DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 377TH AIR BASE WING (AFMC)

Colonel Tom D. Miller
377 ABW/CC
2000 Wyoming Blvd SE
Kirtland AFB, NM 87117-5000

Mr. John Kieling, Chief
Hazardous Waste Bureau (HWB)
New Mexico Environment Department (NMED)
2905 Rodeo Park Road
Santa Fe, New Mexico 87505

Dear Mr. Kieling

Kirtland Air Force Base (AFB) is pleased to submit the Phase 2 Percolation Test Work Plan for the Bulk Fuels Facility Spill, Solid Waste Management Units ST-106 and SS-111 for your review.

The attached Phase 2 Percolation Test Work Plan outlines the activities needed to conduct additional in-situ falling head infiltration testing, geotechnical borings, and soil classification to support design of a proposed infiltration gallery at the Kirtland AFB. The infiltration gallery will be designed for discharge of treated groundwater as part of the Groundwater Extraction Pilot Implementation and Additional Plume Characterization Work Plan.

Please contact Mr. Wayne Bitner at (505) 853-3484 or ludie.bitner@us.af.mil or Mr. Scott Clark at 505-846-9017 or scott.clark@us.af.mil if you have any questions.

Sincerely

TOM D. MILLER, Colonel, USAF
Commander

cc:
NMED (Roberts) w/ attach
NMED-HWB (Cobrain, McDonald) w/attch
NMED (McQuillan, Longmire) w/attch
NMED-PSTB (Reuter) w/attch
NMED-OGC (Kendall) w/attch
EPA Region 6 (King) w/attch

40 CFR 270.11
DOCUMENT CERTIFICATION
JANUARY 2014

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

JAN 2 6 2015

TOM D. MILLER, Colonel, USAF
Commander, 377th Air Base Wing

This document has been approved for public release.

KIRTLAND AIR FORCE BASE
377th Air Base Wing Public Affairs

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January 26, 2015

Subject: **Kirtland Air Force Base Bulk Fuel Facility Spill – Phase 2 Percolation Test Work Plan**

This Kirtland Air Force Base (AFB) Percolation Test Work Plan has been prepared by CB&I Federal Services LLC (CB&I) for the U.S. Army Corps of Engineers (USACE), Albuquerque District, under Contract No. W912DY-10-D-0014. This letter work plan outlines the activities needed to conduct additional in-situ falling head infiltration testing, geotechnical borings, and soil classification to support design of a proposed infiltration gallery at the Kirtland AFB. The infiltration gallery will be designed for discharge of treated groundwater as part of the Groundwater Extraction Pilot Implementation and Additional Plume Characterization Work Plan (USACE, 2014).

Groundwater Extraction Pilot Implementation

The Groundwater Extraction Pilot Implementation Plan is designed to demonstrate the effectiveness of groundwater extraction technology for the extraction and treatment of dissolved-phase ethylene dibromide (EDB). The pilot test consists of an extraction well (KAFB-106228), a groundwater treatment system, infiltration galleries, and conveyance piping to transfer the groundwater through the system.

Extraction well KAFB-106228 will be designed and installed to extract water from the shallow, intermediate, and deep zones of the aquifer. The final design specifications of the well will be determined based on the results of a "probe well" installed to evaluate the depth of EDB contamination in the aquifer, the groundwater flow model, and previously obtained data to capture the groundwater contamination most effectively.

Groundwater from extraction well KAFB-106228 will be pumped through a conveyance pipeline to a groundwater treatment system located just east of Louisiana Boulevard on Kirtland AFB property. Groundwater will be treated to remove EDB and any other contaminants to below EPA Drinking Water Standards (maximum contaminant levels or MCLs) prior to discharge to an infiltration gallery, where the water will percolate into the vadose zone soil. The groundwater will be treated by granular-activated carbon. Influent, in-process, and effluent samples will be collected to monitor treatment effectiveness.

Once the extracted water has been treated on Kirtland AFB property, the treated water will be pumped to the infiltration gallery also located on Kirtland AFB property. The infiltration gallery will be designed to provide sufficient surface area for the treated groundwater to percolate into the vadose zone soil. The system design and location of the infiltration gallery will be targeted for infiltration into the perched aquifer, based on information provided by Kirtland AFB. The footprint of the infiltration gallery is dependent upon the infiltration rate of the site soil. The finished infiltration gallery will be designed to infiltrate 1.15 million gallons per day.

Additional details on the Groundwater Extraction Pilot Test can be found in the Groundwater Extraction Pilot Implementation and Additional Plume Characterization Work Plan (USACE, 2014).

Percolation Testing

The objectives of the percolation testing will be to characterize and evaluate subsurface conditions at the proposed project site and provide geotechnical recommendations for the design of the infiltration gallery. The percolation testing will be conducted by in-situ falling head infiltration testing and soil classification. 26 geotechnical borings will be installed to a depth of 40 feet to collect detailed information about the shallow stratigraphy in the area. Following this, falling head infiltration tests will be conducted in-situ by installing an open casing about 10 feet below the ground surface at 12 locations to be selected based on the results of the geotechnical borings. The open casing will be filled with water, and a falling head test will be performed.

Location

The proposed infiltration testing locations required for infiltration gallery design are between Pennsylvania Street and Wyoming Blvd, along the southern side of Hardin Blvd. Infiltration galleries are proposed to be located along the south side of Hardin Blvd. This area is open, undeveloped land that is part of the runway clearance zone for the Albuquerque Airport and Kirtland AFB. The proposed gallery location is not within the boundaries of Solid Waste Management Unit 111 therefore contaminated material is not anticipated.

Figure 1 is a site plan showing topography, relevant boundaries, overhead and buried utilities, roads, and structures. The site plan includes the proposed location of the borings and the relevant coordinates for locating the borings using a handheld Global Positioning System.

During siting for utility clearance prior to drilling and during the first phase of percolation testing, two non-explosive drill rounds and a related item were found by the field team. The locations of these items are shown in Figure 2, which also identifies an area of “former revetments” and the former Oxnard Field runway. As a result of these findings, anomaly avoidance procedures will be included in work to be performed in this area (Appendix A).

