropropene)	3.1	5
Benzene	2.5	5
Bromobenzene	1.9	5
Bromochloromethane	3.8	5
Bromodichloromethane	1.9	5
Bromoform	0.65	5
Bromomethane	3.7	10
Carbon Disulfide	2.8	5
Carbon Tetrachloride	3.3	5
Chlorobenzene	2	5
Chloroethane	3.8	10
Chloroform	2	5
Chloromethane	2.7	10
Cyclohexane	3.1	5
Cyclohexanone	9.3	10
Dibromochloromethane	2.2	5
Dibromomethane	1.7	5
Dichlorodifluoromethane	3.8	5
Diethyl Ether (Ethyl Ether)	4	10

Method Detection and Reporting Limit Study

Method SW8260B
Matrix Water
Date 6/7/2007

Parameter	MDL - ug/L	RL-ug/L
Ethyl Acetate	2.2	10
Ethyl Methacrylate	2.4	5
Ethylbenzene	2.6	5
Ethylene Dibromide	2.3	5
Freon 113	4.2	5
Hexachlorobutadiene	4.3	5
Iodomethane (Methyl Iodide)	2.5	5
Isobutyl Alcohol	78	100
Isopropyl Ether	2.4	5
Isopropylbenzene	2.9	5
Methacrylonitrile	22	50
Methyl Acetate	2.4	5
Methylcyclohexane	3.1	5
Methylene Chloride	4.3	10
Naphthalene	2.1	5
Pentachloroethane	1.7	5
Propane Nitrile (Propionitrile)	18	50
Sec-Butylbenzene	3	5
Styrene	2.3	5
Tetrachloroethylene	3.2	5
Tetrahydrofuran	4.8	5
Toluene	3	5
Total 1,2-Dichloroethene	6	10
Trichloroethene	2.2	5
Trichlorofluoromethane	3.5	5
Vinyl Acetate	2.2	10
Vinyl Chloride	4.3	10
Xylenes, Total	7.7	15
cis-1,2-Dichloroethene	2.8	5
cis-1,3-Dichloropropene	2.5	5
m,p-Xylenes	5.8	10
n-Butylbenzene	3.8	5
n-Propylbenzene	2.6	5
o-Xylene	2	5
tert-Butylbenzene	2.8	5
tert-butyl methyl ether	3	5
trans-1,2-dichloroethene	3.4	5
trans-1,3-dichloropropene	2.2	5
trans-1,4-dichloro-2-butene	4.2	5

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Method Detection and Reporting Limits

Method: SW8270C_SL

Matrix: Water

Analysis Date: 02/26/2007

Parameter	Method Detection Limit	Reporting Limit	Units
1,1- Biphenyl	1.1	10	ug/L
1,2,4-Trichlorobenzene	2.1	10	ug/L
1,2-Dichlorobenzene	1.6	10	ug/L
1,2-Diphenylhydrazine	1.5	10	ug/L
1,3-Dichlorobenzene	1.5	10	ug/L
1,4-Dichlorobenzene	2.1	10	ug/L
2,2-Oxybis(1-chloropropane)	1.8	10	ug/L
2,4,5-Trichlorophenol	2.4	10	ug/L
2,4,6-Trichlorophenol	3.7	10	ug/L
2,4-Dichlorophenol	3.8	10	ug/L
2,4-Dimethylphenol	3.5	10	ug/L
2,4-Dinitrophenol	3.0	20	ug/L
2,4-Dinitrotoluene	2.3	10	ug/L
2,6-Dinitrotoluene	1.8	10	ug/L
2-Chloronaphthalene	1.2	10	ug/L
2-Chlorophenol	3.3	10	ug/L
2-Methylnaphthalene	2.4	10	ug/L
2-Nitroaniline	1.3	10	ug/L
2-Nitrophenol	2.8	10	ug/L
2-methylphenol	3.3	10	ug/L
3,3-Dichlorobenzidine	4.4	20	ug/L
3-Nitroaniline	0.81	10	ug/L
4,6-dinitro-2-methyl phenol	4.6	20	ug/L
4-Bromophenyl-phenylether	1.9	10	ug/L
4-Chloroaniline	0.40	10	ug/L
4-Chlorophenyl Phenyl Ether	1.8	10	ug/L
4-Nitroaniline	3.1	10	ug/L
4-Nitrophenol	4.8	20	ug/L

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Method Detection and Reporting Limits

Method: SW8270C_SL

Matrix: Water

Analysis Date: 02/26/2007

Parameter	Method Detection Limit	Reporting Limit	Units
4-chloro-3-methylphenol	2.9	10	ug/L
4-methylphenol	5.1	10	ug/L
Acenaphthene	1.3	10	ug/L
Acenaphthylene	1.8	10	ug/L
Acetophenone	1.8	10	ug/L
Aniline (Phenylamine, Aminobenzene)	1.3	10	ug/L
Anthracene	2.0	10	ug/L
Atrazine	6.7	10	ug/L
Benzaldehyde	2.7	10	ug/L
Benzidine	0.0	10	ug/L
Benzo(a)anthracene	1.8	10	ug/L
Benzo(a)pyrene	2.0	10	ug/L
Benzo(b)fluoranthene	1.6	10	ug/L
Benzo(g,h,i)perylene	2.0	10	ug/L
Benzo(k)fluoranthene	1.7	10	ug/L
Benzoic Acid	3.6	20	ug/L
Benzyl Alcohol	1.6	10	ug/L
Benzyl Butyl Phthalate	0.88	10	ug/L
Caprolactam	3.0	10	ug/L
Carbazole	2.1	10	ug/L
Chrysene	1.3	10	ug/L
Dibenz(a,h)Anthracene	2.4	10	ug/L
Dibenzofuran	1.6	10	ug/L
Diethyl Phthalate	2.0	10	ug/L
Dimethyl Phthalate	2.6	10	ug/L
Fluoranthene	2.2	10	ug/L
Fluorene	1.9	10	ug/L
Hexachlorobenzene	2.9	10	ug/L

Parameter	Method Detection Limit	Reporting Limit	Units
Hexachlorobutadiene	1.8	10	ug/L
Hexachlorocyclopentadiene	1.6	10	ug/L
Hexachloroethane	2.5	10	ug/L
Indeno(1,2,3-c,d)Pyrene	2.3	10	ug/L
Isophorone	1.3	10	ug/L
Naphthalene	1.9	10	ug/L
Nitrobenzene	2.4	10	ug/L
Pentachlorophenol	5.6	20	ug/L
Phenanthrene	2.3	10	ug/L
Phenol	3.4	10	ug/L
Pyrene	1.6	10	ug/L
Pyridine	2.6	10	ug/L
bis(2-chloroethoxy) methane	1.9	10	ug/L
bis(2-chloroethyl) ether	2.7	10	ug/L
bis(2-ethylhexyl) phthalate	1.8	10	ug/L
di-n-Butyl Phthalate	3.8	10	ug/L
di-n-Octyl Phthalate	1.8	10	ug/L
n-Nitrosodi-n-Propylamine	2.0	10	ug/L
n-Nitrosodimethylamine	3.3	10	ug/L
n-Nitrosodiphenylamine	2.3	10	ug/L

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Laboratory Method Detection Limits and Reporting Limits

