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

JUN 12 2015

Colonel Eric H. Froehlich
377 ABW/CC
2000 Wyoming Blvd SE
Kirtland AFB, NM 87117-5600

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

Dear Mr. Kieling,

Kirtland Air Force Base is pleased to submit *"Revised Final Basis of Design – Mid-Plume Pump and Treat System,"* for the Bulk Fuels Facility Spill, Solid Waste Management Units ST-106 and SS-111, Kirtland AFB, NM. This Revised Basis of Design describes the technical approach and the design parameters that will be used in development of the pump and treat system.

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

Sincerely,

ERIC H. FROEHLICH, Colonel, USAF
Commander

cc:
NMED-HWB (Roberts, Kieling, Cobrain, McDonald)
NMED (McQuillan, Longmire)
NMED-PSTB (Reuter)
NMED-GWQB (Bustamonte)
NMED-OGC (Kendall)
EPA Region 6 (King)
AFCEC-CZRX (Renaghan, Bodour)
Public Info Repository, AR/IR, and File

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40 CFR 270.11
DOCUMENT CERTIFICATION
JUNE 2015

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.

JUN 1 2 2015

ERIC H. FROEHLICH, 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

Prepared by CB&I Federal Services LLC
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June 12, 2015

Subject: Response Letter for Revised Final Basis of Design – Mid-Plume Pump and Treat System, Kirtland Air Force Base Bulk Fuel Facility, New Mexico

This letter is in response to the April 24, 2015 New Mexico Environment Department (NMED) approval with conditions of the Kirtland Air Force Base (AFB) Bulk Fuel Facility Basis of Design, Mid-Plume Pump and Treat System, Final 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.

Condition 1

The Permittee shall submit, within 90 days of the date of this letter, a supplemental document to the BOD demonstrating that treatment technology for elevated dissolved concentrations of iron (1 mg/L) and manganese (0.2 mg/L) exceeding New Mexico Water Quality Control Commission (WQCC) standards can be incorporated into the treatment system if necessary.

Anticipated concentrations of iron and manganese in extracted groundwater at Kirtland AFB [KAFB]-106228 have been evaluated. Modeling of projected pumping rates at KAFB-106228, using groundwater monitoring data from the Fourth Quarter in 2014, predicts that iron and manganese concentrations at KAFB-106228 will be below New Mexico Water Quality Control Commission standards levels, and will be below levels that could impact operation of the carbon adsorption system. Regular monitoring samples of influent water will be analyzed for dissolved iron and manganese. If concentrations of iron and manganese are detected in exceedance of regulatory limits in the sample collected before the first carbon treatment vessel, then system operation will be stopped, and additional treatment equipment may be added.

As additional extraction wells are added to the pump and treat system, and as the system continues to operate and create a larger zone of influence, this analysis will need to be updated to determine the need to expand the treatment train in order to address elevated concentrations of iron and manganese. If additional treatment equipment is needed, an addendum to the Basis of Design (BOD) will be submitted to the NMED. The Revised Final BOD attached to this letter includes text describing the analysis and results for predicted concentrations of iron and manganese at KAFB-106228.

Condition 2

The Permittee shall install piezometers within the infiltration gallery to measure water levels.

Infiltration galleries are not included in the discharge plan for the temporary treatment system. Treated water from the temporary treatment system will be discharged to the main pond at the Kirtland AFB Tijeras Arroyo Golf Course for irrigation. Based on past irrigation rates and needs from the golf course, it is anticipated that the discharge rate from KAFB-106228 will need to be reduced from 100 gallons per minute (gpm) during the winter months in order to not exceed the capacity of the main pond and irrigation.

The final discharge plan for the permanent treatment system will need to be able to handle up to 400 gpm year-round; a maximum of 400 gpm is anticipated from KAFB-106228, plus up to three additional extraction wells to be installed in fall/winter 2015. Infiltration trenches at the Tijeras Arroyo Golf Course are under consideration. An updated design plan for the permanent system will be submitted for NMED review following finalization of the design of the discharge plan for the permanent system. This design will include piezometers for infiltration trenches, if applicable.

Condition 3

The Permittee shall, by June 30, 2015, submit an analysis of whether or not backwashing of the carbon beds is anticipated.

The carbon treatment vessels are equipped with backwash nozzles, so if plugging is an issue, the beds can be backwashed. The criteria for backwashing the beds will be addressed in the Operation and Maintenance (O&M) Plan (see response to Condition 4).

Condition 4

The Permittee shall, by June 30, 2015 submit an operation and maintenance (O&M) plan for NMED approval. The O&M plan shall include procedures for carbon exchange, carbon reactivation/replacement, backwashing (if applicable), filter exchange, management of potential biofoulding, iron and manganese removal, and any other relevant procedures. The permittee shall, by September 30, 2015, submit a revised O&M plan if necessary to modify procedures based on experience with system operation.

An O&M plan will not be prepared for the temporary treatment system being installed as it will only be in operation for 3 to 4 months until the permanent treatment system is online. The temporary treatment system vendor has supplied an operations manual that will be used for O&M of the temporary equipment.

Kirtland AFB would like to request an extension to September 30, 2015 for delivery of an O&M plan for the permanent treatment system. This will allow sufficient time to develop the design of the permanent system discharge and incorporate it into the O&M plan. Additionally, Kirtland AFB would like to request that a revised O&M plan be submitted on December 15, 2015, following at least 1 month of operation of the permanent treatment system, so that it can be updated based on experience with system operation.

Condition 5

The Permittee shall, by June 30, 2015 submit a sampling and analysis plan for NMED approval. The sampling and analysis plan shallow include the sampling locations, sampling methods, and sampling frequencies and analytical methods that will be used to monitor and optimize the treatment system.

A Monitoring and Contingency Plan for both the temporary and permanent treatment systems was submitted to the NMED Ground Water Quality Bureau on May 15, 2015, as required by the approved discharge permit DP 1770. This plan includes the sampling locations, sampling methods and sample frequencies, as well as the analytical methods that will be used for monitoring the two treatment systems.

The O&M Plan for the permanent treatment system will include a sampling and analysis plan for the permanent system as well as a discussion on how the sampling results will be used to optimize the treatment system. Kirtland AFB is requesting that the permanent treatment system O&M Plan be submitted by September 30, 2015, so that it can incorporate the system design for discharge of treated water.

Condition 6

The Permittee shall, within 30 days of the date of this letter, submit an addendum to the BOD that corrects:

a) The inconsistency between the BOD and Addendum 3 Work Plan regarding the length of the extraction well screen.

b) The inconsistency between whether stream no. 14 vents a treated or an untreated water tank.

c) The inconsistency between Sections 2.2 and 2.3 of the BOD regarding the sizing and capabilities of the extraction water pipelines.

The revised Final BOD attached to this letter corrects the above-listed inconsistencies.

Condition 7

If treated-water disposition options different from those described in the BOD are anticipated, the Permittee shall submit supplemental BOD document(s) for those options for NMED approval prior to their construction and use.

The treated water from the temporary treatment system is going to be discharged for irrigation to the main pond of the Tijeras Arroyo Golf Course on Kirtland AFB. The revised Final BOD attached to this letter reflects the discharge plan for up to 100 gpm from KAFB-106228, but does not include the plan for discharging up to 400 gpm for the permanent treatment system.

Discharge for water treated in the permanent system is still being evaluated. It is anticipated that a component of the permanent system treatment discharge will include infiltration trenches at the Tijeras Arroyo Golf Course, though additional options are being considered. Once a discharge plan has been selected for the permanent system, the design will be finalized and provided for NMED review prior to construction and use.

Condition 8

Upon completion of the pump-and-treat system, the Permittee shall submit an as-built construction completion report to NMED that includes the following:

a) The locations of sampling ports within the carbon treatment system, and a revised Figure 2 Process Flow Diagram that denotes the sampling ports.

b) The capacity, outlet, and other details of the treatment building sump.

c) Pipeline integrity testing methods and results.

d) A list of the regulatory permits that were obtained.

e) A list of the regulatory construction inspections that were conducted.

f) Specifications on trenching, backfilling, compaction and vertical and horizontal infrastructure separation.

g) A revised Figure 3 that has labels for equipment layout.

h) Figures depicting a typical trench detail, road crossings, manifold details, and infiltration gallery plan and section details.

i) Design basis and rationale, for infiltration gallery cell dimensions based on anticipated long-term infiltration acceptance rates.

j) Design basis for selection of underground and aboveground extraction water conveyance lines.

k) Design basis and supporting calculations for the selection of two 20,000 pound carbon treatment vessels and bag filter sizing.

l) Design basis and justification for the slab-on-grade/pavement design load.

m) Infiltration gallery piezometer specifications.

n) All relevant manufacturer cut sheets.

An as-built construction report will be generated for the permanent treatment system that is anticipated to come online in fall 2015. The revised final BOD and/or the as-built will include the following items related to the list above:

a) Drawings showing the sample ports are shown on Figure 2, "Process Flow Diagram" in the revised final BOD.

b) The capacity, outlet, and details for the permanent treatment building sump will be included in the as-built report. The temporary treatment system does not have a sump.

c) The results and methods of pipeline integrity testing will be included in the as-built report.

d) A list of the regulatory permits that the treatment system was designed to meet (e.g., requirements for the discharge permit DP 1770) will be included in the as-built report.

e) A list of construction inspections completed for the permanent treatment system will be included in the as-built report.

f) Specifications on trenching, backfilling, compaction, and vertical and horizontal infrastructure separation will be included in the as-built report.

g) Figure 3 in the revised final BOD has been revised to include labels for the equipment layout.

h) The revised Final BOD has been revised to remove any details and design of an infiltration trench; the temporary treatment system will discharge treated water to the main pond at the Tijeras Golf Course for irrigation. Plan and cross-section view drawings for road crossings, manifold details, and trenching will be included in the as-built report. The discharge for the permanent treatment system has not been finalized. When a decision is made on the discharge for the permanent treatment system, Kirtland AFB will provide the design to NMED for review.

i) The final discharge for the permanent treatment system has not been defined. Construction of infiltration trenches is currently being considered for the permanent treatment system. When a final decision is made on the discharge for the permanent treatment system, Kirtland AFB will submit the basis and design to the NMED.

j) A discussion of the design basis for underground and aboveground conveyance lines for the extracted water (influent and effluent) has been added to the revised final BOD.

k) Design basis and supporting calculations for the selection of the carbon treatment vessels and bag filter size will be included in the as-built report.

l) Design basis and calculations for the slab-on-grade/pavement design load will be included in the as-built report.

m) The discharge for the permanent treatment system has not been finalized. Construction of infiltration trenches at the Tijeras Arroyo Golf Course is an option being considered for the permanent treatment system. When a decision is made on the discharge for the permanent treatment system, Kirtland AFB will submit the design to the NMED for review.

n) Relevant manufacturer cut sheets will be included in the permanent system O&M manual to be submitted under separate cover.

ATTACHMENT 1

Revised Final Basis of Design, Mid-Plume Pump and Treat System

Prepared by CB&I Federal Services LLC
2440 Louisiana Blvd. NE, Suite 300
Albuquerque, NM 87110
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June 12, 2015

Subject: **Revised Final Basis of Design – Mid-Plume Pump and Treat System, Kirtland Air Force Base Bulk Fuel Facility, New Mexico**

1. INTRODUCTION

As part of an Interim Measure for remediation of the off-base portion of the dissolved phase ethylene dibromide (EDB; a fuel additive) groundwater plume, CB&I Federal Services LLC (CB&I) has been tasked to complete a detailed design for a groundwater extraction well, pipeline, treatment, and discharge system to be constructed on or near Kirtland Air Force Base (AFB), Albuquerque, New Mexico. This Basis of Design (BOD) describes the technical approach planned for the project and the design parameters that will be used. The full system is ultimately expected to be designed to extract and treat up to 800 gallons per minute (gpm) of groundwater, which will require installation of several new groundwater extraction wells in the dissolved EDB plume. Groundwater will be pumped from wells located to the west of the base to a treatment facility located on base, treated to remove EDB and any other contaminants exceeding regulatory standards.

