ENTERED

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

OCT 29 2013

Colonel Tom D. Miller
377 ABW/CC
2000 Wyoming Blvd SE
Kirtland AFB, New Mexico 87117-5600

RECEIVED

OCT 31 2013

NMED
Hazardous Waste Bureau

Mr. Tom Blaine, Manager
Environmental Health Division Director
Environmental Health Division
New Mexico Environment Department (NMED)
1190 St. Francis Drive
Santa Fe, New Mexico 87502

Dear Mr. Blaine

Attached is the Aquifer Testing Work Plan for Groundwater Extraction Well KAFB-106157. This work plan details the aquifer testing activities that will be taken in support of the Bulk Fuels Facility Spill at Solid Waste Management Units SS-106 and SS-111.

If you have any questions or concerns about this letter or its attachment, please contact Mr. L. Wayne Bitner at (505) 853-3484 (Ludie@bitner@kirtland.af.mil) or Ms. Victoria R. Martinez at (505) 846-6362 (Victoria.martinez@kirtland.af.mil).

Sincerely

TOM D. MILLER, Colonel USAF
Commander

Attachment:
Aquifer Testing Work Plan for Groundwater Extraction Well KAFB-106157

cc:
NMED-HWB (Kieling, Cobrain, Moats, McDonald, Brandwein) w/attch
NMED-GWQB (Schoeppner) w/attch
NMED-PSTB (Reuter) w/attch
NMED-OGC (deSaillan) w/o attch
EPA Region 6 (King) w/o attch
AFCEC-CZRX (Oyelowo) w/o attch
Public Info Repository, AR/IR, File w/attch

KAFB4112

40 CFR 270.11
DOCUMENT CERTIFICATION
OCTOBER 2013

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.

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

This document has been approved for public release.

KIRTLAND AIR FORCE BASE
377th Air Base Wing Public Affairs

	KAFB Aquifer Testing Work Plan BFF Spill Solid Waste Management Unit SS-106 and SS111			
NO.	PAGE	INITIAL COMMENTS	SECONDARY COMMENTS	RESPONSE TO COMMENTS
1	Global		This plan will ultimately be viewed by the public. Identify all acronyms at first use and explain technical terms and provide the rationale for proposed actions, where appropriate.	Concur. All acronyms have been identified and technical terms have been explained.
2	Appendix B		"EPA Suggested Operating Procedures for Aquifer Pumping Tests" – it is not necessary to provide copies of guidance in a work plan.	Concur. Appendix B has been removed.
3	ES-1	The test will actually be evaluating the aquifer at the down gradient extent of the historical occurrence of LNAPL and the down gradient extent of the BTEX plume. Not really underneath the spill or all the way down gradient of the release		Concur. Text has been revised to clarify that the aquifer test will be conducted to evaluate conditions at the downgradient extent of the historical LNAPL area and BTEX plume.
4	ES-1	CBI isn't actually going to sample the carbon. If they are, why?		Concur. Text has been revised to state that the Carbon will be sampled for disposal purposes only.
5	2-1	Monitoring wells to the south, including proposed observation wells exceed BTEX standards	Adequately Addressed	Concur. Text has been revised to state that BTEX may exceed regulatory limits during the aquifer test (See section 4.2).
6	2-2	Is there going to be a transducer in the extraction well?		Concur. There will be a transducer in the extraction well. Text has been revised to clarify.
7	Section 2, current page 2-2		Provisions must be made to confirm that treated groundwater meets the discharge limits before water can be discharged to the ABCWUA reuse system.	Concur. The text has been revised to show that the KAFB detention pond is now the primary option for disposal of water. Section 3 has been revised to include a comprehensive description of the treatment system design, along with a sampling plan, describing how the system will be monitored to prevent breakthrough of contaminated water.

	KAFB Aquifer Testing Work Plan BFF Spill Solid Waste Management Unit SS-106 and SS111			
NO.	PAGE	INITIAL COMMENTS	SECONDARY COMMENTS	RESPONSE TO COMMENTS
8	pages 2-2 and 3-6	Concerning the constant rate test, the Work Plan states "If no drawdown is observed in any of the observation wells, then only the data from the pumping test will be used." Aquifer transmissivity and the radius of influence cannot be accurately estimated by a single well constant discharge test. While a single well constant discharge test will provide better information than a slug test, it is highly likely that it will still underestimate hydraulic conductivity by a large percentage tied to well efficiency that cannot be estimated without measurable drawdown in an observation well.	Not addressed	Non-concur. As discussed in the 23 September 2013 working group meeting, Shaw will perform the aquifer test with the observation wells available, and at a maximum pumping rate of 150 gpm as determined by the step-test. Shaw will use the data collected during the aquifer test to determine aquifer characteristics. If it is determined that the data collected during testing is inadequate to fill data gaps to inform an EDB treatment interim measure, Shaw will work with NMED to determine appropriate subsequent steps.
9	Section 2		Aquifer Testing, states that drawdown will be used to determine storage coefficient, instead of specific capacity, which is the correct term that applies to unconfined aquifers (test will actually be evaluating conditions at the downgradient end of the LNAPL plume).	Non-concur. The term storage coefficient is applicable to both confined and unconfined aquifers (Water Supply Paper 2220- Heath, 2004). The magnitude of the parameter is typically much greater for unconfined aquifers and is numerically equivalent to the Specific Yield.
10	2-3	What is that height above the pump intake?		Concur. Pump intake will be a minimum of 10 feet above the bottom of the well. Text has been revised to clarify.
11	2-3	What is the transducer head limit		Concur. Transducer head limit depends on the transducer. Text has been revised to clarify that the transducer selected will be capable of withstanding the maximum anticipated head.
12	Page 2-2 and 2-3	The "general steps" must be replaced with the actual proposed scope of work that includes specifics on equipment, methods and procedures.	Not addressed. The plan appears to list general steps for a CB&I pumping test but does not state that the proposed actions are specific to this particular test.	Concur. Text has been revised to state, "The specific steps that will be performed to complete the step-drawdown and constant rate pumping tests are as follows. Additional details pertaining to each test are described in Sections 2.1 and 2.2"

	KAFB Aquifer Testing Work Plan BFF Spill Solid Waste Management Unit SS-106 and SS111			
NO.	PAGE	INITIAL COMMENTS	SECONDARY COMMENTS	RESPONSE TO COMMENTS
13	Page 2-3, Item 6	No discussion is provided of the height of the transducer relative to the pump intake.	Not provided. Sufficient well conditions and water level data should have been collected at this point to provide a response to this comment now that well development is complete.	Concur. The final transducer placement will be established during the step draw down testing. The initial transducer placement will be a minimum of five feet (ft) above the pump intake. A 30 PSI transducer (69 foot measurement range) will be used to measure drawdown. Transducer placement will be adjusted if pump turbulence affects reading stability. The constant rate test transducer placement will be based on the results of the step draw down test. The transducer selection and well placement will be based on the amount of drawdown observed in the step test. Prior to the constant rate test, the transducer will be placed 5 ft below the anticipated maximum drawdown of the constant rate test based on the step-drawdown test
14	Page 2-3, Item 7	No discussion is provided of the height of the water column and the proposed depth of the pump intake.	Not provided. Sufficient well conditions and water level data should have been collected at this point to provide a response to this comment now that well development is complete. The statement that "pumping rates will be adjusted to ensure the pump does not cavitate" is inappropriate for a constant discharge test**. [Note: this quotation is from the version Steve Reuter reviewed and is different from the version HWB received]**	Concur. The text will be revised to state that prior to well development the total water column height was measured at 60.7 ft. For the step draw down test, the pump will be placed at the center of the well screen. The constant rate test and the pump placement will be based on the results of the step drawdown test. Cavitation is a concern during both the step and constant rate tests. The pump size, total head, pumping rate and amount of drawdown influence pump cavitation. Text has been revised to state, "During testing pump size, pump placement and pumping rates will be adjusted to ensure the drawdown will not be so great as to cause the pump to cavitate during the step-drawdown test".
15	Page 2-3, | Item 8,	No discussion of how the anticipated maximum drawdown is determined for transducer installation.	Not addressed. The discussion related to monitoring for the influence of barometric pressure is acceptable	The anticipated maximum drawdown will be determined based on the results of the step-drawdown test, and by preliminary predictive modeling.

	KAFB Aquifer Testing Work Plan BFF Spill Solid Waste Management Unit SS-106 and SS111			
NO.	PAGE	INITIAL COMMENTS	SECONDARY COMMENTS	RESPONSE TO COMMENTS
16	Page 2-3, Item 10,	No discussion of actual time intervals for measurement of water levels is included.	Addressed	Concur. Text has been revised to state, "A true logarithmic water level measurement schedule will be used for the pumping well with the first readings at 4 per second and increasing up to 55-minute intervals later in the test. This schedule will be set on the pressure transducers using the "true logarithmic" option with a maximum interval of 55 minutes. The transducers in the monitoring wells will be set to record water levels at one minute intervals starting at least 24 hours prior to the start of the test"
17	Page 2-3,	No reference to determination of the pumping rate based on step test is provided.	Addressed	Concur. Text has been added to state, "Select the optimal pumping rate based on the results of the step-drawdown test described in Section 2.1 below"
18	Page 2-3, Item 11,	Frequency of monitoring the pumping rate is not provided.	Addressed	Concur. Text has been added to state, "Record the pump start time and flow rate at the start of the test and every 15 minutes for the first hour after the start of pumping".
19	Page 2-3, Item 14,	Pumping rate monitoring frequency is undefined.	Addressed	Concur. Text has been revised to state, "Observe and record the wellhead flow meter readings once per hour during working hours. Additionally, flow meter readings will be taken outside of working hours at the EPA recommended hours of 8 PM and 2 AM daily (EPA, 1993) (Appendix B). If the flow rates recorded during the day vary by more than 5 percent, additional overnight readings may be necessary."
20	Page 2-3, Item 15,	Frequency of water level measurement for the recovery period is undefined.	Addressed	Concur. Text has been revised to state, "Continue to record the water-level recovery in the wells with the pressure transducers/data loggers until the water level in the pumping well has recovered and stabilized. Also, continue to take manual water-level measurements every four hours during working hours during recovery in each of the monitoring wells without a transducer installed. The recovery time will be at a minimum equal to the pumping time."
21	Section 2.1 page 2-4	The section does not specify that the step test will be conducted before the constant discharge test.	Addressed	Concur. Text has been revised to state, "Select the optimal pumping rate based on the results of the step-drawdown test described in Section 2.1 below"

	KAFB Aquifer Testing Work Plan BFF Spill Solid Waste Management Unit SS-106 and SS111			
NO.	PAGE	INITIAL COMMENTS	SECONDARY COMMENTS	RESPONSE TO COMMENTS
22	Section 2.1, page 2-4	Insufficient number of pumping rates are proposed for the step test since the estimated hydraulic conductivity is based on slug test data.	Not addressed. In addition, no references to the slug tests are provided. If the cited aquifer properties are assumed based on the general properties for aquifers listed in the literature, it should be stated as such. A step using 200 gpm should be added.	Non-concur. References to the slug tests have been provided in the text. As stated in the text, it was initially determined that the pumping rates for the step-drawdown tests would be 50, 100, and 150 gpm. It was estimated that a pumping rate of 150 gpm would be sufficient to determine aquifer properties. Additionally, estimates of the amount of water generated during aquifer testing are based on a maximum pumping rate of 150 gpm. In light of the technical and logistical difficulties encountered in disposing of the treated water generated during aquifer testing, increasing the maximum amount of water pumped to over 2 million gallons would require a reevaluation of possible disposal options and negatively impact schedule.
23	2-4	How is this different from bullet # 12 above? (number 12 on page 2-3)		Concur. Bullet #12 refers to readings when the aquifer test commences. Bullet #14 refers to readings for the duration of the aquifer test.
24	2-4	Define "periodically"	Addressed	Concur. Text has been revised to define "periodically" in all instances.
25	Section 2.1, page 2-4 and 2-5	The description of the use of the data generated from the step drawdown test and the calculation of the optimal pumping rate for the constant discharge test was not provided.	Not addressed. The equation was changed to the equation provided in Driscoll (1986) but details related to the actual use of the water level data to determine the optimal pumping rate is not provided. What constitutes and "Optimal" pumping rate?	Concur. Text has been revised to state, "The data from the step drawdown test will be used to evaluate the efficiency of the well, to determine the qualitative magnitude of drawdown at given pump rates, and to provide generalized aquifer properties (i.e. transmissivity). The aquifer parameters will be applied to groundwater modeling predictions of aquifer response at the observation wells. Transducer placement and range will be based on this model information. Well efficiency will be determined as described in Groundwater and wells (Driscoll, 1986 Pgs. 554 through 559). Aquifer properties will be determined using graphical methods described in Driscoll (Pgs. 558 and 559) or through the application of step test analysis routines available in commercial aquifer tests programs (AQTESOLV, Schlumberger – Aquifer Test ESI- Aquifer Win32). The "optimal" pumping rate is the minimum rate at which drawdown can be achieved in observation wells."

	KAFB Aquifer Testing Work Plan BFF Spill Solid Waste Management Unit SS-106 and SS111			
NO.	PAGE	INITIAL COMMENTS	SECONDARY COMMENTS	RESPONSE TO COMMENTS
26	2-5	Q is in gallons per minute converting to cubic feet per minute to keep units constant across the equation yields a drawdown of 1.6 feet for a pumping rate of 91 gallons a minute. If you let "b" equal the saturated screen length of 60 feet, it gets worse……		Concur. Text has been revised to reflect corrected maximum theoretical flow rate, and explain the rationale for initially recommending the step-drawdown test flow rates.
27	2-5	Water is at approximately 480 feet, bottom of screen is at 540 feet. You only have 60 feet of water column to play with. Setting the pump near the bottom of the screen and placing the transducer high enough to not be interfered by the pump intake will substantially lessen the amount of water column you have to stress the aquifer with.		Concur. Depth to water to the depth of the drilled hole was 100 feet. However, the bottom of the casing is 35 feet above the maximum drilled extent, leaving a water column of approximately 65 feet in the well.
28	Section 2.1, page 2-5,	The units are not consistent in the listed equation; therefore the estimated drawdown is incorrect in Section 2.1, page 2-5, Item 3.	Addressed.	Concur. The equation has been updated.
29	Section 2.1, page 2-5, Item 1	It is highly likely that K is underestimated; therefore the estimated drawdown is incorrect in Section 2.1, page 2-5, Item 3.	Not addressed. See Item 22 above. Include data and evaluation acquired during the recently completed well development.	Non-concur. The water level data from well development has not been analyzed at this time. The test is designed to acquire as much data as possible by going from low to high pumping rates, and is designed in such a way to minimize the errors that could be caused by misidentification of K.
30	Section 2.1, page 2-5, Item 3	Specified water column of 100 does not agree with table 2.1 or the well construction diagram for Well 106157. It appears that an 80 foot drawdown would be below the bottom of the well sump.	Addressed (removed).	Concur. This inconsistency has been removed.

	KAFB Aquifer Testing Work Plan BFF Spill Solid Waste Management Unit SS-106 and SS111			
NO.	PAGE	INITIAL COMMENTS	SECONDARY COMMENTS	RESPONSE TO COMMENTS
31	Section 2.1	Describes transducer in pumping well during overpumping at well development. This has occurred. What are the results and what does it tell us about anticipated pumping rates and estimated transmissivities?	Not Addressed.	Non-concur. The water level data collected during well development has not yet been evaluated.
32	Section 2.2, page 2-6,	Adequate discussion of the length of the constant discharge test and the criteria for the duration is not provided.	Not Addressed.	Non-concur. The text states that the constant rate test will last from 72 to 168 hours (3-7 days). The constant rate test will be complete after the rate of drawdown in the well has stabilized for at least 24 hours, or after a minimum pumping duration of 72 hours, whichever is later. If no drawdown is observed in observation wells by this time, NMED will be contacted to discuss the data collected to date and any further actions.

	KAFB Aquifer Testing Work Plan BFF Spill Solid Waste Management Unit SS-106 and SS111			
NO.	PAGE	INITIAL COMMENTS	SECONDARY COMMENTS	RESPONSE TO COMMENTS
33	Section 2.2 page 3-7	A single well test will not provide adequate information on the radius of influence of the extraction well.	Not addressed. The reference to 0.0 feet of observed drawdown in observations wells and the distance to the "nearest pumping well" does not make sense. And it contradicts the sentence before describing contacting the NMED if no drawdown is observed to determine path forward.	Non-concur. As discussed in the 23 September 2013 working group meeting, Shaw will perform the aquifer test with the observation wells available, and at a maximum pumping rate of 150 gpm as determined by the step-test. Shaw will use the data collected during the aquifer test to determine aquifer characteristics. If it is determined that the data collected during testing is inadequate to fill data gaps to inform an EDB treatment interim measure, Shaw will work with NMED to determine appropriate subsequent steps. As stated in the work plan, if no drawdown is observed in observation wells, NMED will be contacted to discuss the data collected and any further actions. The reference to 0.0 feet of drawdown was indicating that even if no drawdown is measured in the observation wells, that piece of information can be used to constrain aquifer transmissivity and estimate capture zone, regardless of the path forward determined by NMED.
34	Section 3, page 3-7	the Work Plan calls for two GAC units for treating contaminated groundwater before discharging the water into the ABCWUA system. In the meeting of September 4, 2013, between the NMED, KAFB, CBI, and others, three and four GAC units were discussed. No description of the GAC units (e.g., size, capacity, sampling ports) is provided.	Partially addressed. No design provided.	Concur. Section 3 has been expanded to include a more comprehensive description of the treatment system. This includes equipment specifications and design drawings and calculations.

	KAFB Aquifer Testing Work Plan BFF Spill Solid Waste Management Unit SS-106 and SS111			
NO.	PAGE	INITIAL COMMENTS	SECONDARY COMMENTS	RESPONSE TO COMMENTS
35	Section 3, page 3-7	No description of contingency measures, should breakthrough occur, is provided.	Not addressed. If the constant discharge test is in progress and discharged limits are found to have been exceeded, what steps will be taken (e.g., stop the test, improve the treatment system and start over; continue the test and store the generated water)?	Concur. Section 4 has been updated to include additional sampling during the constant rate test. EDB samples will be collected at the outlet of each of the three GAC units. These samples will be analyzed by method SW8011 by Hall Environmental Laboratory in Albuquerque NM. Samples will be collected in the morning, and preliminary data will be available by the COB the same day. These EDB samples will monitor for contaminant breakthrough of the carbon beds, allowing the treatment system to be shutdown in a timely manner if breakthrough does occur. If breakthrough is detected after the third GAC unit, the constant rate test will be stopped, and the treatment system will be evaluated to determine where treatment has been insufficient and how it can be optimized. Because all of the water generated during the step test will be containerized, a contingency plan is not necessary for this first part of the test.
36	3-7	Pending sampling results a third GAC unit may be desirable as a safeguard		Concur. Text has been revised to clarify the GAC unit arrangement. Two sets of three GAC units will be used to treat the groundwater generated during aquifer testing.
37	3-7	Is there going to be an initial analysis of the pumped water prior to discharge to the ABCWUA re-use system?		Concur. Section 4 has been revised to state that there will be analysis following well development and during the step-drawdown test. The constant rate test will not commence until the results from the step-drawdown test are complete.
38	3-7	This paragraph is a repeat of the first paragraph above. Redundancy doesn't add value.		Concur. Repeated paragraphs have been deleted.
39	3-8	Repeat of prior statement		Concur. Repeated paragraphs have been deleted.
40	Section 4, page 4-8	Testing includes TPH rather than GRO and DRO. No analytical methods are listed, no description of sampling procedures is provided.	Not Addressed.	Concur. Analytical methods and sampling procedures have been added to Section 4 and Table 4-1.
41	Section 4, page 4-8	The rationale for the effluent sampling frequency is not provided.	Not Addressed.	Concur. Section 4 has been updated to include a more comprehensive sampling plan during the constant-rate test. See response to Comment 42.

	KAFB Aquifer Testing Work Plan BFF Spill Solid Waste Management Unit SS-106 and SS111			
NO.	PAGE	INITIAL COMMENTS	SECONDARY COMMENTS	RESPONSE TO COMMENTS
42	Section 4, page 4-8	The proposed frequency of sampling for extraction water quality is limited and does not include data collection for evaluating trends in contaminant concentrations to assess contributions from the BTEX and free product plume vs. downgradient groundwater(e.g., to help identify anisotropic conditions).	Not Addressed.	Concur. Section 4 has been updated to include a more comprehensive sampling plan during the constant-rate test. During the constant rate test, daily influent samples will continue. Samples will be collected at the outlet of both the primary and tertiary (last) carbon beds and submitted for analysis of the same suite of analytes as the untreated groundwater (Appendix E; Table 4-1) with a 72-hr TAT for all analyses. Additionally EDB samples will be collected at the outlet of each of the three GAC units. These samples will be analyzed by method SW8011 by Hall Environmental Laboratory in Albuquerque NM. Samples will be collected in the morning, and preliminary data will be available by the COB the same day. These EDB samples will monitor for contaminant breakthrough of the carbon beds, allowing the treatment system to be shutdown in a timely manner if breakthrough does occur.
43	4-8	This sounds like there will be a full day of discharge before there is analytical verification that it's acceptable to discharge	Not addressed. Testing of water generated during the step test is mentioned with insufficient detail to the extent that it is not even clear if the step test water will be stored prior to testing. Since well development is complete, references to the well development should be changed to reference the actual data acquired during development	Concur. Section 4 will include a more detailed description of the fate of the water generated from the step-test. This water will be containerized and profiled following treatment.
44	4-8	What is the EDB criterion?		Concur. The EDB criterion is the EPA MCL of 0.05 µg/L. has been included in section 3.
45	4-8	You're not going to replace the carbon…you're going to install a fresh GAC unit correct?		Concur. Section 3 has been revised to clarify that the amount of GAC acquired for the aquifer testing will be adequate for both the step-drawdown and constant rate test.
46	Section 4	The reasoning for this sampling frequency is not clear…..		Concur. Text has been revised to clarify sampling frequency.

	KAFB Aquifer Testing Work Plan BFF Spill Solid Waste Management Unit SS-106 and SS111			
NO.	PAGE	INITIAL COMMENTS	SECONDARY COMMENTS	RESPONSE TO COMMENTS
47	2-2	Addition of New Mexico Water Quality Control Commission groundwater cleanup standards.	Addressed. Does not reference LDRs, cite 40 CFR 268 or reference underlying hazardous constituents.	Concur. 40 CFR 268 has been cited in the text.
48	2-3, number 7	Either provide a depth or describe how the pump intake depth will be determined	Addressed	Concur. Pump intake will be a minimum of 10 feet above the bottom of the well. Text has been revised to clarify.
49	2-3, number 10	What will the frequency of measurement actually be?. Typically, the data should be logged every 15 seconds for the first 5 minutes, then every 30 seconds for the next 10 minutes follow by every minute for te next 15 minutes and so on. Also changed: immediately to "a minimum of twenty four hours"		Concur. Text has been revised to clarify the frequency of the measurement data.
50	2-3, number 11	Select the optimal pumping rate based on the results of the step-drawdown test described in Section 2.1 below.		Concur. The text has been updated to state the optimal pumping rate will be selected based on the results of the step-drawdown test described in Section 2.1 below.
51	2-3, number 13	Define periodic		Conur. Text has been revised to define "periodic."
52	No. 25, 2-4	slug tests tend to underestimate hydraulic conductivity; therefore, a higher pumping rate should be added to the step test		Concur. Text has been added to state that drawdown will be observed during well development, and data will be used to re-analyze step-drawdown test flow rates.
53	2-5	see pump intake depth comment in Section 2 Item 7		Concur. Text has been revised to reflect actual water column.
54	2-6	If no influence is observed in observation wells after ten days, the Permittee will contact NMED to discuss the data collected to date and any further actions.		Concur. Text has been revised to state that the Permittee will contact NMED to discuss the data if no influence is observed in observation wells after 72 hours and at least 24 hours of stable drawdown.
55	4-8	Assuming stopping the test is to be avoided, what will be the contingency in the event of breakthrough from the second carbon bed? Is once a day sampling acceptable to ABCWUA for verification of discharge water quality?		Concur. Text has been revised to clarify the GAC setup and sampling frequency. See also response to Comment 42. The contingency plan has been addressed in the final paragraph of Section 3.