Method: 6010B/7470A

Date: 02/2007

Compound	Lab MDL Water ug/L	Lab Reporting Limit Water ug/L
Aluminum	23.0	200
Antimony	3.2	20
Arsenic	3.1	20
Barium	0.39	5.0
Beryllium	0.04	2.0
Boron	4.9	15.0
Cadmium	0.35	6.0
Calcium	136.0	1000
Chromium	0.60	5.0
Cobalt	0.64	5.0
Copper	0.77	10
Iron	14.8	150
Lead	1.70	10
Magnesium	20.9	250
Manganese	0.18	5.0
Mercury	0.021	0.2
Molybdenum	1.4	5.0
Nickel	1.7	10
Potassium	16.6	250
Selenium	2.8	20
Silver	0.68	5.0
Sodium	207.0	2500
Thallium	4.3	30
Tin	2.4	25
Titanium	1.2	25
Vanadium	0.7	10
Zinc	8.8	20

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Laboratory Method Detection Limits and Reporting Limits

Method: SW8330B
Date: 02/07/07

Compound	Lab MDL Water ug/L	Lab Reporting Limit Water ug/L
HMX	0.061	0.40
1,3,5-Trinitrobenzene	0.034	0.20
Tetryl	0.18	0.40
2,4,6-Trinitrotoluene	0.086	0.20
4-Amino-2,6-Dinitrotoluene	0.058	0.20
2,6-Dinitrotoluene	0.054	0.20
4-Nitrotoluene	0.095	0.40
RDX	0.072	0.40
1,3-Dinitrobenzene	0.028	0.20
Nitrobenzene	0.062	0.20
2-Amino-4,6-Dinitrotoluene	0.053	0.20
2,4-Dinitrotoluene	0.037	0.20
2-Nitrotoluene	0.11	0.40
3-Nitrotoluene	0.18	0.40
Nitroglycerin	10.00	20.00
PETN	0.183	1.00
3,5-Dinitroaniline	0.093	0.40

Laboratory Method Detection Limits and Reporting Limits

Method: E300/SW9056
Date: 01/25/07

Compound	Lab MDL Water mg/L	Lab Reporting Limit Water mg/L
Fluoride	**0.0040**	**0.10**
Chloride	**0.0130**	**0.10**
Nitrite-N	**0.0042**	**0.10**
Bromide	**0.0072**	**0.10**
Nitrate-N	**0.0022**	**0.10**
ortho-Phosphate-P	**0.0091**	**0.10**
Sulfate	**0.0099**	**0.10**

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Laboratory Method Detection Limits and Reporting Limits

Method: SW6020/7470A

Date: 02/2007

Compound	Lab MDL Water ug/L	Lab Reporting Limit Water ug/L
Aluminum	21.7	100
Antimony	0.28	1.0
Arsenic	1.00	5.0
Barium	0.36	5.0
Beryllium	0.037	0.20
Cadmium	0.072	0.50
Calcium	18.40	1000
Chromium	1.200	2.0
Cobalt	0.056	1.0
Copper	0.790	2.0
Iron	4.70	50.0
Lead	0.15	2.0
Lithium	0.079	2.0
Magnesium	21.90	100
Manganese	0.17	2.0
Mercury	0.02	0.2
Molybdenum	0.38	5.0
Nickel	0.21	1.0
Potassium	13.40	1000
Selenium	1.00	5.0
Silver	0.10	0.3
Sodium	29.30	1000
Strontium	0.43	2.0
Thallium	0.10	2.0
Tin	0.57	5.0
Titanium	0.86	2.0
Vanadium	2.20	10.0
Zinc	1.80	10.0

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Laboratory Method Detection Limits and Reporting Limits

Method: Wet Chem
Date: 2007

Compound	Method	Lab MDL Water mg/L	Lab Reporting Limit Water mg/L	
Alkalinity	E310.1/SM2320B	0.31	1.0	
Ammonia-N	E350.2	0.007	0.10	
Ammonia-N	E350.3	0.017	0.10	
BOD	E405.1/SM	0.29	2.00	
Chloride	E325.3/SM4500CL-C	0.172	0.50	
COD	410.2/SM5220C	1.996	5.0	
COD	410.4/SM5220D	1.42	5.0	
Conductivity	E120.1/SM2510B/SW9050	0.25	1.0	umhos/cm
Cyanide	E 335.2/SW9014/CLP	0.0013	0.005	
Ferrous Iron	SM3500Fe-D	0.0295	0.200	
Fluoride	E340.2/SM4500C	0.0091	0.10	
Foaming Agents (MBAS)	E425.1	0.067	0.20	
Hardness	E130.2	0.475	1.00	
Hexavalent Chromium	SW7196A	0.003	0.01	
Nitrate-N	E353.2	0.007	0.05	
Nitrite-N	E354.1/SM4500NO2	0.0014	0.02	
Nitrocellulose	IAAP	0.0990	0.357	
Oil & Grease (HEM)	1664	1.332	5.0	
TPH(SGT)	1664	0.48	5.0	
Phenolics	E 420.1/SW9065	0.0150	0.05	
Total -Phosphorus	E365.3	0.007	0.02	
Ortho-Phosphorus	E365.3	0.004	0.02	
Silica	E370.1	0.084	0.50	
Sulfate	E375.4/SW9038	0.092	1.0	
Sulfide	E376.1/SW9030/SW9034	0.61	2.0	
TDS	E160.1/SM2540C	3.07	10	
TKN	E351.3	0.024	0.10	
TOC	E 415.1/SW9060	0.13	1.0	
TSS	E160.2	1.19	5.0	
Turbidity	E180.1	0.15	1.0	NTU

LABORATORIES

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Method Detection and Reporting Limits

Method: SW8015GRO

Matrix: Water

Analysis Date: 02/20/2007

Parameter	Method Detection Limit	Reporting Limit	Units
TPH-GRO (Gasoline Range Organics)	44	100	ug/L

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Method Detection and Reporting Limits

Method: SW8015DRO

Matrix: Water

Analysis Date: 01/17/2007

Parameter	Method Detection Limit	Reporting Limit	Units
TPH-DRO (Diesel Range Organics)	0.0015	0.050	mg/L

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Method Detection and Reporting Limits

Method: SW8141A

Matrix: Water

Analysis Date: 02/13/2007

Parameter	Method Detection Limit	Reporting Limit	Units
Bolstar (Sulprofos)	0.036	0.10	ug/L
Chlorpyrifos	0.022	0.10	ug/L
Coumaphos	0.048	0.10	ug/L
Demeton-O	0.0086	0.10	ug/L
Demeton-S	0.021	0.10	ug/L
Diazinon	0.015	0.10	ug/L
Dichlorvos (DDVP)	0.023	0.10	ug/L
Disulfoton	0.017	0.10	ug/L
Ethoprop	0.048	0.10	ug/L
Fensulfothion	0.065	0.10	ug/L
Fenthion	0.040	0.10	ug/L
Merphos	0.058	0.10	ug/L
Methylazinphos	0.038	0.10	ug/L
Methylparathion	0.041	0.10	ug/L
Mevinphos	0.052	0.10	ug/L
Naled	0.037	0.10	ug/L
Phorate	0.036	0.10	ug/L
Ronnel	0.041	0.10	ug/L
Stirophos (Tetrachlorovinphos)	0.044	0.10	ug/L
Tokuthion (protothiofos)	0.034	0.10	ug/L
Trichloronate	0.022	0.10	ug/L