The initial steps in this Interim Measure that are described in this BOD are the installation and operation of the first extraction well designed to pump 100 gpm, an influent pipeline, site improvements and infrastructure (including a building) sized for the eventual capacity of 800 gpm, a groundwater treatment system sized for 400 gpm, and a discharge pipeline that will connect to an existing line that will carry the treated water to the main pond of the Tijeras Arroyo Golf Course on Kirtland AFB. The initial groundwater extraction well will be installed near Gibson Avenue where groundwater exceeds criteria for only EDB. The initial treatment system will use carbon adsorption to remove EDB. Final system design will be detailed in As-Built reports submitted to New Mexico Environment Department.

Additionally, a temporary groundwater treatment system is to be installed in accordance with the New Mexico Environment Department approved Groundwater Extraction Pilot Implementation and Additional Plume Characterization Letter Work Plan Addendum #2 (U.S. Army Corps of Engineers [USACE], 2015a). This temporary system will incorporate portions of the full pump and treat system outlined in this Basis of Design document, and is anticipated to begin operation by June 30, 2015. Additional details regarding the design of the temporary treatment system are included in the Groundwater Extraction Well KAFB-16228 Aquifer Pilot-Test Work Plan (USACE, 2015b).

2. DESIGN CRITERIA

A groundwater extraction well (Kirtland AFB [KAFB]-106228), well vault, and influent pipeline will be installed on City of Albuquerque (COA) or Christ United Methodist Church (CUMC) property. A portion of the influent pipeline, the groundwater treatment system (GWTS) and building, effluent pipeline, and infiltration gallery will be installed on Kirtland AFB. Off-base design and construction will be coordinated with COA. This design basis has been divided into five phases. The phases are as follows:

- Phase 1 – Groundwater extraction well KAFB-106228
- Phase 2 – Wellhead vault and influent pipeline

- Phase 3 – GWTS equipment
- Phase 4 – GWTS process building and infrastructure
- Phase 5 – Effluent pipeline for treated water

CB&I will procure subcontractors to construct and supply the requirements of each phase. CB&I will coordinate and provide oversight of each phase from design through construction. The phases are described in the following sections.

2.1 Phase 1 – Groundwater Extraction Well KAFB-106228

An extraction well will be installed on CUMC property at 6200 Gibson Boulevard SE. At this location, the groundwater level is approximately 460 feet below ground surface. The extraction well will be 8 inches in diameter and screened from 20 feet above the water table to approximately 80 feet below the water table to capture the dissolved-phase EDB plume. The well will be fitted with a submersible well pump (480-volt, three-phase) capable of pumping a nominal flow rate of 100 gpm. A motor actuated control valve will be installed in the well vault (Phase 2) to regulate the groundwater extraction rate. The groundwater extraction rate will be controlled based on water level in the well (approximately 30 feet of drawdown) or to deliver a set flowrate. Continuous feedback of well water level from a level transducer will be recorded into the programmable logic controller (PLC) at the groundwater treatment plant (Phase 4). A secondary system will be implemented to shut down the pump during low-water level conditions. An overall site plan is included as Figure 1 to detail the well location. This extraction well will become part of the permanent pump & treat system, but will be installed in time to meet the June 30, 2015 scheduled date for startup of the temporary system.

2.2 Phase 2 – Wellhead Vault and Influent Pipeline

The well vault will be installed to house and protect the wellhead (KAFB-106228), plumbing, fittings, and remote instrumentation necessary for extraction well operation and monitoring. The low profile, lockable well vault will be concrete constructed with H-20 traffic-rated cover, and flush-mounted with the existing grade. After completion, the installation will allow unimpeded truck and automobile traffic through the church parking lot. The well vault will be constructed with a concrete collar for protection. This wellhead vault will become part of the permanent pump & treat system, but will be installed in time to meet the June 30, 2015 scheduled date for startup of the temporary system.

Instruments and controls within the well vault include pump controls, flow and well level instrumentation, and leak-monitoring devices. These components will be connected to the GWTS control panel on Kirtland AFB by a control cable buried in the trench with the groundwater pipeline. Additionally, pressure and temperature indication will be present at the well vault, as well as a sample port for pre-treatment groundwater sample collection. An automated control valve at the wellhead will be used to regulate groundwater flow rate and pressure, as described above.

Electrical power will be sourced from nearby Power New Mexico (PNM) overhead lines. The required power for the well pump operation will be provided from overhead lines in the vicinity of the well vault following COA and PNM standard specifications. The existing single-phased overhead line in the alley will be upgraded to three-phase power, and will be extended to one pole west of the wellhead vault by using the existing overhead system (upgrading poles as needed). The nearest pole to the wellhead will be equipped with a poletop three-phase transformer that feeds 480-volt, three-phase power routed a short distance underground to an above-grade rack. The rack will be located on CUMC property and will be protected by bollards and/or fencing. The rack will secure a 200-ampere line disconnect switch, service meter (provided by PNM), service entrance disconnect, pump motor starter and control components, and a small power-supply transformer for instruments and other 120-volt devices. The panels will be lockable. Power from the panel will be routed underground to the wellhead vault to power the well pump and instruments. Control wiring for the well pump and other well instrumentation will be installed in conduit

alongside the pipeline from the wellhead to the treatment plant. All controls will be fed to the main control panel in the GWTS building. An electrical splice box will be located at the on-base valve vault in order to provide control connections to the temporary treatment system.

The influent pipeline from the wellhead onto base property will be a single run with a 4-inch inner pipe and an 8-inch outer containment pipe. This pipeline will be installed by a combination of horizontal directional drilling (HDD) and trenching under the unnamed COA-owned alley, and under Louisiana Boulevard to a valve vault on Kirtland AFB. The influent pipeline will be underground to prevent any possible freezing of the pipeline, as well as to prevent tampering of the pipeline. Once on Kirtland AFB property, the pipeline will be placed in a trench along the Kirtland AFB fence line to the treatment plant. The valve vault will serve as a below-grade point for leak monitoring and low-point drains. Pits will be excavated at each boring point for HDD equipment. The number of pits will be determined based on location of underground and above ground utilities, aboveground facilities, and maximum pipe pull allowances. Although the well will be pumping at 100 gpm during operation, the maximum capacity of the influent pipeline will be 200gpm to allow for aquifer testing.

Approximately 1,600 linear feet (LF) of pipe will be located under the alley on COA property and 1,600 LF inside the Kirtland AFB fence line from the valve vault to the treatment plant. The on-base trench will be located as close as practical to the base fenceline allowing for access in a bladed service road next to the fence. The trench will follow the fence line south to the GWTS located at the southeast quadrant of the intersection of Perimeter Circle and Ridgecrest Avenue. Figure 1, the Overall Site Plan, shows the well vault and pipeline locations. Final pipe routing has been coordinated with Kirtland AFB Civil Engineering.

The influent pipeline will be constructed using a double–wall high-density polyethylene (HDPE) piping system for containment of the contaminated groundwater. Pipe lengths will be joined by heat fusion. The first pipeline will be sized for a minimum flow rate of 100 gpm and maximum flow rate of 200 gpm, and will service the proposed extraction well (KAFB-106228). This proposed pipeline will be fitted with automated leak monitoring of the pipeline annular space at a low point drain located in the well vault, and at an inspection port and manhole where the proposed pipelines will enter Kirtland AFB. Future wells and connecting pipelines are to be located at a later date and not included in this BOD. Additional piping will be required to transport groundwater from the northern half of the EDB plume to the treatment plant, but are not included in this BOD.

Trenching, backfilling, and compaction will be completed according to COA standard specification. The top of pipe will be buried 36 inches below finished grade. The plastic pipe will be bedded in sand, and the trench will be backfilled with native soil. All buried piping and conduit will maintain COA minimum separation requirements.

HDD will be used at two road crossings for the pipeline. The first road crossing involves drilling under Louisiana Boulevard from COA property to Kirtland AFB. The road crossing will be constructed near the end of the unnamed alley to a valve vault located on Kirtland AFB. The precast, shallow valve vault will be set approximately 5 feet below grade (base and flat top) and will be flush mounted with ground surface. The first road crossing is estimated to be 150 LF for the dual-containment piping (4-inch carrier, 8-inch containment), and a conduit for the control cable. The second road crossing will be on base, under the intersection of Perimeter Circle and Ridgecrest Avenue and is estimated at 200 LF. High-point air relief valves will be located in the well vault and on-base valve vault.

The subcontractor for the wellhead vault and pipeline (Phase 2 work) will terminate the influent pipelines and control wiring approximately 75 feet north of the GWTS building (Phase 4) located south of Ridgecrest Avenue. The piping will be capped, buried, and marked. A temporary flush-mounted handhole will be installed adjacent to the capped pipe. The control wiring from the well to the GWTS will include additional lengths coiled in the handhole for future extension and termination at the building

electrical/control panel during Phase 4. Final pipe and wire connections will be made by the GWTS building contractor during Phase 4 of this work.

2.3 Phase 3 – Groundwater Treatment System Equipment

A permanent GWTS will be installed on Kirtland AFB near the southeast corner of Ridgecrest Avenue and Perimeter Circle, west of Walker Street in the former Zia Park neighborhood. The Phase 3 task details the groundwater treatment equipment will be purchased for the initial 400-gpm treatment train that will be installed during Phase 4 (GWTS building), and to accommodate groundwater from the first four extraction wells. Ultimately, after installation of additional groundwater extraction wells (beyond the first four), the GWTS will be expanded to have the capacity to treat up to ,800 gpm of groundwater using two 400-gpm treatment trains. Each 400-gpm system will use carbon adsorption to decrease concentrations of EDB in the groundwater from an expected influent concentration of 0.5 to 1.5 micrograms per liter (µg/L) to below the U.S. Environmental Protection Agency drinking water maximum contaminant level of 0.050 µg/L. Based on recent sampling of the nearby groundwater monitoring well cluster (KAFB-106035, -106036, and -106037), the groundwater from the extraction well will not contain any other contaminants above their respective maximum contaminant levels or other regulatory criteria. All VOCs, other than EDB, are below detection limits, as are total petroleum hydrocarbons and dissolved metals.

Based on the plume maps and same well concentration trends, EDB is the only expected contaminant for this well. Groundwater modeling using data from Fourth Quarter 2014 indicates that manganese will reach a maximum concentration of approximately 40 µg/L after KAFB-106228 begins pumping, which is below the New Mexico Water Quality Control Commission limit of 200 µg/L. Additionally, regular monitoring samples will be analyzed for dissolved iron and manganese. If concentrations of iron and manganese are detected in exceedance of regulatory limits, then system operation will be stopped, and additional treatment equipment may be added. A BOD Addendum will be submitted detailing any additional equipment added to the system.

The GWTS will be designed and instrumented to efficiently operate 24 hours per day with minimal operator attention needed. The GWTS will be monitored and controlled by a PLC-based system (part of Phase 4) that will include telemetry and web access to alert operators to off-hour upset conditions, and to allow them to monitor the system. The GWTS building will be designed with a curbed floor that provides secondary containment for the treatment system equipment. A Process Flow Diagram for the GWTS is attached as Figure 2.Major components in each 400-gpm system include the following:

- Influent 6,000-gallon feed tank
- Carbon feed pumps
- Pre-treatment bag filters
- Activated carbon treatment vessels (2 in lead/lag configuration, 20,000 pounds each)
- Post-treatment bag filters
- 6,000-gallon treated water storage tank
- Discharge pump
- Air compressor for slurry carbon fill/exchange

The design of the treatment building includes space needed for possible additional treatment equipment. The design of the second train will be completed at a later date when the location and pumping rate of the additional groundwater extraction wells have been determined. If wells closer to the plume source area are installed, the second treatment system may require additional unit operations for removal of manganese, iron, and gasoline range hydrocarbons.

The GWTS feed tank is a 6,000-gallon storage tank that will receive untreated water from the well pump. It will be a flat-bottomed tank constructed of fiberglass-reinforced plastic or epoxy-coated carbon steel

and will be 10 feet in diameter. The treated water storage tank will be similar to the feed tank. Both tanks will be fitted with level switches and level-indication devices.