	KAFB Aquifer Testing Work Plan BFF Spill Solid Waste Management Unit SS-106 and SS111			
NO.	PAGE	INITIAL COMMENTS	SECONDARY COMMENTS	RESPONSE TO COMMENTS
56	4-8	The proposed frequency of sampling for extraction water quality is limited for evaluating trends in contaminant concentrations, which could be useful to assess contributions from the BTEX-free product plume vs. down gradient groundwater. There is no mention of field water quality testing (e.g., pH, temperature, conductivity, ORP, dissolved oxygen, turbidity) or parameters related to hydrocarbon degradation (e.g., dissolved iron, manganese, sulfate, nitrate)	Addressed; however the proposed frequency of collection of these field measurements is too limited.	Concur. Text has been revised to state that field water quality testing will be conducted twice daily during aquifer testing, and that parameters related to hydrocarbon degradation will be analyzed (along with all parameters analyzed for during regular quarterly groundwater monitoring).
57	General	The Work Plan does not describe how the data from both the step-drawdown and constant rate tests will be evaluated to determine pump efficiency and aquifer characteristics.	Not Addressed.	Concur. The text in section 2.2 has been revised to state, "The step and pump test data will be evaluated using either manual graphic techniques or commercial aquifer test software (see Comment 25 above). The data will be evaluated for spurious data, corrected for regional trends based on background wells, and then subjected to analysis. Analysis methods representing unconfined and semi-confined aquifers will be applied. The step test data will be incorporated into a predictive model in order to design the constant rate test. The well efficiency will be evaluated using the approach presented in Driscoll, 1986, Pgs. 554 through 559. Aquifer properties will be evaluated using methods appropriate for semi and unconfined aquifers."
58	General	The Work Plan does not describe how the results of the tests will be reported.	Not Addressed.	Concur. Reporting requirements for the collected data have been added to Section 4 of the work plan.
59	General	Appendix A, which is supposed to contain a schedule to complete the step-drawdown and the constant rate test, is missing and could not be reviewed.	Not Addressed.	Concur. Appendix A has been included in the submittal

	KAFB Aquifer Testing Work Plan BFF Spill Solid Waste Management Unit SS-106 and SS111			
NO.	PAGE	INITIAL COMMENTS	SECONDARY COMMENTS	RESPONSE TO COMMENTS
60	General	The sampling (and analysis) procedures described in Section 4 are unclear, lack detail, and appear to be inadequate for the purpose of waste management. A description of sample collection procedures, shipment and handling, chain of custody, analytical methods, and field and laboratory quality control methods and reporting are not provided.	Not Addressed.	Concur. Section 4 has been revised to include a more comprehensive sampling plan, sample collection procedures, shipment and handling, chain of custody, and analytical methods. Any additional information regarding sampling quality control can be found in the NMED accepted project specific *Quality Assurance Project Plan* (August 2011).
61	General	The Work Plan does not discuss the potential need for an emergency permit to treat the groundwater should it be a hazardous waste.	Not Addressed.	Concur. Section 4 has been revised to state, "KAFB will coordinate with NMED to determine if the results of the sampling from well development require an emergency permit to treat the groundwater. If the groundwater is shown to be hazardous waste, KAFB will obtain an emergency permit."

KIRTLAND AIR FORCE BASE
ALBUQUERQUE, NEW MEXICO

Groundwater Extraction Well KAFB-106157
Aquifer Testing Work Plan
Bulk Fuels Facility Spill
Solid Waste Management Units ST-106 and SS-111

October 2013

377 MSG/CEANR
2050 Wyoming Blvd. SE
Kirtland AFB, New Mexico 87117-5270

KIRTLAND AIR FORCE BASE
ALBUQUERQUE, NEW MEXICO

GROUNDWATER EXTRACTION WELL KAFB-106157 AQUIFER TESTING WORK PLAN BULK FUELS FACILITY SPILL SOLID WASTE MANAGEMENT UNITS ST-106 AND SS-111

October 2013

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

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

Prepared by
Shaw Environmental & Infrastructure, Inc.
(A CB&I company)
6380 South Fiddler’s Green Circle, Suite 300
Greenwood Village, Colorado 80111

NOTICE

This report was prepared for the U.S. Army Corps of Engineers by Shaw Environmental & Infrastructure, Inc., a CB&I company, for the purpose of aiding in the implementation of a final remedial action plan under the U.S. Air Force Environmental Restoration Program (ERP). As the report relates to actual or possible releases of potentially hazardous substances, its release prior to a final decision on remedial action may be in the public's interest. The limited objectives of this report and the ongoing nature of the ERP, along with the evolving knowledge of site conditions and chemical effects on the environment and health, must be considered when evaluating this report, since subsequent facts may become known that may make this report premature or inaccurate.

Government agencies and their contractors registered with the Defense Technical Information Center (DTIC) should direct requests for copies of this report to: DTIC, Cameron Station, Alexandria, Virginia 22304-6145.

Non-government agencies may purchase copies of this document from: National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161.

THIS PAGE INTENTIONALLY LEFT BLANK

REPORT DOCUMENTATION PAGE	Form Approved OMB No. 0704-0188

1. AGENCY USE ONLY	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	October 2013	Work Plan for Aquifer Testing in October and November 2013

4. TITLE AND SUBTITLE	5. FUNDING NUMBERS
Groundwater Extraction Well KAFB-106157, Aquifer Testing Work Plan Bulk Fuels Facility Spill,Solid Waste Management Units ST-106 and SS-111	USACE Contract No. W912DY-10-D-0014 Delivery Order 0002
6. AUTHOR V. Bracht D. Agnew T. Cooper	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Shaw Environmental & Infrastructure, Inc. (A CB&I company) 6380 South Fiddler's Green Circle, Suite 300 Greenwood Village, Colorado 80111	8. PERFORMING ORGANIZATION REPORT NUMBER KAFB-013-0014c
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) USACE Albuquerque District 4101 Jefferson Plaza NE Albuquerque, New Mexico 87109-3435 Project Manager: Walter Migdal	10. SPONSORING/MONITORING AGENCY REPORT NUMBER
11. SUPPLEMENTARY NOTES	
12a. DISTRIBUTION/AVAILABILITY STATEMENT	12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

This letter is being submitted as a Work Plan for aquifer testing of groundwater extraction well KAFB-106157, prepared by Shaw Environmental & Infrastructure, Inc. (Shaw), a CB&I company, for the U.S. Army Corps of Engineers (USACE) under contract W912DY-10-D-0014, Delivery Order 0002. This work plan describes the following activities: A step-drawdown test will be conducted on well KAFB-106157 in order to determine the flow rate to use for the aquifer test. Pending resolution of outstanding permitting and logistical requirements for wastewater disposal, a constant aquifer test will be conducted using well KAFB-106157 as the pumping well to fully evaluate conditions in the aquifer beneath and downgradient from the Bulk Fuels Facility (BFF) spill site.

14. SUBJECT TERMS	15. NUMBER OF PAGES
Bulk Fuels Facility (BFF) Spill, Aquifer Testing	116
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT

THIS PAGE INTENTIONALLY LEFT BLANK

40 CFR 270.11
DOCUMENT CERTIFICATION
OCTOBER 2013

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.

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

This document has been approved for public release.

KIRTLAND AIR FORCE BASE
377th Air Base Wing Public Affairs

THIS PAGE INTENTIONALLY LEFT BLANK

PREFACE

This Groundwater Extraction Well KAFB-106157, Aquifer Testing Work Plan has been prepared by Shaw Environmental & Infrastructure, Inc. (Shaw), a CB&I company, for the U.S. Army Corps of Engineers (USACE), under Contract W912DY-10-D-0014, Delivery Order 0002. It pertains to the Kirtland Air Force Base Bulk Fuels Facility Spill, Solid Waste Management Units ST-106 and SS-111, located in Albuquerque, New Mexico. This report was prepared in accordance with all applicable federal, state, and local laws and regulations, including the New Mexico Hazardous Waste Act, New Mexico Statutes Annotated 1978, New Mexico Hazardous Waste Management Regulations, Resource Conservation and Recovery Act, and regulatory correspondence between the New Mexico Environment Department Hazardous Waste Bureau and the U.S. Air Force, dated April 2, June 4, August 6, and December 10, 2010.

This work will be performed under the authority of USACE Contract No. W912DY-10-D-0014, Delivery Order 0002. Mr. Walter Migdal is the USACE Albuquerque District Project Manager; Mr. Wayne Bitner, Jr. is the Kirtland Air Force Base Restoration Section Chief; and Mr. Thomas Cooper is the Shaw Project Manager. This report was prepared by Diane Agnew.

Thomas Cooper, PG, PMP
Shaw Environmental & Infrastructure, Inc.
(a CB&I company)
Project Manager

THIS PAGE INTENTIONALLY LEFT BLANK

CONTENTS

Section **Page**

CONTENTS (Concluded)

APPENDICES

FIGURES

Figure

TABLES

Table

ACRONYMS AND ABBREVIATIONS

µg/L	microgram(s) per liter
°C	degrees Celsius
AFB	Air Force Base
BFF	Bulk Fuels Facility
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylene
COC	contaminant of concern
EDB	ethylene dibromide
EPA	U.S. Environmental Protection Agency
ft	feet/foot
ft/day	feet per day
ft^2/day	square feet per day
GAC	granular activated carbon
gpm	gallons per minute
LNAPL	light non aqueous phase liquid
MCL	maximum contaminant level
NAPL	non aqueous phase liquid
NMED	New Mexico Environment Department
Shaw	Shaw Environmental & Infrastructure, Inc., a CB&I company
TAT	turn-around time
USACE	U.S. Army Corps of Engineers
VOA	volatile organic analysis
VOC	volatile organic compound
WQCC	Water Quality Control Commission

THIS PAGE INTENTIONALLY LEFT BLANK

EXECUTIVE SUMMARY

This letter is being submitted as a Work Plan for aquifer testing of groundwater extraction well KAFB-106157, prepared by Shaw Environmental & Infrastructure, Inc. (Shaw), a CB&I company, for the U.S. Army Corps of Engineers (USACE) under contract W912DY-10-D-0014, Delivery Order 0002. This work plan describes the following activities:

- A step-drawdown test will be conducted on well KAFB-106157 in order to determine the flow rate to use for the aquifer test.
- A constant rate aquifer test will be conducted using well KAFB-106157 as the pumping well to evaluate conditions in the aquifer at the downgradient extent of the historical light non aqueous phase liquid (LNAPL) area and benzene, toluene, ethylbenzene, total xylenes (BTEX) plume. The start date of the constant discharge aquifer test is pending results of the step-drawdown test to fully determine the optimum pumping rate and New Mexico Environment Department (NMED) approval of the disposal of wastewater generated during the constant rate test.
- Water generated during the step-drawdown test and the constant rate test with be treated using a treatment system comprised of granular activated carbon (GAC) filters. Groundwater will be treated to U.S. Environmental Protection Agency (EPA) maximum contaminant levels (MCLs) or the New Mexico Water Quality Control Commission (WQCC) groundwater cleanup standards, whichever is lower.

THIS PAGE INTENTIONALLY LEFT BLANK

1. INTRODUCTION

1.1 Scope of Activities

In order for interim measures and a final remedy for the Bulk Fuels Facility (BFF) spills to be fully evaluated, hydraulic properties in the aquifer downgradient from the BFF spill site must be assessed. The existing extraction well, KAFB-106157, will be used as a pumping well to conduct an aquifer test to further characterize aquifer hydraulic properties, to further evaluate contaminant fate and transport, and aid in evaluating potential corrective measures. The extraction well was installed downgradient of the historical non aqueous phase liquid (NAPL) plume, which is collocated with the portion of the dissolved-phase groundwater plume that contains the highest concentrations of volatile organic compounds (VOCs) including benzene, toluene, ethylbenzene, total xylenes (BTEX), ethylene dibromide (EDB), and other fuels-related organic compounds. Currently, the NAPL plume is mostly submerged. In the nearest groundwater monitoring well, only EDB has a concentration exceeding regulatory limits. However, the leading edge of the BTEX plumes are close to the extraction well, so BTEX may also exceed regulatory limits during the aquifer test.

Aquifer testing will be conducted in accordance with industry standard practices, the U.S. Environmental Protection Agency's (EPA) *Suggested Operating Procedures for Aquifer Pumping Tests* (EPA, 1993), and with the Kirtland Air Force Base (AFB) Resource Conservation and Recovery Act Permit (New Mexico Environment Department [NMED], 2010).

The schedule for completing this work can be found in Appendix A.

THIS PAGE INTENTIONALLY LEFT BLANK

2. AQUIFER TESTING

Prior to conducting aquifer testing, groundwater extraction well KAFB-106157 will be adequately developed to ensure that the aquifer test accurately characterizes groundwater conditions in the vicinity of the well (USACE, 2013).

Aquifer testing at KAFB-106157 will consist of two phases. In the first phase, a step-drawdown test will be conducted to determine the pumping rate for the long-term aquifer test. In the second phase, a constant rate aquifer test will be conducted to evaluate conditions in the aquifer downgradient from the BFF spills site. The schedule for the constant discharge aquifer test is dependent results of the step-drawdown test required to fully determine the optimum pumping rate for the aquifer and NMED approval for disposal of wastewater generated by the constant rate test. Prior to the step-drawdown test, recording transducers will be installed in selected observation wells (Table 2-1) and in the extraction well.

All pumping test-produced water will be routed through a temporary granular activated carbon (GAC) water treatment system for organics removal prior to disposal (Section 3). Discharged water will be treated so that all contaminants of concern (COCs) are below the lower of the EPA maximum contaminant levels (MCLs), or the New Mexico Water Quality Control Commission (WQCC) groundwater cleanup standards and 40 CFR 286. EPA Region 6 regional screening levels for tap water will be used for COCs without an MCL or WQCC standard determined.

A pumping test involves pumping water from a well at either a constant or variable discharge rate while monitoring the water-level changes (drawdown) in the pumped well and observation wells. The drawdown, measured in response to the pumping, is used to determine the transmissivity and storage coefficient of the aquifer. Water-level recovery will also be monitored after the pumping is discontinued.

The specific steps that will be performed to complete the step-drawdown and constant rate pumping tests are as follows. Additional details pertaining to each test are described in Sections 2.1 and 2.2:

1. Inspect the equipment to be used to ensure that it is in good working order.
2. Calibrate and/or test all measuring and testing equipment before use. All transducers will be time synchronized as part of the calibration process.
3. Decontaminate all downhole equipment using deionized water and Alconox®.
4. Visually inspect the well heads for damage or obstructions that could hinder the water-level recorder or pump insertion and removal.
5. Physically measure the liquid levels in the pumping and observation wells with electric tape and record them along with the date and time. Use 24-hour military time for all data collection. Use separate data sheets for each well. Install the pump in the pumping well along with the pressure transducer and associated electrical or air supply lines. Install the transducer just above the top of the pump and secure at periodic intervals to the drop pipe or tubing as the assembly is lowered into the well. The transducer will be attached to the pump column at a level that 1) eliminates effects from the pump intake, and 2) is below the anticipated water level during maximum drawdown. The final transducer placement will be established during the step draw down testing. The transducer installed will be capable of withstanding the expected maximum head. The initial transducer placement will be a minimum of five feet (ft) above the pump intake. A 30 PSI transducer (69 foot submersion range) will be used to measure drawdown. Transducer placement will be adjusted if pump turbulence affects reading stability. The constant rate test transducer placement will be based on the results of the step test. The transducer selection and placement will be based on the amount of drawdown observed in the step test. Prior to the constant rate test, the transducer will be placed no less than 5 ft below the anticipated maximum drawdown of the constant rate test based on the step-drawdown test.
6. The position of the pump intake inside the well will be a minimum of 10 feet above the bottom of the well. Note the height of the water column from the static water level to the pump intake. Prior to well development, the total water column height was measured at 60.7 ft. For the step-drawdown test, the pump will be placed at the center of the submerged well screen. The constant rate test and the pump placement will be based on the results of the step-drawdown test. During testing, pumping rates will be adjusted to ensure the drawdown will not be so great as to cause the pump to cavitate during the step-drawdown test. Record all information, including the depth of the pump intake and pressure transducer. Install the transducers in the monitoring wells. The transducers will be installed at a position inside each well that is below the anticipated water level during maximum drawdown, and does not exceed the maximum head limitation. The anticipated maximum drawdown will be determined based on the results of the step-drawdown test, and by preliminary predictive modeling. Manual water level measurements will be taken prior to installing the transducer in each well. Three transducer monitoring wells will be located upgradient from the plume at the KAFB-106032 well cluster to monitor the barometric water level fluctuations during the test. These fluctuations will be used to factor out the barometric fluctuations in the pumping test observation wells. Water level recording will start at least one week prior to the start of pumping in all monitoring wells, including the upgradient wells, to quantify the barometric efficiency of each well. During this week of water level recording, the pressure transducers will be set to log the water

level every 20 minutes. The weather station located at the Albuquerque International Sunport will be used as the barometric pressure station.

7. Record the depths of the transducers below the water surface using the data logger.

8. Set the recording frequencies in the pressure transducers for the pumping test. A true logarithmic water level measurement schedule will be used for the pumping well with the first readings at 4 per second and increasing up to 55-minute intervals later in the test. This schedule will be set on the pressure transducers using the "true logarithmic" option with a maximum interval of 55 minutes. The transducers in the monitoring wells will be set to record water levels at one minute intervals, starting at least 24 hours prior to the start of the test.

9. Select the optimal pumping rate based on the results of the step-drawdown test described in Section 2.1 below

10. Start the pump at the scheduled time and adjust the valve or flow regulator to maintain a constant rate of discharge. Record the pump start time and flow rate at the start of the test and every 15 minutes for the first hour after the start of pumping.

11. Continue to monitor water levels with the pressure transducers and data loggers during pumping. Transducers will be checked every two hours during the working day. Manual water-level measurements will be taken every four hours during working hours in each of the wells with the electric tape in each of the monitoring wells without a transducer installed. The water-level data will be evaluated during the test and, if necessary, the recording frequencies of the data loggers will be adjusted.

12. Observe and record the wellhead flow meter readings once per hour during working hours. Additionally, flow meter readings will be taken outside of working hours at the EPA recommended hours of 8 PM and 2 AM daily (EPA, 1993) (Appendix B). If the flow rates recorded during the day vary by more than 5 percent, additional overnight readings may be necessary.

13. Near the end of the pumping period, reset the pumping well data logger to record the recovery test. A true logarithmic water level measurement schedule will be used for the pumping well with the first readings at 4 per second and increasing up to 55-minute intervals later in the test. The monitoring wells will remain on the one minute recording schedule.

14. Take a manual water-level measurement with the electric well tape in each of the monitoring wells without a transducer installed, and record the measurements and times.

15. Shut down the pump at the scheduled stopping time. Record the time that the pump was shut down.

16. Continue to record the water-level recovery in the wells with the pressure transducers/data loggers until the water level in the pumping well has recovered and stabilized. Also, continue to take manual water-level measurements every four hours during working hours during recovery in each of the monitoring wells without a transducer installed. The recovery time will be at a minimum equal to the pumping time.

17. If free product is pumped out of the well at any time during the aquifer test, the test will be stopped and data collected up to that point will be used in the analysis.

18. Take a physical water-level measurement using an electric tape in each observation well once the recovery period has ended. Record the measurements and times.

19. Additional depth-to-water measurements may be physically taken following complete well recovery in order to monitor post-test trends in water levels.

20. Review data in the field to help ensure the validity of the test. Once the pump test is satisfactorily completed for the well, remove and decontaminate all downhole equipment and secure the wellheads.

The above procedures may be modified based on field conditions and data observations.

2.1 Step-Drawdown Test

After KAFB-106157 has been developed and prior to conducting the constant discharge test, a step-drawdown (variable rate) test will be performed to determine the flow rate of the long-term test. The step-drawdown test will consist of three steps; 50, 100, and 150 gallons per minute (gpm); for two hours each. These steps will be conducted sequentially with no recovery period between steps. These flow rates are based on slug tests conducted on wells in the vicinity of KAFB-106157, which show hydraulic conductivities ranging from 40 to 120 feet per day (ft/day). The Cooper-Jacob equation (Cooper and Jacob, 1946) can be used to estimate the specific capacity of a pumping well from an estimated transmissivity (Driscoll, 1986). Assuming a hydraulic conductivity of 100 ft/day and a thickness of 80 feet, the transmissivity would be 8,000 square feet per day (ft^2/day) or 60,000 gallons/day/ft. The specific capacity of a well is related to the transmissivity by:

$$T = \frac{Q}{s} * 2000$$

where:

Q = pumping rate (gpm)
T = transmissivity (gal/day/ft) = Kb
K = hydraulic conductivity (ft/day)
b = aquifer thickness (ft)
s = drawdown (ft)

Assuming that there is 50 feet of drawdown available in KAFB-106157, and that there is 10 feet of well loss in the pumping well (so that available drawdown in the well is 40 feet), using the above transmissivity, an estimated maximum theoretical flow rate of 1,200 gpm is calculated. However, it is not necessary to pump at the maximum theoretical flow rate in order to determine aquifer properties and estimate a capture zone. Based on slug tests conducted at nearby wells, it was initially determined that the pumping rates for the step-drawdown tests would be 50, 100, and 150 gpm. It was estimated that a pumping rate of 150 gpm would be sufficient to determine aquifer properties. A pressure transducer will be installed in the pumping well during the overpumping phase of well development. Drawdown will be observed, and initial estimates of transmissivity will be made to determine if the pumping rates for the step-drawdown test will be sufficient.

Following the step-drawdown test, the aquifer will be allowed to recover for at least 24 hours. A pressure transducer will record drawdown during pumping and recovery following pumping in KAFB-106157. Water level measurements will be obtained from the extraction well at the frequency described in Section 2, Item 15 above. The data from the step-drawdown test will be used to evaluate the efficiency of the well, to determine the qualitative magnitude of drawdown at given pump rates, and to provide generalized aquifer properties (i.e. transmissivity). The aquifer parameters will be applied to groundwater modeling predictions of aquifer response at the observation wells. Transducer placement and range will be based on this model information. Well efficiency will be determined as described in *Groundwater and Wells* (Driscoll,1986, pp. 554 through 559). Aquifer properties will be determined using graphical methods described in Driscoll (pp. 558 and 559) or through the application of step test analysis routines available in commercial aquifer tests programs (AQTESOLV, Schlumberger –Aquifer Test ESI- Aquifer Win32). The “optimal” pumping rate is the minimum rate at which drawdown can be achieved in observation wells.