Phase 1 Percolation Testing

Phase 1 of the percolation testing was conducted from November 3 through 14, 2014. This initial round of percolation testing indicated varied infiltration rates ranging from 0.72 gallons per day per square foot (gpd/sf) to 4.10 gpd/sf at a depth of approximately 5 feet below ground surface (bgs) (AMEC, 2014). The lower rates appear to be the result of underlying caliche layers inhibiting vertical infiltration and the higher rates appear to be the result of testing in sandy backfill which does not represent the native lithology. Preliminary gallery designs using the lowest expected infiltration rate (0.72 gpd/sf) with a safety factor of 2 (0.36 gpd/sf), resulted in much larger galleries than desired. Based on soil boring logs from this initial test, a more permeable sand layer may exist at approximately 10 feet bgs. Additional deeper soil borings and percolation tests performed in Phase 2 will provide additional data to develop optimal infiltration galleries.

Field Work

Site Clearance

Prior to beginning drilling operations, the path to be followed by the drilling rig will be visually inspected for Munitions and Explosive of Concern (MEC) by a UXO Technician III. If any MEC is encountered, work will be stopped, Kirtland AFB Command will be notified, and the item(s) will be avoided. Boring locations will be inspected for utilities and MEC, visually and using a ferrous magnetometer. The UXO procedures are described in further detail in the Anomaly Avoidance Plan (Appendix A).

The New Mexico (NM) One Call and a third party subcontractor will be contacted to provide utility clearances for boring locations. Also, the CB&I Percolation Testing subcontractor will test for utility clearance at each boring to a minimum of 5 feet with a hand-auger, post-hole digger, or air/water knifing techniques.

Percolation Testing

After utility clearance and the MEC surface sweep are performed, an experienced field engineer or geologist will lay out borings and supervise exploratory drilling and sampling operations. Twenty six (26) geotechnical exploratory borings will be drilled by hollow-stem auger methods to a maximum depth of 40 feet bgs or refusal at each borehole. A drill rig will be used to advance each boring. During drilling, the Foerster FEREX API or equivalent will be used to check the borehole for anomalies up to 4 feet bgs as progress is made. Based on the type of items previously found at the site, anomaly avoidance practices are not necessary below four feet bgs. If anomalies are detected, the borehole location will be moved and the process re-started (Appendix A). Standard penetration tests will be performed on each boring at 0.5 feet, and at 5 foot intervals to the bottom of the borehole or refusal if shallower than 40.0 feet. Penetration resistance and samples will be obtained by the Standard Penetration Test (American Society for Testing and Materials [ASTM] 01586). Up to two samples may be collected at each borehole and analyzed for the laboratory parameters identified below.

Following the installation of the geotechnical borings, 12 falling head infiltration tests will be conducted at the site in 12 separate boreholes adjacent to geotechnical borings. The 12 infiltration test locations and depths will be chosen based on the soil boring logs produced during standard penetration testing. The field testing will be performed on native soils below the caliche layers to determine an infiltration rate for sizing the proposed infiltration galleries. The falling head infiltration test boreholes will be drilled by hollow-stem auger. During drilling, the Foerster FERX API or equivalent will be used to check the borehole for anomalies up to a depth of 4 feet bgs. The method to perform vertical infiltration testing consists of constructing a casing (typically 6-inch diameter) to a minimum 5-foot depth (below land surface). This casing will be installed in a separated borehole adjacent to the borehole used for sampling and standard penetration tests. Infiltration testing will be conducted at approximately 10 feet bgs or below if caliche is present in the borehole at 10 feet. Testing depths and locations may change based on the results of the exploratory borings. The bottom of the hole should be a clean, flat, and natural with no large rocks. The casing will be worked 1 to 2 inches into the undisturbed soil to promote a tight seal around the bottom of the casing to prevent lateral infiltration. If a tight seal cannot be maintained, a bentonite seal will be installed on the outside of the casing bottom to restrict lateral infiltration. The open casing will then be filled with water.

The falling head test will consist of recording the drop in water level within the pipe over time, at incremental time intervals, until less than 30 percent of the initial water height remains. This will provide data points beyond the 37 percent value required in the Basic Time Lag Method (Lambe and Whitman, 1969). The testing results will be graphed in the field to confirm steady state conditions and consistent test results.

After percolation testing is complete, the boreholes will be backfilled using soil cuttings; remaining cuttings will be thin-spread on site.

Laboratory Analysis

Laboratory tests will be performed on soil samples to gain confidence in the material properties and as a basis for evaluating engineering properties that may influence project performance. The following analysis will be performed:

- Grain Size Analysis of Soils (ASTM D422)

- Atterberg Limit Test (ASTM D4318)
- Moisture Content (ASTM D2216)
- Soil Classification (ASTM D2487)
- Gradation/Sieve Analysis (ASTM D6913)

These tests will be performed on selected samples to verify visual classifications made in the field. Actual types and quantities of tests performed will be dependent upon subsurface conditions encountered and specific design requirements.

The geotechnical laboratory performing the analysis will have current American Association of State Highway & Transportation Officials Materials Reference Laboratory certification and will complete the required testing in accordance with applicable ASTM standards.

Quality Control

Standard procedures, guidelines, and practices for the control of equipment, materials, and testing services will be followed during the percolation test. Documentation of project readiness and progress and field quality control (QC) surveillance activities will use standard forms/checklists (Appendix B). Surveillance consists of examination of records, field observation, and inspection using a contractor QC system approach common to USACE hazardous, toxic, and radioactive waste projects for each definable feature of work. There are two main field tasks/definable features of work: 1 – Anomaly Avoidance and 2 – Percolation Testing. The authorized CB&I Site QC Manager (SQCM) will implement the Three-Phase Control System of surveillance/inspection to manage each definable feature of work.

A list of inspections and tests for each definable feature of work will be prepared prior to start of fieldwork and subsequently monitored and verified in the field by the SQCM. Results of daily QC activities will be documented using a standard Daily QC Report (DQCR). Additional tests or inspections may be added by the SQCM as needed to ensure the quality of equipment and materials and the quality of workmanship is controlled and documented. Material receiving inspection will be performed in the field as equipment and material is received. Equipment and materials conformance with work plan requirements will be verified during receiving inspection and documented in the DQCR. Preservation of equipment/materials is to be practiced from the time it is stored until it is installed or otherwise turned over to the custody of the Owner.

Test results will be reviewed for completeness and stored with the QC forms and other project QC records. Unacceptable work procedures or test results will be brought to the immediate attention of the project manager for resolution prior to continuing with the activity. Test failures or failure to follow specifications/project requirements will result in the issuance of a Nonconformance Report, which includes the corrective action request. The SQCM, site manager, and personnel from the responsible organization will review deficiency items and generate corrective action requirements as soon as practical. Nonconformances are reported using a standard Nonconformance Report and tracked in a standard Nonconformance Log. Nonconformance corrective actions shall describe corrective action and its disposition by a planned date, and shall be closed out after implementation of the required corrective actions.