The feed pumps for the pre-filters and carbon beds are two identical centrifugal pumps sized for 200 gpm each. Having two smaller pumps will provide better turndown for the system while it is operating with just the first groundwater extraction well. They will be horizontal, American National Standards Institute-(ANSI-) style pumps with stainless steel wetted parts and mechanical seals. The feed pumps and the pre-filters will be purchased as a pre-piped, skid-mounted system that will include flow meters and other instruments. The flow from the pumps will be controlled by a variable frequency drive (VFD) controlling the speed of the pumps.

The pre-filters for the carbon beds will be two bag-filter housings piped in parallel. Each housing will hold six, 30-inch by 6-inch diameter filter bags rated at nominal 10-micron filtration. The post filters will be the same. The filter housings will be epoxy-coated carbon steel with stainless steel baskets. A davit support for the filter housing lid will be provided. The post-filters will be identical.

The two carbon adsorbers will be 10 feet in diameter and each can be loaded with 20,000 pounds of activated carbon. They will be constructed of epoxy-lined carbon steel and fitted with a common manifold that allows either bed to operate in the lead/lag position. Since the GWTS will initially be operated at 100 gpm, the groundwater flow distributors on the carbon beds will be designed to minimize channeling at low flow rates. Flow distributors and other internals in the carbon adsorbers will be constructed of stainless steel, not polyvinyl chloride.

The discharge pump is a single pump rated for 400 gpm. It will also be a horizontal ANSI -style centrifugal pump and have stainless steel wetted parts. The discharge pump skid will have similar instrumentation as the feed pump skid. The flow from the discharge pump will be controlled by a VFD controlling the speed of the pump.

Additional details of equipment layout within the GWTS building are detailed in Figure 3, Equipment Layout.

2.4 Phase 4 – Groundwater Treatment System Process Building and Infrastructure

The GWTS building will be a new single-story, free-standing 4,160-square foot (52 feet by 80 feet), non-sprinkled structure that will house the GWTS equipment identified in Phase 3. The structure will have a covered (16 feet by 80 feet) truck loading/unloading bay with a sloped concrete pad and secondary concrete containment sump pit with a traffic-rated metal grate spanning the entire length. The concrete containment sump is sized to contain the release of untreated water from a tanker truck. The building will have a control room attached to the main structure. Figures 4 and 5 depict architectural renderings of the building.

The building will be constructed of conventional reinforced concrete masonry block walls supporting an open-web, parallel chord steel bar joist roof framing with a metal roof deck, which will serve as a horizontal diaphragm to transfer lateral loading to the exterior bearing/shear walls. The floor slab will be constructed as a reinforced concrete slab-on-grade with isolated spread footings provided as necessary to support the carbon beds and water tanks. The slab will be designed to accommodate American Association of State Highway and Transportation Officials vehicle and/or fork-truck traffic/loading as well as loading from miscellaneous totes and equipment. The building structure will be designed for containment as required by the governing building code provisions. The roof structure will be flat with positive drainage achieved by the use of built-up insulation creating a mono-slope condition to one side of the building, and drainage achieved using roof scuppers with downspouts. The eave height of the building (i.e., maximum joist-bearing elevation) is assumed not to exceed 23 feet, 4 inches above the finished

floor, based on the height of the selected GWTS (Phase 3) and clearances required. A parapet will extend above the roof bearing such that the top of masonry is 28 feet, 8 inches above the finish floor elevation around the entire perimeter of the structure. Stormwater runoff from the building, and surrounding drive and parking will be diverted to the existing Kirtland AFB storm water collection system. Figure 6 shows the building orientation and improvements around the building.

The building will require tanker unloading of granular activated carbon that is used in the carbon beds. The carbon will be transferred from the delivery tankers and the carbon beds as water slurry. Fill and discharge hoses will be connected from the tanker to the carbon vessels through penetrations or doorways in the wall. A covered area outside the building will be used to park the tanker during loading operations. The attached open-air truck-loading/unloading area will be covered with a roof structure comprised of open-web, steel bar joists with a structural metal roof deck bearing on the outside wall of the building, and structural steel beams supported by steel columns on the opposite end. This area will include a concrete apron that will slope to a containment trench designed to capture approximately 5,000 gallons of liquid in the event of a spill during loading/unloading activities.

The foundation system will include shallow, continuous and isolated spread footings bearing on suitable native soil or engineered fill as determined by geotechnical analysis. The slab-on-grade construction will bear on a compacted gravel sub-base as determined by geotechnical analysis. Intermediate or deep foundation systems such as a raft or mat foundation is not included as part of the scope for this building. A curb inside the building or integral to the wall will be poured and sealed to act as secondary containment. The containment will be able to hold the liquid volume of the largest vessel in the facility if a pipe/tank should rupture.

Kirtland AFB personnel have stated that existing piping at the former Zia Park housing area may contain asbestos. The influent pipeline, treatment building foundation, and effluent pipeline may encounter this piping during construction. A competent person will be on-site during construction activities to provide oversight and ensure that activities are halted if asbestos is encountered. A certified asbestos removal subcontractor will then be used to remove the friable or non-friable pipeline as needed and dispose of it properly.

The groundwater treatment system equipment, purchased in Phase 3, will be installed during Phase 4. Only one treatment train sized for 400 gpm will be installed at this time. The floor plan of the building (Figure 3) allows the current and future tanks and equipment to be transported into the building and lifted into their respective place. All interconnecting piping, pipe supports, valves, sample ports, and instrumentation for one 400-gpm system will be installed during this phase. Where applicable, piping blind flanges/caps, floor space, and electrical capacity will be installed to reduce redundant efforts when the second 400-gpm system is installed at a later date.

A PLC will be housed in the GWTS building as part of Phase 4. The PLC will integrate all control and feedback systems from the well to the infiltration gallery. These systems include, but are not limited to, GWTS equipment instrumentation, leak detection, well vault, and infiltration gallery instrumentation. Additional safety interlocks will be installed at the building and programmed in the PLC, including a high-high level switch in the building sump, and controls described in Phases 2 and 5. When high-high level, leak detection, or other safety interlocks are activated, a signal will shut down the extraction well pump at KAFB-106228 and GWTS equipment.

The building will be heated to 50 degrees Fahrenheit (°F) and ventilated with exhaust fans. The heating system will prevent freezing of pipelines, and the location of control/electrical equipment will be acceptable for proper electrical component operation. Additional cooling/heating equipment will be implemented for the control room as those requirements develop during design. Power required for the building will be a 480-volt, three-phase service. Subject to final KAFB and USACE direction, electrical service will be supplied by demolishing an existing handhole east of Pennsylvania Street and installing a

PMH-9 pad-mounted sectionalizer and tapping into the existing 12470 volt service line. Two lengths of 5-inch HDPE conduit will be directionally drilled under Pennsylvania Street to the west. Once beyond Pennsylvania Street, two runs of 5-inch schedule 40, Polyvinyl Chloride (PVC) conduit will be begin and extend underground to Walker Street in Zia Park by means of open-cut excavation. One other road crossing across San Pablo Street will include directional drilling underneath with 5-inch HDPE conduit. Five (5) additional PMH-9 sectionalizers will be installed at increments of approximately 500 feet along the conduit path. A # 4/0 American Wire Gauge (AWG) copper service line will be installed in one run of conduit making terminations at each sectionalizer. An underground service line from the sectionalizer at Walker Street will be installed to feed a 500 kVA transformer located east of treatment building. This line will be directionally drilled utilizing 5-inch HDPE conduit, and #1/0 AWG copper line. Underground cable will connect the transformer to the main disconnect panel in the GWTS building utilizing directly buried schedule 40 PVC conduit and cable runs sized per the load requirements of the building. The electrical service panel in the building will contain breakers and motor starters or VFDs for the first 400-gpm train of the treatment system, and will have room for the second treatment train. Final electrical design and specifications will be documented in the as-built reports.

Additional utilities include a non-potable water connection from the Kirtland AFB water distribution for general wash-down and carbon slurry fill operations. One hose bibb (hydrant style connector) should be available outside the facility for personnel to fill water trucks with treated water for dust control. A new fire water line and fire hydrant are to be installed from the nearest, assumed location (south of electrical substation 10 on Randolph Ave). The new fire water line is to be installed by trenching through Zia Park and across all existing roadways. The trenching will be backfilled and seeded to match existing conditions, while the roads will be re-paved to match existing conditions at the locations of the trenching. The fire hydrant will be installed within the site parameters of the building location and will meet all Kirtland AFB standards/ requirements. A communication line will be buried from nearby splice box (location to be determined by Kirtland AFB) to the treatment building. The communication line will be used to transmit a fire alarm signal in the building to the base-specified terminal. Trenching, backfilling, and compaction will be completed according to COA standard specification. The top of pipe will be buried 36 inches below finished grade. The plastic pipe will be bedded in sand, and the trench will be backfilled with native soil.

The influent and effluent piping described in Phases 2 and 5 will terminate approximately 75 feet north and south of the building, respectively. The work described in Phase 4 includes making final connections of piping and electrical/control wiring at the described transition locations. The coiled control/electrical wiring will terminate at the appropriate panels and final fusing of influent and effluent HDPE pipelines in order to integrate the GWTS from the well (KAFB-106228) and the effluent pipeline leading to the infiltration gallery. The Utility Routing Plan included as Figure 7 details locations of connection integration.

2.5 Phase 5 – Effluent Pipeline and Discharge to Tijeras Arroyo Golf Course

The current plan for discharge of the treated water is to pump through a partially new and existing force main to the Tijeras Arroyo Golf Course Pond. The base currently has a force main that brings water from well KAFB -7 to the golf course pond. A discharge pipeline will be installed from the treatment system and tap into the existing force main from KAFB-7. The discharge pipe will be single-wall HDPE pipe buried 36 inches below the finished grade and sized to allow discharge of 800 gpm from the GWTS to the golf course pond. Discharge of treated water is being evaluated and may include infiltration trenches near the golf course.

This phase begins approximately 75 feet south of the GWTS building. The discharge pipeline will be capped, buried, and marked at this location. A high-high level switch will be installed at the golf course pond to prevent overfilling. Upon activation, the switch will send a signal through radio telemetry to the

treatment system building, thus shutting down the discharge pump.. Final pipe connections to the treatment plant will be made during Phase 4 of this work.

The route of the pipeline is shown on Figure 1. The discharge pipeline will include open-cut trenching and HDD methods. High-traffic road crossings and sensitive utility crossings will implement HDD as the method of installation, as shown on Figure 1. Trenching, backfilling, and compaction will be performed according to COA and Kirtland AFB standard specifications. Buried pipe will be bedded in sand, and the trench will be backfilled with native soil.

2.6 References

NMED. 2013. *20.7.3 New Mexico Administrative Code, Liquid Environmental Protection, Wastewater and Water Supply Facilities, Waste Disposal and Treatment*, September.

USACE. 2015a. *Groundwater Extraction Pilot Implementation and Additional Plume Characterization Letter Work Plan Addendum #2*, January.

USACE. 2015b. *Groundwater Extraction Well KAFB-106228 Aquifer Pilot-Test Work Plan*, March.

USACE. 2015c. *Groundwater Extraction Pilot Implementation and Additional Plume Characterization Letter Work Plan Addendum #3*, March.

3. CODES AND STANDARDS

Specific building and design requirements are listed in this section.

- Jurisdictional Authority for off-base construction will be COA planning/permits division.
- Jurisdictional Authority for on-base construction will be Kirtland AFB.
- Transition to and under base fence line will be approved through COA and Kirtland AFB.