2.2 Constant Rate Test

Following analysis of the step-drawdown test and approval from NMED for the resolution disposal of treated wastewater from the constant rate test, a 72-hour (3 days) to 168-hour (7 days) constant rate pumping test will be performed using extraction well KAFB-106157 as the pumping well. Nearby monitoring wells will be used as observation wells during the pumping test. Both manual and recording transducer water-level will be obtained. Figure 2-1 illustrates the location of KAFB-106157 pumping and monitoring wells that will be used as observation wells during the pumping test. Appendix B contains the well completion diagrams for the pumping well and all monitoring wells, and Table 2-1 lists the observation wells, including which ones will have a pressure transducer installed and which will be monitored by periodic manual measurements. In wells with a pressure transducer installed, manual water measurements will be taken when the transducer is installed and when it is removed. Data will be checked every two hours during work hours in case of transducer failure. Pressure transducers will be installed in the monitoring wells nearest to the pumping well and wells used as background monitoring wells. The constant rate test will be complete after the rate of drawdown in the well has stabilized for at least 24 hours, or after a minimum pumping duration of 72 hours, whichever is later. If no drawdown is observed in observation wells by this time, NMED will be contacted to discuss the data collected to date and any further actions. Additionally, valuable data can still be gained from a single well test. If no drawdown is observed in the observation wells, then drawdown in the pumping well, combined with a known drawdown of 0.0 feet at the distance to the nearest pumping well, can be used to constrain the aquifer transmissivity and estimate the capture zone.

Wells KAFB-106032, KAFB-106033, and KAFB-106034 are outside the expected zone of influence and will be used as background monitoring wells. Pressure transducers will be installed in each well to determine the fluctuations in water level in the shallow, deep, and intermediate zones that are not attributable to pumping at KAFB-106157. Following pumping, the aquifer will be allowed to recover for at least the same length of time as the duration of pumping. Pressure transducers in the pumping well and observation wells will record drawdown during pumping and recovery following pumping. Both pumping and recovery data from wells with an observable drawdown will be used to evaluate the pumping test. If no drawdown is observed in any of the observation wells, then only the data from the pumping test will be used. The step drawdown and constant rate test data will be evaluated using either manual graphic techniques or commercial aquifer test software (AQTESOLV, Schlumberger –Aquifer Test ESI- Aquifer Win32). The data will be evaluated for spurious data, corrected for regional trends based on background wells, and then subjected to analysis. Analysis methods representing unconfined and semi-confined aquifers will be applied. The step test data will be incorporated into a predictive model in order to design the constant rate test. The well efficiency will be evaluated using the approach presented in Driscoll, 1986, Pgs. 554 through 559. Aquifer properties will be evaluated using methods appropriate for semi and unconfined aquifers.

THIS PAGE INTENTIONALLY LEFT BLANK

3. DISCHARGE WATER TREATMENT SYSTEM

The groundwater from the aquifer test is expected to contain EDB and possibly BTEX at levels that will exceed regulatory limits. Water from both the step-drawdown test and the constant rate test will be run through a treatment system comprised of an initial bag filter to remove suspended sediment, a containment tank, two sets of three carbon beds to treat the water to regulatory standards, and subsequent bag filters to remove any suspended carbon fines.

The treatment system will be comprised of six carbon beds, each containing 1,500 pounds of virgin coconut shell based activated carbon.. The six carbon beds will be arranged as two parallel trains of 3 beds each. The pumped groundwater flow will be split evenly between the two trains. With 1500 pounds of carbon in each bed, the first two beds of each train contain enough carbon to treat all of the contaminants in the water fed to the treatment system. The third bed in each train is provided as a back-up adsorber and is not expected to see any contaminants. Drawings of the location of the treatment system and its design are located in Appendix C. Appendix D includes tables of calculations demonstrating the amount of GAC required to complete the both the step-drawdown test, and constant rate test based on concentrations of EDB and total petroleum hydrocarbons at the nearby well KAFB-106082. These calculations are based on known loading concentrations provided by Cabot Norit Activated Carbon. Based on the EDB concentration detected in KAFB-106082 of 1.47 micrograms per liter (µg/L), a maximum flow rate of 150 gpm, and a contact time of ten minutes in the primary adsorbers, it is calculated that 5,414 pounds of carbon are necessary to remove EDB to levels below the EPA MCL of 0.05 µg/L. This demonstrates that the two primary, and two secondary carbon beds, with a total of 6,000 pounds of carbon, will be sufficient to treat EDB, with the third set of carbon beds providing a factor of safety. With the pumped water split between two 3-bed adsorber trains, the primary, or first bed will remove, the majority of the contaminants. The second set of carbon beds, also containing 1,500 pounds of carbon each, will provide contact time needed to remove BTEX and EDB to low levels and will remove the low levels of contaminants that bleed through the first set of beds. The third set of beds will also contain at least 1,500 pounds of carbon each and will serve as the backup adsorbers. Equipment specification sheets for individual treatment system components, including the carbon beds, are located in Appendix E.

An estimated 70,000 gallons of water will be generated during the step-drawdown test. Following treatment of the water generated during the step-drawdown test, the water will be containerized in four separate frac tanks, each with a capacity of 21,000 gallons (Appendix C). Secondary containment barriers will be installed around each treatment component and the frac tanks as a preventative measure in case of any leaks. If water generated during the step-drawdown test does not meet the regulatory criteria once it has been treated, the groundwater treatment system design will be revised to achieve the needed criteria. The containerized water will be re-treated until it meets requirements. Water generated during the constant rate test will be treated in the same manner as water generated during the step-drawdown test. However, the volume of water produced during the step-drawdown test (a maximum volume of 1.5 million gallons) will be too large to store in the planned frac tanks.

Ultimate disposal of the water generated during the step-drawdown and constant rate tests will utilize a KAFB stormwater detention pond. Treated water will be pumped through temporary piping across Bullhead Park to KAFB and into a stormwater detention pond adjacent to Randolph Ave. The existing effluent point of the detention pond will be blocked to prevent treated water from entering the KAFB stormwater system. Weather will be monitored leading up to the constant-rate test to ensure that no rain events will contribute to the volume of water in the detention pond. In the case that a rain event occurs, or if infiltration does not take place as rapidly as anticipated, additional piping will allow for water to be diverted for land applications in the Zia Park area of KAFB, preventing overflow of the detention pond.

Section 4 outlines sampling plans for both the step-drawdown test and the constant rate test to monitor the treatment system's effectiveness. If breakthrough is detected after the third GAC unit, the constant rate test will be stopped, and the treatment system will be evaluated to determine where treatment has been insufficient and how it can be optimized. Because all of the water generated during the step test will be containerized, a contingency plan is not necessary for this first part of the test.

THIS PAGE INTENTIONALLY LEFT BLANK

4. SAMPLING

4.1 Sampling and Analysis of Extracted Groundwater

Following well development of KAFB-106157, a groundwater sample will be collected from the well and analyzed for two suites of analytes. The first suite is a list of analytes that the Albuquerque Bernalillo County Water Utility Authority requires prior to discharge into the water reuse system, and the second suite is the standard list of analytes sampled for during regular quarterly groundwater sampling at the Kirtland AFB BFF site. The list of analytes sampled for during regular quarterly groundwater sampling is provided in Appendix F.

When aquifer testing commences, a groundwater sample will be collected from the well and analyzed for the standard list of analytes sampled for during regular quarterly groundwater sampling at the Kirtland AFB BFF site (Appendix F) with a 72-hour turn-around time (TAT) for EDB and benzene, as outlined in Section 3.1.1.2 of the NMED accepted Quality Assurance Project Plan (USACE, 2011). Groundwater samples prior to treatment will be collected once per day during pumping. Field water quality parameters, including temperature, pH, conductivity, dissolved oxygen, oxidation-reduction potential, and alkalinity will be collected in the morning and in the afternoon during each day of pumping. Table 4-1 lists all of the samples to be collected during the step-drawdown and constant rate tests.

4.2 Sampling of Treated Groundwater

During the aquifer test, it is likely that the extracted groundwater will exceed regulatory criteria for EDB and possibly BTEX. As described in Section 3, carbon treatment will be used to remove all contaminants. During both the step-drawdown and constant rate tests the effluent from the primary and secondary carbon beds will be sampled and analyzed to confirm that the discharged water meets regulatory criteria. All samples will be collected within 30 minutes of collecting the daily sample of extracted groundwater.

4.2.1 Sampling of Treated Groundwater During Step-Drawdown Test

The first set of samples from the carbon treatment system will be collected near the end of the step-drawdown test when the groundwater feed rate to the carbon beds is at the maximum rate of 150 gpm. Samples will be collected at the outlet of all three carbon beds and submitted for analysis of the same suite of analytes as the untreated groundwater (Appendix F; Table 4-1) with a 72-hr TAT for all analyses, including EDB by method SW8011 and benzene by SW8260B. At the end of the step-drawdown test, the system will be shut down until the results of these analyses are received and it is confirmed that COCs in the treated water are below regulatory criteria. Only then will the constant rate test be started.

The results from theses analyses are required to resolve outstanding logistical issues for disposal of wastewater generated by the constant rate test. All treated water from the step-test will be containerized. If the treated water does not meet the regulatory criteria, the groundwater treatment system design will be revised to achieve the needed criteria. The containerized water will be re-treated until it meets requirements.

Once the effectiveness of the groundwater treatment system has been demonstrated during the step-drawdown test, and outstanding logistical issues for disposal of wastewater have been resolved, the constant rate test will commence. Kirtland AFB will coordinate with NMED to determine if the results of the sampling from well development require an emergency permit to treat the groundwater. If the groundwater is shown to be hazardous waste, Kirtland AFB will obtain an emergency permit.

4.2.2 Sampling of Treated Groundwater During Constant Rate Test

During the constant rate test, daily influent samples will continue. Additionally, samples will be collected at the outlet of both the primary and tertiary (last) carbon beds and submitted for analysis of the same suite of analytes as the untreated groundwater (Appendix F; Table 4-1) with a 72-hr TAT.

Additionally EDB samples will be collected at the well, and at the outlet of each of the three GAC units. These samples will be analyzed by method SW8011 by Hall Environmental Laboratory in Albuquerque, New Mexico. Samples will be collected in the morning, and preliminary data will be available by the close of business the same day. These EDB samples will monitor for contaminant breakthrough of the carbon beds, allowing the treatment system to be shutdown in a timely manner if breakthrough does occur. Although a lower sampling frequency would ensure adequate monitoring for breakthrough, collecting EDB samples after each of the three GAC units provides data that will inform the design of any future groundwater treatment systems.

All sampling and analysis of groundwater samples will be conducted as outlined in Section 3.1.1.2 of the NMED accepted Quality Assurance Project Plan (USACE, 2011).

4.3 Sample Collection

Samples will be collected for field parameter and laboratory analysis. A sample chain-of-custody can be found in Table 4-2. Collection of samples will follow the following procedures:

1. Sample containers will be labeled before sample collection.
2. Samples for volatile organic analysis (VOA) will be collected first. The samples will be carefully filled to avoid overflow and potential loss of preservative and tapped so entrapment of air is minimized and no head space exists.
3. Samples for non-VOA will be collected following the volatile organic sample collection. Samples for dissolved metals analysis may be field-filtered according to procedures presented below. If field filtration is not performed, the sample container must be clearly marked to state "laboratory filtration required."
4. Samples for field parameter measurements will be collected last.
5. Filter of field samples (dissolved iron and manganese) will use a cellulose-based membrane filter of 0.45-micron, nominal pore size. The sample must be filtered immediately after collection to minimize changes in the concentration of the substance of interest. Samples are only passed through the filtration apparatus once. Samples are then preserved immediately as required. All paperwork accompanying samples to the laboratory will clearly state that the samples have been field-filtered, in

order to avoid second filtration at the laboratory. Field filtering of water samples will be conducted as follows:

6. The filter apparatus will be decontaminated and cleaned.

7. The sample will be poured into the filter apparatus and filtered through a cellulose-based membrane filter of 0.45-micron, nominal size. To condition the filter, half of the sample volume will be passed through the filter apparatus and filter paper and then discarded. The full sample volume will then be filtered and collected in the appropriate sample container. Samples are only passed through the filter once.

8. Samples will be preserved immediately, as required.

9. Analytical samples will be placed in a cooler and chilled to 4°C. Samples will be shipped to the appropriate laboratory within 24 hours.

10. The field logbook, sample log sheet, labels, custody seals, and chain-of-custody forms will be filled out during sample collection.

4.4 Sample Packaging and Shipping

Sample packaging and shipping requirements are designed to maintain sample integrity from the time a sample is collected until it is received at the analytical laboratory. All chain-of-custody forms, sample labels, custody seals, and other sample documents will be completed as specified in the Quality Assurance Project Plan (USACE, 2011). Specific procedures for packaging and shipping of environmental samples are presented below.

1. A sample label, completed with indelible ink, will be attached to the sample bottle.

2. A picnic cooler (e.g., Coleman or other sturdy cooler) will typically be used as a shipping container. In preparation for shipping samples, the drain plug will be taped shut so that no fluids, such as melted ice, will drain out of the cooler during shipment. A large plastic bag may be used as a liner for the cooler. Packing material, such as bubble wrap, or Styrofoam beads, will be placed in the bottom of the liner.

3. The containers will be placed in the lined picnic cooler. Cardboard separators may be placed between the containers at the discretion of the shipper.

4. All samples for chemical analysis must be shipped cooled to 4°C with ice. All samples will require icing before shipment. A temperature blank will be included in each shipment of water and soil samples.

5. The liner will be taped closed, if used, and sufficient packing material will be used to prevent sample containers from making contact or rolling around during shipment.

6. A copy of the chain-of-custody form will be placed inside the cooler.

7. The cooler will be closed and taped shut with strapping tape (filament-type).

8. Custody seals will be placed on the cooler. Clear tape will be placed over the custody seals to help prevent them from being accidentally torn or ripped off.

9. The cooler of samples will be shipped via an overnight carrier. A standard air bill is necessary for shipping environmental samples.

THIS PAGE INTENTIONALLY LEFT BLANK

REFERENCES

Cooper, H. H. and C. E. Jacob, 1946. A generalized graphical method for evaluating formation constants and summarizing well field history. American Geophysical Union Transaction, vol. 27, pp. 526-534.

Driscoll, 1986. *Groundwater and Wells*. Johnson Division, 1089 pp.

EPA, 1993. *Suggested Operating Procedures for Aquifer Pumping Tests.* Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, D. C. February.

NMED, 2010. *Hazardous Waste Treatment Facility Operating Permit, EPA ID No. NM9570024423.* New Mexico Environment Department Hazardous Waste Bureau, Santa Fe, New Mexico. July.

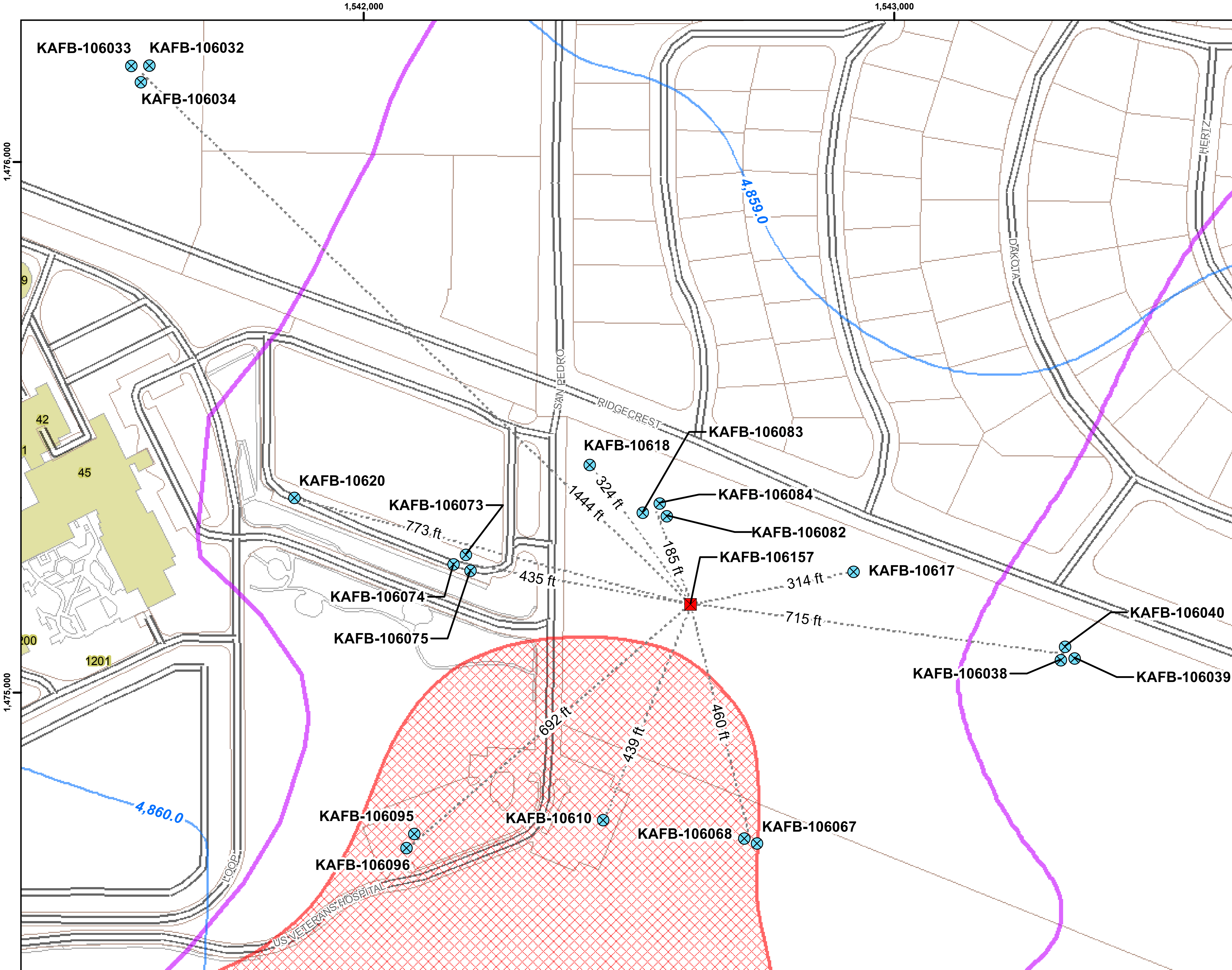
USACE, 2013. *Groundwater Extraction Well KAFB-106157 Well Development Work Plan, Bulk Fuels Facility Spill, Solid Waste Management Units ST-106 and SS-111.* Prepared by Shaw Environmental & Infrastructure, Inc. for the USACE Albuquerque District under USACE Contract No. W912DY-10-D-0014, Delivery Order 0002. September.

USACE, 2011. *Quality Assurance Project Plan, Bulk Fuels Facility (BFF) Spill, Solid Waste Management Units ST-106 and SS-111, Kirtland Air Force Base, Albuquerque, New Mexico.* Prepared by Shaw Environmental & Infrastructure, Inc. for the USACE Albuquerque District under USACE Contract No. W912DY-10-D-0014, Delivery Order 0002. April..

THIS PAGE INTENTIONALLY LEFT BLANK

FIGURES

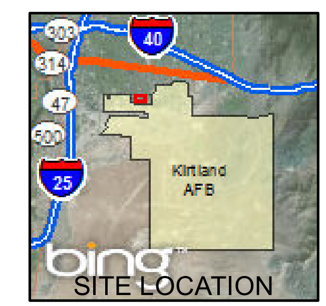
THIS PAGE INTENTIONALLY LEFT BLANK



Legend

- Monitor Well
- Pumping Test Well
- April 2013 Groundwater Level Contour (ft above msl)
- Distance Line
- Dissolved Plume Extent (April 2013)
- Historical Area of Observed NAPL (July 2009)
- Installation Boundary

Distance lines represent the horizontal distance from the approximate center of each well cluster or observation well to pumping test well KAFB-106157.



Revision Date: 09/30/13

N

0 100 200 400

Feet

1 inch = 200 feet

Projection : NAD83 State Plane New Mexico Central FIPS3002 Feet

GROUNDWATER EXTRACTION WELL KAFB-106157
AQUIFER TESTING WORK PLAN
BULK FUELS FACILITY
KIRTLAND AIR FORCE BASE, NEW MEXICO

FIGURE 2-1

PUMP TEST LOCATIONS

H:\Kirtland_AFB\GIS_Documents\Project_Maps\Misc_Maps\KAFB_061_pump_test_wells.mxd 09/30/13

THIS PAGE INTENTIONALLY LEFT BLANK

TABLES

THIS PAGE INTENTIONALLY LEFT BLANK

Table 2-1. Pump Test Well Summary

Well	NMED Location	Screen Interval (feet bgs)	Horizontal Distance from KAFB-106157 (feet)	Pumping Test Use
KAFB-106157	LNAPL Extraction	495-550	-	Pumping well (transducer)
KAFB-10610	Previously Existing	483-508	439	Observation Well (transducer)
KAFB-10617	Previously Existing	482-507	314	Observation Well (transducer)
KAFB-10618	Previously Existing	476-501	324	Observation Well (transducer)
KAFB-10620	Previously Existing	482-507	773	Observation Well (manual)
KAFB-106032	GWM-02-1	456-476	1444	Observation Well (transducer)
KAFB-106033	GWM-02-2	477-492	1444	Observation Well (transducer)
KAFB-106034	GWM-02-3	502-517	1444	Observation Well (transducer)
KAFB-106038	GWM-04-1	478-508	715	Observation Well (manual)
KAFB-106039	GWM-04-2	508-523	715	Observation Well (manual)
KAFB-106040	GWM-4	531-546	715	Observation Well (manual)
KAFB-106067	GWM-14-1	485-505	460	Observation Well (manual)
KAFB-106068	GWM-14-2	580-595	460	Observation Well (manual)
KAFB-106073	GWM-16-1	500-514	435	Observation Well (transducer)
KAFB-106074	GWM-16-2	570-584	435	Observation Well (transducer)
KAFB-106075	GWM-16-3	480-500	435	Observation Well (transducer)
KAFB-106082	GWM-19-1	472-492	185	Observation Well (transducer)
KAFB-106083	GWM-19-2	495-510	185	Observation Well (transducer)
KAFB-106084	GWM-19	566-581	185	Observation Well (transducer)
KAFB-106095	GWM-23-2	503-519	692	Observation Well (manual)
KAFB-106096	GWM-23-3	576-591	692	Observation Well (manual)

bgs below ground surface
LNAPL light non aqueous phase liquid
NMED New Mexico Environment Department

THIS PAGE INTENTIONALLY LEFT BLANK

Table 4-1. Sampling Plan for Step-Drawdown Test and Constant Rate Test

Aquifer Test Stage	Location	Frequency	Analytical Parameters	Laboratory	Turn-Around Time	Total No. of Samples (depending duration of constant rate test)
Full duration of step-drawdown and constant rate test	Influent-prior to treatment	once per day (within 30 minutes of effluent samples)	EDB by SW8011, Metals by SW6010B, SVOCs, by SW8270D, TPH-DRO and TPH-GRO by SW8015B, VOCs by SW8260B, general chemistry parameters (See Appendix E)	Empirical Laboratories	72 hr	4-8
During 150 gpm pumping rate of step-drawdown test	Effluent of primary GAC unit	once	EDB by SW8011, Metals by SW6010B, SVOCs, by SW8270D, TPH-DRO and TPH-GRO by SW8015B, VOCs by SW8260B, general chemistry parameters (See Appendix E)	Empirical Laboratories	72 hr	1
During 150 gpm pumping rate of step-drawdown test	Effluent of secondary GAC unit	once	EDB by SW8011, Metals by SW6010B, SVOCs, by SW8270D, TPH-DRO and TPH-GRO by SW8015B, VOCs by SW8260B, general chemistry parameters (See Appendix E)	Empirical Laboratories	72 hr	1
During 150 gpm pumping rate of step-drawdown test	Effluent of tertiary GAC unit	once	EDB by SW8011, Metals by SW6010B, SVOCs, by SW8270D, TPH-DRO and TPH-GRO by SW8015B, VOCs by SW8260B, general chemistry parameters (See Appendix E)	Empirical Laboratories	72 hr	1
Full duration of constant rate test	Effluent of primary GAC unit	once per day	Metals by SW6010B, SVOCs, by SW8270D, TPH-DRO and TPH-GRO by SW8015B, VOCs by SW8260B, general chemistry parameters (See Appendix E)	Empirical Laboratories	72 hr	3-7
Full duration of constant rate test	Effluent of tertiary GAC unit	once per day	Metals by SW6010B, SVOCs, by SW8270D, TPH-DRO and TPH-GRO by SW8015B, VOCs by SW8260B, general chemistry parameters (See Appendix E)	Empirical Laboratories	72 hr	3-7