GPL Laboratories, LLLP

Method Detection and Reporting Limits

Method: SW8081A

Matrix: Water

Analysis Date: 02/14/2007

Parameter	Method Detection Limit	Reporting Limit	Units
Toxaphene	0.14	1.0	ug/L

GPL Laboratories, LLLP

Method Detection and Reporting Limits

Method: SW8081A

Matrix: Water

Analysis Date: 02/13/2007

Parameter	Method Detection Limit	Reporting Limit	Units
Chlordane	0.30	1.0	ug/L

GPL Laboratories, LLLP

Method Detection and Reporting Limits

Method: SW8081A

Matrix: Water

Analysis Date: 01/27/2007

Parameter	Method Detection Limit	Reporting Limit	Units
4,4-DDD	0.0058	0.050	ug/L
4,4-DDE	0.0042	0.050	ug/L
4,4-DDT	0.023	0.050	ug/L
Aldrin	0.0036	0.050	ug/L
Alpha-BHC	0.0029	0.050	ug/L
Alpha-Chlordane	0.0080	0.050	ug/L
Beta-BHC	0.0043	0.050	ug/L
Delta-BHC	0.010	0.050	ug/L
Dieldrin	0.0030	0.050	ug/L
Endosulfan I	0.0038	0.050	ug/L
Endosulfan II	0.0034	0.050	ug/L
Endosulfan Sulfate	0.0021	0.050	ug/L
Endrin	0.0039	0.050	ug/L
Endrin Aldehyde	0.0033	0.050	ug/L
Endrin Ketone	0.0018	0.050	ug/L
Gamma-BHC (Lindane)	0.0035	0.050	ug/L
Gamma-Chlordane	0.0038	0.050	ug/L
Heptachlor	0.0035	0.050	ug/L
Heptachlor Epoxide	0.0036	0.050	ug/L
Methoxychlor	0.0032	0.050	ug/L

LABORATORIES

GPL Laboratories, LLLP

Method Detection and Reporting Limits

Method: SW8151A

Matrix: Water

Analysis Date: 02/09/2007

Parameter	Method Detection Limit	Reporting Limit	Units
2,4,5-T	0.067	1.0	ug/L
2,4,5-TP (Silvex)	0.086	1.0	ug/L
2,4-D	0.068	1.0	ug/L
2,4-DB	0.12	1.0	ug/L
4-Nitrophenol	0.16	1.0	ug/L
Dalapon	0.21	1.0	ug/L
Dicamba	0.11	1.0	ug/L
Dichloroprop	0.098	1.0	ug/L
Dinoseb	0.18	1.0	ug/L
MCPA	6.2	100	ug/L
MCPP	11	100	ug/L
Pentachlorophenol	0.072	1.0	ug/L
Picloram	0.18	1.0	ug/L

DataChem MDL and LCS Limits Report

Analytical Method	*Preparatory Method*	*Matrix*	*Date Analyzed*	*Instrument*
6850	**6850**	**WATER**	**3/12/2006**	**LC/MS**

Analyte Name	*Units*	*MDL*	*PQL*	*LCL*	*UCL*
Perchlorate	ug/L	0.195	0.5	78.52	121.80

MDL Studies are required to be updated annually. Valid MDL Studies when approved are used. MDLs may change at any time. The above MDLs are valid MDLs used by DataChem currently. If you require more current MDL values please contact the laboratory. For multiple instrumentation DataChem uses the highest MDL values from all instruments in the study and a date range is given.

Reporting Limits for Dioxin/Furan Methods

Analyte	8290/1613 Solid (pg/g)	8290/1613 Aqueous (pg/L)	8290/1613 Wipe (pg/wipe)	8280 Solid (ng/g)	8280 Aqueous (ng/L)	M23/TO-9A Train/PUF (pg)
2378-TCDD	1	10	20	1	10	10
12378-PeCDD	5	50	100	1	10	50
123478-HxCDD	5	50	100	2.5	25	50
123678-HxCDD	5	50	100	2.5	25	50
123789-HxCDD	5	50	100	2.5	25	50
1234678-HpCDD	5	50	100	2.5	25	50
OCDD	10	100	200	5	50	100
2378-TCDF	1	10	20	1	10	10
12378-PeCDF	5	50	100	1	10	50
23478-PeCDF	5	50	100	1	25	50
123478-HxCDF	5	50	100	2.5	25	50
123678-HxCDF	5	50	100	2.5	25	50
234678-HxCDF	5	50	100	2.5	25	50
123789-HxCDF	5	50	100	2.5	25	50
1234678-HpCDF	5	50	100	2.5	25	50
1234789-HpCDF	5	50	100	2.5	25	50
OCDF	10	100	200	5	50	100

Note:
(pg/g) = ppt
(pg/L) = ppq
(ng/g) = ppb
(ng/L) = ppt

Paradigm Analytical Labs

LABORATORIES

GPL Laboratories, LLLP

Method Detection and Reporting Limits

Method: GPL_8270M_MM

Matrix: Water

Analysis Date: 03/02/2007

Parameter	Method Detection Limit	Reporting Limit	Units
Phosphorus, White	0.034	0.10	ug/L

APPENDIX H
NMED GUIDANCE DOCUMENTS

HAZARDOUS WASTE BUREAU

New Mexico Environment Department

Position Paper ***Position Paper***

Use of Low-Flow and Other Non-Traditional Sampling Techniques for RCRA Compliant Groundwater Monitoring[1]

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1. Scope

Currently, many sites use a traditional method of well purging and sampling, which involves removal of a specific pre-calculated number of well volumes from the monitoring well prior to sample collection. Due to rising disposal costs, some Resource Conservation and Recovery Act (**RCRA**) permitted facilities in New Mexico are looking for ways to reduce the volume of water produced during purging and are exploring alternative sampling techniques. As a result, purging and sampling techniques for compliance groundwater monitoring have become an important issue for both facilities and the regulatory agency. The Hazardous Waste Bureau (**HWB**) of the New Mexico Environment Department (**NMED**) developed the following guidance regarding low-flow and other non-traditional sampling methods to promote clarity and consistency. This HWB position paper is intended to provide guidance to the regulated community and assist with preparation of written requests to HWB for sampling deviations based on site-specific conditions. The selection of a sampling technique depends on well and site conditions. HWB outlines the selection criteria for low-flow well purging and sampling in this document. Information is provided for the appropriate use of the low-flow technique in order to obtain RCRA compliant groundwater monitoring results that are defensible and reproducible. Other non-traditional sampling techniques are also discussed.

2. Background

[1]This document is intended as guidance for employees of the Hazardous Waste Bureau (HWB) and RCRA-regulated facilities within the State of New Mexico. This guidance does not constitute rule making and may not be relied upon to create a right or benefit, substantive or procedural, enforceable at law or in equity, by any person. HWB may take action at variance to this guidance and reserves the right to modify this guidance at any time without public notice.