Following the completion of field activities, the SQCM will conduct inspections to document substantial completion and generate any punchlist items for corrective action prior to final inspection and acceptance of field work.

The Accident Prevention Plan (USACE, 2013) will be followed during the activities discussed in this work plan.

Reporting

A Perocolation Testing Report presenting the results of exploratory drilling, field testing, laboratory testing, and engineering analyses developed by CB&I's subcontractor will be incorporated into the design of the infiltration gallery. The report will be included as an appendix to the design. A detailed engineering design of the extraction well pilot-system components will be submitted under separate cover. This detailed design plan will include the location and design of the infiltration gallery.

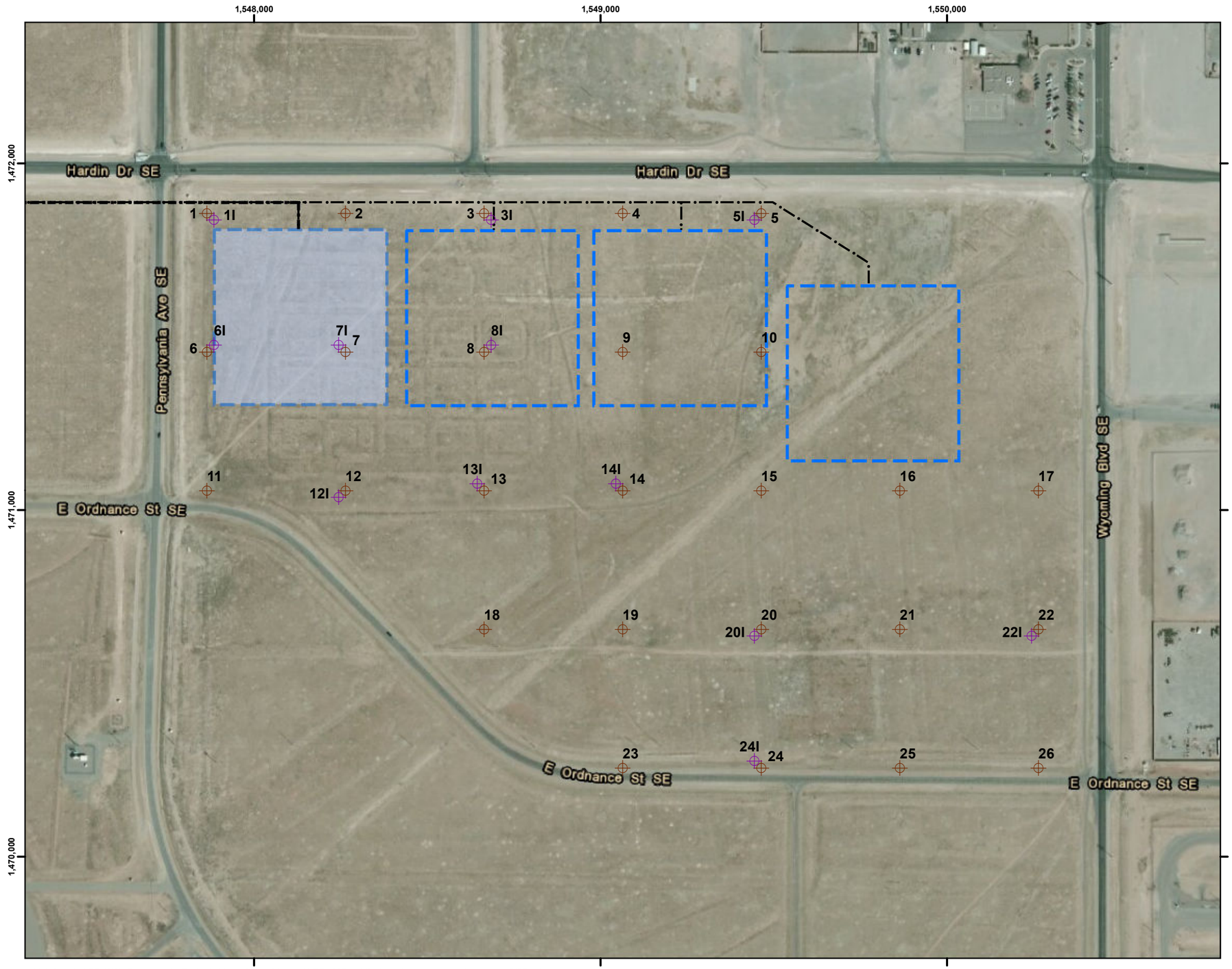
References

Lambe, T. William and Robert V. Whitman. 1969. *Soil Mechanics.* Massachusetts Institute of Technology. New York: John Wiley & Sons. January.

U.S. Army Corps of Engineers (USACE). 2014. *Groundwater Extraction Pilot Implementation and Additional Plume Characterization Work Plan – Revision 1, Bulk Fuels Facility (BFF) Spill, Solid Waste Management Units ST-106 and SS-111, Kirtland Air Force Base, Albuquerque, New Mexico.* Prepared by CB&I Federal Services LLC for the USACE Albuquerque District under USACE Contract No. W912DY-10-D-0014, Delivery Order 0002. October.

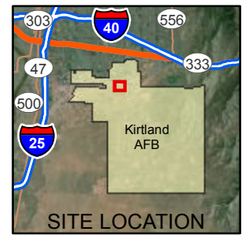
U.S. Army Corps of Engineers (USACE). 2013. *Accident Prevention Plan, Bulk Fuels Facility (BFF) Spill, Solid Waste Management Units ST-106 and SS-111, Kirtland Air Force Base, Albuquerque, New Mexico.* Prepared by CB&I Federal Services LLC for the USACE Albuquerque District under USACE Contract No. W912dY-10-D-0014, Delivery Order 0002. August.

FIGURES



Legend

- Soil Boring to 40 ft (26 locations)
- Location for Infiltration Testing Below Caliche Layer (12 locations)
- New Underground Discharge Piping
- Proposed Infiltration Gallery Location
- Proposed Future Infiltration Gallery Location



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Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community. VA parking lot area from Google Maps.