Table 4-1. Sampling Plan for Step-Drawdown Test and Constant Rate Test (concluded)

Aquifer Test Stage	Location	Frequency	Analytical Parameters	Laboratory	Turn-Around Time	Total No. of Samples (depending duration of constant rate test)
Full duration of constant rate test	Influent-prior to treatment	once per day	EDB by SW8011	Hall Analytical Laboratories	6 hr	3-7
Full duration of constant rate test	Effluent of primary GAC unit	once per day	EDB by SW8011	Hall Analytical Laboratories	6 hr	3-7
Full duration of constant rate test	Effluent of secondary GAC unit	once per day	EDB by SW8011	Hall Analytical Laboratories	6 hr	3-7
Full duration of constant rate test	Effluent of tertiary GAC unit	once per day	EDB by SW8011	Hall Analytical Laboratories	6 hr	3-7

EDB 1,2-dibromoethane
GAC granular activated carbon
gpm gallons per minute
TAT turn-around-time

Table 4-2. Sample Chain of Custody

CHAIN OF CUSTODY

Ref. Document # ____________________

Page _____ of _________

Project Number: ____________________

Project Name / Location: ____________________

Purchase Order #: ____________________

Project Contact: ____________________
(Name & phone #)

Shipment Date: ____________________

Waybill Number: ____________________

Lab Destination: ____________________

Lab Contact Name / ph. #: ____________________

Send Report To:	
Phone/Fax Number:	
Address:	
City:	

Sampler's Name(s):

		Collection Information					Preservative		Analyses Requested								
							Container										Cooler Temperature
Sample ID Number	Sample Description	Date	Time	Method	Matrix	# of containers	Beginning depth (ft)	Ending depth (ft)									
Temperature Blank																	

Special Instructions:

Turnaround Time: Standard 10 Day	☐ 24-hr	☐ 48-hr	Level Of QC Required:
	☐ 3-day	☐ 5-day	I II III Project Specific:

Relinquished By:	Date: Time:	Received By:	Date: Time:
Relinquished By:	Date: Time:	Received By:	Date: Time:

Method Codes

C = Composite G = Grab

Matrix Codes

DW = Drinking Water SO =Soil

GW = Ground Water

WW = Waste Water

V = Vapor

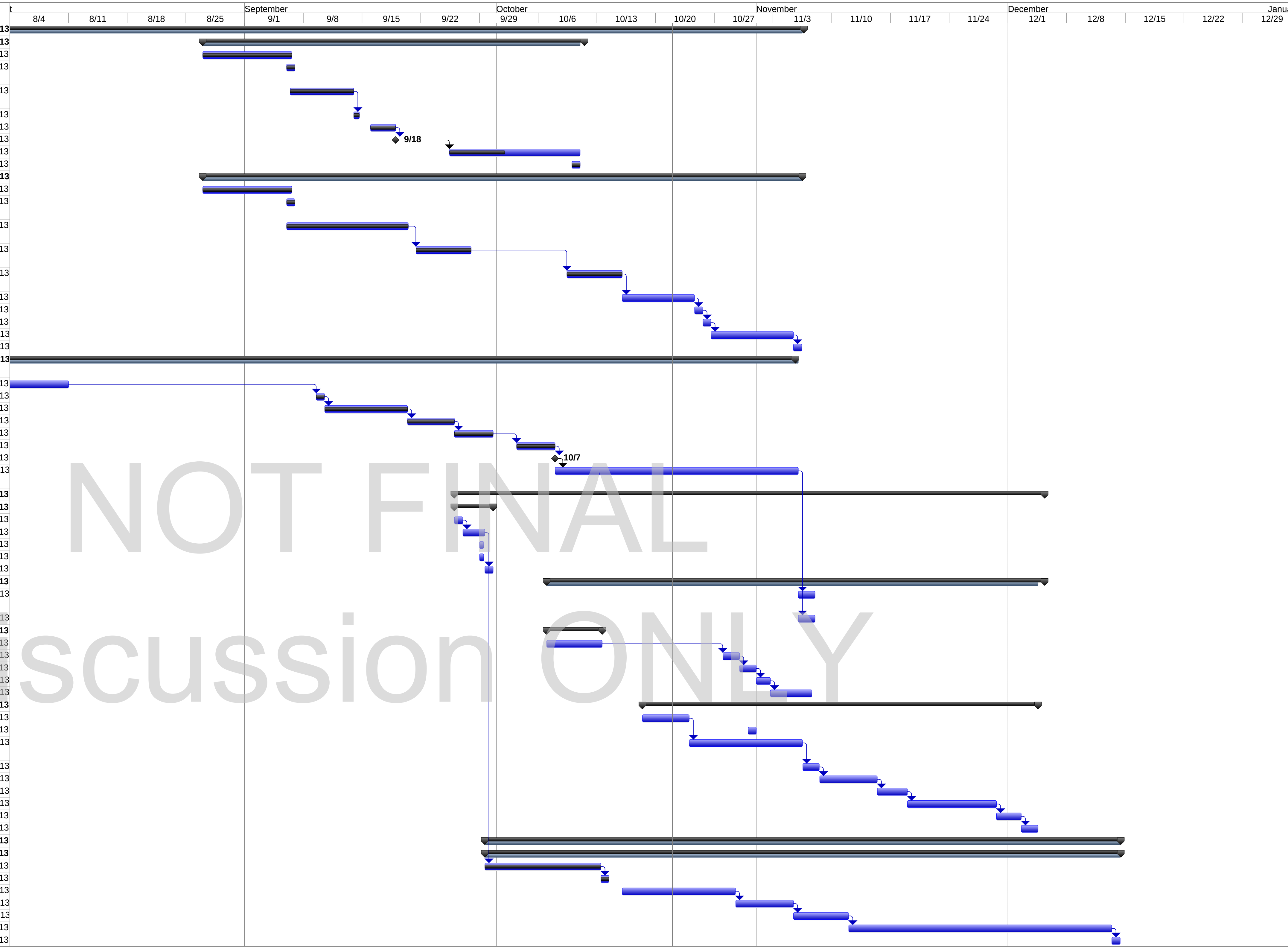
THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX A

Schedule of Activities

THIS PAGE INTENTIONALLY LEFT BLANK

ID		Task Name	Duration	Start	Finish
1		**Well Development and Aquifer Testing Planning**	**105 days**	**Fri 7/26/13**	**Wed 11/6/13**
2		**Well Development Pilot Test Work Plan**	**47 days**	**Tue 8/27/13**	**Fri 10/11/13**
3	✓	Prepare Draft Well Development Pilot Test Work Plan	11 days	Tue 8/27/13	Fri 9/6/13
4	✓	USACE and KAFB review of Draft Well Development Pilot Test Work Plan	1 day	Fri 9/6/13	Fri 9/6/13
5	✓	NMED Review of "Look Ahead" Well Development Pilot Test Work Plan	8 days	Fri 9/6/13	Fri 9/13/13
6	✓	Prepare Final Well Development Pilot Test Work Plan	1 day	Sat 9/14/13	Sat 9/14/13
7	✓	KAFB Commander Signature for Official Submittal	3 days	Mon 9/16/13	Wed 9/18/13
8	✓	Final Well Development Pilot Test Work Plan to NMED	0 days	Wed 9/18/13	Wed 9/18/13
9		NMED Review of Well Development Pilot Test Work Plan	16 days	Wed 9/25/13	Thu 10/10/13
10	✓	NMED Approval of Well Development Pilot Test Work Plan	1 day	Thu 10/10/13	Thu 10/10/13
11		**Aquifer Testing Pilot Test Work Plan**	**74 days**	**Tue 8/27/13**	**Wed 11/6/13**
12	✓	Prepare Draft Aquifer Testing Pilot Test Work Plan	11 days	Tue 8/27/13	Fri 9/6/13
13	✓	USACE and KAFB review of Draft Aquifer Testing Pilot Test Work Plan	1 day	Fri 9/6/13	Fri 9/6/13
14	✓	NMED Review of "Look Ahead" Aquifer Testing Pilot Test Work Plan	15 days	Fri 9/6/13	Fri 9/20/13
15	✓	Prepare Revised "Look Ahead" Aquifer Testing Pilot Test Work Plan	7 days	Sat 9/21/13	Fri 9/27/13
16	✓	NMED Review of Revised "Look Ahead" Aquifer Testing Pilot Test Work Plan	7 days	Wed 10/9/13	Tue 10/15/13
17		Prepare Final Aquifer Testing Pilot Test Work Plan	9 days	Wed 10/16/13	Thu 10/24/13
18		KAFB Commander Signature for Official Submittal	1 day	Thu 10/24/13	Fri 10/25/13
19		Final Aquifer Testing Pilot Test Work Plan to NMED	1 day	Fri 10/25/13	Sat 10/26/13
20		NMED Review of Aquifer Testing Pilot Test Work Plan	10 days	Sat 10/26/13	Tue 11/5/13
21		NMED Approval of Aquifer Testing Pilot Test Work Plan	1 day	Tue 11/5/13	Wed 11/6/13
22		**Design of Pressure Bypass at WUA Southside Reuse Pump House**	**104 days**	**Fri 7/26/13**	**Tue 11/5/13**
23		Prepare Draft Design Drawings	14 days	Fri 7/26/13	Sat 8/10/13
24	✓	WUA Review of Design Drawings	1 day	Mon 9/9/13	Tue 9/10/13
25	✓	Prepare Revised Design Drawings	10 days	Tue 9/10/13	Fri 9/20/13
26	✓	WUA Review of Revised Design Drawings	6 days	Fri 9/20/13	Wed 9/25/13
27	✓	Prepare Revised Design Drawings (Round 2)	5 days	Thu 9/26/13	Mon 9/30/13
28	✓	WUA Review of Revised Design Drawings (Round 2)	5 days	Thu 10/3/13	Mon 10/7/13
29	✓	WUA Approval of Design Drawings	0 days	Mon 10/7/13	Mon 10/7/13
30		Procurement of materials and services for construction of pressure bypass and tie-in	30 days	Tue 10/8/13	Tue 11/5/13
31		**Well Development & Aquifer Testing**	**70.5 days**	**Thu 9/26/13**	**Thu 12/5/13**
32		**Well Development**	**5 days**	**Thu 9/26/13**	**Mon 9/30/13**
33		Mobilization for Well Development	1 day	Thu 9/26/13	Thu 9/26/13
34		Well Development of KAFB-106157	3 days	Fri 9/27/13	Sun 9/29/13
35		Groundwater sample from KAFB-106157	0.5 days	Sun 9/29/13	Sun 9/29/13
36		Waste Profile Sample	0.5 days	Sun 9/29/13	Sun 9/29/13
37		Demobilization for Well Development	1 day	Sun 9/29/13	Mon 9/30/13
38		**Aquifer Testing**	**59 days**	**Mon 10/7/13**	**Thu 12/5/13**
39		Construction of Pressure Bypass at WUA Southside Pump House	2 days	Wed 11/6/13	Thu 11/7/13
40		Construction of Tie-in at Ridgecrest Dr. WUA Reuse	2 days	Wed 11/6/13	Thu 11/7/13
41		**Procurement of Groundwater Treatment System**	**7 days**	**Mon 10/7/13**	**Sun 10/13/13**
42		Shipment of treatment system	7 days	Mon 10/7/13	Sun 10/13/13
43		Mobilization for Step-testing	2 days	Mon 10/28/13	Tue 10/29/13
44		Step-testing of KAFB-106157	2 days	Wed 10/30/13	Thu 10/31/13
45		Demobilization for Step-testing	2 days	Fri 11/1/13	Sat 11/2/13
46		Analysis of composite sample collected during Step-testing	5 days	Sat 11/2/13	Thu 11/7/13
47		**Constant Rate Test**	**47 days**	**Fri 10/18/13**	**Wed 12/4/13**
48		Piping design for discharge	6 days	Fri 10/18/13	Wed 10/23/13
49		NMED Approval of Temporary Discharge Letter	1 day	Thu 10/31/13	Thu 10/31/13
50		Procurement of additional pipe and materials for discharge	14 days	Thu 10/24/13	Wed 11/6/13
51		Mobilization for Constant Rate Aquifer Testing	2 days	Wed 11/6/13	Fri 11/8/13
52		Construction of piping and sprinklers for discharge	7 days	Fri 11/8/13	Fri 11/15/13
53		Plugging of retention pond and construction of fence	4 days	Fri 11/15/13	Mon 11/18/13
54		Drawdown/Recovery Aquifer Testing of KAFB-106157	10 days	Tue 11/19/13	Fri 11/29/13
55		Restoration of pond	2 days	Fri 11/29/13	Mon 12/2/13
56		Demobilization for Constant Rate Aquifer Testing	2 days	Mon 12/2/13	Wed 12/4/13
57		**Well Development & Aquifer Testing Reporting**	**76 days**	**Sun 9/29/13**	**Sat 12/14/13**
58		**Well Development Report**	**76 days**	**Sun 9/29/13**	**Sat 12/14/13**
59	✓	Prepare Draft Well Development Report	14 days	Sun 9/29/13	Sun 10/13/13
60	✓	USACE and KAFB Review of Draft Well Development Report	1 day	Sun 10/13/13	Mon 10/14/13
61		NMED Review of "Look Ahead" Well Development Report	14 days	Wed 10/16/13	Tue 10/29/13
62		Prepare Final Well Development Report	7 days	Tue 10/29/13	Tue 11/5/13
63		Commander Signature for Official Submittal	7 days	Tue 11/5/13	Mon 11/11/13
64		NMED Review of Final Well Development Report	30 days	Tue 11/12/13	Fri 12/13/13
65		NMED Approval of Final Well Development Report	1 day	Fri 12/13/13	Sat 12/14/13



Project: SVE Schedule 009052012
Date: Tue 10/22/13
Page Number: 1 of 1

Task	Summary	External Milestone	Inactive Summary	Manual Summary Rollup	Finish-only
Split	Project Summary	Inactive Task	Manual Task	Manual Summary	Progress
Milestone	External Tasks	Inactive Milestone	Duration-only	Start-only	Deadline

APPENDIX B

Well Completion Diagrams

THIS PAGE INTENTIONALLY LEFT BLANK

PROJECT NUMBER	WELL NUMBER	
279495.04.01.01	KAFB-10610	SHEET 1 OF 1

CH2MHILL

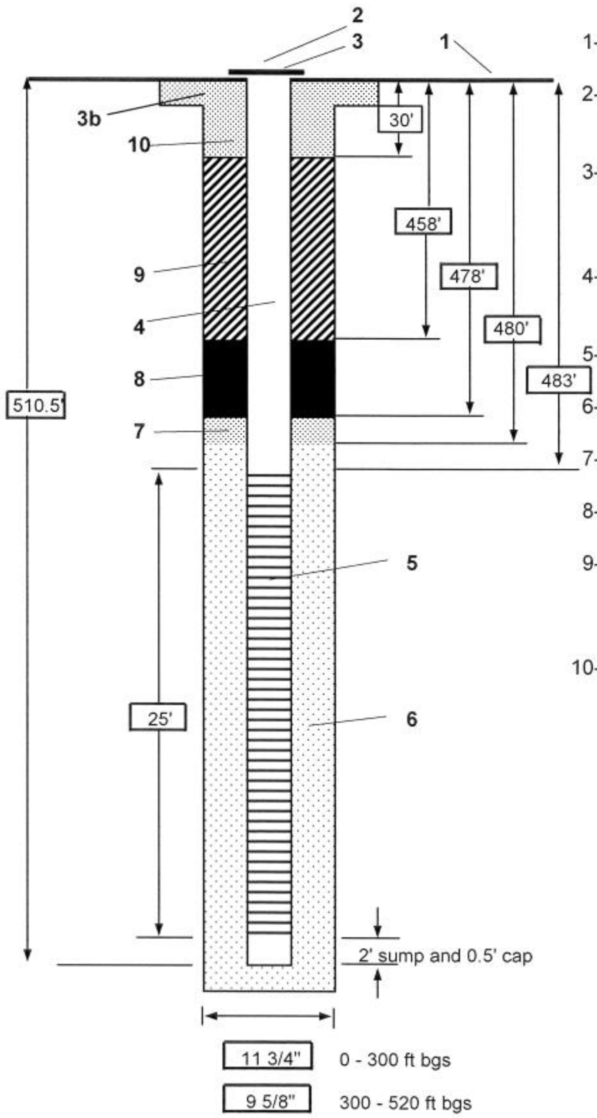
WELL COMPLETION DIAGRAM

PROJECT : ST-106 KAFB Bulk Fuels Facility — LOCATION : Bullhead Park

DRILLING CONTRACTOR : WDC Exploration & Wells — COORDINATES : N 1,475,266.8613 E 1,542,980.1899 New Mexico State Plane Coordinates, Central Zone, NAD 83 Datum

DRILLING METHOD AND EQUIPMENT USED : Air Rotary Casing Hammer, Speedstar 15K

WATER LEVEL : 490.41' bgs (12/7/2007) — START : 12/5/2007 — END : 12/6/2007 — LOGGER : M. Brislen/J. Waldron



1- Ground elevation at well: 5343.39 ft above Mean Sea Level

2- Top of casing elevation: 5343.20 ft above Mean Sea Level
- a) vent hole? no

3- Wellhead protection cover type: surface completion 12" dia. steel vault
- a) weep hole? no
- b) concrete pad dimensions: 4' x 4' flush mount

4- Dia./type of well casing: 4" schedule 80 PVC

5- Type/slot size of screen: stainless steel 0.010" slot

6- Type screen filter: 10/20 Colorado Silica Sand 480' - 520'

7- Transition sand: 20/40 Colorado Silica Sand 478' - 480'

8- Type of seal: hydrated bentonite chips 478' - 458'

9- Grout
- a) Grout mix used: volclay bentonite grout 30' - 458'
- b) Method of placement: tremmie pipe

10- Cement
- a) Cement mix used: portland cement grout 1' - 30'
- b) Method of placement: tremie pipe

Development method: not developed

Estimated purge volume:

Comments:

Not to scale

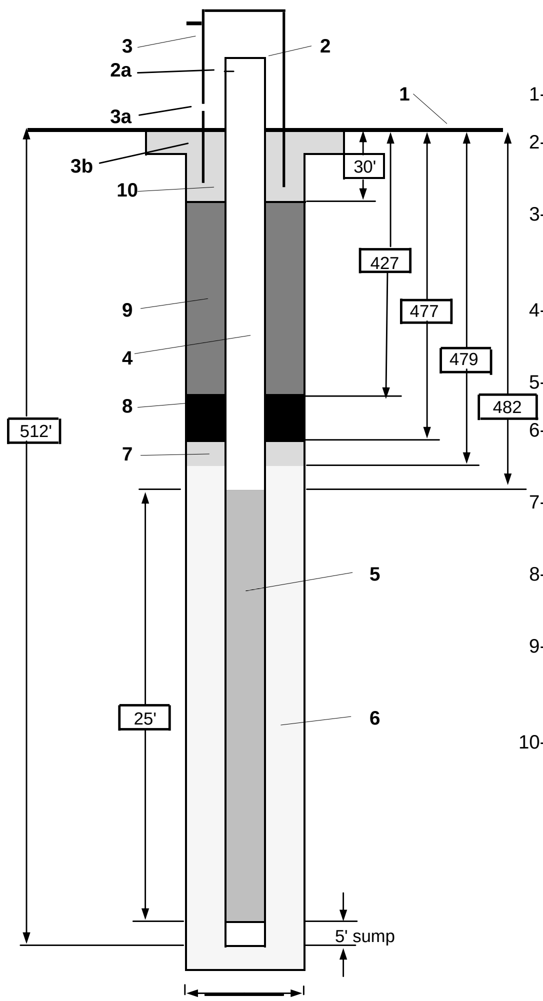
CH2MHILL	PROJECT NUMBER	WELL NUMBER KAFB-10617 SHEET 1 OF 1
	ESTIMATED WELL COMPLETION DIAGRAM	

PROJECT : ST-106 KAFB Bulk Fuels Facility LOCATION : VA Field

DRILLING CONTRACTOR : WDC Exploration & Wells COORDINATES : 1542923.45 ft E 1475228.99 ft N (NAD 83 NM central)

DRILLING METHOD AND EQUIPMENT USED : Air Rotary Casing Hammer, Speedstar 30K

WATER LEVEL : 488 7/12' START : END : LOGGER : K. Mouzakis and T. Arowwood



11 3/4" 0 - 300 ft bgs

9 5/8" 300 - 520 ft bgs

1- Ground elevation at well: 5339.5 ft msl (NADV88)

2- Top of casing elevation: 5342.51 ft msl (NADV88)
- a) vent hole? no

3- Wellhead protection cover type: above ground 8" dia. steel pipe w/locking lid
- a) weep hole? no
- b) concrete pad dimensions: 4' x 4' with 4 concrete filled bollards

4- Dia./type of well casing: 4" schedule 80 PVC

5- Type/slot size of screen: stainless steel 0.010" slot

6- Type screen filter: 10/20 Colorado Silica Sand
- a) thickness to be installed: 46 bags

7- Transition sand: 20/40 Colorado Silica Sand
- a) thickness to be installed

8- Type of seal: hydrated bentonite chips
- a) thickness to be installed

9- Grout
- a) Grout mix used: volclay bentonite grout
- b) thickness to be installed: 397'

10- Cement
- a) Cement mix used: portland cement grout
- b) thickness to be installed: 30' (from ground surface to 30' bgs)

Development method: bail, swab, bail, pump

Estimated purge volume: See development log

Development time: See development log

Comments

Not to scale

CH2MHILL	PROJECT NUMBER	WELL NUMBER KAFB-10618 SHEET 1 OF 1

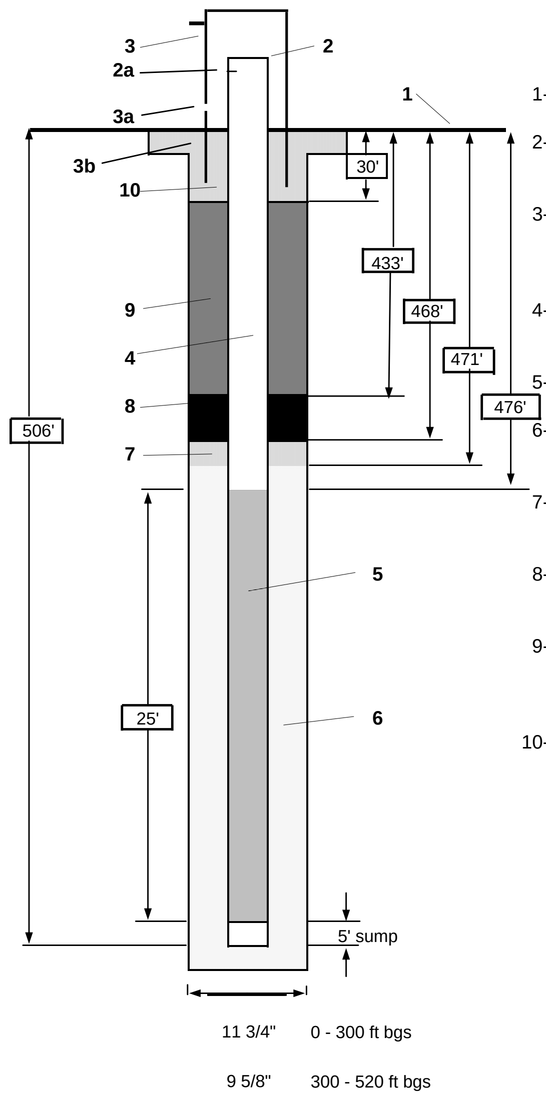
ESTIMATED WELL COMPLETION DIAGRAM

PROJECT : ST-106 KAFB Bulk Fuels Facility LOCATION : SW of Bulk Fuels

DRILLING CONTRACTOR : WDC Exploration & Wells COORDINATES : 1542425.96 ft E 1475430.35 ft N (NAD 83 NM central)