The objective of sampling is to obtain groundwater samples that are representative of aquifer conditions. However, many factors contribute to the water chemistry results obtained from groundwater monitoring wells. Laboratory analytical methods for most analytes and sample types are well established and carefully documented. Errors associated with the collection and handling of a sample generally exceed those associated with the analysis. The site-specific conditions must be fully evaluated during the initial stages of monitoring well network design, construction, installation, development, and during well operation and maintenance. If a well is not properly constructed and developed, zones other than the intended zone may be sampled (Puls and Barcelona, April 1996). Proper development following monitoring well installation is required prior to sampling. Selection of the development technique must be based on the aquifer properties encountered during well drilling and other site-specific factors. No sampling technique can overcome an improperly designed or developed well. Guidelines for proper well development (with the exception of open-borehole bedrock wells) can be found in ASTM D5521-94. Documentation of indicator parameters during well development is useful to aid in the establishment of purging behavior for a specific well.

With the traditional sampling technique, three to five well volumes are removed from the well prior to sample collection. Indicator parameters are collected during the purging process. Once the indicator parameters have stabilized, a groundwater sample is collected. This method has its advantages, some of which include: easy calculation and removal of a set volume of water, a variety of equipment can be employed (some of which is relatively inexpensive, e.g., disposable bailer) and it is a commonly accepted method. Disadvantages of this technique include: increased sample turbidity resulting from agitation or mixing of the well water, mobilization of colloids which may not be mobile under natural conditions[2], failure to ensure that stagnant[3] water is removed from the well prior to sampling, generation of large volumes of purge water, especially in large diameter wells, and arbitrary removal of a specific number of well volumes because the purge volume calculation is not site-specific.

Low-flow purging and sampling techniques have been developed to eliminate some of the potential problems associated with traditional sampling methods including: reduction in the amount of purge water generated, directly resulting in a reduction in disposal costs associated with purging a well, reduction in sample turbidity eliminating the need for filtration, attainment of better quality samples, and sample collection in a manner that minimizes disruption to the monitoring well (Powell and Puls, 1997). Although low-flow purging and sampling has been used at a variety of sites, it has primarily been tested and used in two-inch diameter wells. Initially there were limited data available on its performance in wells greater than 2-inches in diameter (Van Maltby and Unwin, 1992), but more recent information indicates that sufficient results may be obtained from larger diameter wells (Shanklin, Sidle, and Ferguson, 1995). Also, it should be noted that low-flow purging and sampling

[2]Natural conditions refer to conditions that are assumed to exist in the aquifer under flow conditions that are not under stress due to pumping.

[3]Stagnant water is water that has been standing in the casing for a period of time and may be chemically different from formation water due to off-gassing or other chemical processes that may have occurred while the water remained in the casing.

results might not be indicative of water chemistry in the entire screened interval. Generally, low-flow purging and sampling water chemistry results will be indicative of the screened interval surrounding the pump intake. This can also be true when using traditional sampling techniques because the screened interval might cross variable stratigraphy, some of which yield water more readily than others. Therefore, it is best to minimize the overall length of the screened interval, if possible, and place the pump in the targeted contaminant zone that is representative of plume conditions.

HWB makes a distinction between low-flow and micropurging methods. There are major differences between low-flow and micropurging sampling techniques and the terms cannot be used interchangeably. In addition, HWB distinguishes between micropurging, the sampling method, and MicroPurge®[4], the trade name. To avoid further confusion, HWB will avoid using the terms MicroPurge® and micropurging interchangeably.

For the purpose of this document, micropurging refers to evacuation of water from the sample collection tubing and the sample device prior to sample collection. Basically, the well is sampled at a low-flow rate, but is not purged prior to sample collection. Without purging the well before sample collection, there is no mechanism for determining whether formation or standing well water is being sampled. This method leads HWB to question the sample results and whether the sample is representative of groundwater conditions in the vicinity of the well. In some cases, this may also be a problem for the traditional method of sampling low-yield wells that are pumped dry, then allowed to recover and sampled once water has recharged the well.

3. Definitions

HWB provides the following definitions for use throughout this document. Most of these terms are not currently defined by standards organizations and may be used differently in other publications.

Discrete Sampling Device: A device or system that is installed in a monitoring well and collects a groundwater sample from targeted single interval or multiple zones.

High Flow Rate Sampling: Evacuation of water from the screened interval of a monitoring well at a rate that significantly exceeds natural flow through the screen (Barcelona, Wehrman, and Varljen, 1994) or the groundwater flow velocity for which the well was designed. High pumping rates of groundwater from the monitoring well may cause undue stress on the well screen or sand pack, shorten the usability and life span of the well, cause excessive turbidity, or may cause other damage to well construction. High flow rates coupled with long screen lengths (greater than 20 feet) can also yield false contaminant plume locations and, in some cases, incorrect contaminant concentrations (Powell and Puls, 1997). Long screens can result in the interconnection of different permeable zones that may cause misleading sample results.

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[4]The use of trade names does not imply endorsement by HWB.

Low-Flow Purge and Sampling: Minimal drawdown[5]. This approach allows for indicator parameters (e.g. dissolved oxygen, pH, temperature, and specific conductance) to be monitored and allowed to stabilize during well purging. Low-flow purging and sampling rates generally range from 0.1 to 1.0 liter per minute (**L/min**) using a pump. Bailers are not acceptable for use in low-flow well purging. The actual purge rate is site-specific and may vary slightly from the range provided (Powell and Puls, 1997). Steady-state drawdown in the casing should occur if the pumping rate is sufficiently slow. Drawdown should be kept to a minimum. For wells that recharge at a rate insufficient for the use of low-flow purging and sampling, another method must be used. Employing a lower pumping rate is an attempt to approach natural flow conditions in the formation surrounding the well and produce a less turbid[6] and more representative groundwater sample.

MicroPurge®: A low-flow sampling system developed, designed, and marketed by QED Environmental Systems, Inc. (QED). It may include the following components: flow control device, pneumatic power supply, power and flow control device, parameter stabilization system (to collect indicator parameters and determine when stabilization has occurred within the well), a drawdown meter, and a pump system. The system is designed to collect a representative and reproducible groundwater sample at a low-flow rate with minimal drawdown, using a dedicated or portable pump, with collection of indicator parameter values for the determination of stabilization prior to sample collection. Although QED equipment can be used for low-flow purging and sampling, equipment from other manufacturers is available.

Micropurging: (synonymous with **no-flow**) Evacuation of water from the sample device and tubing prior to sample collection. The sample is collected from standing water in the well; meaning an inadequate amount of water is evacuated from the well casing prior to sample collection. Indicator parameters are generally not measured; however, if measured they are representative of water present in the tubing device, not formation water. There is not a mechanism for determining whether stagnant casing or formation water is being sampled when collected from a standard completion monitoring well using this method since drawdown is not measured. In addition, water level fluctuations are not accounted for. Micropurging and no-flow assume that groundwater is constantly moving through the well screen and that the residence time of water in a well is minimal. In addition, vertical gradient and groundwater flow direction, which may vary from time to time, are not accounted for causing a high degree of variability in sample results. This method should not be confused with MicroPurge®, which is actually a low-flow sampling system.

No-Purge: Sampling groundwater from a well without any removal of water from the well prior to sampling (Newell, Lee, and Spexet, 2000).

Passive Sampling: Collection of a groundwater sample without the ongoing expenditure of external energy. Typically, a sample device is lowered into the well and allowed to equilibrate.