N

Revision Date: 12/22/14

0 150 300 600

Feet
1 inch = 300 feet

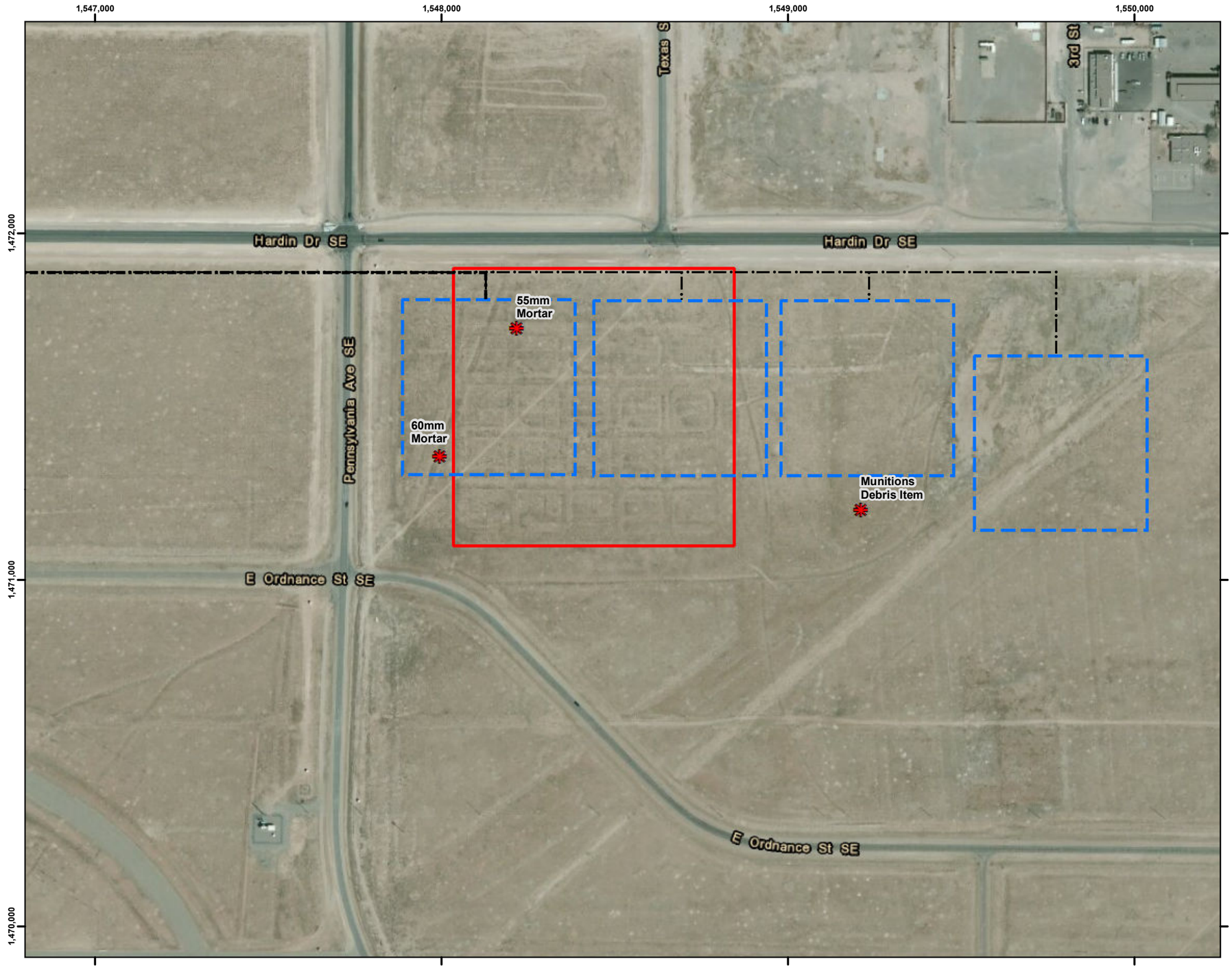
Projection : NAD83 State Plane New Mexico Central FIPS3002 Feet

STATEMENT OF WORK
BULK FUELS FACILITY
KIRTLAND AIR FORCE BASE, NEW MEXICO

FIGURE 1

SOIL BORING AND INFILTRATION TEST LOCATIONS

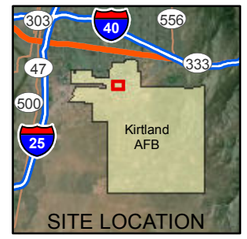
H:\Kirtland_AFB\GIS_Documents\Project_Maps\Misc_Maps\KAFB_113_infiltration_test_gallery_bh.mxd 12/22/14



Legend

- Found Munitions and Mortar Material
- New Underground Groundwater Piping
- New Underground Discharge Piping
- Proposed Infiltration Gallery Locations
- Former Revetment

Note: Former revetment location obtained from the website wikimapia.org. (http://wikimapia.org/#lang=en&lat=35.042365&lon=-106.555066&z=15&m=b&show=/14987579/Old-Revetments)



Revision Date: 11/04/14

N

0 150 300 600

Feet
1 inch = 300 feet

Projection : NAD83 State Plane New Mexico Central FIPS3002 Feet

PERCOLATION TEST WORK PLAN
BULK FUELS FACILITY
KIRTLAND AIR FORCE BASE, NEW MEXICO

FIGURE 2

FOUND MUNITIONS AND
MORTAR DEBRIS LOCATIONS

H:\Kirtland_AFB\GIS_Documents\Project_Maps\Misc_Maps\KAFB_108_old_revetments.mxd 11/04/14

APPENDIX A

Anomaly Avoidance Plan

KIRTLAND AIR FORCE BASE
ALBUQUERQUE, NEW MEXICO

SITE-SPECIFIC MUNITIONS AND EXPLOSIVES OF CONCERN ANOMALY AVOIDANCE PLAN, PHASE 2 INVESTIGATION WORK PLAN, PHASE 2 BULK FUELS FACILITY SPILL SOLID WASTE MANAGEMENT UNITS ST-106 AND SS-111 KIRTLAND AIR FORCE BASE, NEW MEXICO

January 2015

Prepared for
U.S. Army Corps of Engineers
Albuquerque District
Albuquerque, New Mexico 87109

USACE Contract No. W912DY-10-D-0014
Delivery Order 0002

Prepared by
CB&I Federal Services LLC
2440 Louisiana Blvd. NE, Suite 300
Albuquerque, New Mexico 87110

MUNITIONS AND EXPLOSIVES OF CONCERN ANOMALY AVOIDANCE PLAN

INVESTIGATION WORK PLAN KIRTLAND AIR FORCE BASE ALBUQUERQUE, NEW MEXICO

I have read and approve this site-specific MEC Anomaly Avoidance Plan for the proposed Investigation at Kirtland Air Force Base Albuquerque, New Mexico, with respect to project hazards, regulatory requirements, and CB&I MEC procedures.