Building requirements for structures on Kirtland AFB are as follows:

- Architectural Compatibility Plan, Kirtland AFB
- U.S. Air Force, 377th Civil Engineer Division, 2014, General Design Standards, Civil Engineer Services
- Unified Facilities Criteria UFC 1-200-01, 2013, "General Building Requirements"
- International Code Council, International Building Code IBC 2012
- Leadership in Energy and Environmental Design (LEED) Standards: Engineering Technical Letter ETL 08-13 – Utility Structure (7 Credit Points to be met for structure)
- Energy Independence and Security Act, Section 438

Additional guidance will be referenced from the following:

- New Mexico Administrative Code, Title 20, *Environmental Protection*, Chapter 7, "Wastewater and Water Supply Facilities," Part 3, "Liquid Waste Disposal and Treatment"

- New Mexico Administrative Code, Title 20, *Environmental Protection*, Chapter 6, "Water Quality," Part 2, "Ground and Surface Water Protection"
- High Performance and Sustainable Buildings
- City of Albuquerque, 2011, "Standard Specifications for Public Works Construction"
- Endangered Species Act (burrowing owl)
- National Historic Preservation Act, Cultural Resources Section 106

4. SITE-SPECIFIC DESIGN ASSUMPTIONS

4.1 Equipment and Component Requirements

- The electrical area classification is "unclassified."
- Aboveground piping materials of construction – ASTM International 53 Carbon Steel (at treatment building).
- Belowground piping materials of construction – PE4710 HDPE.
- Installation of piping along the unnamed alley and directional-drilling under Louisiana Boulevard will not encounter significant utility obstructions.
- An infiltration test will be performed at the infiltration gallery site. These data will be used in the design of the infiltration gallery.
- A Geotechnical Report will be produced by a third party, so that the treatment facility building foundation design can be completed.
- Equipment dimensions, and weights and anchorage, specifications will be required from equipment providers for proper slab/foundation design.

4.2 Ambient Conditions

The following information will be used in the system design:

- Maximum outdoor design temperature: 100°F
- Minimum outdoor design temperature: 10°F
- Plant ambient pressure: 5,385 feet above mean sea level
- Slab-On-Grade/Pavement design = American Association of State Highway and Transportation Officials HS20-44 or 3,000-pound load acting on a 4.5-inch by 4.5-inch area or 125 pounds per square foot or Mitsubishi model FD55N, pneumatic tire forklift truck with a maximum lift capacity of 12,000 pounds

- Environmental Loading as per Unified Facilities Criteria UFC 3-301-01, "Structural Engineering," May 2014

    a. Ground Snow = 10 pounds per square foot

    b. Frost Penetration Depth = 18 inches minimum, pending more stringent geotechnical requirements

    c. Wind Speed = 115 miles per hour (Risk Category II)

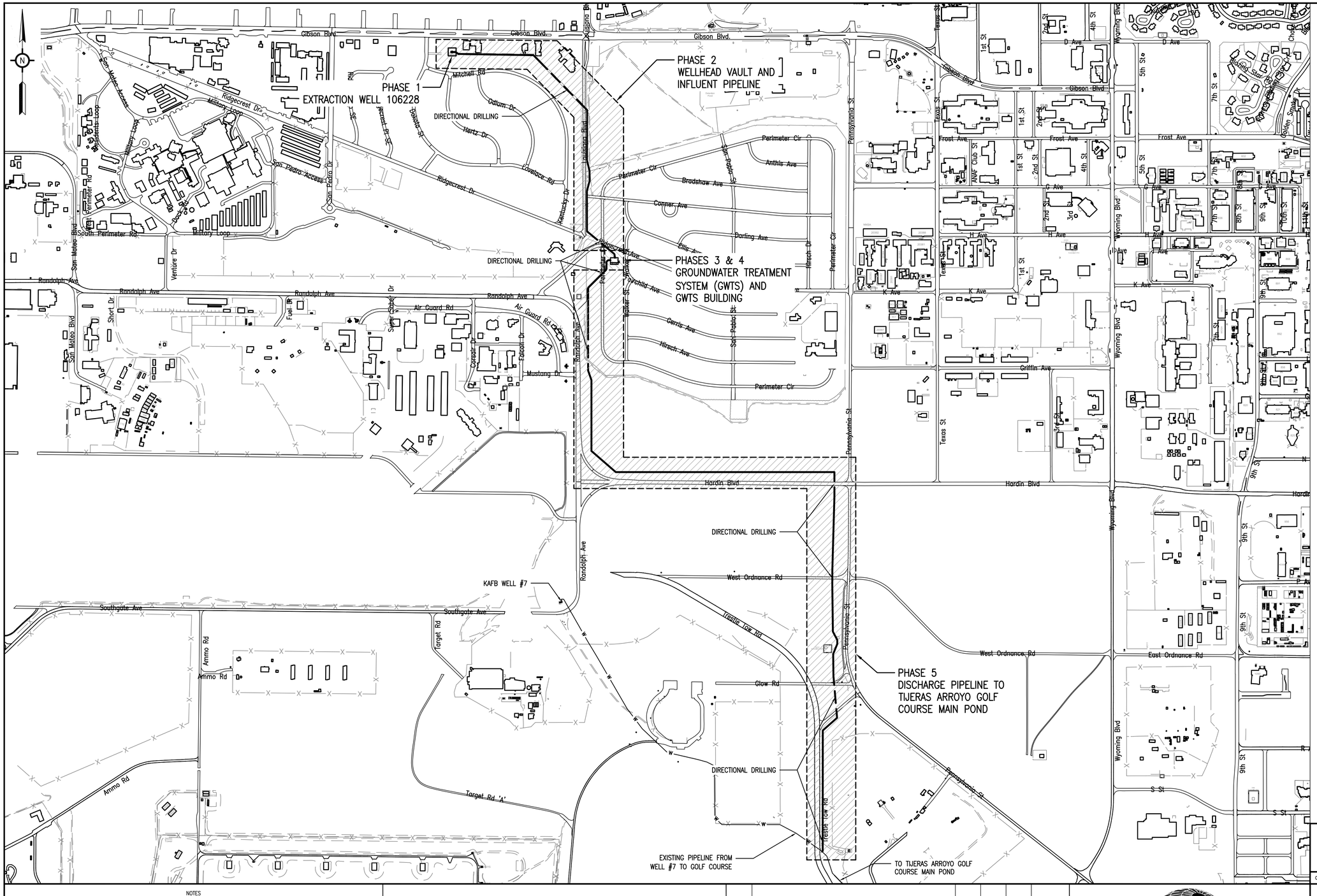
    d. Seismic Design Criteria: Ss = 47 percent of gravity (0.47g), S1 = 14 percent of gravity (0.14g)

4.3 Utility Sourcing

The off base well vault will source power from a local three-phase electrical pole nearby in the unnamed alley.

Power for the GWTS building will be sourced from an underground 12470 volt, three-phase line near the corner of Pennsylvania Street and K Avenue, pending final direction from USACE and KAFB (Figure 7). Water supply for the building and fire hydrant line will be a non-looped, single tap at a main line on the intersection of Ridgecrest Avenue and Randolph Avenue. A communication line will be installed from the treatment building to a nearby splice box (location to be determined by Kirtland AFB). Figure 7 shows the proposed locations of utility drops/connections.

FIGURES



LEGEND:

- BUILDING (SIZE AND SHAPE VARIES)
- ROAD
- FENCE
- BURIED PIPE (OPEN-CUT EXCAVATION)
- BURIED PIPE (HORIZONTAL DIRECTIONAL DRILLING)
- PHASE DELINEATION
- WATER LINE

0 2 4 6 8 1000ft

ORIGINAL SCALE 1"=500'-0"

PROFESSIONAL SEAL

U.S. ARMY CORPS OF ENGINEERS
ALBUQUERQUE DISTRICT
ALBUQUERQUE, NEW MEXICO

CB&I FEDERAL SERVICES LLC
312 DIRECTORS DRIVE
KNOXVILLE, TENNESSEE 37923
865-690-3211

CLIENT DWG NO:

NOTES

NO.	REVISION	DRAWN	CK'D	APPD	DATE

REFERENCE DRAWINGS

DRAWN: CFB | CK'D: | APPD: | DATE: 05/26/15 | SCALE: 1" = 500'

FIGURE 1 – OVERALL SITE PLAN
BASIS OF DESIGN
MID-PLUME PUMP & TREAT SYSTEM

FOR: BULK FUELS FACILITY, KIRTLAND AFB, NM

PROJECT NO: 140705 | DWG NO: 140705-001-CV-03-BOD001 | REV:

File: 140705-001-CV-03-BOD001.DWG
Plot Date/Time: May 27, 2015 - 12:16pm
Plotted By: charles.bentley

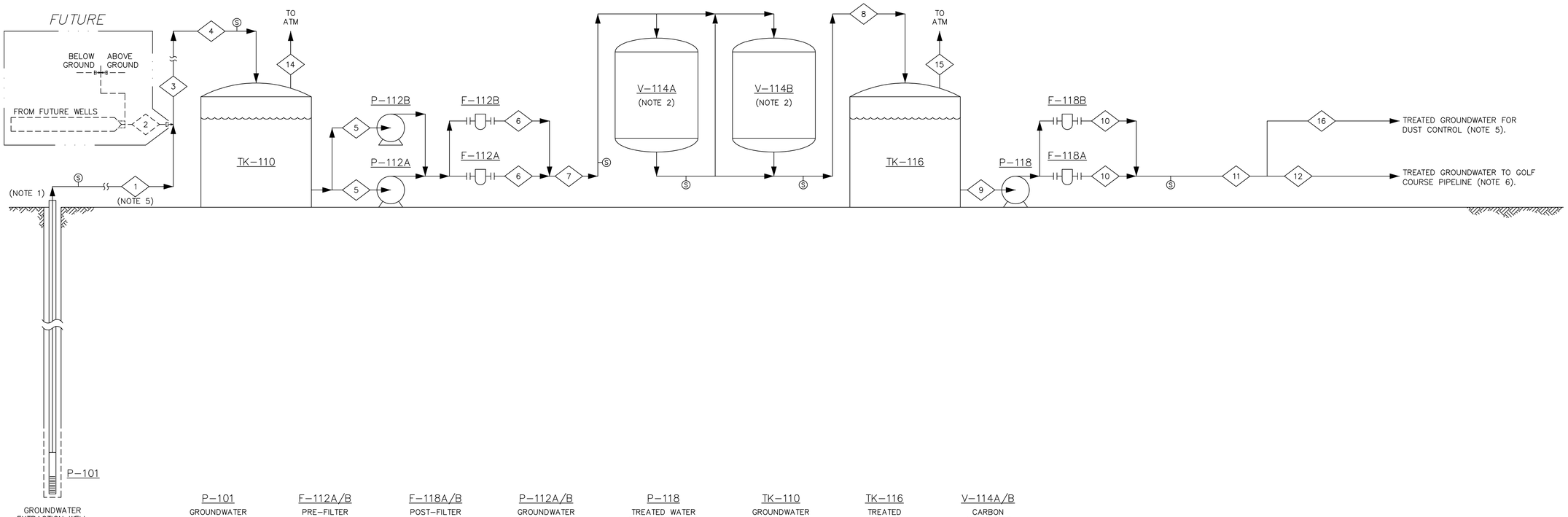
Form: CMS-830-00-FM-02104 CBI ANSI D.dwg

NOTES:

1. PIPELINE FROM GROUNDWATER WELL KAFB–106228 IS DOUBLE–WALLED HDPE PIPE.
2. CARBON VESSELS ARE RUN IN SERIES WITH OPTIONAL VALVING FOR PARALLEL AND LEAD/LAG CONFIGURATION.
3. BASED ON RECENT ANALYTICAL DATA FROM GROUNDWATER MONITORING WELLS KAFB–106035, 106036, AND 106037, EDB IN EXTRACTED GROUNDWATER IS EXPECTED TO BE BETWEEN 0.5 UG/L AND 1.0 UG/L. DESIGN INLET EDB CONCENTRATION IS 2 UG/L.
4. TREATED GROUNDWATER WILL BE BELOW THE EPA MCL OF 0.05 UG/L (LT 0.05) FOR EDB.
5. TREATED WATER CONNECTION FOR DUST CONTROL. INTERMITTENT FLOW.
6. TREATED GROUNDWATER WILL BE PUMPED THROUGH AN EXISTING PIPELINE TO THE MAIN POND OF THE TIJERAS ARROYO GOLF COURSE.