DRILLING METHOD AND EQUIPMENT USED : Air Rotary Casing Hammer, Speedstar 30K

WATER LEVEL : 482.5' START : END : LOGGER : T. Arowwood



1- Ground elevation at well: 5333.3 ft msl (NADV88)

2- Top of casing elevation: 5335.97 ft msl (NADV88)
   a) vent hole?: no

3- Wellhead protection cover type: above ground 8" dia. steel pipe w/locking lid
   a) weep hole?: no
   b) concrete pad dimensions: 4' x 4' with 4 concrete filled bollards

4- Dia./type of well casing: 4" schedule 80 PVC

5- Type/slot size of screen: stainless steel 0.010" slot

6- Type screen filter: 10/20 Colorado Silica Sand
   a) thickness to be installed: 32 bags

7- Transition sand: 20/40 Colorado Silica Sand
   a) thickness to be installed: 3 bags

8- Type of seal: hydrated bentonite chips
   a) thickness to be installed: 46 bags

9- Grout
   a) Grout mix used: volclay bentonite grout
   b) thickness to be installed: 387'

10- Cement
   a) Cement mix used: portland cement grout
   b) thickness to be installed: 30' (from ground surface to 30' bgs)

Development method: bail, swab, bail, pump

Estimated purge volume: See development log

Development time: See development log

Comments

Not to scale

CH2MHILL	PROJECT NUMBER	WELL NUMBER KAFB-10620 SHEET 1 OF 1

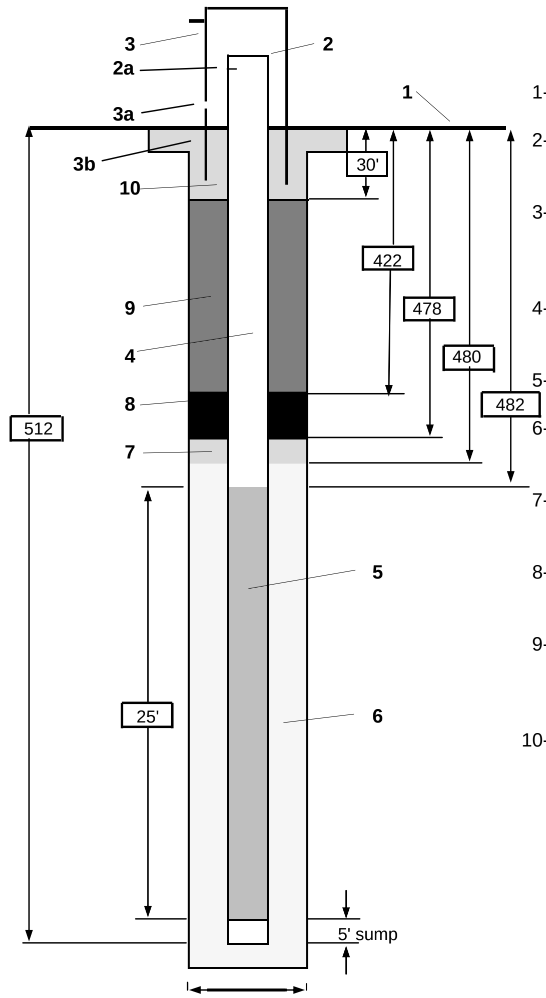
ESTIMATED WELL COMPLETION DIAGRAM

PROJECT : ST-106 KAFB Bulk Fuels Facility LOCATION : SW of Bulk Fuels

DRILLING CONTRACTOR : WDC Exploration & Wells COORDINATES : 1541868.99 ft E 1475368.41 ft N (NAD 83 NM central)

DRILLING METHOD AND EQUIPMENT USED : Air Rotary Casing Hammer, Speedstar 30K

WATER LEVEL : 489' START : END : LOGGER : K. Mouzakis



11 3/4" 0 - 300 ft bgs

9 5/8" 300 - 520 ft bgs

1- Ground elevation at well: 5341.11 ft msl (NADV88)

2- Top of casing elevation: 5340.75 ft msl (NADV88)
 a) vent hole?: no

3- Wellhead protection cover type: flush mount, 6x4 pad, 12-in diam. steel well vau
 a) weep hole?: no
 b) concrete pad dimensions: 4' x 4' with 4 concrete filled bollards

4- Dia./type of well casing: 4" schedule 80 PVC

5- Type/slot size of screen: stainless steel 0.010" slot

6- Type screen filter: 10/20 Colorado Silica Sand
 a) thickness to be installed: 32 bags

7- Transition sand: 20/40 Colorado Silica Sand
 a) thickness to be installed: 3 bags

8- Type of seal: hydrated bentonite chips
 a) thickness to be installed: 46 bags

9- Grout
 a) Grout mix used: volclay bentonite grout
 b) thickness to be installed: 387'

10- Cement
 a) Cement mix used: portland cement grout
 b) thickness to be installed: 30' (from ground surface to 30' bgs)

Development method: bail, swab, bail, pump

Estimated purge volume: See development log

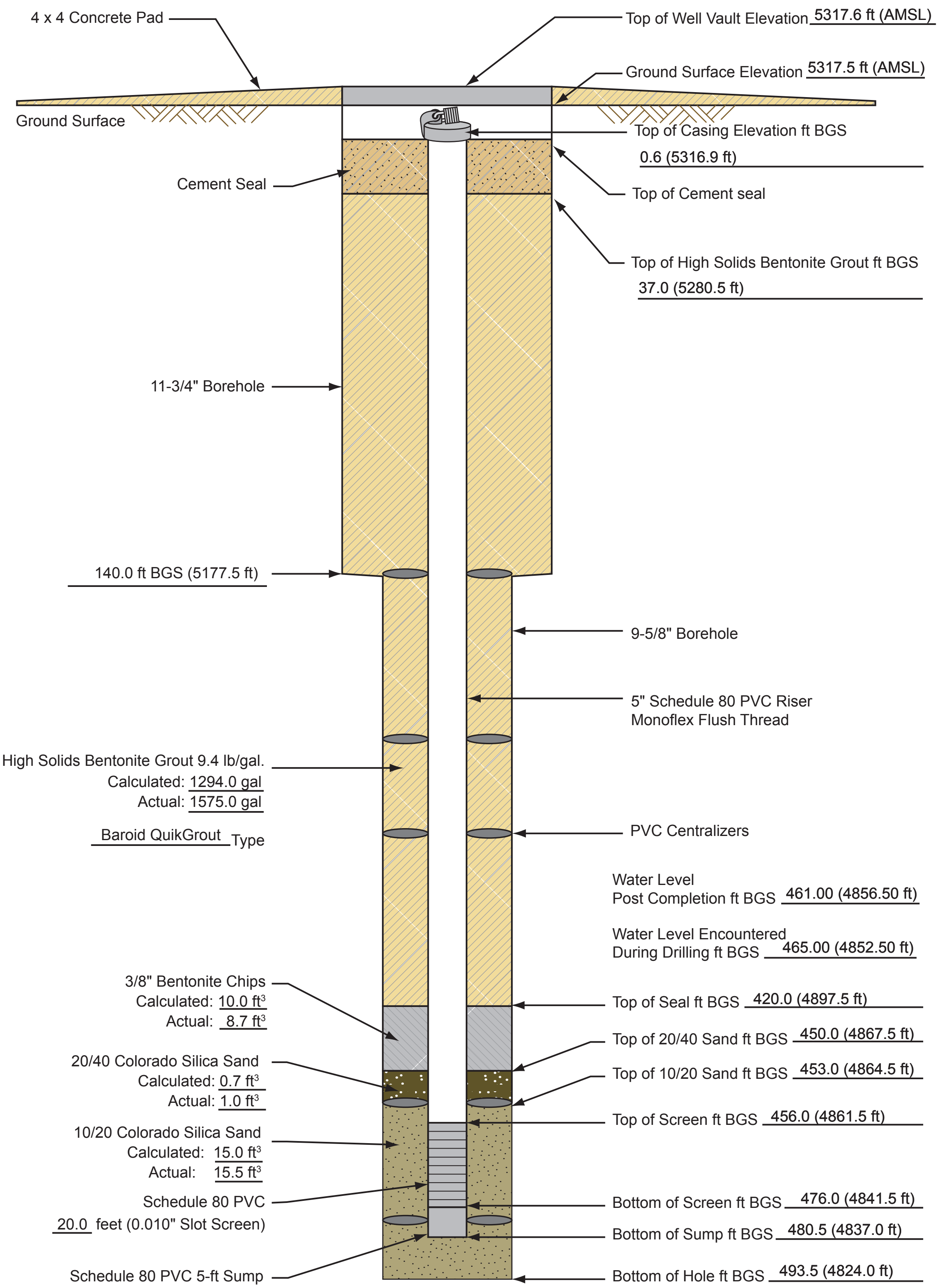
Development time: See development log

Comments: screened interval 482' - 507' bgs

Not to scale

Monitoring Well Completion Diagram KAFB-106032

Installation Start Date/Time: 6/21/2011 @ 13:54
Installation End Date/Time: 6/24/2011 @ 10:19



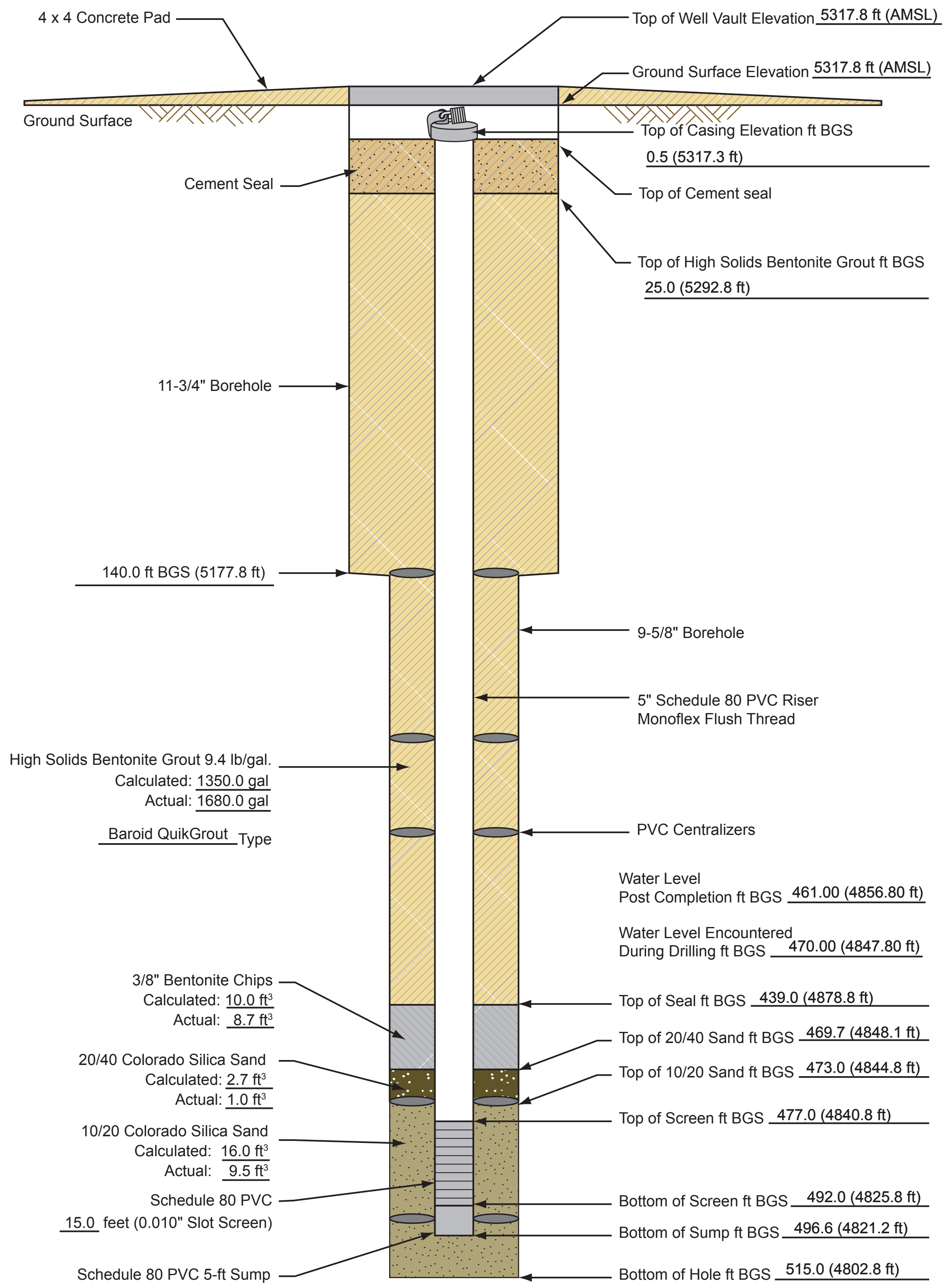
(4,816.90) = *Elevations are NAVD 88 Datum values based on NGS Control Station "Hanger", Elevation = 5,343.43 ft. GPS/RTK methods and GEO1D99 model were used to determine elevations of all surveyed points.*

Not to Scale
BGS = Below Ground Surface

140705.CB010040_MW_KAFB_106032

Monitoring Well Completion Diagram KAFB-106033

Installation Start Date/Time: 6/17/2011 @ 10:14
Installation End Date/Time: 6/24/2011 @ 11:15



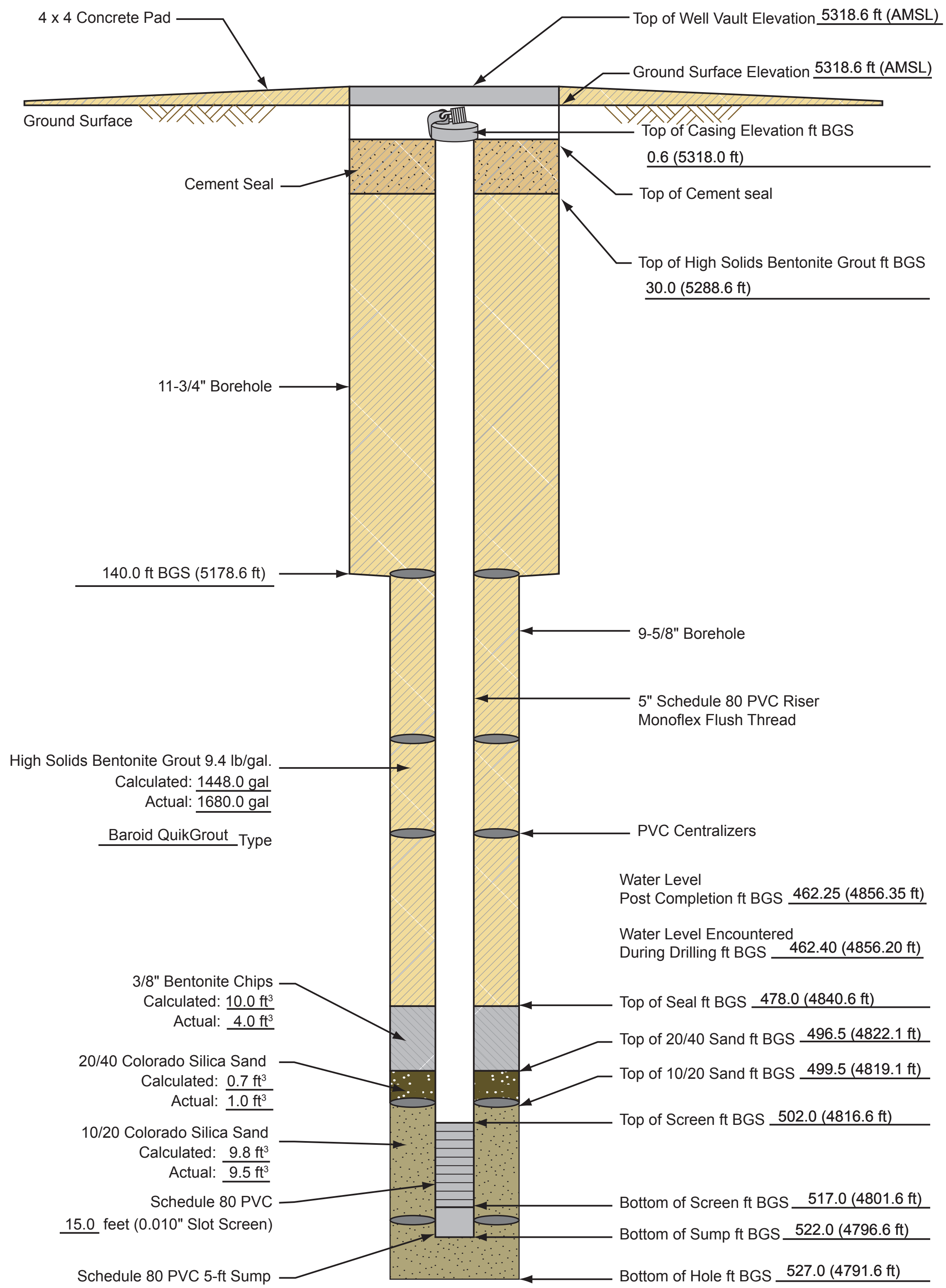
(4,816.90) = *Elevations are NAVD 88 Datum values based on NGS Control Station "Hanger", Elevation = 5,343.43 ft. GPS/RTK methods and GEO1D99 model were used to determine elevations of all surveyed points.*

Not to Scale
BGS = Below Ground Surface

140705.CB010040_MW_KAFB_106033

Monitoring Well Completion Diagram KAFB-106034

Installation Start Date/Time: 6/8/2011 @ 11:50
Installation End Date/Time: 6/24/2011 @ 10:31



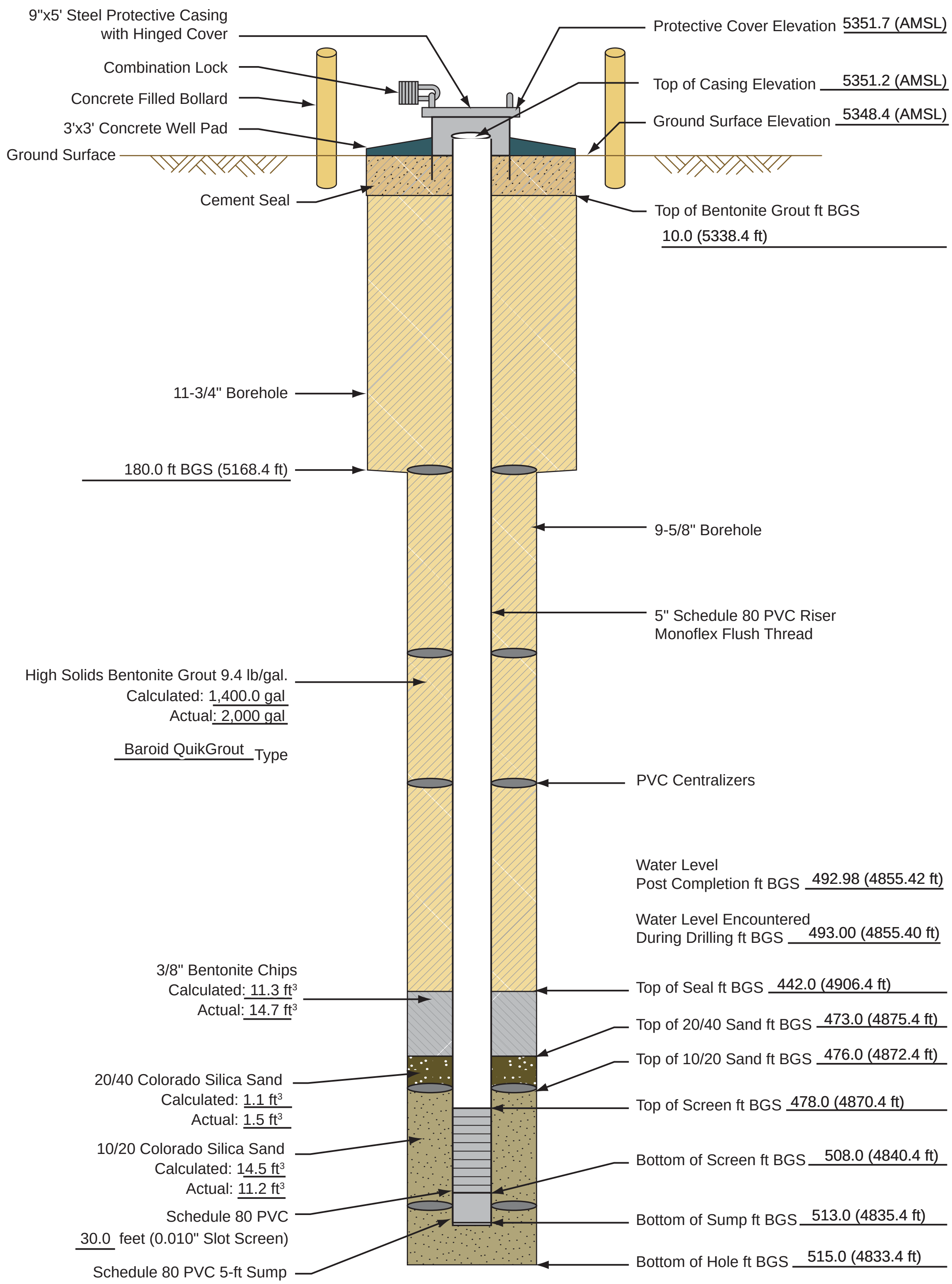
(4,816.90) = *Elevations are NAVD 88 Datum values based on NGS Control Station "Hanger", Elevation = 5,343.43 ft. GPS/RTK methods and GEO1D99 model were used to determine elevations of all surveyed points.*

Not to Scale
BGS = Below Ground Surface

140705.CB010040_MW_KAFB_106034

Monitoring Well Completion Diagram KAFB-106038

Installation Start Date/Time: 8/03/2011 @ 08:00
Installation End Date/Time: 8/05/2011 @ 12:00