Joe Stultz
Digitally signed by Joe Stultz
DN: cn=Joe Stultz, o, ou, email=joe.stultz@cbifederalservices.com, c=US
Date: 2015.01.02 09:53:30 -06'00'

1/2/2015

Joe Stultz
Senior UXO Supervisor

Date

1/6/2015

James Joice
Health & Safety Manager

Date

CONTENTS

1. INTRODUCTION

This document defines anomaly avoidance procedures for activities to be performed by CB&I Federal Services LLC (CB&I) unexploded ordnance (UXO) technician in conjunction with the investigation activities to be conducted for a Percolation Test at Kirtland Air Force Base (AFB) in Albuquerque, NM. This document is not a stand-alone document and must be used in conjunction with the Percolation Test Work Plan (U.S. Army Corps of Engineers [USACE], 2014).

CB&I qualified UXO personnel will perform visual, handheld magnetometer, and metal detector surveys to support sampling and associated field activities. The purpose is to avoid Munitions and Explosives of Concern (MEC) (formerly referred to as UXO or ordnance and explosives) during the Percolation Testing fieldwork at Kirtland AFB. Three items have been previously found at the site, including two non-explosive drill rounds and a related item. Intrusive anomaly investigation is not authorized for soil borings and will not be performed during the surface access survey. Based on the type of items previously found at the site, during drilling, the Foerster FEREX API or equivalent will be used to check the borehole for anomalies up to 4 feet below ground surface (bgs) as progress is made. The items previously found at the site indicate there is low risk for finding anomalies below four feet. Any suspect MEC items encountered during that investigation will be conspicuously marked and immediately reported to the appropriate Kirtland AFB personnel, who will arrange for disposition of the item.

Site Description and History

Kirtland AFB is owned by the U.S. government and operated by the U.S. Department of Defense. The proposed locations where infiltration testing is required for design are between Pennsylvania Street and Wyoming Blvd, along the southern side of Hardin Blvd. Infiltration galleries are proposed to be located along the south side of Hardin Blvd. This area is open, undeveloped land that is part of the runway clearance zone for the Albuquerque Airport and Kirtland AFB. The proposed gallery location is not within the boundaries of any solid waste management unit area; contaminated material is not anticipated

During siting for utility clearance prior to drilling and the initial percolation testing, two non-explosive drill rounds and a related item were found by the field team. The locations of these items are shown in Figure 2 of the Percolation Test Work Plan (U.S. Army Corps of Engineers [USACE], 2014). As a result of these findings, munitions avoidance procedures will be included in work to be performed in this area.

Field Work

26 geotechnical exploratory borings by hollow-stem auger methods will be drilled to an approximate depth of 40 feet or refusal at each borehole. Samples and standard penetration tests will be performed on each boring at 0.5 feet, 5.0 feet, and at 5 foot intervals or refusal if shallower than 40.0 feet. Penetration resistance and samples will be obtained by the Standard Penetration Test (American Society for Testing and Materials [ASTM] 01586).

After the geotechnical borings are completed, CB&I will conduct in-situ falling head infiltration testing and soil classification at 12 locations on native soils in adjacent borings to support design of the proposed infiltration gallery at the Kirtland AFB. Locations for the infiltration tests will be based upon the results of the geotechnical testing. The falling head infiltration tests will be conducted in-situ by installing an open casing to approximately 10 feet below the ground surface. The open casing will be filled with water and a falling head test performed at each of the 12 locations. The objectives of the study will be to characterize and evaluate subsurface conditions at the proposed project site and to provide geotechnical

recommendations for a design infiltration rate. The testing is part of the overall Groundwater Extraction Pilot Interim Measure Implementation associated with the Bulk Fuels Facility.

Anomaly avoidance practices will be the same as for the original boreholes.

Prior to field mobilization, utility clearances for boring locations will be completed. CB&I will also have utility locations marked using a qualified subcontractor. The drilling subcontractor will also be required to verify for utility clearance at each boring to a minimum of 5 feet with a hand-auger, post-hole digger, air knife, or water knife.

Figure 1 of the Work Plan shows the proposed locations for the additional soil boring and infiltration testing, and Figure 2 shows the locations of the previously found non-explosive drill rounds and additional debris item.

2. UXO TECHNICIANS

UXO Technicians will be qualified in accordance with TP-18, *Minimum Qualifications for UXO Technicians and Personnel* (Department of Defense Explosives Safety Board, 2004); and EM 385-1-97, *Explosives Safety and Health Requirements Manual* (USACE, 2008, Errata Sheet No62010). The avoidance team shall consist of at least two personnel, one of whom must be a qualified UXO Technician III or above.

3. RESPONSIBILITIES

The on-site UXO Technician will provide MEC avoidance, explosive ordnance recognition, location, and safety functions for CB&I employees and any subcontractors during the investigation field activities. The UXO Technician will safeguard the site pending arrival of the appropriate authority.

4. AUTHORITY

CB&I UXO Technician are authorized to perform MEC avoidance activities only. UXO Technicians are not permitted to initiate MEC investigative or disposal activities. Any suspect MEC items encountered during this investigation will be conspicuously marked and immediately reported to the appropriate Kirtland AFB personnel, who will arrange for disposition of the item.

5. MEC AVOIDANCE PROCEDURES IN SUPPORT OF HTRW ACTIVITIES

Because MEC may be present at the Percolation Testing Area at Kirtland AFB, the UXO team must conduct a surface access survey for MEC before any type of activities commence. This includes foot and vehicular traffic. MEC avoidance activities will include:

a) Access Corridors and Sampling Sites

1) The UXO team will conduct access surveys of the footpaths and vehicular lanes approaching and leaving the site. Access surveys will begin in a known clear area and proceed by the most direct route to the site. The boundaries of the access route and site will be marked with white tape or white pin flags.

2) If a surface MEC item is found during the survey, the location will be conspicuously marked with a red pin flag and avoided by altering the route. Subsurface anomalies will be marked with a yellow flag. Any MEC items found will be reported to the appropriate Kirtland AFB personnel.

3) Instrumentation used at this site may include the Schonstedt GA-52Cx or equivalent, the CST Corporation Magna-Trak 102, or the White's Spectrum XLT Metal Detector. Additionally, the Foerster FEREX API or equivalent may be used for downhole anomaly avoidance. All equipment will be operated as specified in the appropriate operator's manual. All equipment will be function tested prior to use in accordance with manufacturer's instructions and the following procedures:

   - Prior to field use, all magnetometers and metal detectors will be set up following the guidelines in the manufacturer's operating manual for the specific instrument used.