LEGEND:

Ⓢ – SAMPLE PORT



P–101	GROUNDWATER PUMP 100 GPM	F–112A/B	PRE–FILTER
F–118A/B	POST–FILTER	P–112A/B	GROUNDWATER TREATMENT FEED PUMP
P–118	TREATED WATER DISCHARGE PUMP	TK–110	GROUNDWATER TREATMENT FEED TANK
TK–116	TREATED WATER STORAGE TANK	V–114A/B	CARBON ADSORBERS

STREAM NO. / COMPONENT		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
		KAFB–106228 TO GWTS	FUTURE WELLS TO GWTS	WELL FIELD TO GWTS	INFLUENT TO FEED TANK	GWTS FEED PUMPS	PRE–FILTER	CARBON ABSORPTION INLET	TREATED WATER	DISCHARGE PUMP	POST–FILTER	TREATED GROUNDWATER	TREATED GROUNDWATER		GROUNDWATER TREATMENT FEED TANK VENT	TREATED WATER STORAGE TANK VENT	TREATED WATER TO DUST CONTROL CONNECTION		
LIQUID FLOW (DESIGN)	gpm		300	400	400	200	400	400	400	400	400	400	400				100 (NOTE 4)		
LIQUID FLOW (average)	gpm	100																	
AIR FLOW	acfm (scfm)																		
ETHYLENE DIBROMIDE (EDB) (NOTE 3,4)	ug/L	2	2	2	2	2	2	2	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05						
PRESSURE	psig (ATM)	25	25	25	25	5	25	25	25	5	25	25	25		(12.05)	(12.05)			
TEMPERATURE	°F	58	58	58	58	58	58	58	58	58	58	58	58		68	68			
DENSITY (AT 70°F)	lb/ft³	62.4	62.4	62.4	62.4	62.4	62.4	62.4	62.4	62.4	62.4	62.4	62.4		0.061	0.061			

NOTES

REFERENCE DRAWINGS

NO.	REVISION	DRAWN	CK'D	APPD	DATE
1	ISSUED FOR BASIS OF DESIGN	EGA	SES	BAH	05/27/15

DRAWN: EGA | CK'D: SES | APPD: BAH | DATE: 05/27/15 | SCALE: NONE

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ALBUQUERQUE, NEW MEXICO

CB&I FEDERAL SERVICES LLC
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865-690-3211

CLIENT DWG NO:

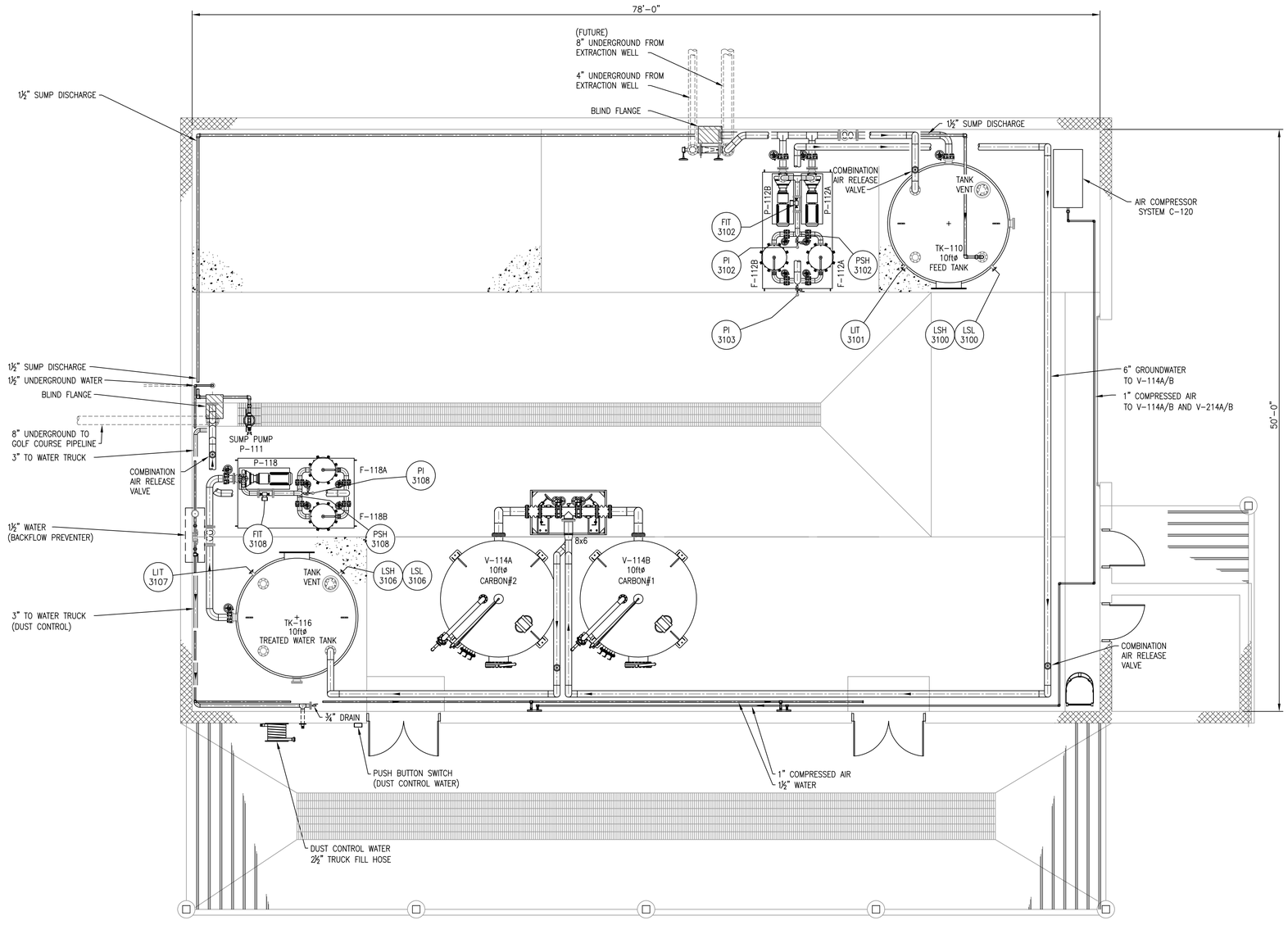
FIGURE 2 – PROCESS FLOW DIAGRAM
BASIS OF DESIGN SUBMITTAL
PHASE IV MID–PLUME PUMP & TREAT SYSTEM

FOR: BULK FUELS FACILITY, KIRTLAND AFB, NM

PROJECT NO: 140705 | DWG NO: 140705–001–PR–01–B0D002 | REV: 1

File: 140705-001-PR-01-B0D002.dwg
Plot Date/Time: May 27, 2015 – 4:00pm
Plotted By: mark.lawson

Form: CMS–830–00–FM–02104 CBI ANSI D.dwg



MECHANICAL EQUIPMENT PLAN

SCALE: 3/16" = 1'-0"

1 0 2 4 6 8 10 12ft

ORIGINAL SCALE 3/16"=1'-0"

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ALBUQUERQUE, NEW MEXICO

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312 DIRECTORS DRIVE
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865-690-3211

CLIENT DWG NO:

NOTES

NO.	REVISION	DRAWN	CK'D	APPD	DATE
0	ISSUED FOR FINAL BASIS OF DESIGN	MFL	DWB	BAH	05/26/15

REFERENCE DRAWINGS

DRAWN: MFL | CK'D: DWB | APPD: BAH | DATE: 05/26/15 | SCALE: 3/16"=1'-0"

FIGURE 3 – EQUIPMENT LAYOUT
BASIS OF DESIGN
PHASE IV MID-PLUME PUMP & TREAT SYSTEM

FOR: BULK FUELS FACILITY, KIRTLAND AFB, NM

PROJECT NO: 140705 | DWG NO: 140705-001-CA-02-B0D003 | REV: 0

File: 140705-001-CA-02-B0D003.dwg
Plot Date/Time: May 26, 2015 - 1:55pm
Plotted By: mark.lawson

Form: CMS-830-00-FM-02104 CB ANSI D.dwg

PROPOSED RENDERING: SOUTH-EAST CORNER

PROPOSED RENDERING: NORTH-EAST CORNER

NOTES

REFERENCE DRAWINGS	NO.	REVISION	DRAWN	CK'D	APPD	DATE

DRAWN: | CK'D: | APPD: | DATE: 12/17/14 | SCALE:

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

CLIENT DWG NO:

FIGURE 4 – ARCHITECTURAL RENDERING
BASIS OF DESIGN
MID-PLUME PUMP & TREAT SYSTEM

FOR: BULK FUELS FACILITY, KIRTLAND AFB, NM

PROJECT NO: 140705 | DWG NO: 140705-001-CA-02-BOD004 | REV:

Form: CMS-830-00-FM-02104 CBI ANSI D.dwg

File: 140705-001-CA-02-BOD004.dwg
Plot Date/Time: Dec 17, 2014 - 11:10am
Plotted By: charles.bentley

PROPOSED RENDERING: NORTH-WEST CORNER

PROPOSED RENDERING: SOUTH-WEST CORNER

NOTES	REFERENCE DRAWINGS	NO.	REVISION	DRAWN	CK'D	APPD	DATE

DRAWN: | CK'D: | APPD: | DATE: 12/17/14 | SCALE:

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CLIENT DWG NO:

FIGURE 5 – ARCHITECTURAL RENDERING
BASIS OF DESIGN
MID–PLUME PUMP & TREAT SYSTEM

FOR: BULK FUELS FACILITY, KIRTLAND AFB, NM

PROJECT NO: 140705 | DWG NO: 140705–001–CA–02–BOD005 | REV:

File: 140705-001-CA-02-BOD005.dwg
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Plotted By: charles.bentley

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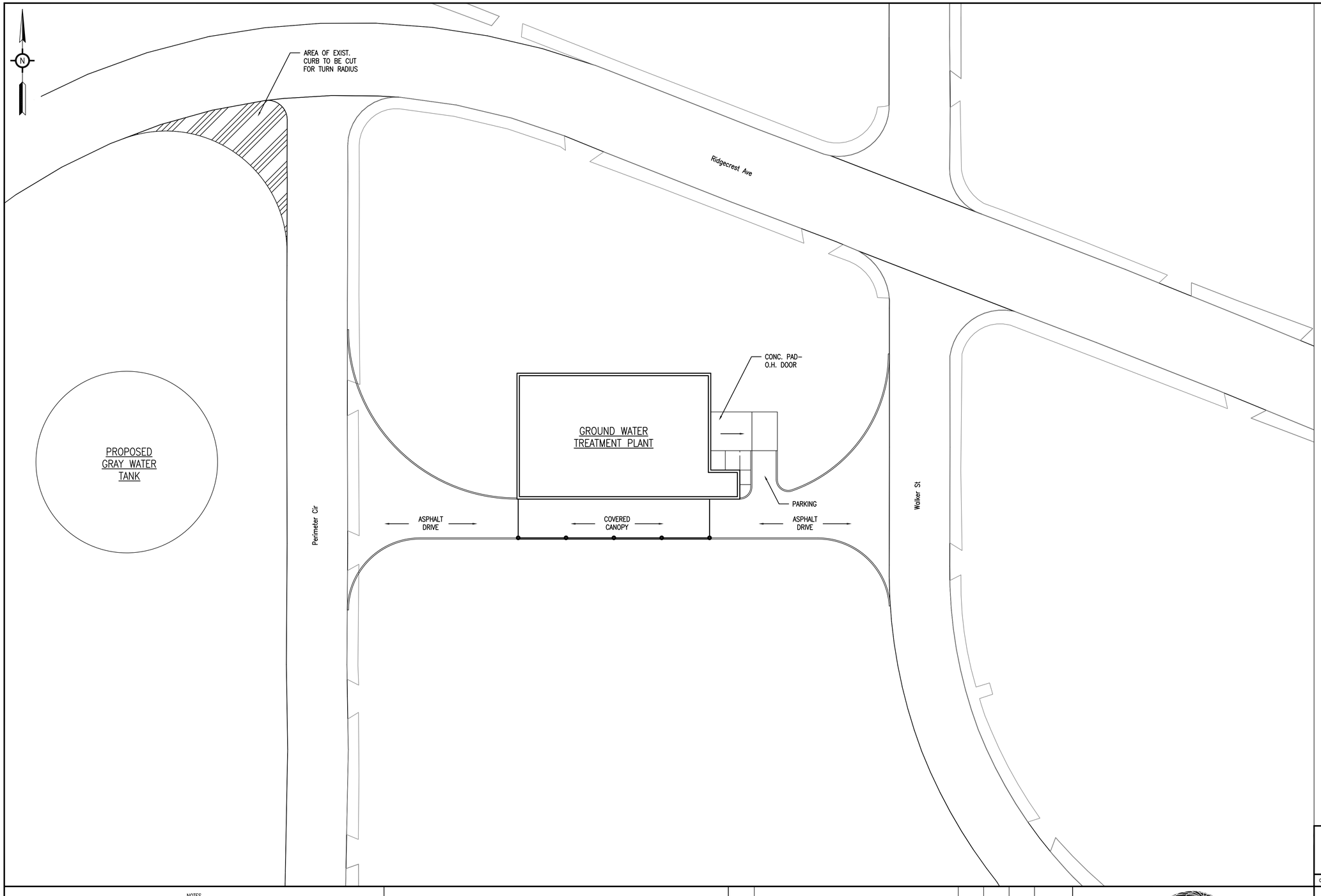