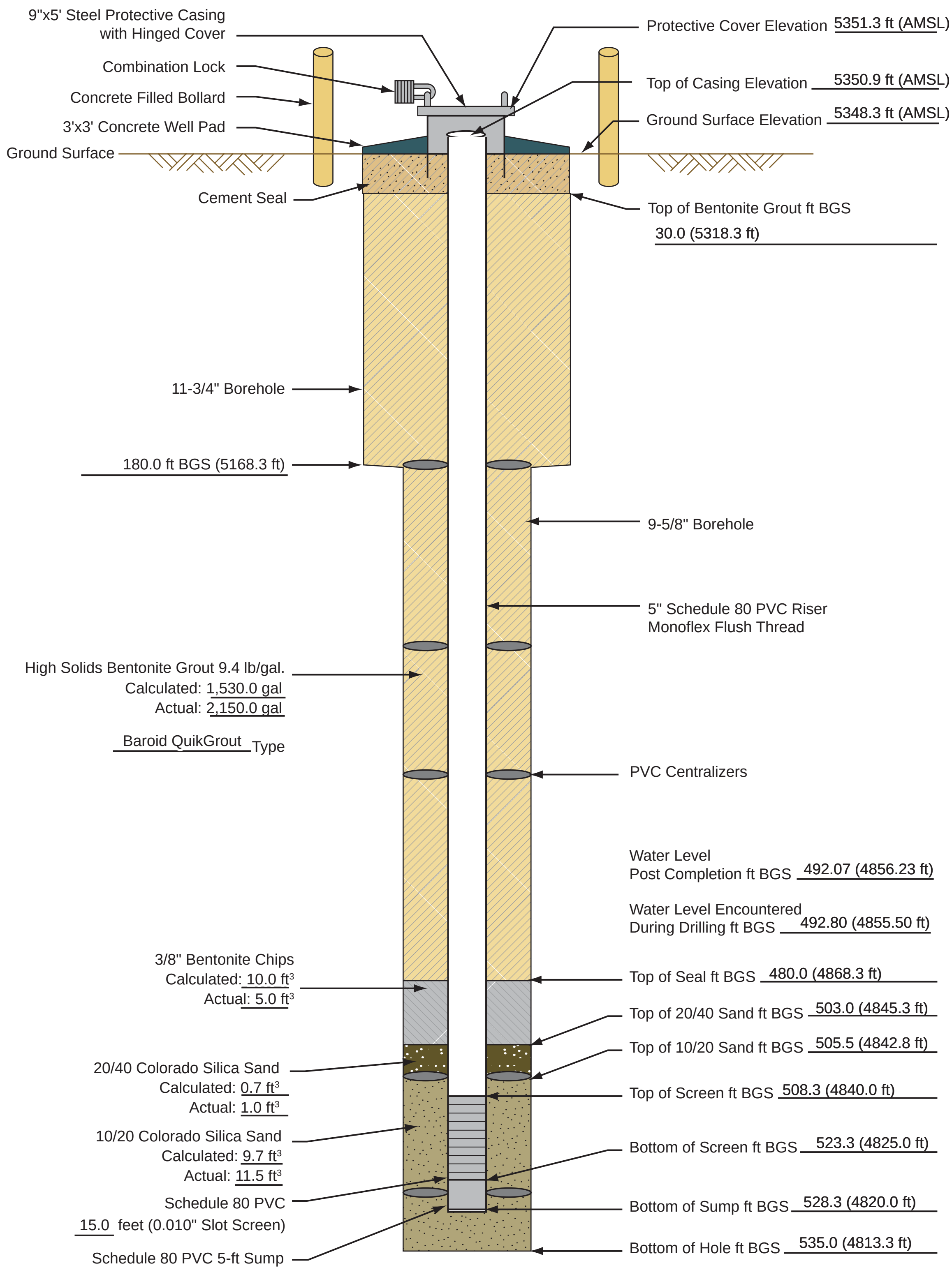


(4,816.90) = *Elevations are NAVD 88 Datum values based on NGS Control Station "Hanger", Elevation = 5,343.43 ft. GPS/RTK methods and GEO1D99 model were used to determine elevations of all surveyed points.*

Not to Scale
BGS = Below Ground Surface

Monitoring Well Completion Diagram KAFB-106039

Installation Start Date/Time: 7/22/2011 @ 11:00
Installation End Date/Time: 7/26/2011 @ 13:40



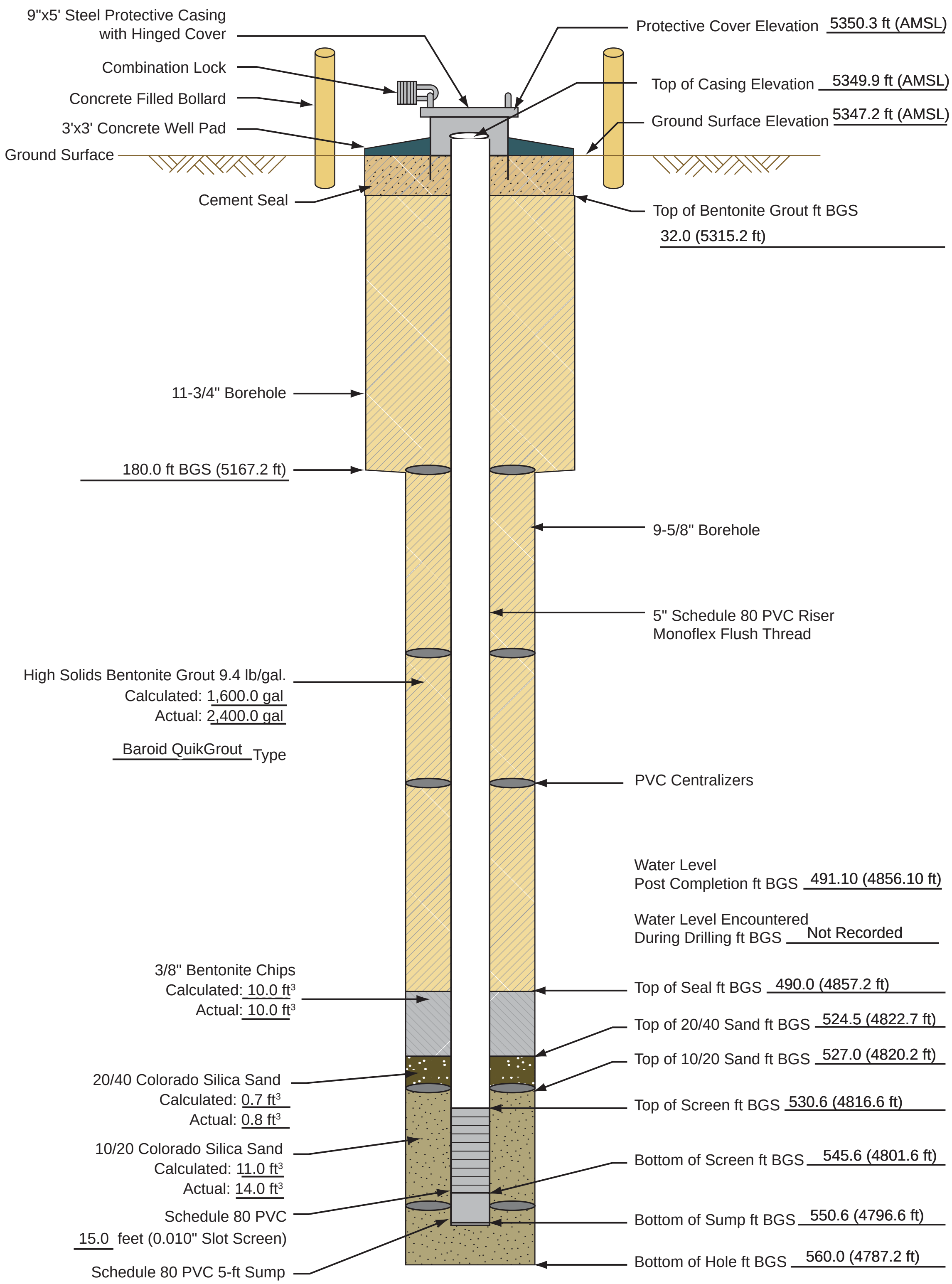
(4,816.90) = *Elevations are NAVD 88 Datum values based on NGS Control Station "Hanger", Elevation = 5,343.43 ft. GPS/RTK methods and GEO1D99 model were used to determine elevations of all surveyed points.*

Not to Scale
BGS = Below Ground Surface

140705.CB010040_MW_KAFB_106039

Monitoring Well Completion Diagram KAFB-106040

Installation Start Date/Time: 7/12/2011 @ 11:15
Installation End Date/Time: 7/19/2011 @ 11:50



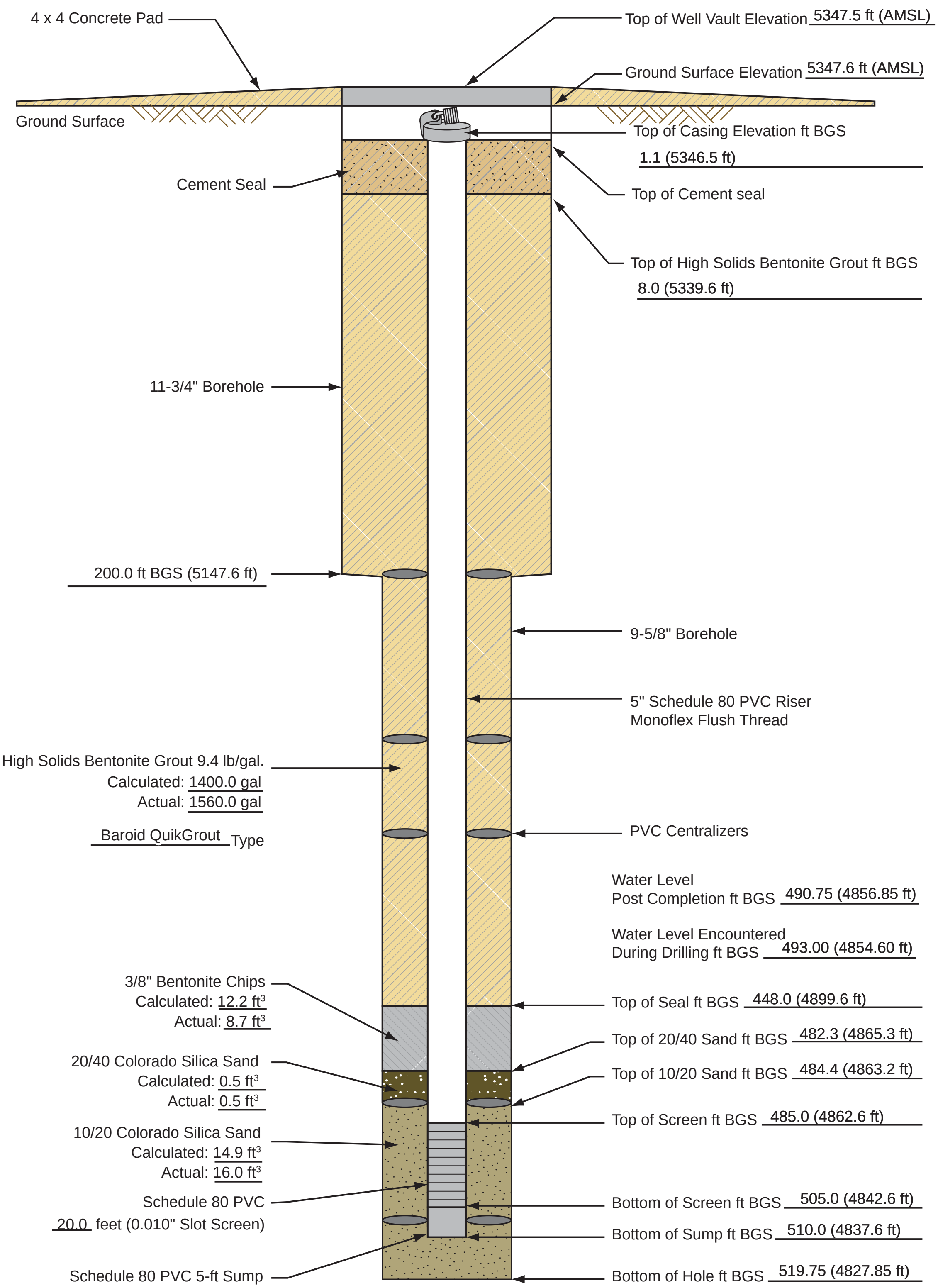
(4,816.90) = *Elevations are NAVD 88 Datum values based on NGS Control Station "Hanger", Elevation = 5,343.43 ft. GPS/RTK methods and GEO1D99 model were used to determine elevations of all surveyed points.*

Not to Scale
BGS = Below Ground Surface

140705.CB010040_MW_KAFB_106040

Monitoring Well Completion Diagram KAFB-106067

Installation Start Date/Time: 5/5/2011 @ 13:00
Installation End Date/Time: 5/11/2011 @ 09:30



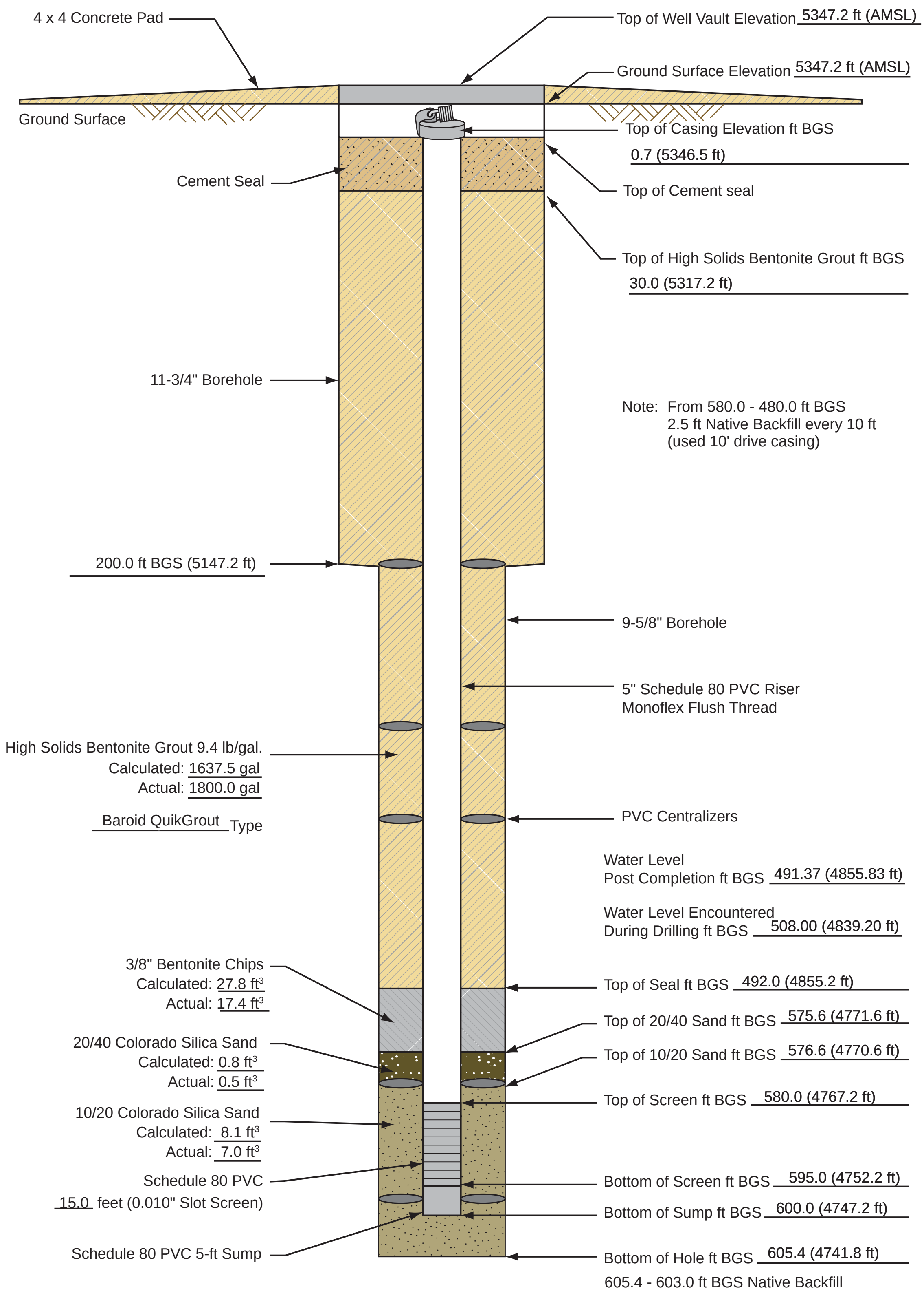
(4,816.90) = *Elevations are NAVD 88 Datum values based on NGS Control Station "Hanger", Elevation = 5,343.43 ft. GPS/RTK methods and GEO1D99 model were used to determine elevations of all surveyed points.*

Not to Scale
BGS = Below Ground Surface

140705.CB010040_MW_KAFB_106067

Monitoring Well Completion Diagram KAFB-106068

Installation Start Date/Time: 4/31/2011 @ 17:00
Installation End Date/Time: 5/03/2011 @ 09:30



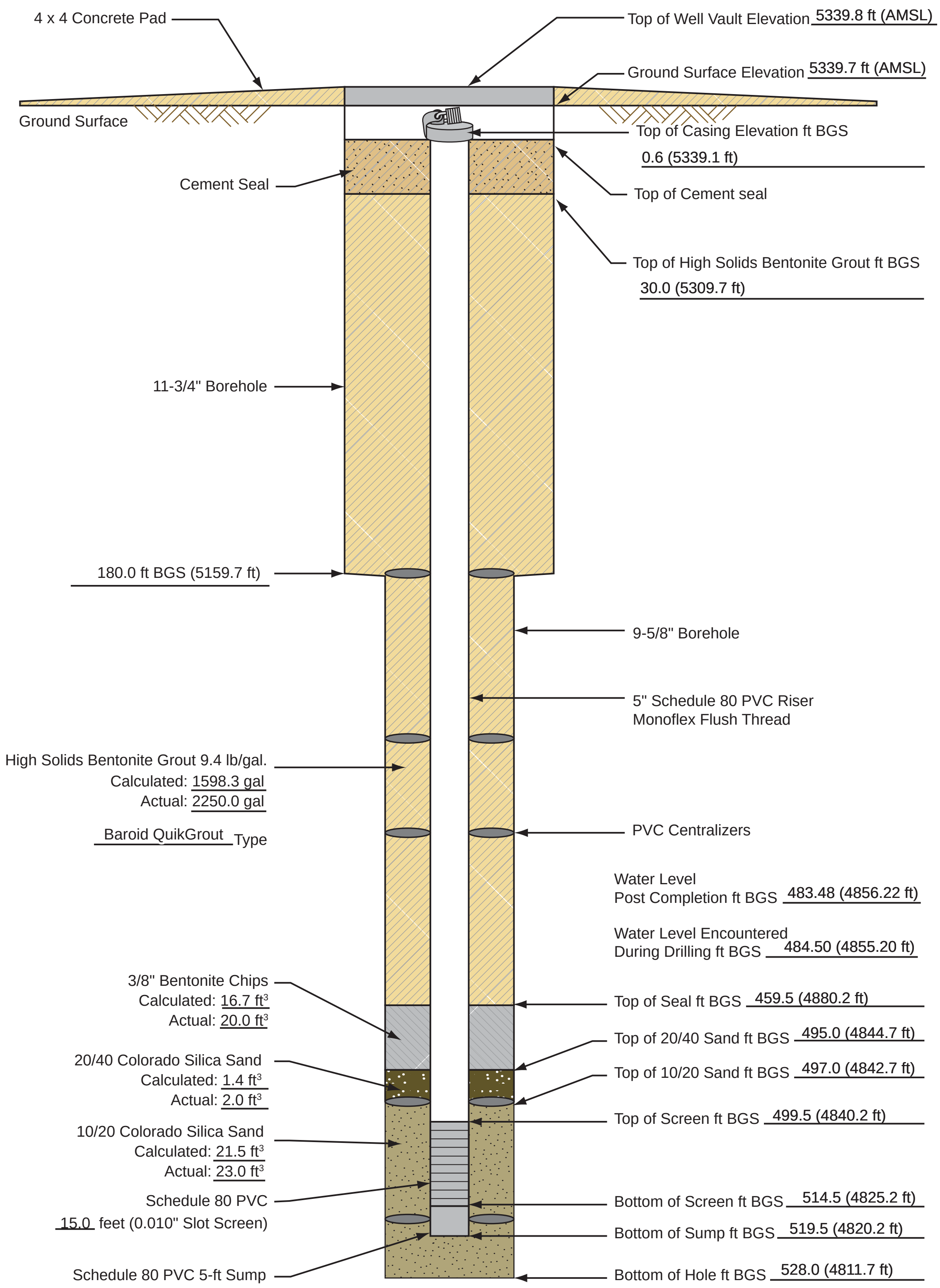
(4,816.90) = *Elevations are NAVD 88 Datum values based on NGS Control Station "Hanger", Elevation = 5,343.43 ft. GPS/RTK methods and GEO1D99 model were used to determine elevations of all surveyed points.*

Not to Scale
BGS = Below Ground Surface

140705.CB010040_MW_KAFB_106068

Monitoring Well Completion Diagram KAFB-106073

Installation Start Date/Time: 5/2/2011 @ 10:35
Installation End Date/Time: 5/5/2011 @ 10:00



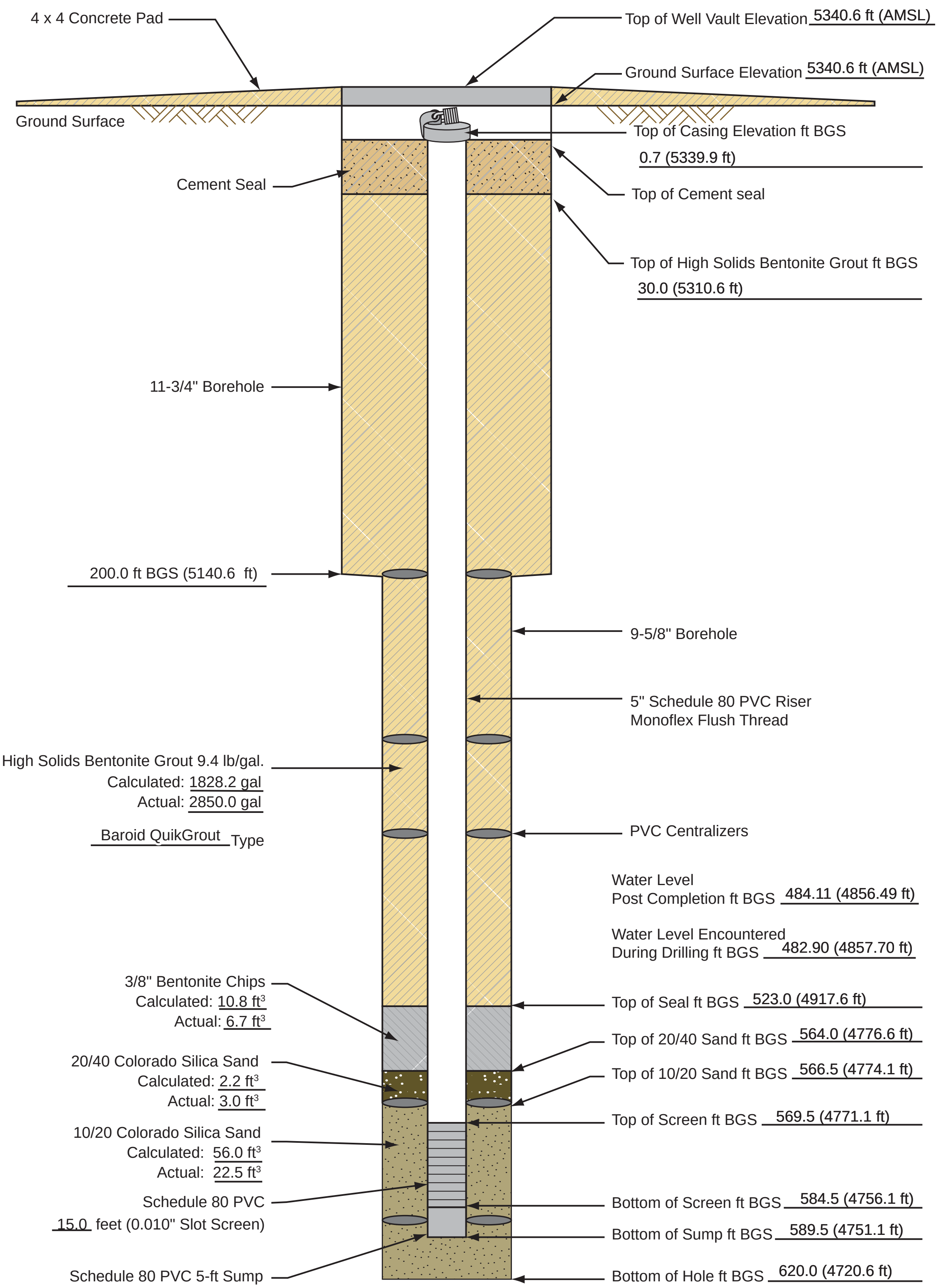
(4,816.90) = *Elevations are NAVD 88 Datum values based on NGS Control Station "Hanger", Elevation = 5,343.43 ft. GPS/RTK methods and GEO1D99 model were used to determine elevations of all surveyed points.*