   - All equipment will be operated in a manner consistent with instructions contained in the appropriate operator's manual. All equipment will be function-tested prior to use each work day. The metal detector will be used in conjunction with handheld magnetometers in areas with high concentrations of "hot rocks" (i.e., naturally occurring geologic materials with a magnetic signature) to minimize the potential for false-positive anomaly identification. The operating manual for each of the instruments used at Kirtland AFB will be available for use with the equipment.

   - Once the instrument has been determined to be working according to the manufacturer's operating manual, the operator will perform a function test using the detection methods described in the manual. The same sources will be used during each function test to ensure consistency. The instrument detection indicator, as described in the operator's manual, will be noted in the instrument logbook. For site checks, a 6-inch length of 1/2-inch steel reinforcing rod or equivalent will be available to each operator at the work site.

   - Instruments that fail to reproduce a detection indication consistent with previous tests will be checked to verify that the power supply or batteries are sufficient. If the power supply is determined to be sufficient and the operator cannot find a fault in accordance with the operator's manual, the instrument will be tagged and removed from service.

   - If an instrument is determined to be working improperly, the UXO Team Leader and the Site Superintendent will be immediately notified. Any activities performed using that instrument since its last positive test procedure will be considered invalid and will require reevaluation.

   - Upon completion of the function test, the results will be recorded in the operator's MEC logbook.

   - After an instrument has been function-tested at the beginning of each day, the instrument will be checked at least once during every hour of use or each time the instrument is turned on after having been turned off. This check will consist of dropping the 6-inch length of 1/2-inch reinforcing rod or equivalent in a clear area and passing the detector over the rod in a manner consistent with the operator's instructions. The instrument indication will be compared to the

indication produced during the morning function test. Instruments that fail to produce a consistent indication will be checked and removed from service as required.

4) Footpath lanes will be a minimum of 3 feet wide. As a minimum, the surveyed area will have a dimension in all directions equal to twice the length of the longest vehicle or piece of equipment to be brought on-site.

5) If surface MEC or subsurface anomalies are encountered that cannot be avoided, the access route will be diverted to avoid contact. No personnel will be allowed outside of the surveyed areas without a UXO Technician escort. No unescorted access will be permitted inside the corridor area until a survey has been completed and the boundaries established.

6) The UXO Technicians will survey the soil sampling areas for any indication of MEC. Sampling is not permitted at any location where an anomaly has been detected.

7) Vehicles whose movement would disturb the soil are authorized for use only in areas that have been surveyed and in which no anomalies have been detected.

8) Erosion and weathering may cause some MEC items to become exposed at the ground surface. In cases where access corridors or sampling locations have not been surveyed or traversed for a period of time, additional surveys may be required. The decision to perform follow-on surveys will be made by the UXO Technicians in consultation with the Site Superintendent and project management. The decision will be based on factors such as the amount of time since the last survey was performed, the weather during this period, the terrain in the area of concern, the former use of the area, and the type and quantity of MEC found during initial surveys.

b) Magnetometer/Metal Detector Checkout and Field Procedures

- All intrusive field actives in potential MEC areas (e.g., digging, fencepost driving, grading, well installation, or excavation) will be preceded by a MEC sweep. Each hole made in areas where MEC may potentially be found will have a check immediately over the spot of the intrusion. Magnetometer operations at Kirtland AFB will assume a detection depth of 4 foot when surveying an area for excavation.

- All magnetometers and metal detectors will be operated in accordance with the manufacturer's specifications and procedures.

- During drilling, the Foerster FEREX API or equivalent will be used to check the borehole for anomalies up to 4 feet bgs as progress is made. The type of items found previously at the site indicates that the risk of finding MEC below four feet bgs is negligible. If anomalies are detected, the borehole location will be moved and the process re-started.

- The White metal detector or equivalent will be used to augment the magnetometers on sites where "hot rocks" are suspected. The purpose of using the metal detector in addition to the magnetometers is to minimize the potential for "hot rocks" to cause a false-positive anomaly identification; however, hot rocks are not anticipated at the Kirtland AFB site.

c) MEC Logbooks and Documentation

- UXO Technicians will maintain an individual daily logbook of work activities. The purpose of the logbook is to record MEC actions and activities taken at each work site.

- Logbooks will contain bound and numbered pages. Entries will be on successive pages as work is performed. The individual using the logbook will sign the page after the last entry for that page has been made. These logbooks will be included with the project files upon completion of each investigation.

- At a minimum, individual logbooks will contain the following information:

  - Date, time, and location of MEC activities
  - Personnel involved in the activities
  - MEC activities performed, including areas swept and MEC/anomalies found
  - A record of the magnetometer or other equipment used, including instrument serial number
  - Weather conditions

6. SAFETY

In addition to the requirements of the Accident Prevention Plan (USACE, 2014) prepared for this site, the UXO personnel will ensure the following:

- The UXO Technicians will monitor all field activities to ensure compliance with applicable safety requirements.

- The UXO Technicians are responsible for MEC awareness training.

- The UXO Technicians will advise project personnel regarding all evacuation and/or exclusion zones as appropriate.

- The UXO Technicians will allow only the required personnel to be present on site.

7. REFERENCES

Department of Defense Explosives Safety Board. 2004, TP-18, Minimum Qualifications for UXO Technicians and Personnel.

USACE. 2014. *Groundwater Extraction Pilot Implementation and Additional Plume Characterization Work Plan – Revision 1, August.*

U.S. Army Corps of Engineers (USACE). 2014. *Accident Prevention Plan, Bulk Fuels Facility (BFF) Spill, Solid Waste Management Units ST-106 and SS-111, Kirtland Air Force Base, Albuquerque, New Mexico.* Prepared by CB&I Federal Services LLC for the USACE Albuquerque District under USACE Contract No. W912dY-10-D-0014, Delivery Order 0002. August.

USACE. 2008. *EM 385-1-97, Explosives Safety and Health Requirements Manual* With errata 1 through 5.