[5] Drawdown of 0.1 meter (0.3 feet), based on site-specific hydrogeology is recommended; however, greater drawdown may be acceptable based on site-specific conditions (USEPA, 1995).

[6] Generally less than 5 Nephelometric Turbidity Units (**NTU**), although this is a site-specific value and may change based on site-specific hydrogeologic conditions.

Theoretically, diffusion across a concentration or electrochemical gradient occurs causing the collection of a water sample in the screened interval.

Traditional Sampling Method: Evacuation of three to five well volumes of water from a monitoring well prior to collection of a groundwater sample. Pumps or hand bailing equipment are typically used and many times the pumps are operated at high flow rates. Indicator parameters may be collected during purging and used to determine if the well has stabilized. Often the well is purged based solely on volumetric calculations.

Vertical Profiling (of monitoring wells): The collection of formation water samples along the screened interval using a low-flow or passive method to characterize the contaminant profile of the monitoring well. Samples should be collected at approximately two-foot intervals along the screened section of the well if information regarding permeable zones is unknown (based on drilling logs or geophysical information obtained from the well). If information regarding permeable zones is known, samples should be collected from the targeted permeable zones. If the screened interval is located in only one permeable zone (and supporting documentation is available), the pump location should be set at the mid-point or slightly above the mid-point of the screened interval (USEPA, 1996). Once the contaminant profile is established, proper pump placement may be determined. Re-evaluation of pump placement should be conducted periodically to ensure proper placement over time.

4. Description of Low-Flow Technique

Low-flow is related to the amount of drawdown in a well during purging and the rate at which the well is purged. During the purging process indicator parameters are collected and allowed to stabilize prior to sample collection. Purge rates may be higher than sample rates in order to maximize purge efficiency. Prior to the collection of the groundwater sample, following stabilization of the site-specific indicator parameters, the pumping rate may be reduced. A reduced pumping rate more closely mimics natural aquifer conditions.

Once the well has met the selection criteria (*Low-Flow Well Selection Criteria*, Section 5), approval from HWB must be granted prior to changing sampling methodology for the well or at the site. This approval may require the applicant to submit new or revised standard operating procedures (**SOPs**) or other quality assurance documentation. The applicant should submit a revised sampling plan containing detailed information regarding the site hydrologic properties, the frequency and methodology of indicator parameter collection (as well as the indicator parameters to be measured), detailed lithologic logs, pump placement, tubing size, and contingencies to be implemented in the event indicator parameter stabilization cannot be achieved or equipment failure occurs. The applicant must submit the results of the initial vertical profile, if required, conducted to determine pump placement. HWB recommends a vertical profile be conducted if conditions change at the site (water table fluctuation, gradient changes due to pumping, or other factors). The actual frequency will be site-specific. Vertical profiling, where appropriate, will be required on a well-by-well basis as opposed to a site-wide basis. Vertical profiling will not be required if adequate geologic information is collected during drilling. Each well will be treated independently; therefore it is important to have construction and lithologic information for each well, as well as information regarding well development.

5. Low-Flow Well Selection Criteria

Once the well has been properly installed and developed, the sampling methodology for the well can be fully evaluated. Pre-approval from HWB is required to determine if the well or group of wells is appropriate for low-flow purging and sampling. In order for a well to be a potential candidate for the low-flow technique the following criteria must be met and documented to HWB for review and approval:

- Well construction details (detailed installation logs containing lithologic and well construction information or geophysical logs) are required;

- The wellhead must be constructed according to current State and EPA guidance and not allow for surface water infiltration into screened intervals. In addition to proper wellhead completion, screened intervals of the well must be properly sealed to prevent communication between saturated zones (if applicable) and/or surface infiltration;

- The screened interval of the monitoring well should be short[7]. Optimal screen length should be less than 10 feet (USEPA, March 1998). Low-flow purging and sampling may be approved for use in wells with screen lengths greater than 10 feet, provided pump intake placement is demonstrated to be appropriate. Wells with screened intervals connecting intervals of different head and/or hydraulic conductivity may act as conduits for vertical flow within the screened interval (Stone, 1997);

- Wells constructed across multiple perched or groundwater zones must be excluded unless they are constructed using devices that seal off discrete zones to eliminate communication between zones or unless they are constructed using a system designed to collect multi-level groundwater samples (discrete sampling systems);

- Drawdown must be measured and recorded during purging. The formation water must be recharging the well at a rate that is equal to the rate at which water is being removed from the well. If a well is pumped dry during purging, an alternate method[8] must used for sample collection; and

[7] In guidance titled "NM Environment Department - Groundwater Section Monitor Well Construction and Abandonment Guidelines" a minimum 20-foot screened section for monitor wells (5 feet of screen above the water table to allow for seasonal water table fluctuations) is required. Note that a variance from the GWQB requirement may be requested by submitting a written request to the GWQB, if the site falls under more than one regulatory authority. HWB recommends that screened intervals be less than 10 feet unless the screened interval crosses the water table, in which case longer screen lengths are acceptable.

[8] For wells with insufficient recharge during sustained pumping where stabilization of indicator parameters cannot be achieved, samples shall be collected in the following manner (using a properly selected pump): collect indicator parameters, when the well purges dry the sampler shall note so in the log book and include the total volume of water removed, once the well is allowed to recover the sample shall be collected. Indicator parameters should be collected from the well prior to sample collection. If the well purges dry for four consecutive quarters or one year, the use of the well as a compliance monitoring point will need to be re-evaluated.

- Dedicated sampling equipment is preferred. If dedicated sampling equipment is not available, equipment must be installed prior to sample collection to allow well conditions to equilibrate prior to initiation of purging and sampling. Generally, equipment should be installed a minimum of 12 hours prior to sample collection. A shorter time period may be requested, if appropriate. If the use of bailers is planned, low-flow purge and sampling techniques cannot be employed.

6. Low-Flow Sampling Procedure

- Select the proper pump in order to avoid aeration, agitation, volatilization, or chemical interference during sampling. Selection of the proper pump is essential to obtaining valid and defensible sample results. Some pumps are not able to pump at a very low pumping rate without generating a large amount of heat, which may have a direct impact on temperature measurements (Giles and Story, November 1997). In addition, heat generation may cause the sample to off-gas possibly decreasing the concentrations of some chemicals, particularly volatile organic compounds (**VOC**) or semi-volatile organic compounds (**SVOC**).

- Select the proper tubing size and tubing material. In order to prevent air bubbles and other potential problems, a maximum tubing size of ¼ to ⅜ inch inside diameter (**ID**) is recommended (USEPA, March 1998). The type of tubing material (e.g., Teflon®, polyurethane, silicone) may influence the sample quality due to water interaction (i.e., leaching and sorption) with the tubing material. Excess surface tubing should be minimized in an attempt to avoid heating or cooling of the water by the atmosphere before temperature measurements are collected.

- Select the water quality indicator parameter measuring device. HWB recommends the use of in-line or flow-through cell monitoring equipment, but recognizes some facilities may have more limited instrumentation. In-line or flow-through cell equipment is recommended in order to minimize sample contact with the atmosphere, which may alter sample temperatures and results through the introduction of air. HWB recommends the use of dedicated equipment, however, portable equipment may be used. By using equipment dedicated to a specific well, decontamination time and cost will be eliminated, further reducing the volume of water generated during purging. In addition, preparation time will be decreased and the amount of variability introduced by the use of different sampling equipment will be reduced.