Not to Scale
BGS = Below Ground Surface

140705.CB010040_MW_KAFB_106073

Monitoring Well Completion Diagram KAFB-106074

Installation Start Date/Time: 4/26/2011 @ 14:20
Installation End Date/Time: 4/28/2011 @ 15:00



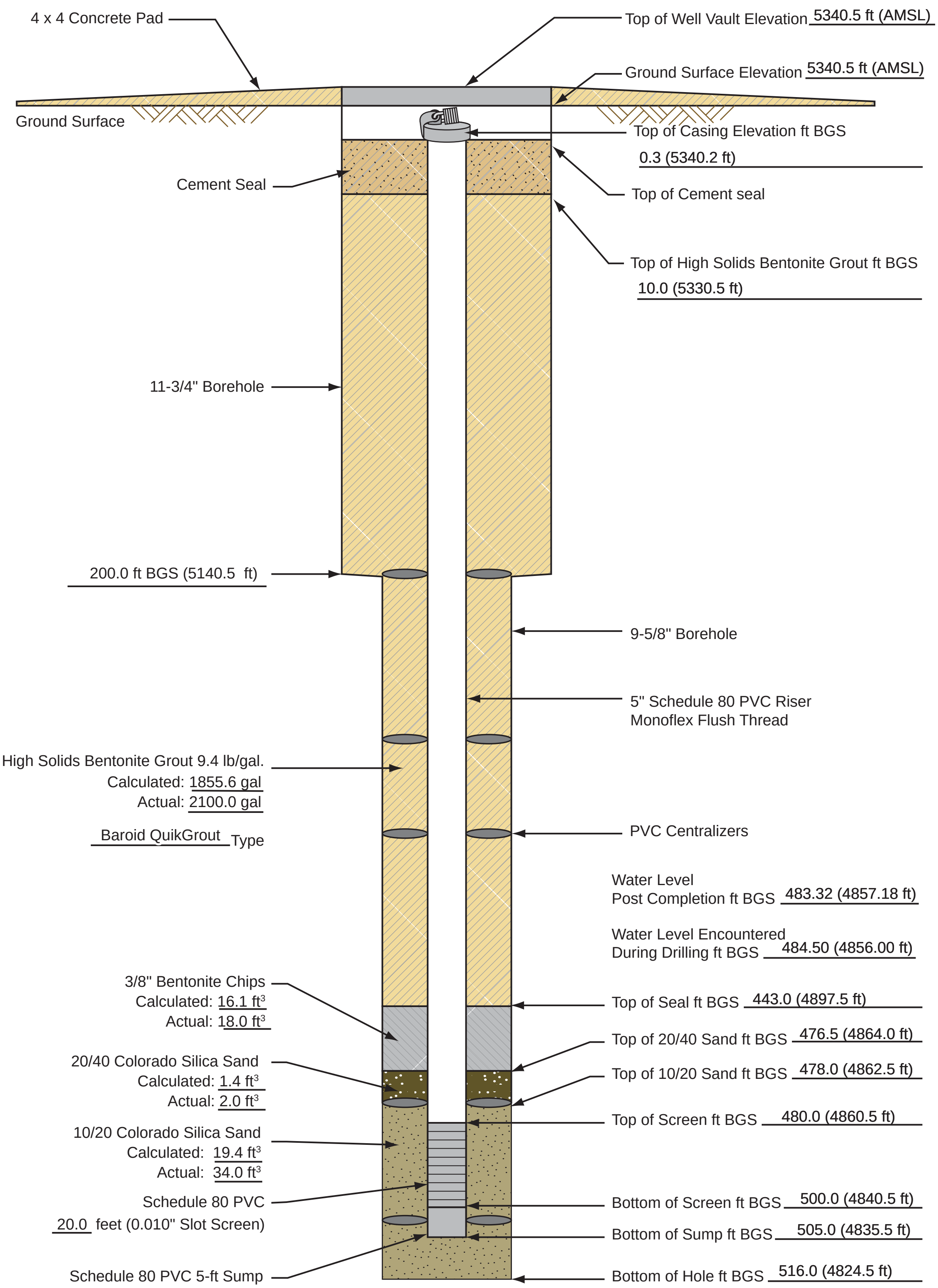
(4,816.90) = *Elevations are NAVD 88 Datum values based on NGS Control Station "Hanger", Elevation = 5,343.43 ft. GPS/RTK methods and GEO1D99 model were used to determine elevations of all surveyed points.*

Not to Scale
BGS = Below Ground Surface

140705.CB010040_MW_KAFB_106074

Monitoring Well Completion Diagram KAFB-106075

Installation Start Date/Time: 4/15/2011 @ 12:45
Installation End Date/Time: 4/17/2011 @ 10:41



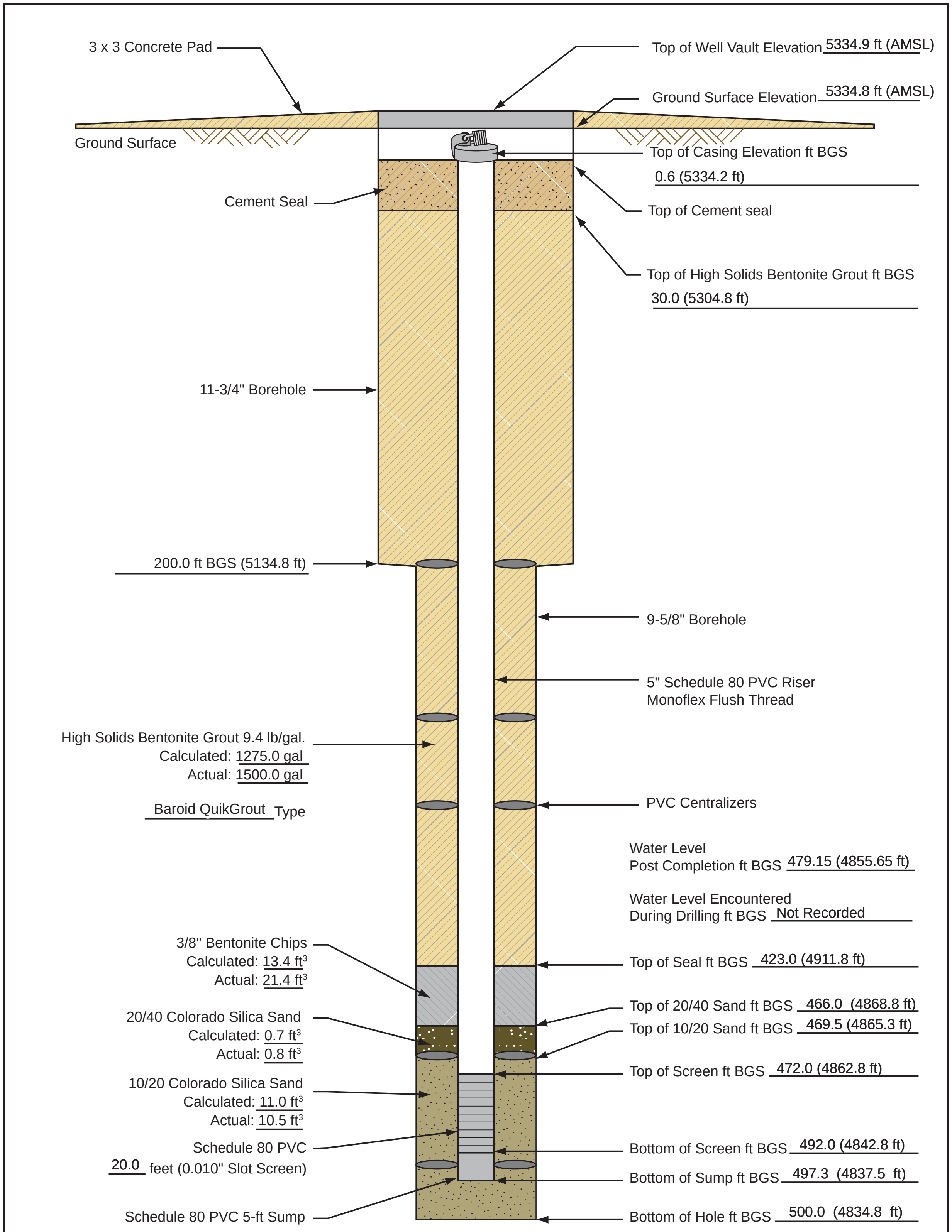
(4,816.90) = *Elevations are NAVD 88 Datum values based on NGS Control Station "Hanger", Elevation = 5,343.43 ft. GPS/RTK methods and GEO1D99 model were used to determine elevations of all surveyed points.*

Not to Scale
BGS = Below Ground Surface

140705.CB010040_MW_KAFB_106075

Monitoring Well Completion Diagram KAFB-106082

Installation Start Date/Time: 3/18/2011 @ 11:00
Installation End Date/Time: 4/5/2011 @ 10:00



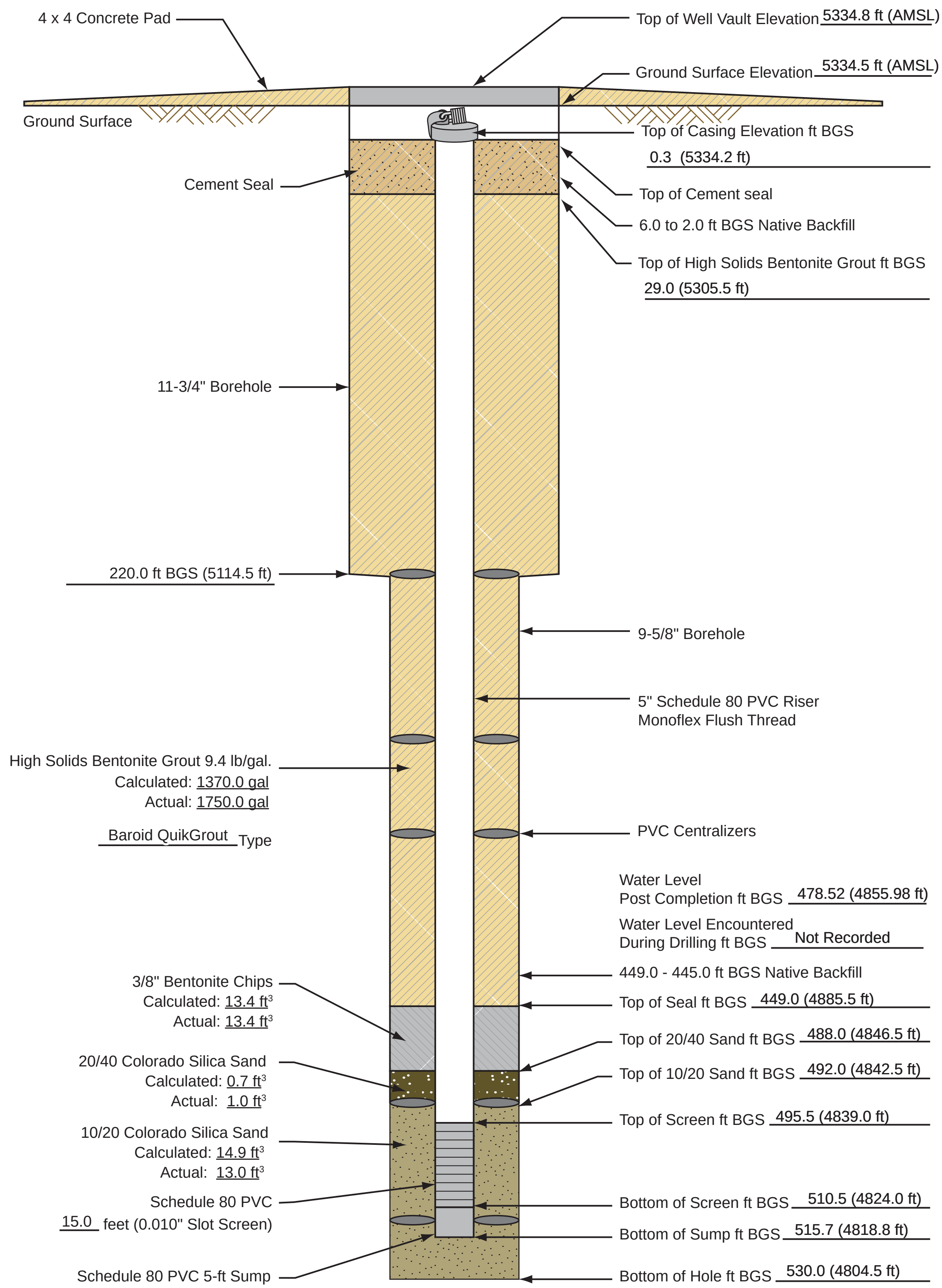
(4,816.90) = *Elevations are NAVD 88 Datum values based on NGS Control Station "Hanger", Elevation = 5,343.43 ft. GPS/RTK methods and GEO1D99 model were used to determine elevations of all surveyed points.*

Not to Scale
BGS = Below Ground Surface

140705.CB010040_MW_KAFB_106082.ai

Monitoring Well Completion Diagram KAFB-106083

Installation Start Date/Time: 4/3/2011 @ 12:00
Installation End Date/Time: 4/15/2011 @ 09:45



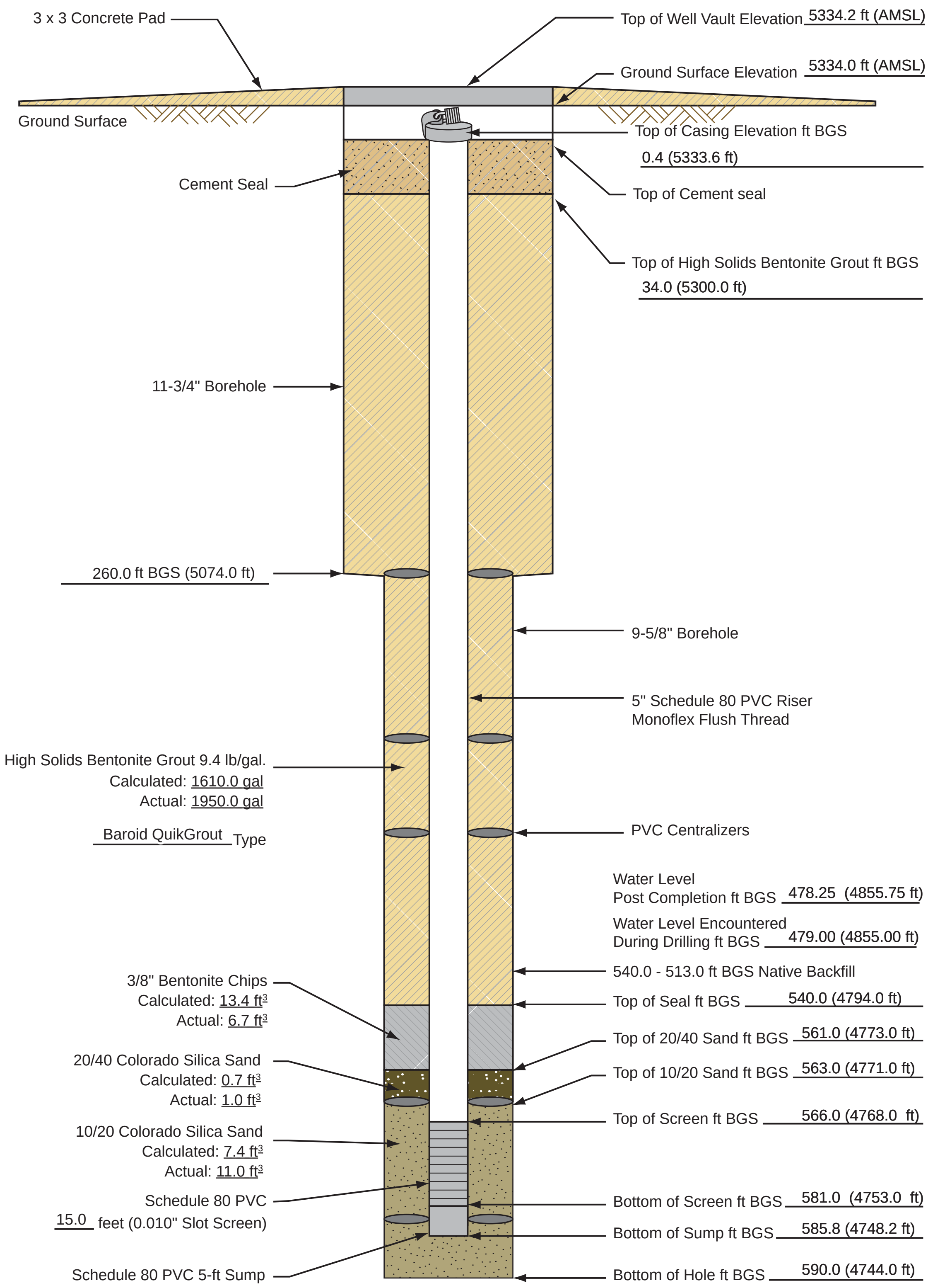
(4,816.90) = *Elevations are NAVD 88 Datum values based on NGS Control Station "Hanger", Elevation = 5,343.43 ft. GPS/RTK methods and GEO1D99 model were used to determine elevations of all surveyed points.*

Not to Scale
BGS = Below Ground Surface

140705.CB010040_MW_KAFB_106083

Monitoring Well Completion Diagram KAFB-106084

Installation Start Date/Time: 3/23/2011 @ 16:00
Installation End Date/Time: 4/5/2011 @ 12:00

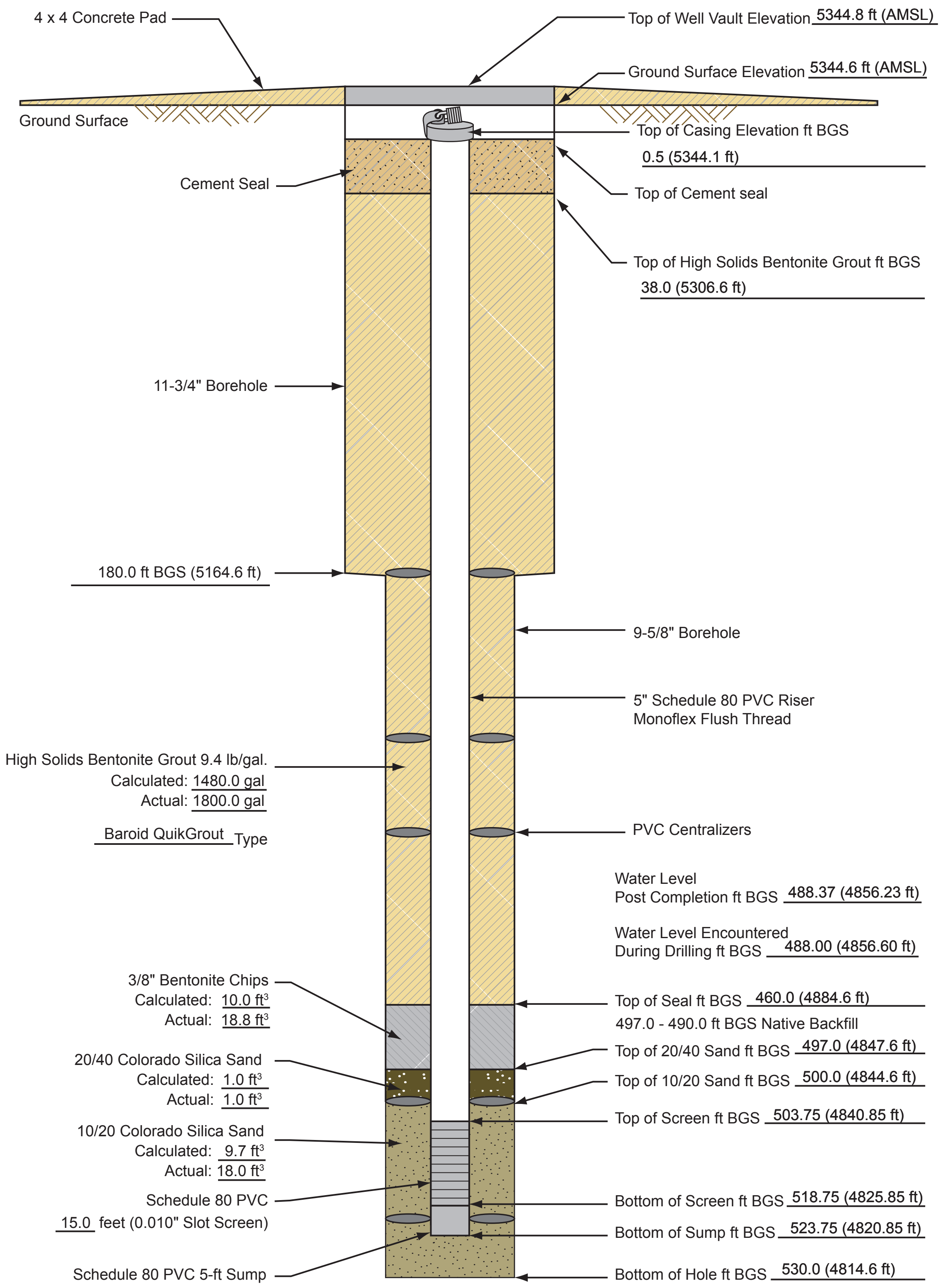


(4,816.90) = *Elevations are NAVD 88 Datum values based on NGS Control Station "Hanger", Elevation = 5,343.43 ft. GPS/RTK methods and GEO1D99 model were used to determine elevations of all surveyed points.*

Not to Scale
BGS = Below Ground Surface

Monitoring Well Completion Diagram KAFB-106095

Installation Start Date/Time: 6/16/2011 @ 11:10
Installation End Date/Time: 6/24/2011 @ 14:00