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CLIENT DWG NO:

NOTES

REFERENCE DRAWINGS	NO.	REVISION	DRAWN	CK'D	APPD	DATE

DRAWN: CFB | CK'D: | APPD: | DATE: 12/17/14 | SCALE: 1" = 20'

FIGURE 6 – ARCHITECTURAL SITE PLAN
BASIS OF DESIGN
MID–PLUME PUMP & TREAT SYSTEM

FOR: BULK FUELS FACILITY, KIRTLAND AFB, NM

PROJECT NO: 140705 | DWG NO: 140705–001–CA–02–BOD006 | REV:

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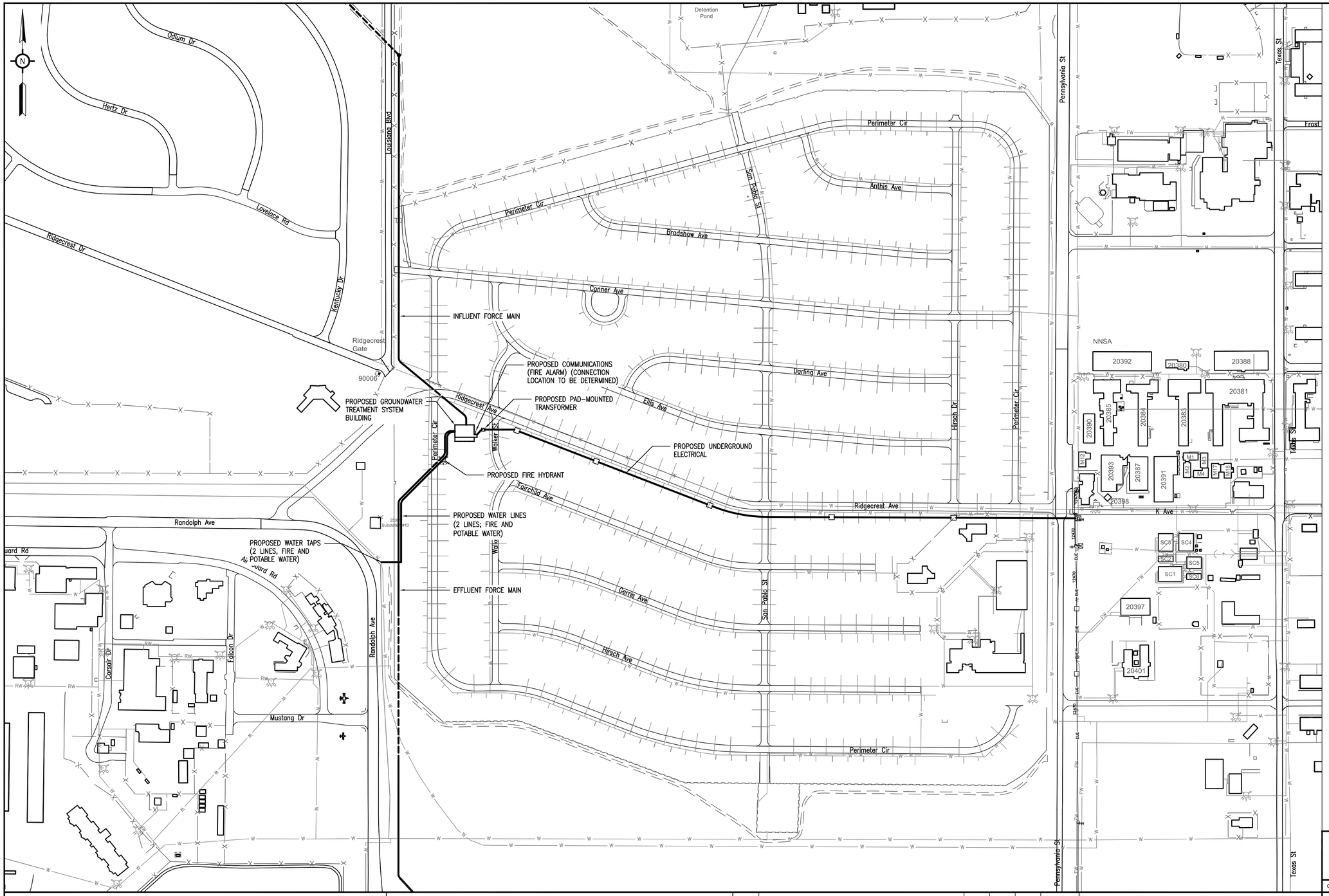
Plotted By: charles.bentley

Form: CMS-830-00-FM-02104 CB! ANSI D.dwg



LEGEND:

- BUILDING (SIZE AND SHAPE VARIES)
- ROAD
- FENCE
- BURIED PIPE (OPEN-CUT EXCAVATION)
- BURIED PIPE (HORIZONTAL DIRECTIONAL DRILLING)

0 1 2 3 4 500ft

ORIGINAL SCALE 1"=200'-0"

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CLIENT DWG NO:

NOTES

REFERENCE DRAWINGS	NO.	REVISION	DRAWN	CK'D	APPD	DATE

DRAWN: CFB | CK'D: | APPD: | DATE: 12/17/14 | SCALE: 1" = 400'

FIGURE 7 – UTILITY ROUTING PLAN
BASIS OF DESIGN
MID-PLUME PUMP & TREAT SYSTEM

FOR: BULK FUELS FACILITY, KIRTLAND AFB, NM

PROJECT NO: 140705 | DWG NO: 140705-001-CV-03-BOD007 | REV:

File: 140705-001-CV-03-BOD007.DWG
Plot Date/Time: Dec 18, 2014 - 1:05pm
Plotted By: charles.bentley

Form: CMS-830-00-FM-02104 CBI ANSI D.dwg

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www.CBI.com

May 28~~March 20~~, 2015

Subject: ~~**Kirtland Air Force Base –**~~ **Revised Final Basis of Design – Mid-Plume Pump and Treat System, Kirtland Air Force Base Bulk Fuel Facility, New Mexico**

1. INTRODUCTION

As part of an Interim Measure for remediation of the off-base portion of the dissolved phase ethylene dibromide (EDB; a fuel additive) groundwater plume, CB&I Federal Services LLC (CB&I) has been tasked to complete a detailed design for a groundwater extraction well, pipeline, treatment, and discharge system to be constructed on or near Kirtland Air Force Base (AFB), Albuquerque, New Mexico. This Basis of Design (BOD) describes the technical approach planned for the project and the design parameters that will be used. The full system is ultimately expected to be designed to extract and treat up to 800 gallons per minute (gpm) of groundwater, which will require installation of several new groundwater extraction wells in the dissolved EDB plume. Groundwater will be pumped from wells located to the west of the base to a treatment facility located on base, treated to remove EDB and any other contaminants exceeding regulatory standards.

The initial steps in this Interim Measure that are described in this BOD are the installation and operation of the first extraction well designed to pump 100 gpm, an influent pipeline, site improvements and infrastructure (including a building) sized for the eventual capacity of 800 gpm, a groundwater treatment system sized for 400 gpm, and a discharge pipeline that~~pipelinethat~~ will connect to an existing line that will carry the treated water to the main pond of the Tijeras Arroyo Golf Course on Kirtland AFB~~KAFB~~. The initial groundwater extraction well will be installed near Gibson Avenue where groundwater exceeds criteria for only EDB. The initial treatment system will use carbon adsorption to remove EDB. Final system design will be detailed in As-Built reports submitted to New Mexico Environment Department~~NMED~~.

Additionally, a temporary groundwater treatment system is to be installed in accordance with the New Mexico Environment Department~~NMED~~ approved Groundwater Extraction Pilot Implementation and Additional Plume Characterization Letter Work Plan Addendum #2 (U.S. Army Corps of Engineers [USACE], 2015a~~, 2015~~). This temporary system will incorporate portions of the full pump and treat system outlined in this Basis of Design document, and is anticipated to begin operation by June 30, 2015. Additional details regarding the design of the temporary treatment system are included in the Groundwater Extraction Well KAFB-16228 Aquifer Pilot-Test Work Plan (USACE, 2015b~~2015~~).

2. DESIGN CRITERIA

A groundwater extraction well (Kirtland AFB [KAFB]-106228), well vault, and influent pipeline will be installed on City of Albuquerque (COA) or Christ United Methodist Church (CUMC) property. A portion of the influent pipeline, the groundwater treatment system (GWTS) and building, effluent pipeline, and infiltration gallery will be installed on Kirtland AFB. Off-base design and construction will be coordinated with COA. This design basis has been divided into five phases. The phases are as follows:

- Phase 1 – Groundwater extraction well KAFB-106228
- Phase 2 – Wellhead vault and influent pipeline
- Phase 3 – GWTS equipment
- Phase 4 – GWTS process building and infrastructure
- Phase 5 – Effluent pipeline for treated water

CB&I will procure subcontractors to construct and supply the requirements of each phase. CB&I will coordinate and provide oversight of each phase from design through construction. The phases are described in the following sections.

2.1 Phase 1 – Groundwater Extraction Well KAFB-106228

An extraction well will be installed on CUMC property at 6200 Gibson Boulevard SE. At this location, the groundwater level is approximately 460 feet below ground surface. The extraction well will be 8 inches in diameter and screened from 20 feet above the water table to approximately 80 feet below the water table to capture the dissolved-phase EDB plume. The well will be fitted with a submersible well pump (480-volt, three-phase) capable of pumping a nominal flow rate of 100 gpm. A motor actuated control valve will be installed in the well vault (Phase 2) to regulate the groundwater extraction rate. The groundwater extraction rate will be controlled based on water level in the well (approximately 30 feet of drawdown) or to deliver a set flowrate. Continuous feedback of well water level from a level transducer will be recorded into the programmable logic controller (PLC) at the groundwater treatment plant (Phase 4). A secondary system will be implemented to shut down the pump during low-water level conditions. An overall site plan is included as Figure 1 to detail the well location. This extraction well will become part of the permanent pump & treat system, but will be installed in time to meet the June 30, 2015 scheduled date for startup of the temporary system.

2.2 Phase 2 – Wellhead Vault and Influent Pipeline

The well vault will be installed to house and protect the wellhead (KAFB-106228), plumbing, fittings, and remote instrumentation necessary for extraction well operation and monitoring. The low profile, lockable well vault will be concrete constructed with H-20 traffic-rated cover, and flush-mounted with the existing grade. After completion, the installation will allow unimpeded truck and automobile traffic through the church parking lot. The well vault will be constructed with a concrete collar for protection. This wellhead vault will become part of the permanent pump & treat system, but will be installed in time to meet the June 30, 2015 scheduled date for startup of the temporary system.

Instruments and controls within the well vault include pump controls, flow and well level instrumentation, and leak-monitoring devices. These components will be connected to the GWTS control panel on Kirtland AFB by a control cable buried in the trench with the groundwater pipeline. Additionally, pressure and temperature indication will be present at the well vault, as well as a sample port for pre-treatment groundwater sample collection. An automated control valve at the wellhead will be used to regulate groundwater flow rate and pressure, as described above.