- If well-dedicated equipment is not used, equipment should be installed in the well a minimum of 12 hours prior to the purging and sampling event to allow the equipment to equilibrate with well conditions. HWB recognizes site-specific conditions may not allow for the equipment to be installed prior to the sampling event, however, every attempt should be made to allow the equipment to equilibrate prior to purging and sampling.

- Water levels must be measured prior to purging. Water levels should be monitored at 5-minute intervals during purging to ensure that minimal drawdown is occurring in the well during the purge event. If excessive drawdown is noted during the purge event, the flow rate must be adjusted until minimal drawdown is achieved.

- Begin purging the well at a pre-determined low-flow rate based on site and well-specific characteristics. If the water-yielding ability of the well is unknown, low-flow purging can be initiated at approximately 100 ml/min (0.1 L/min) and the drawdown measured. Based on results, the purging rate may be increased incrementally up to approximately 500 ml/min (0.5 L/min), but should not exceed 1 L/min.

- Monitor indicator parameters at least every 5 minutes until stabilization is achieved. The well is considered to be stable when the indicator parameters have stabilized over three consecutive readings spaced a minimum of 5 minutes apart and when indicator parameters fall within the ranges shown in Table 1.

Table 1. Indicator Parameter Stabilization

±0.5 pH	±10% Specific conductance	±10% Temperature	±10% Dissolved oxygen (DO)	±10% turbidity (if appropriate)

- Collect groundwater samples if minimal drawdown is achieved during purging. If the well consistently purges dry, an alternate purge method will be needed. Since each site is different and the contaminants of concern vary, analytical requirements will vary from site-to-site or well-to-well. In general, samples for VOC and SVOC analysis should be collected first.

- If well-dedicated equipment is not used, equipment must be properly decontaminated prior to use in a different well. In this case, wells should be sampled from lowest to highest contamination concentration in an attempt to minimize cross-contamination.

7. Low- Flow Sampling for Metals

RCRA and the New Mexico Water Quality Control Commission (**WQCC**) have different requirements for collection of groundwater samples for metals analyses. RCRA requires unfiltered inorganic groundwater samples in an attempt to emulate drinking water maximum contaminant levels (**MCLs**). However, the NMED Groundwater Quality Bureau (**GWQB**), which derives its regulatory authority from the WQCC regulations, requires filtered samples. It is important to identify the purpose of the metals sampling (characterization, risk assessment, or monitoring) to determine if filtered or non-filtered samples should be collected. Since NMED may use WQCC standards and/or standards based on drinking water MCLs, there are instances when HWB may require the collection and analyses of both filtered and unfiltered samples. Generally, unfiltered groundwater samples are collected to determine total metal content, while filtered samples are collected for dissolved or suspended metal content in groundwater. Dissolved and total metals data cannot be used interchangeably.

Filtration is used in an attempt to eliminate sampling-induced turbidity. Generally, when samples are filtered in the field prior to analyses a 0.45-micron (μ**m**) filter is used. Field filtration should not be used in an attempt to compensate for poor well construction or inadequate well development. Groundwater samples that are filtered in the field prior to chemical analyses will not provide accurate information regarding metals mobility because some metal species are mobile as colloidal-sized particulates and are likely to be removed by filtration (Puls and Barcelona, 1989). In addition, the Regional Superfund Groundwater Forum (a group of groundwater scientists) concluded that the use of a 0.45 μm filter was not useful, appropriate or reproducible, and that using a filter prior to metals analyses is not appropriate to determine "truly dissolved" constituents in groundwater samples (Puls and Barcelona, 1989). If properly conducted, low-flow purging and sampling for metals without sample filtration can provide an estimate of metals that may be mobile in groundwater, including both dissolved and naturally mobile particulates.

Since the low-flow purging and sampling technique is designed to reduce turbidity in groundwater samples (typically less than 5 NTU unless naturally mobile particulates exist in greater quantities), field filtration is not necessary. If groundwater generated during low-flow purging and sampling is in excess of 5 NTU, re-evaluation of the sample method and procedure should be conducted prior to sample collection and analysis. It may be necessary to conduct additional purging until the groundwater is below 5 NTU or further development of the well may be needed before metals sampling can be conducted.

8. Low-Flow Sampling Using Discrete Samplers

Discrete sampling systems are used to collect groundwater samples from the formation, not standing well water, without extensive purging prior to sample collection. Discrete samplers can be designed to collect groundwater samples from pre-determined targeted sample intervals or from multiple zones. Discrete samplers have many advantages, but can be expensive. Although the initial expense to purchase and install the equipment may be high, in the long term the amount of purge water generated is minimal and over the life of the well or sampling project, disposal costs can be significantly reduced. Examples of discrete sampling devices or systems include, but are not limited to: Multiport Sock Samplers (Jones, Lerner, and Baines, 1999), the WaterLoo Profiler™, and Westbay® sampling systems.

A type of discrete sampling device used for multi-layer groundwater sampling is the Multiport Sock Sampler produced and tested by the Ground Water Protection and Restoration Research Unit **(GWPRRU)**. Sock samplers are constructed of inexpensive materials and can be used in open boreholes to collect discrete groundwater samples (Jones, Lerner, and Baines, 1999).

The Waterloo Profiler™ is a tool that can be used to collect depth-specific groundwater samples using a direct-push groundwater-sampling tool. This method of sample collection can be used during the investigation phase (when direct-push technology is used) to collect a vertical groundwater profile for a specific location. The Waterloo Profiler™ collects the groundwater sample through screened ports or openings in the tip of the sample tube. The ports are connected to an internal fitting inside the tool and the water sample is brought to the surface inside the pipe using stainless steel or Teflon tubing (Precision, 1997).

Westbay® is a specific type of discrete sampling system that is designed to collect a representative groundwater sample from formation water with minimal purging. It contains a specialized sample casing that is designed and inserted into a borehole to collect discrete multi-level groundwater samples. Following installation, the system is purged to induce groundwater flow in an attempt to restore the formation to natural flow conditions, as existed prior to well installation. After proper well development and initial purging of the system, samples are collected from the Westbay® system without extensive purging because the sample is collected using valved port couplings along that casing that access the aquifer directly. Hydrostratigraphy must be determined to properly place the sampling ports. The monitoring and sampling system consists of casing components that allow a borehole to be completed at one monitor zone or many discrete monitoring zones. The inner casing contains sealed valves along its entire length to prevent groundwater from flowing in or out of the casing until the valves are opened. Casing packers seal the borehole between monitoring zones to prevent vertical flow of groundwater between zones. Electronic and mechanical probes and various sampling tools may be lowered inside the casing to measure various parameters (fluid pressure, temperature, and hydraulic parameters) and to collect groundwater samples. Monitoring zones are sampled using any number of valved port couplings that can be operated by the probe. A set volume of water is removed by sending pressure evacuated sample bottles down the well to the appropriately valved port. The bottles are filled when the sample ports are opened. Generally, sample bottles ranging from 250 to 1000 milliliters (**ml**) are used. HWB recommends discarding the first sample bottle collected. The number of bottles sent down the well is determined on a site-specific basis and depends on site analytical requirements.