APPENDIX B

Field QC Forms and Checklists

Field QC Forms & Checklists

For

Groundwater Extraction Pilot Implementation Percolation Testing

At

Bulk Fuels Facility
Kirtland Air Force Base
Albuquerque, New Mexico

List of Field Forms:	Form No./Rev No.
Project QC Readiness Review	Rev 4
Preparatory Control Worksheet	Rev 4
Daily Quality Control Report	Rev 5
Initial Control Worksheet	Rev 4
Meeting Minutes	Rev 2
Photo Log	Rev 2
Nonconformance Report	CMS-720-01-FM-00151/Issued 18 Mar 2014
NCR Hold Tag	CMS-720-01-FM-00152/Issued 18 Mar 2014
NCR Log	CMS-720-01-FM-00150/Issued 18 Mar 2014
Receiving and Protection Checklist - General	CMS-720-02-CK-00280/Issued 24 Sep 2008
Receiving and Protection Checklist – Project Site Materials	CMS-720-02-CK-00285/Issued 24 Sep 2008

CB&I Federal Services				Kirtland AFB Program Project QC Readiness Review			
PROJECT No.:		**Project Title:**		**Program/TO #:**		**Date:**	

Agenda

- Introduce project personnel and confirm roles (PM, QA, QC, and Engineering)
- Review of the Kirtland AFB QC Process (inspections, field forms, SharePoint)
- Location or existence of the contract documents (Work Plan, SOWs, PO, specifications, drawings)
- Location or existence of resources (industry standards, construction procedures, checklists)

Contract Document Checklist

	Title	Yes	No	N/A	Comments (include location)
Contracts					
	Contract with all amendments				
	RFI's				
Procurement					
	Subcontractor purchase orders with SOW's				
	Subcontractor training and qualifications				
Project Management					
	Project Schedule				
	Work Breakdown Structure				
Project Submittals					
	Submittal Register				
	Project Work Plan				
	Task-Specific Work Plans				
	Commissioning Plan				
	Drawings				
	UFGS Specifications (if No then explain why)				
	Material Submittal Information				
Quality					
	Project CQC Plan – includes DFW List and Testing Plan				
	QC Field Forms – DQCR, Prep, Initial, NCR…etc				
Safety					
	Project APP				

Quality Resources

	Title	Yes	No	N/A	Comments (include location)
Industry Standards (NACE, ASME, API)					
	NACE				
	ASME				
	API				
Task-Specific Checklists					

Attendees

	Name	Position/Project Role
1		
2		
3		
4		
5		
6		

CB&I Federal Services				Kirtland AFB Program Preparatory Control Worksheet			
				CQC SM:		Date:	
PROJECT No.:		Project Title:		Program/TO:		START TIME:	

Definable Feature of Work:

	A. SCHEDULE ACTIVITIES INCLUDED IN DEFINABLE FEATURE OF WORK
1	
2	
3	
4	

	B. REVIEW CONTRACT DRAWINGS AND SPECIFICATIONS	
	Drawing/Spec. No/Document Title	Comments/Conflicts
1		
2		
3		
4		

	C. QUALITY CONTROL REQUIREMENTS	
	Testing and Inspections	Control Checks (include reference document, method, frequency, and description of testing/inspection)
1		
2		
3		
4		

	D. REPETITIVE DEFICIENCIES FOUND ON PREVIOUS PROJECTS
1	
2	
3	
4	

	E. QA/QC DEFICIENCY ITEMS (items to be resolved before work begins)
1	
2	
3	
4	

	F. JOB SITE SAFETY
1	
2	
3	
4	

	G. GOVERNMENT QUALITY ASSURANCE COMMENTS
1	
2	
3	
4	

	H. ATTENDEES		
	Name	Position	Company/Government
1			
2			
3			
4			
5			
6			
7			
8			
9			

CB&I Federal Services

Kirtland AFB Program
Daily Quality Control Report

PROJECT No.:		Project Title:		TO #:		DATE:	
SITE CONDITION (good, fair, poor):				CQC SM:		REPORT NUMBER:	
WORK IMPACTS DUE TO WEATHER:				MIN TEMP		START TIME	
SAFETY MEETING TOPIC:				MAX TEMP		END TIME	

PREPARATORY AND INITIAL CONTROL ACTIVITIES

Inspection (Prep or Init)	Definable Feature of Work	Comments

FOLLOW-UP INSPECTIONS

Definable Feature of Work	Subcontractor	Description of Inspections and Testing Performed Today

TESTS PERFORMED OR SAMPLES TAKEN

Test	Definable Feature of Work	Description (include specification section or reference)

INSPECTION OR TESTING EQUIPMENT IN USE

Equipment	Comments (Include model number, calibration dates, description, and use)

MATERIAL/EQUIPMENT RECEIVED

Material/Equipment	Supplier	Quantity Accepted	Comments (Include material submittal form number and storage)

NONCONFORMANCE REPORTS ISSUED TODAY

NCR Number	Comments

VERBAL COMMENTS RECEIVED FROM THE GOVERNMENT

SAFETY INCIDENTS/NEAR MISS INCIDENTS

ENVIRONMENTAL PROTECTION (Violations, Corrective Actions, Instructions)

ADDITIONAL NOTES

CB&I Federal Services				Kirtland AFB Program Initial Control Worksheet			
				CQC SM:		Date:	
PROJECT No.:		Project Title:		Program/TO:		START TIME:	

Definable Feature of Work:

	A. SCHEDULE ACTIVITIES INCLUDED IN DEFINABLE FEATURE OF WORK
1	
2	
3	
4	

	B. QUALITY CONTROL REQUIREMENTS	
	Testing and Inspections	Control Checks (include reference document, method, frequency, and description of testing/inspection)
1		
2		
3		
4		

	C. QA/QC DEFICIENCY ITEMS (items from Preparatory Inspection)	
	Deficiency Item	Resolution
1		
2		
3		
4		

	D. CONTROL CHECKS PERFORMED DURING THIS INSPECTION	
	Control Check	Result/Comments
1		
2		
3		
4		

	E. JOB SITE SAFETY
1	
2	
3	
4	

	F. GOVERNMENT QUALITY ASSURANCE COMMENTS
1	
2	
3	
4	

	G. ATTENDEES		
	Name	Position	Company/Government
1			
2			
3			
4			
5			
6			
7			
8			
9			

	CB&I Federal Services			**Kirtland AFB Program Meeting Minutes**			
				Date:			
PROJECT No.:		**Project Title:**		**Program/TO:**		**START TIME:**	

Meeting Purpose:

	A. AGENDA ITEMS	
1		
2		
3		
4		

	B. OTHER DISCUSSION ITEMS
1	
2	

	C. ACTION ITEMS	
	Action Item	**Person Responsible**
1		
2		
3		

	D. ATTENDEES		
	Name	**Position**	**Company/Government**
1			
2			
3			
4			
5			
6			

CB&I Federal Services				Kirtland AFB Program Photo Log			
				CQC SM:		Date:	
PROJECT No.:		Project Title:		Program/TO:			

Filename: **Description:**	**Filename:** **Description:**
Filename: **Description:**	**Filename:** **Description:**

	NON-CONFORMANCE REPORT (NCR)	
CBI	<Project Name>	Contract No.