Electrical power will be sourced from nearby Power New Mexico (PNM) overhead lines. The required power for the well pump operation will be provided from overhead lines in the vicinity of the well vault following COA and PNM standard specifications. The existing single-phased overhead line in the alley will be upgraded to three-phase power, and will be extended to one pole west of the wellhead vault by using the existing overhead system (upgrading poles as needed). The nearest pole to the wellhead will be equipped with a poletop three-phase transformer that feeds 480-volt, three-phase power routed a short distance underground to an above-grade rack. The rack will be located on CUMC property and will be protected by bollards and/or fencing. The rack will secure a 200-ampere line disconnect switch, service meter (provided by PNM), service entrance disconnect, pump motor starter and control components, and a small power–supply transformer for instruments and other 120-volt devices. The panels will be

lockable. Power from the panel will be routed underground to the wellhead vault to power the well pump and instruments. Control wiring for the well pump and other well instrumentation will be installed in conduit alongside the pipeline from the wellhead to the treatment plant. All controls will be fed to the main control panel in the GWTS building. An electrical splice box will be located at the on-base valve vault in order to provide control connections to the temporary treatment system.

The influent pipeline from the wellhead onto base property will be a single run with a 4-inch inner pipe and an 8-inch outer containment pipe. This pipeline will be installed by a combination of horizontal directional drilling (HDD) and trenching under the unnamed COA–owned alley, and under Louisiana Boulevard to a valve vault on Kirtland AFB. The influent pipeline will be underground to prevent any possible freezing of the pipeline, as well as to prevent tampering of the pipeline. Once on Kirtland AFB property, the pipeline will be placed in a trench along the Kirtland AFB fence line to the treatment plant. The valve vault will serve as a below-grade point for leak monitoring and low-point drains. Pits will be excavated at each boring point for HDD equipment. The number of pits will be determined based on location of underground and above ground utilities, aboveground facilities, and maximum pipe pull allowances. Although the well will be pumping at 100 gpm during operation, the maximum~~The~~ capacity of the influent pipeline will be 200gpm to allow for aquifer testing~~100gpm~~.
Approximately 1,600 linear feet (LF) of pipe will be located under the alley on COA property and 1,600 LF inside the Kirtland AFB fence line from the valve vault to the treatment plant.~~.~~ The on-base trench will be located as close as practical to the base fenceline allowing for access in a bladed service road next to the fence. The trench will follow the fence line south to the GWTS located at the southeast quadrant of the intersection of Perimeter Circle and Ridgecrest Avenue. Figure 1, the Overall Site Plan, shows the well vault and pipeline locations. Final pipe routing has been coordinated with Kirtland AFB Civil Engineering.

The influent pipeline will be constructed using a double–wall high-density polyethylene (HDPE) piping system for containment of the contaminated groundwater. Pipe lengths will be joined by heat fusion. The first pipeline will be sized for a minimum flow rate of 100 gpm and maximum flow rate of 200 gpm, and will service the proposed extraction well (KAFB-106228). This proposed pipeline will be fitted with automated leak monitoring of the pipeline annular space at a low point drain located in the well vault, and at an inspection port and manhole where the proposed pipelines will enter Kirtland AFB. Future wells and connecting pipelines are to be located at a later date and not included in this BOD. Additional piping will be required to transport groundwater from the northern half of the EDB plume to the treatment plant, but are not included in this BOD.

Trenching, backfilling, and compaction will be completed according to COA standard specification. The top of pipe will be buried 36 inches below finished grade. The plastic pipe will be bedded in sand, and the trench will be backfilled with native soil. All buried piping and conduit will maintain COA minimum separation requirements.

HDD will be used at two road crossings for the pipeline. The first road crossing involves drilling under Louisiana Boulevard from COA property to Kirtland AFB. The road crossing will be constructed near the end of the unnamed alley to a valve vault located on Kirtland AFB. The precast, shallow valve vault will be set approximately 5 feet below grade (base and flat top) and will be flush mounted with ground surface. The first road crossing is estimated to be 150 LF for the dual-containment piping (4-inch carrier, 8-inch containment), and a conduit for the control cable. The second road crossing will be on base, under the intersection of Perimeter Circle and Ridgecrest Avenue and is estimated at 200 LF. High-point air relief valves will be located in the well vault and on-base valve vault.

The subcontractor for the wellhead vault and pipeline (Phase 2 work) will terminate the influent pipelines and control wiring approximately 75 feet north of the GWTS building (Phase 4) located south of Ridgecrest Avenue. The piping will be capped, buried, and marked. A temporary flush-mounted handhole will be installed adjacent to the capped pipe. The control wiring from the well to the GWTS will

include additional lengths coiled in the handhole for future extension and termination at the building electrical/control panel during Phase 4. Final pipe and wire connections will be made by the GWTS building contractor during Phase 4 of this work.

2.3 Phase 3 – Groundwater Treatment System Equipment

A permanent GWTS will be installed on Kirtland AFB near the southeast corner of Ridgecrest Avenue and Perimeter Circle, west of Walker Street in the former Zia Park neighborhood. The Phase 3 task details the groundwater treatment equipment ~~that~~ will be purchased for the initial 400-~~-~~gpm treatment train that will be installed during Phase 4 (GWTS building), and to accommodate groundwater from the first four extraction wells.~~).~~ Ultimately, after installation of additional groundwater extraction wells (beyond the first four),~~,~~ the GWTS will be expanded to have the capacity to treat up to ,800 gpm of groundwater using two~~. The initial~~ 400-gpm treatment trains. Each 400-~~-~~gpm system will use carbon adsorption to decrease concentrations of EDB in the groundwater from an expected influent concentration of 0.5 to 1.5 micrograms per liter (µg/L) to below the U.S. Environmental Protection Agency ~~(EPA)~~ drinking water maximum contaminant level of 0.050 µg/L. Based on recent sampling of the nearby groundwater monitoring well cluster (KAFB-106035, -106036, and -106037), the groundwater from the extraction well will not contain any other contaminants above their respective maximum contaminant levels or other regulatory criteria. All VOCs, other than EDB, are below detection limits, as are total petroleum hydrocarbons and dissolved metals.

Based on the plume maps and same well concentration trends, EDB isthe only expected contaminant for this well. Groundwater modeling using data from Fourth~~4~~th Quarter 2014 indicates~~2015 predicts~~ that manganese will reach a maximum concentration of approximately 40 µg/L after KAFB-106228 begins pumping, which is below the New Mexico Water Quality Control Commission~~NMWQCC~~ limit of 200 µg/L. Additionally, regular monitoring samples will be analyzed for dissolved iron and manganese. If concentrations of iron and manganese are detected in exceedance of regulatory limits, then system operation will be stopped, and additional treatment equipment may be added. A BOD Addendum will be submitted detailing any additional equipment added to the system.

The GWTS will be designed and instrumented to efficiently operate 24 hours per day with minimal operator attention needed. The GWTS will be monitored and controlled by a PLC-based system (part of Phase 4) that will include telemetry and web access to alert operators to off-hour upset conditions, and to allow them to monitor the system. The GWTS building will be designed with a curbed floor that provides secondary containment for the treatment system equipment. A Process Flow Diagram for the GWTS is attached as Figure 2.Major components in each 400-gpm system include the following:

- Influent 6,000-gallon feed tank
- Carbon feed pumps
- Pre-treatment bag filters
- Activated carbon treatment vessels (2 in lead/lag configuration, 20,000 pounds each)
- Post-treatment bag filters
- 6,000-gallon treated water storage tank
- Discharge pump
- Air compressor for slurry carbon fill/exchange

The design ~~will include a second groundwater treatment trainthat is identical to the first train. Design~~ of the treatment building includes~~included~~ space needed for possible additional treatment equipment. The design of the second train will be completed at a later date when the location and pumping rate of the additional groundwater extraction wells have been determined. If wells closer to the plume source area are installed, the second treatment system may require additional unit operations for removal of manganese, iron, and gasoline range hydrocarbons.

The GWTS feed tank is a 6,000-gallon storage tank that will receive untreated water from the well pump. It will be a flat-bottomed tank constructed of fiberglass-reinforced plastic or epoxy-coated carbon steel and will be 10 feet in diameter. The treated water storage tank will be similar to the feed tank. Both tanks will be fitted with level switches and level-indication devices.

The feed pumps for the pre-filters and carbon beds are two identical centrifugal pumps sized for 200 gpm each. Having two smaller pumps will provide better turndown for the system while it is operating with just the first groundwater extraction well. They will be horizontal, American National Standards Institute-(ANSI-) style pumps with stainless steel wetted parts and mechanical seals. The feed pumps and the pre-filters will be purchased as a pre-piped, skid-mounted system that will include flow meters and other instruments. The flow from the pumps will be controlled by a variable frequency drive (VFD) controlling the speed of the pumps.

The pre-filters for the carbon beds will be two bag-filter housings piped in parallel. Each housing will hold six, 30-inch by 6-inch diameter filter bags rated at nominal 10-micron filtration. The post filters will be the same. The filter housings will be epoxy-coated carbon steel with stainless steel baskets. A davit support for the filter housing lid will be provided. The post-filters will be identical.

The two carbon adsorbers will be 10 feet in diameter and each can be loaded with 20,000 pounds of activated carbon. They will be constructed of epoxy-lined carbon steel and fitted with a common manifold that allows either bed to operate in the lead/lag position. Since the GWTS will initially be operated at 100 gpm, the groundwater flow distributors on the carbon beds will be designed to minimize channeling at low flow rates. Flow distributors and other internals in the carbon adsorbers will be constructed of stainless steel, not polyvinyl chloride.

The discharge pump is a single pump rated for 400 gpm. It will also be a horizontal ANSI -style centrifugal pump and have stainless steel wetted parts. The discharge pump skid will have similar instrumentation as the feed pump skid. The flow from the discharge pump will be controlled by a~~either~~ a VFD controlling the speed of the pump.

Additional details of equipment layout within the GWTS building are detailed in Figure 3, Equipment Layout.

2.4 Phase 4 – Groundwater Treatment System Process Building and Infrastructure

The GWTS building will be a new single-story, free-standing 4,160-square foot (52 feet by 80 feet), non-sprinkled structure that will house the GWTS equipment identified in Phase 3. The structure will have a covered (16 feet by 80 feet) truck loading/unloading bay with a sloped concrete pad and secondary concrete containment sump pit with a traffic-rated metal grate spanning the entire length. The concrete containment sump is sized to contain the release of untreated water from a tanker truck. The building will have a control room attached to the main structure. Figures 4 and 5 depict architectural renderings of the building.

The building will be constructed of conventional reinforced concrete masonry block walls supporting an open-web, parallel chord steel bar joist roof framing with a metal roof deck, which will serve as a horizontal diaphragm to transfer lateral loading to the exterior bearing/shear walls. The floor slab will be constructed as a reinforced concrete slab-on-grade with isolated spread footings provided as necessary to support the carbon beds and water tanks. The slab will be designed to accommodate American Association of State Highway and Transportation Officials vehicle and/or fork-truck traffic/loading as well as loading from miscellaneous totes and equipment. The building structure will be designed for containment as required by the governing building code provisions. The roof structure will be flat with positive drainage achieved by the use of built-up insulation creating a mono-slope condition to one side of

the building, and drainage achieved using roof scuppers with downspouts. The eave height of the building (i.e., maximum joist-bearing elevation) is assumed not to exceed 23 feet, 4 inches above the finished floor, based on the height of the selected GWTS (Phase 3) and clearances required. A parapet will extend above the roof bearing such that the top of masonry is 28 feet, 8 inches above the finish floor elevation around the entire perimeter of the structure. Stormwater runoff from the building, and surrounding drive and parking will be diverted to the existing Kirtland AFB storm water collection system. Figure 6 shows the building orientation and improvements around the building.