Pre-approval from HWB is required prior to design, construction, installation, initial purging, and compliance sampling of a discrete sampling system.

9. Description of Micropurging, No-Flow and No-Purge Techniques

Micropurging, which is synonymous with no-flow, is often confused with low-flow (minimal drawdown) purge and sampling techniques, but the two methods are not the same and **cannot** be used interchangeably. Micropurging involves removal of water from the sample tubing and sample device prior to sample collection. Basically, micropurging and no-flow are considered to be sampling without purging. Micropurging does not have a mechanism to verify that the sample results are indicative of water quality in the formation surrounding the well. The water obtained has the potential to be stagnant, increasing the potential that off-gassing or volatilization to occur. If the sample has off-gassed or volatilization has occurred, results obtained may be biased.

Although the fact that groundwater is always moving through the system or within the aquifer is accepted within the environmental community, micropurging assumes that water is constantly flowing or being flushed through the well screen at a steady rate. The rate at which groundwater moves is not always the same. Several factors, including seasonal fluctuation, pumping, extreme drought or wet periods, and recharge rates can have an impact on the movement of groundwater causing the flow rate to vary over time. Vertical flow in the screened interval is not taken into consideration when the micropurging technique is employed. The micropurging method assumes groundwater flow is horizontal in the screened interval and does not account for vertical flow that may be an important factor, especially in wells with long screened intervals (Stone, 1997). If a well is not purged prior to sample collection, sample results will vary over time because the residence time of well water varies, as does flow direction. If the water is recharging slowly, residence time may be increased within the well. The standing water present in the well casing may volatilize or off-gas causing the water quality results to be biased or the pH of the water to be potentially altered due to microbial action caused by exposure to the air in the well casing, which may affect metals mobilization. Based on these reasons, HWB does not approve micropurging methods.

No-purge is another alternative sampling technique. Purging is not actually performed when this method is employed; the well is simply sampled. This raises the question as to whether the sample results are valid (other than observing the presence or absence of particular constituents in groundwater). This method also assumes water is constantly moving through the screened interval, and does not account for the presence of stagnant or standing water in the well. Although this method of sample collection is extremely cost effective, not labor intensive, and requires little time (when compared to low-flow and traditional purging and sampling), samples obtained from the well are not representative of groundwater in the vicinity of the well. The American Petroleum Institute (**API**) (Newell, Lee, and Spexet, 2000) and the Western States Petroleum Association (**WSPA**) (SECOR, 1996), indicate that samples collected from monitoring wells at petroleum contaminated sites using the no-purge method "are not statistically different or provide conservative results" compared to samples collected from monitoring wells that are purged and indicator parameters stabilized. Also, these documents indicate that no-purge samples should be collected "where high-precision sampling is not needed" and "should be supplemented with conventional or low-flow techniques for key datasets." No-purge sampling may be appropriate to determine presence or absence of groundwater contamination, but is unacceptable for RCRA compliant groundwater monitoring. No-purge is not approved for use by HWB because it does not provide adequate data for RCRA compliant groundwater monitoring.

10. Other purging methods

Passive sampling can also be utilized to collect a groundwater sample. Passive sampling generates no purge water because the sample is obtained by diffusion or natural flow of groundwater. A sampling device is lowered into a well and allowed to equilibrate within the well water for a specific period of time. The device is then removed from the well and a sample is sent to the laboratory for analysis of target analytes. For a sampling program at a site use of a passive method has obvious advantages, including the fact that no purge water is generated when this method is employed. By eliminating purge water, waste disposal costs for a well or group of wells are reduced. It should be noted that air sensitive field parameters (Eh and DO) cannot be considered accurate when using these systems because no flow-through cell is used and these parameters must be measured in open air.

Two examples of passive sample devices are a passive diffusion membrane sampler and a diffusion multi-layer sampler (**DMLS**™). DMLS™ is an example of a multi-layer sample device for the collection of groundwater samples from targeted intervals within a 2-inch or 4-inch inside diameter monitoring well. Rods and sampling cells, which are filled with distilled water and covered with a membrane, are lowered into the well. When equilibrium is reached the sampler is removed for laboratory analysis. Based on product literature, groundwater samples obtained using the DMLS™ can be analyzed for major ions, trace metals, organic contaminants, gases and various contaminants. Theoretically, the DMLS can be used to collect vertical chemical distribution data, sample in low permeability zones, and in highly turbid environments (USF/Johnson, 5120). Other passive diffusion membrane samplers are designed to collect groundwater samples utilizing a deionized water-filled, low-density polyethylene diffusion membrane sampling device that is inserted into the well, allowed to equilibrate over time, then removed for analysis (Rennie and Chapman, 1999).

The use of passive sample devices requires prior approval from HWB. These technologies are new and currently evolving and may not be applicable to many site conditions.

11. Summary

The terms micropurging and low-flow have been used synonymously, when in fact they mean very different things. MicroPurge® is a trade name, while micropurging refers to a sampling method of water removal from the sample device and tubing prior to sample collection. When using the micropurging method, water may not be flowing into the well, recharging the water around the sample point. A determination as to whether stagnant well water or formation water is actually being sampled cannot be made. Micropurging is not approved by HWB.

The low-flow method is related to the pumping rate and amount of drawdown measured in the well during purging. Indicator parameters are collected and allowed to stabilize before sample collection. Also prior to sample collection, the pumping rate may be reduced in an attempt to reduce sample turbidity and entrained air in the sample and to mimic natural conditions in the aquifer.

In order to consider low-flow purging and sampling, the well must meet the *Well Selection Criteria* in Section 5. If the well meets the selection criteria and a low-flow purging and sampling approach is selected, indicator parameters are chosen based on site-specific conditions and low-flow sampling equipment may be installed in the well. The use of well-dedicated equipment is suggested, but not required. If non-dedicated equipment is used, it must be allowed to equilibrate. The procedure for low-flow purging and sampling is outlined in detail in Section 6, *Low-Flow Sampling Procedure*. Written requests that specify the proposed use of low-flow purging and sampling, summarize the well selection criteria and follow the correct sampling procedures must be submitted to HWB for prior approval. Variations from the described low-flow purge and sampling technique described herein must also be submitted in writing to HWB for approval prior to implementation.

Finally, when conducting low-flow purging and sampling for metals, filtration of the sample prior to analysis is typically not required by HWB. However, WQCC regulations dictate groundwater standards for filtered metals samples. Since there may be instances where metals samples are being collected to satisfy both RCRA and WQCC, it is important to check with the regulatory agency to determine if both unfiltered and filtered samples need to be collected or if a variance should be requested to collect only unfiltered samples using the low-flow method.

The monitoring well purging and sampling method selected for a specific well or group of wells depends on many site-specific variables. Initial planning, the proper selection of well locations and well construction materials, proper installation techniques and well completion and development are very important. If these factors are not considered, the well may not be properly installed or may even be installed in the improper location and data obtained from the monitoring well may be suspect. Once it has been determined that the well has been properly constructed, installed, and developed, the correct monitoring well purging and sampling technique may be selected.

Regardless of the method of purging and sampling selected at a site, it is important to properly train sampling personnel to use the equipment. It is also important to follow the same purging and sampling procedure each time to obtain data that are reproducible and comparable. The goal of any purging and sampling program should be to collect the most representative, highest quality data possible.