NCR No.	Rev.	Issued by:	Date:

Identify the nonconforming product: (Item No., Serial No., Area, Description, as applicable)

Check if Hold Tag is not practical to affix on the Item ☐

Supplier/Subcontractor Name:	P.O. or Subcontract No. and Item No.

Governing Document No:	Governing Document Requirement:

Description of nonconformance:

Root Cause(s) of the nonconformance:

Action for Correction:

Is a Concession/RFI required? ☐ Yes ☐ No (If Yes, register the number on the NCR Log)

Action by:	Date:	Target Completion Date:

Proposed Corrective Action to Prevent Reoccurrence:

Is a separate CAR issued? ☐ Yes ☐ No If Yes CAR No:

Agreed Disposition			
☐	REWORK, NO Deviation*	☐	REPAIR, Deviation**
☐	REPAIR, NO Deviation*	☐	USE-AS-IS, Deviation Acceptable**
		☐	USE-AS-IS, Revise Requirement**
		☐	REJECT**

* DO NOT Require Client Approval ** MAY Require Client Approval / MAY Require 3rd Party approvals as per applicable codes

Approvals to proceed with the disposition (add as necessary):

Title:	Name:	Signature:	Representing:	Date:
Quality Manager (mandatory)			CB&I	
Engineer (mandatory)			CB&I	

Verification of Correction and Release of the product (add as necessary)::

Title:	Name:	Signature:	Representing:	Date:
Quality Manager (mandatory)			CB&I	

NCR HOLD TAGS

HOLD

(Nonconforming Product - do not use)

Product ID Number: _____

NCR Number: _____

Applied by: _____

Date applied: _____

Tel. Number for info. : _____

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HOLD

(Nonconforming Product - do not use)

Product ID Number: _____

NCR Number: _____

Applied by: _____

Date applied: _____

Tel. Number for info. : _____

CMS-720-01-FM-00152 CB&I

Comment, these labels may be: Printed onto adhesive stickers and cut out to stick to the nonconforming item, or

Printed then laminated to tie to the nonconforming item.

Project Nonconformance Report (NCR) Log

Print Date: 10/17/2014

Project Name: xxxxxxxxxx

Project Number: 18xxx

Seq. Number	NCR Number	Date Issued	Issued By	Discipline	Area	Description of Nonconformance	Root Cause	Root Cause Discipline	If Supplier Item, Name of Supplier	If Subcontractor NCR, Name of Subcontractor	Consession/ RFI Number (If issued)	Consession/ RFI Approval Date (if Approved)	Disposition	Target Completion Date	Status	Date Closed	Days Overdue of Target	Days Open/ Stayed Open	Remarks
0001																			
0002																			
0003																			
0004																			
0005																			
0006																			
0007																			
0008																			
0009																			
0010																			
0011																			
0012																			

RECEIVING and PROTECTION CHECKLIST - GENERAL

Contract No.:	Storage Location:	Report No.:
Prepared By:	Equipment Tag No.:	Date:
EQUIPMENT DESCRIPTION:		
Visual Inspection for physical damage or contamination:		
Observations prior to unloading:		
Observations after unloading:		

	OK	Not OK	NA	Initials	Date
Is equipment/ machinery provided with correct name plates/ tags?					
Shipping protection intact?					
Have off-site (shop) inspections been made?					
Loose components / packages match packing list?					
Are special handling instructions required?					
Are special handling requirements being performed?					
Are components properly identified?					
Do components/ materials / equipment comply with project requirements?					
Are flange faces properly coated, protected and undamaged?					
Are plugs / end caps in place?					
Are desiccants unsaturated?					
Is equipment / machinery lubricated as required?					
Is the equipment/ machinery free from an visible oil leakages?					
Are rotating parts properly guarded/ shielded preventing damages?					
For inert gas purged equipment, is the required purge still applied?					
Are surfaces to be grouted clean and coated?					
Are tapped openings in stuffing boxes and gland plates sealed?					
Are impact measuring devices inspected?					
Are correct items packed in corresponding boxes per packing list?					
Are damage reports completed, issued, and shipped to vendor/ supplier?					
Have COC's, MTR's, as required, received at receiving location?					

RECEIVING and PROTECTION
CHECKLIST – PROJECT SITE PROTECTION
(Materials and Equipment)

Contract No.:	Storage Location:	Report No.:
Prepared By:	Equipment Tag No.:	Date:
EQUIPMENT DESCRIPTION:		

GENERAL INSTRUCTIONS – PROJECT SITE PROTECTION (Materials & Equipment)

	OK	Not OK	NA	Initials	Date
Is the equipment provided with correct name plates/ tags?					
Are Manufacturer's Recommendations For Storage And Protection Available					
Are Material/ Equipment/ Machinery Free Of Ground Contact?					
Is Equipment On Timber If Located Outdoors?					
Do Protective Coverings Allow Free Air Circulation To Prevent Collection Of Water?					
Is Carbon & Low Alloy Steel Protected From Corrosive Or Wet Atmospheres?					
Are Special Parts And Tools Tagged, And Handed Over To User?					
Is Equipment / Machinery Protected From Construction Operations, Against Chipping, Sanding, Painting, Rigging, Welding, And So Forth?					
For Periodic Rotation Of Machinery, Are The Shipping Blocks, Desiccant Bags And Protective Plastics Clear Of Moving Parts?					
Is Equipment / Machinery Properly Lubricated For Rotation?					
Have The Proper Preservatives Been Selected?					
Is Equipment free from any visible oil leakages?					
Is The Nitrogen Purge In Place For Special Purpose Equipment, Or When Specified?					
Do loose or unprotected electrical cables exist?					
Are rotating parts of Equipment properly guarded/ shielded to prevent damage?					
Are All Cavities, Cooling Passages And So Forth, Drained Of Water To Prevent Freezing?					
Are All Dirt And Debris Removed?					
Are Oil Lube Bearing Housings, Seal Housings, Stuffing Boxes, Hydraulic Equipment And Gear Cases Fogged And ¼ Filled With Approved Oil?					
When Specified, has the TAN Number been measured?					
Is Exposed Carbon Steel Coated With Type A, B, Or D Preservative, if req'd?					

Are Machined Surfaces Coated With Type A, B, Or D Preservative and Wrapped With A Waxed Cloth?					
Has The Manufacturer Greased Lube Bearings?					
Is An Oil Mist System Required?					
GENERAL					
Are loosely supplied items separately listed with remarks as “loose supply”?					
Are items properly tagged and identified in documents as well as in boxes?					
Are correct items packed in corresponding boxes per packing list?					