The building will require tanker unloading of granular activated carbon that is used in the carbon beds. The carbon will be transferred from the delivery tankers and the carbon beds as water slurry. Fill and discharge hoses will be connected from the tanker to the carbon vessels through penetrations or doorways in the wall. A covered area outside the building will be used to park the tanker during loading operations. The attached open-air truck-loading/unloading area will be covered with a roof structure comprised of open-web, steel bar joists with a structural metal roof deck bearing on the outside wall of the building, and structural steel beams supported by steel columns on the opposite end. This area will include a concrete apron that will slope to a containment trench designed to capture approximately 5,000 gallons of liquid in the event of a spill during loading/unloading activities.

The foundation system will include shallow, continuous and isolated spread footings bearing on suitable native soil or engineered fill as determined by geotechnical analysis. The slab-on-grade construction will bear on a compacted gravel sub-base as determined by geotechnical analysis. Intermediate or deep foundation systems such as a raft or mat foundation is not included as part of the scope for this building. A curb inside the building or integral to the wall will be poured and sealed to act as secondary containment. The containment will be able to hold the liquid volume of the largest vessel in the facility if a pipe/tank should rupture.

Kirtland AFB personnel have stated that existing piping at the former Zia Park housing area may contain asbestos. The influent pipeline, treatment building foundation, and effluent pipeline may encounter this piping during construction. A competent person will be on-site during construction activities to provide oversight and ensure that activities are halted if asbestos is encountered. A certified asbestos removal subcontractor will then be used to remove the friable or non-friable pipeline as needed and dispose of it properly.

The groundwater treatment system equipment, purchased in Phase 3, will be installed during Phase 4. Only one treatment train sized for 400 gpm will be installed at this time. The floor plan of the building (Figure 3) allows the current and future tanks and equipment to be transported into the building and lifted into their respective place. All interconnecting piping, pipe supports, valves, sample ports, and instrumentation for one 400-gpm system will be installed during this phase. Where applicable, piping blind flanges/caps, floor space, and electrical capacity will be installed to reduce redundant efforts when the second 400-gpm system is installed at a later date.

A PLC will be housed in the GWTS building as part of Phase 4. The PLC will integrate all control and feedback systems from the well to the infiltration gallery. These systems include, but are not limited to, GWTS equipment instrumentation, leak detection, well vault, and infiltration gallery instrumentation. Additional safety interlocks will be installed at the building and programmed in the PLC, including a high-high level switch in the building sump, and controls described in Phases 2 and 5. When high-high level, leak detection, or other safety interlocks are activated, a signal will shut down the extraction well pump at KAFB-106228 and GWTS equipment.

The building will be heated to 50 degrees Fahrenheit (°F) and ventilated with exhaust fans. The heating system will prevent freezing of pipelines, and the location of control/electrical equipment will be acceptable for proper electrical component operation. Additional cooling/heating equipment will be implemented for the control room as those requirements develop during design. Power required for the

building will be a 480-volt, three-phase service. Subject to final KAFB and USACE direction, electrical service will be supplied by demolishing an existing handhole east of Pennsylvania Street and installing a PMH-9 pad-mounted sectionalizer and tapping into the existing 12470 volt service line. Two lengths of 5-inch HDPE conduit will be directionally drilled under Pennsylvania Street to the west. Once beyond Pennsylvania Street, two runs of 5-inch schedule 40, Polyvinyl Chloride (PVC) conduit will be begin and extend underground to Walker Street in Zia Park by means of open-cut excavation. One other road crossing across San Pablo Street will include directional drilling underneath with 5-inch HDPE conduit. Five (5) additional PMH-9 sectionalizers will be installed at increments of approximately 500 feet along the conduit path. A # 4/0 American Wire Gauge (AWG) copper service line will be installed in one run of conduit making terminations at each sectionalizer. An underground service line from the sectionalizer at Walker Street will be installed to feed a 500 kVA transformer located east of treatment building. This line will be directionally drilled utilizing 5-inch HDPE conduit, and #1/0 AWG copper line. Underground cable will connect the transformer to the main disconnect panel in the GWTS building utilizing directly buried schedule 40 PVC conduit and cable runs sized per the load requirements of the building. The electrical service panel in the building will contain breakers and motor starters or VFDs for the first 400-gpm train of the treatment system, and will have room for the second treatment train. Final electrical design and specifications will be documented in the as-built reports.

Additional utilities include a non-potable water connection from the Kirtland AFB water distribution for general wash-down and carbon slurry fill operations. One hose bibb (hydrant style connector) should be available outside the facility for personnel to fill water trucks with treated water for dust control. A new fire water line and fire hydrant are to be installed from the nearest, assumed location (south of electrical substation 10 on Randolph Ave). The new fire water line is to be installed by trenching through Zia Park and across all existing roadways. The trenching will be backfilled and seeded to match existing conditions, while the roads will be re-paved to match existing conditions at the locations of the trenching. The fire hydrant will be installed within the site parameters of the building location and will meet all Kirtland AFB standards/ requirements. A communication line will be buried from nearby splice box (location to be determined by Kirtland AFB) to the treatment building. The communication line will be used to transmit a fire alarm signal in the building to the base-specified terminal. Trenching, backfilling, and compaction will be completed according to COA standard specification. The top of pipe will be buried 36 inches below finished grade. The plastic pipe will be bedded in sand, and the trench will be backfilled with native soil.

The influent and effluent piping described in Phases 2 and 5 will terminate approximately 75 feet north and south of the building, respectively. The work described in Phase 4 includes making final connections of piping and electrical/control wiring at the described transition locations. The coiled control/electrical wiring will terminate at the appropriate panels and final fusing of influent and effluent HDPE pipelines in order to integrate the GWTS from the well (KAFB-106228) and the effluent pipeline leading to the infiltration gallery. The Utility Routing Plan included as Figure 7 details locations of connection integration.

2.5 Phase 5 – Effluent Pipeline and Discharge to Tijeras Arroyo Golf Course

The current plan for discharge of the treated water is to pump through a partially new and existing force main to the Tijeras Arroyo Golf Course Pond. The base currently has a force main that brings water from well KAFB -7 to the golf course pond. A discharge pipeline will be installed from the treatment system and tap into the existing force main from KAFB-7. The dischargeinstalled pipe will be single-wallburied HDPE pipe buried 36 inches below the finished grade and sized to allow discharge of 800 gpm from the GWTS to the golf course pond. Discharge of treated water is beingThe golf course pond will be evaluated and may includefor storage capacity for 800 gpm inflow year round. Additional ponds or infiltration trenches neargalleries may be installed at the golf course to meet the golf courserate required.

This phase begins approximately 75 feet south of the GWTS building. The discharge pipeline will be capped, buried, and marked at this location. A high-high level switch will be installed at the golf course pond to prevent overfilling. Upon activation, the switch will send a signal through radio telemetry to the treatment system building, thus shutting down the discharge pump.. Final pipe connections to the treatment plant will be made during Phase 4 of this work.

~~The discharge pipeline will be a single-wall HDPE pipe buried 36 inches below finished grade.~~ The route of the pipeline is shown on Figure 1. The discharge pipeline will include open-cut trenching and HDD methods. High-traffic road crossings and sensitive utility crossings will implement HDD as the method of installation, as shown on Figure 1. Trenching, backfilling, and compaction will be performed according to COA and Kirtland AFB standard specifications. Buried pipe will be bedded in sand, and the trench will be backfilled with native soil.

2.6 References

~~AMEC. 2014. *Kirtland Air Force Base Seepage Testing, Geotechnical Memo*, AMEC Environment & Infrastructure, November, 2014.~~

~~EPA. 2002. *Onsite Wastewater Treatment Systems Manual*, Table 4-3.~~

NMED. 2013. *20.7.3 New Mexico Administrative Code, Liquid Environmental Protection, Wastewater and Water Supply Facilities, Waste Disposal and Treatment*, September.

USACE. 2015a~~2015~~. *Groundwater Extraction Pilot Implementation and Additional Plume Characterization Letter Work Plan Addendum #2*, January.

~~USACE. 2015b. Groundwater Extraction Well KAFB-16228 Aquifer Pilot Test Work Plan. ADD COMPLETE INFO.~~
USACE. 2015b. *Groundwater Extraction Well KAFB-106228 Aquifer Pilot-Test Work Plan.* March.

USACE. 2015c~~2015~~. *Groundwater Extraction Pilot Implementation and Additional Plume Characterization Letter Work Plan Addendum #3*, March.

3. CODES AND STANDARDS

Specific building and design requirements are listed in this section.

- Jurisdictional Authority for off-base construction will be COA planning/permits division.
- Jurisdictional Authority for on-base construction will be Kirtland AFB.
- Transition to and under base fence line will be approved through COA and Kirtland AFB.

Building requirements for structures on Kirtland AFB are as follows:

- Architectural Compatibility Plan, Kirtland AFB
- U.S. Air Force, 377th Civil Engineer Division, 2014, General Design Standards, Civil Engineer Services
- Unified Facilities Criteria UFC 1-200-01, 2013, "General Building Requirements"
- International Code Council, International Building Code IBC 2012

- Leadership in Energy and Environmental Design (LEED) Standards: Engineering Technical Letter ETL 08-13 – Utility Structure (7 Credit Points to be met for structure)

- Energy Independence and Security Act, Section 438

Additional guidance will be referenced from the following:

- New Mexico Administrative Code, Title 20, *Environmental Protection*, Chapter 7, "Wastewater and Water Supply Facilities," Part 3, "Liquid Waste Disposal and Treatment"

- New Mexico Administrative Code, Title 20, *Environmental Protection*, Chapter 6, "Water Quality," Part 2, "Ground and Surface Water Protection"

- High Performance and Sustainable Buildings

- City of Albuquerque, 2011, "Standard Specifications for Public Works Construction"

- Endangered Species Act (burrowing owl)

- National Historic Preservation Act, Cultural Resources Section 106

4. SITE-SPECIFIC DESIGN ASSUMPTIONS

4.1 Equipment and Component Requirements

- The electrical area classification is "unclassified."

- Aboveground piping materials of construction – ASTM International 53 Carbon Steel (at treatment building).

- Belowground piping materials of construction – PE4710 HDPE.

- Installation of piping along the unnamed alley and directional-drilling under Louisiana Boulevard will not encounter significant utility obstructions.

- An infiltration test will be performed at the infiltration gallery site. These data will be used in the design of the infiltration gallery.

- A Geotechnical Report will be produced by a third party, so that the treatment facility building foundation design can be completed.

- Equipment dimensions, and weights and anchorage, specifications will be required from equipment providers for proper slab/foundation design.

4.2 Ambient Conditions

The following information will be used in the system design:

- Maximum outdoor design temperature: 100°F

- Minimum outdoor design temperature: 10°F

- Plant ambient pressure: 5,385 feet above mean sea level
- Slab-On-Grade/Pavement design = American Association of State Highway and Transportation Officials HS20-44 or 3,000-pound load acting on a 4.5-inch by 4.5-inch area or 125 pounds per square foot or Mitsubishi model FD55N, pneumatic tire forklift truck with a maximum lift capacity of 12,000 pounds
- Environmental Loading as per Unified Facilities Criteria UFC 3-301-01, "Structural Engineering," May 2014

  a. Ground Snow = 10 pounds per square foot

  b. Frost Penetration Depth = 18 inches minimum, pending more stringent geotechnical requirements

  c. Wind Speed = 115 miles per hour (Risk Category II)

  d. Seismic Design Criteria: Ss = 47 percent of gravity (0.47g), S1 = 14 percent of gravity (0.14g)

4.3 Utility Sourcing

The off base well vault will source power from a local three-phase electrical pole nearby in the unnamed alley.

Power for the GWTS building will be sourced from an underground 12470 volt, three-phase line near the corner of Pennsylvania Street and K Avenue, pending final direction from USACE and KAFB (Figure 7). Water supply for the building and fire hydrant line will be a non-looped, single tap at a main line on the intersection of Ridgecrest Avenue and Randolph Avenue. A communication line will be installed from the treatment building to a nearby splice box (location to be determined by Kirtland AFB). Figure 7 shows the proposed locations of utility drops/connections.

FIGURES

40 CFR 270.11
DOCUMENT CERTIFICATION
MAY~~MARCH~~ 2015

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.

ERIC H. FROEHLICH, Colonel, USAF
Commander, 377th Air Base Wing

This document has been approved for public release.

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