Regulatory agency approval is important for appropriate monitoring well design, construction, and development. When considering a low-flow purge and sampling program for a well, the regulatory agency should be notified and, if possible, involved in the initial planning. The same is true for any non-traditional sampling system being considered for a site.

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HAZARDOUS AND RADIOACTIVE MATERIALS BUREAU
New Mexico Environment Department

Position Paper ***Position Paper***

GENERAL REPORTING REQUIREMENTS FOR ROUTINE GROUNDWATER MONITORING AT RCRA SITES

The purpose of this document is to provide guidance for the reporting of periodic or routine groundwater and remediation system monitoring at RCRA facilities. This document provides a general outline for groundwater monitoring reports and also lists the minimum requirements for reporting within each subsection when preparing routine groundwater monitoring reports for RCRA regulated sites. All data, collected during each groundwater monitoring and sampling event in the reporting period, must be included in the reports. The general report outline is provided below.

TITLE PAGE
The title page should include the identity of the owner/operator, facility name, site or unit name, address, U.S. Environmental Protection Agency (EPA) or New Mexico Environmental Department (NMED) facility identification number and the submittal date.

EXECUTIVE SUMMARY
This section should provide a brief summary of the purpose, scope and results of groundwater monitoring conducted at the subject site during the reporting period. The site facility name, address and U.S. Environmental Protection Agency (EPA) or New Mexico Environmental Department (NMED) facility identification number(s) should be included in the executive summary. In addition, this section should include a brief summary of conclusions based on the monitoring results and recommendations for future monitoring, remedial action or site closure.

TABLE OF CONTENTS
The table of contents should list all text sections and subsections, tables, figures and appendices or attachments included in the report. The corresponding page numbers for the titles of each unit of the report should be included in the table of contents.

INTRODUCTION
This section should include the facility name, facility address, facility status (e.g.

compliance, corrective action, post-closure care, etc), EPA and/or NMED facility identification number(s), the name of the owner/operator of the facility and the purpose and type of groundwater monitoring being conducted (e.g. quarterly, semi-annual, annual, closure, etc.). Pertinent background information should be provided in this section.

SCOPE OF SERVICES

This section should provide a summary of all activities actually performed during the groundwater monitoring event including field data collection, chemical testing, remediation system monitoring, if applicable, and purge/decontamination water storage and/or disposal.

REGULATORY CRITERIA

This section should provide information regarding applicable groundwater cleanup standards, risk-based screening levels and/or risk-based cleanup goals for the subject facility. The appropriate cleanup levels for each unit within the subject facility should be included if site-specific levels have been established at separate facility locations. A table summarizing the applicable cleanup standards or inclusion of applicable cleanup standards in the data tables can be substituted for this section. Risk-based evaluation procedures, if used to calculate cleanup levels, must either be included or referenced.

GROUNDWATER MONITORING RESULTS

This section should provide a summary of the results of groundwater monitoring conducted at the site including, but not limited to, the dates that groundwater monitoring was conducted, the measured depths to groundwater, direction(s) of groundwater flow, field water quality measurements and a comparison to previous groundwater monitoring results. Field observations or conditions that may influence the results of groundwater monitoring should be reported in this section. Tables summarizing groundwater elevation/depth to groundwater measurements and field water quality measurements can be substituted for this section.

GROUNDWATER CHEMICAL ANALYTICAL DATA

This section should summarize the dates of groundwater sampling, groundwater chemical analytical methods and analytical results, and provide a comparison of the data to the cleanup standards or established cleanup levels for the site. The rational or purpose for altering or modifying the groundwater sampling program should be provided in this section. A table summarizing the groundwater and QA/QC chemical analytical data, applicable cleanup levels and modifications to the groundwater sampling program can be substituted for this section.

REMEDIATION SYSTEM MONITORING

This section should summarize remediation system capabilities, performance, monitoring data, treatment system discharge sampling requirements and system influent and effluent sampling chemical analytical results. The dates of operation, system failures and modifications made to the remediation system during the reporting period should be included in this section. A summary table may be substituted for this section.

SUMMARY

This section should provide a discussion and conclusions with regard to the results of groundwater monitoring conducted at the site. In addition, this section should provide a comparison of the results to applicable cleanup levels and relevant historical groundwater monitoring and chemical analytical data. An explanation should be provided with regard to data gaps. A discussion of remediation system performance, monitoring results, modifications, if applicable, and compliance with discharge requirements should be provided in this section. Recommendations and explanations regarding future monitoring, remedial action or site closure also should be included in this section.

LIST OF TABLES

The following summary tables should be included in each groundwater monitoring report. Data presented in the tables should include the current data plus data from the three previous monitoring events or, if data from less than three monitoring events is available, all data acquired during previous subsurface investigations and groundwater and/or remediation system monitoring. Summary tables can be substituted for portions of the text.

- Summary of regulatory criteria (a Regulatory Criteria text section can be substituted for this table or the applicable cleanup levels can be included in the analytical data tables).
- Summary of groundwater elevation and depth to groundwater data. The table should include the monitoring well depths and the screened intervals in each well.
- Summary of field measurements of water quality data (must include historical water quality data as described above).
- Summary of groundwater chemical analytical data (must include historical groundwater chemical analytical data as described above).
- Summary of remediation system monitoring data, if applicable (must include historical remediation system monitoring data as described above).

LIST OF FIGURES

The following figures should be included with each groundwater monitoring report. All figures must include a scale and north arrow. An explanation should be provided on each figure for all abbreviations, symbols, acronyms and qualifiers.

- Vicinity map showing topography and the general location of the subject site relative to surrounding features or properties.
- Facility site plan that presents pertinent site features and structures, well locations and remediation system location(s) and features. Off-site well locations and pertinent features should be included on the site plan if practical. Additional site plans may be required to present the locations of off-site well locations, structures and features.
- Figure presenting groundwater elevation data and indicating groundwater flow direction(s).
- Figure(s) presenting groundwater chemical analytical data for the current monitoring event. The chemical analytical data corresponding to each sampling location can be

presented in tabular form on the figure or as an isoconcentration map.

APPENDICES

Groundwater monitoring reports should include the following appendices. Additional appendices may be necessary to present data or documentation not listed below.

FIELD METHODS

The methods used to acquire field measurements of groundwater elevations, water quality data and groundwater samples should be included in this section. Methods include, but are not limited to, the methods and types of instruments used to measure depths to water, air or headspace parameters, and water quality parameters. In addition, decontamination, well purging and well sampling techniques and sample handling procedures should be provided in this appendix. Methods of measuring and sampling remediation systems should be reported in this section, if applicable. Purge and decontamination water storage and disposal methods also should be presented in this appendix. Copies of purge and decontamination water disposal documentation should be provided in a separate appendix.

CHEMICAL ANAYTICAL PROGRAM

Chemical analytical methods, a summary of data quality objectives and data quality review procedures should be reported in this appendix. A summary of data quality exceptions and their effect on the acceptability of the chemical analytical data with regard to the monitoring event and the site status should be included in this appendix along with references to case narratives provided in the laboratory reports.

CHEMICAL ANAYTICAL REPORTS

This section should include all laboratory chemical analytical data generated for the reporting period. The reports must include all chain-of-custody records and QA/QC results provided by the laboratory.

APPENDIX I
REFERENCES CITED

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