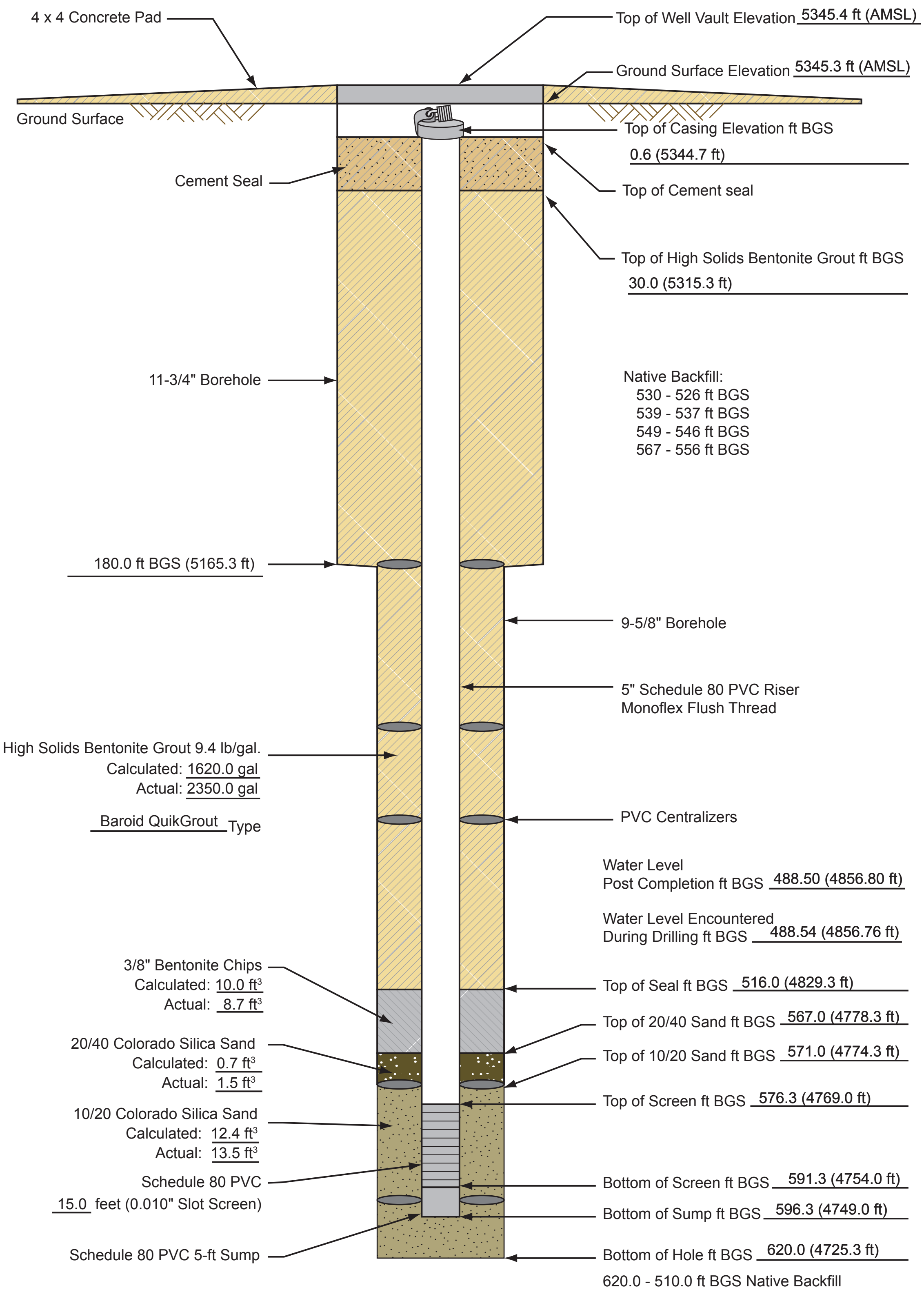
(4,816.90) = *Elevations are NAVD 88 Datum values based on NGS Control Station "Hanger", Elevation = 5,343.43 ft. GPS/RTK methods and GEO1D99 model were used to determine elevations of all surveyed points.*

Not to Scale
BGS = Below Ground Surface

140705.CB010040_MW_KAFB_106095

Monitoring Well Completion Diagram KAFB-106096

Installation Start Date/Time: 6/5/2011 @ 10:45
Installation End Date/Time: 6/7/2011 @ 13:45



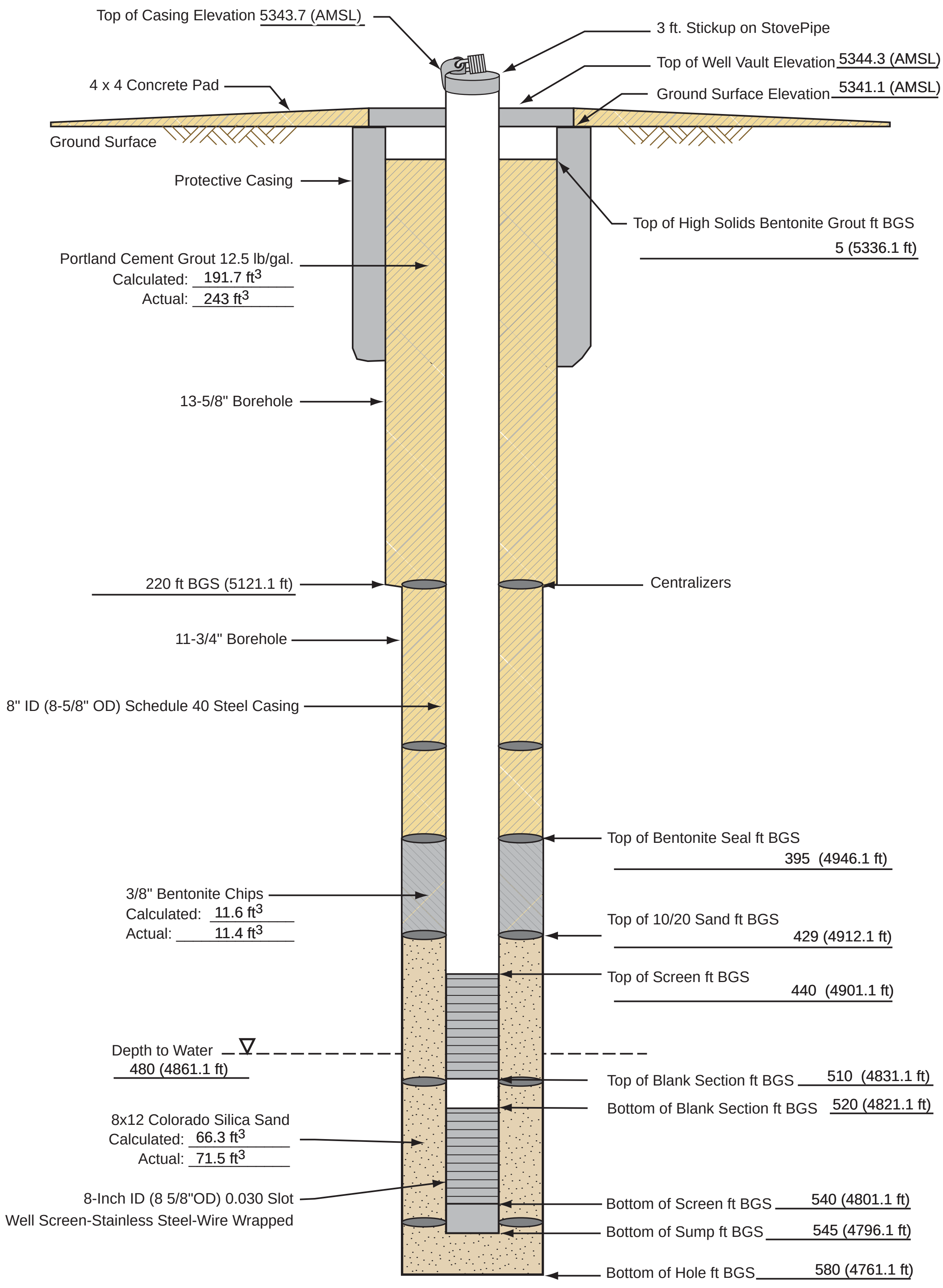
(4,816.90) = *Elevations are NAVD 88 Datum values based on NGS Control Station "Hanger", Elevation = 5,343.43 ft. GPS/RTK methods and GEO1D99 model were used to determine elevations of all surveyed points.*

Not to Scale
BGS = Below Ground Surface

140705.CB010040_MW_KAFB_106096

LNAPL Extraction Well 106157

Installation Start Date/Time: 12/10/11 @ 0800
Installation End Date/Time: 12/16/11 @ 0900



(4,816.90) = *Elevations are NAVD 88 Datum values based on NGS Control Station "Hanger", Elevation = 5,343.43 ft. GPS/RTK methods and GEO1D99 model were used to determine elevations of all surveyed points.*

Not to Scale
BGS = Below Ground Surface

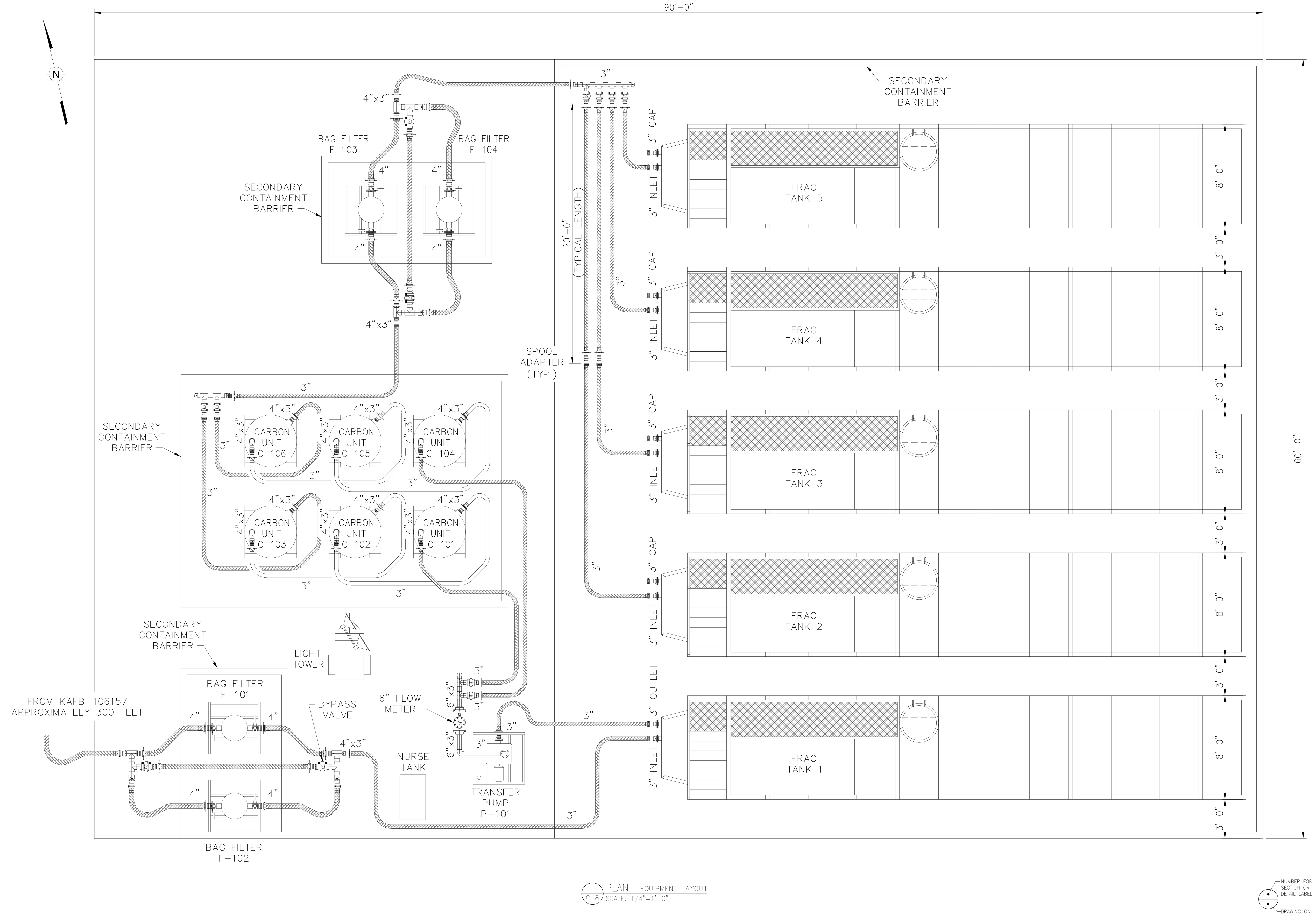
140705.DA010010_A2

APPENDIX C

Design Drawings of Treatment System

THIS PAGE INTENTIONALLY LEFT BLANK

5	4	3	2	1



FOR REVIEW ONLY! – NOT FOR CONSTRUCTION

PRELIMINARY PROGRESS DRAWINGS ARE NOT FOR CONSTRUCTION OR FABRICATION. BILL OF MATERIALS, SHOP DRAWINGS, ETC., CREATED FROM THESE DRAWINGS MAY BE REVISED AT THE EXPENSE OF THE CONTRACTOR.

Revisions			
Symbol	Descriptions	Date	Approved
A	ISSUED FOR REVIEW	10/17/13	

Shaw Environmental & Infrastructure, Inc.
(A CB&I Company)
312 DIRECTORS DRIVE KNOXVILLE, TENNESSEE 37923

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

KIRTLAND AIR FORCE BASE — ALBUQUERQUE, NEW MEXICO

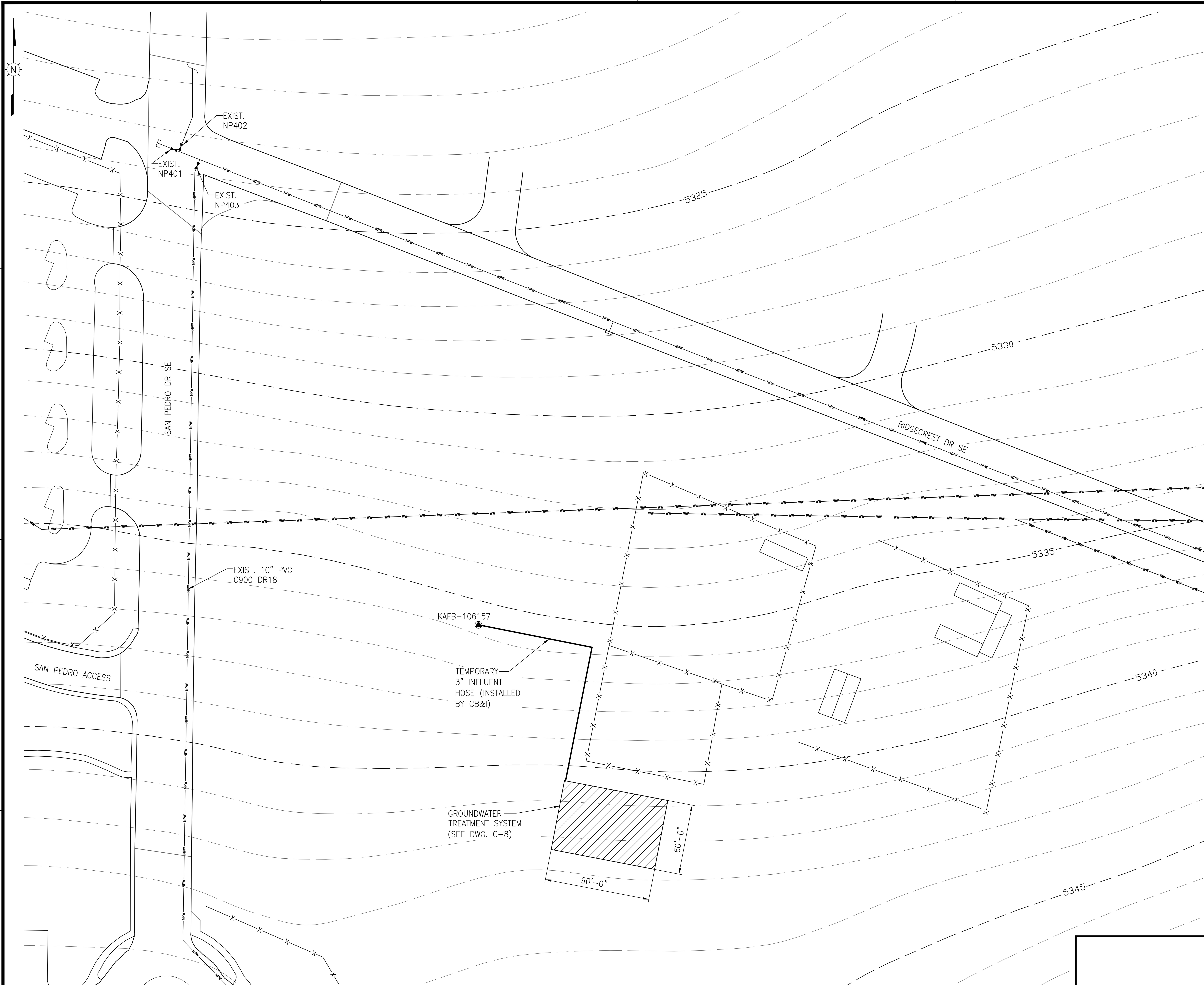
KAFB-106157 WELL DEVELOPMENT GROUND WATER TREATMENT EQUIPMENT LAYOUT

Designed by: MFL
Drawn by: MFL
Checked by: JTS
Reviewed by:
Submitted by:

Plot Scale Ratio: 1 = 1
Design File: 140705-A-C08.dwg
Date: 10/17/13
Spec. No.:
Contract No.:
Drawing Code:
Sheet reference number: C-8

File: C:\Users\mark.lawson\Documents\projects_workd\Kirtland AFB\SVE MOD 10-2013\140705_A-C08_Rev A.dwg
Plot Date/Time: Oct 17, 2013 - 5:41pm

5	4	3	2	1



LEGEND:

- BUILDING
- ROAD
- FENCE
- 5350 MAJOR CONTOURS
- MINOR CONTOUR
- GAS LINE
- STORM SEWER
- WASTE WATER LINE
- NON-POTABLE WATER IRRIGATION
- WATER LINE
- ELECTRICAL CABLE
- FUEL LINE
- FORMER FUEL LINE
- INDUSTRIAL WASTE LINE
- LIGHT POLE
- POWER POLE
- VALVE
- KAFB-106157 EXTRACTION WELLS
- ABOVEGROUND HOSE ROUTE
- GROUNDWATER TREATMENT SYSTEM

FOR REVIEW ONLY! – NOT FOR CONSTRUCTION

PRELIMINARY PROGRESS DRAWINGS ARE NOT FOR CONSTRUCTION OR FABRICATION. BILL OF MATERIALS, SHOP DRAWINGS, ETC., CREATED FROM THESE DRAWINGS MAY BE REVISED AT THE EXPENSE OF THE CONTRACTOR.

SCALE: 1"=40'
0 40 80 FEET

Revisions			
Symbol	Descriptions	Date	Approved
D	ISSUED FOR REVIEW	10/17/13	
C	ISSUED FOR REVIEW	09/30/13	
B	ISSUED FOR REVIEW	09/20/13	
A	PRELIMINARY	09/09/13	

Shaw Environmental & Infrastructure, Inc.
(A CB&I Company)
312 DIRECTORS DRIVE KNOXVILLE, TENNESSEE 37923

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

ARCHITECT/ENGINEER SEAL

Designed by: JS
Drawn by: JW
Checked by: AS
Reviewed by:
Submitted by:

KIRTLAND AIR FORCE BASE — ALBUQUERQUE, NEW MEXICO

KAFB-106157 WELL DEVELOPMENT PIPING ROUTING SITE PLAN

Plot Scale Ratio: 1 = 1
Design File: 140705-A- C05.dwg
Date: 09/20/13
Spec. No.:
Contract No.:
Drawing Code:
Sheet reference number: C-5

File: K:\Kirtland AFB\KAFB 106157 WELL DEVELOPMENT PIPE ROUTE\Civil\Drawing - Design\140705-A- C05 Rev D.dwg
Plot Date/Time: Oct 17, 2013 - 5:06pm

APPENDIX D

Granular Activated Carbon Calculations

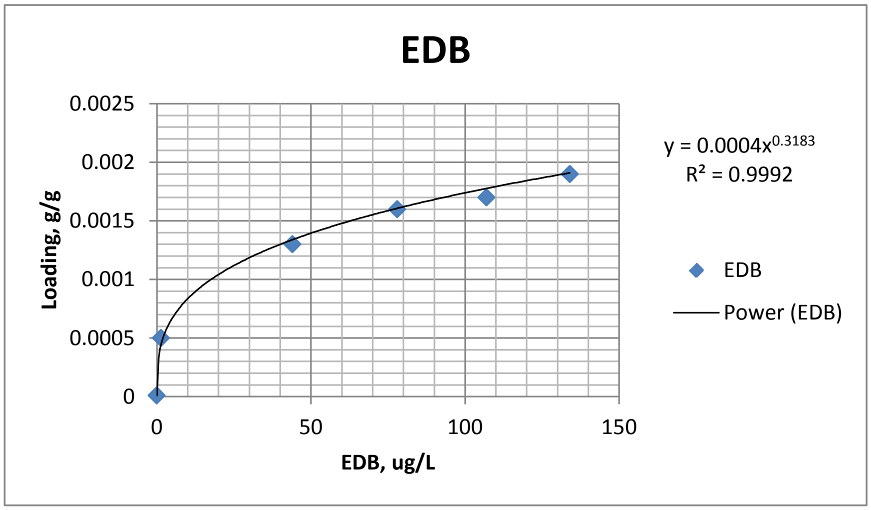
THIS PAGE INTENTIONALLY LEFT BLANK

Carbon Treatment Calculations
Kirtland BFF Aquifer Test

Calculate estimated carbon consumption using loading data for EDB on carbon vs inlet concentration.

EDB loading from Norit

conc, ug/L	loading g EDB/g carbon
1.4	0.0005
0.00001	0.00001
44	0.0013
78	0.0016
107	0.0017
134	0.0019



carbon usage

EDB conc in GW, ug/L	1.47
loading from correllation, g EDB/g carbon	0.00045
flow, gpm	150
EDB, lb/day	0.00265
carbon, lb/day	5.859

Calculate carbon volume needed to provide adequate contact time to remove EDB to low levels.

Flow rate, gpm	150	
Contact time, minutes	10	
carbon volume, ft3	201	
carbon weight, lb	**5414**	*note current design uses 6000 lb of carbon*

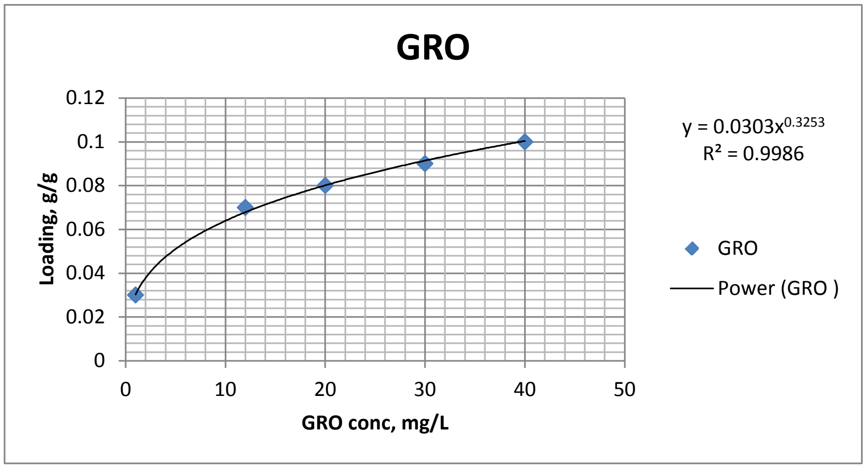
Note 1 - per Siemens use 10 to 15 minute contact time for MIBK, EDB not as bad as MIBK, Norit uses 8 to 10 minute for EDB at low levels

Carbon Treatment Calculations
Kirtland BFF Aquifer Test

Calculate estimated carbon consumption using loading data for GRO/DRO on carbon vs inlet concentration.

GRO loading from Norit

conc, mg/L	loading g GRO/g carbon
1	0.03
12	0.07
20	0.08
30	0.09
40	0.1



carbon usage

GRO/DRO conc in GW, mg/L	10	
loading from correllation, g GRO-DRO/g carbon	0.06408	
flow, gpm	150	
GRO/DRO, lb/day	0.01802	
carbon, lb/day	0.281	minimal carbon usage over 7 day pump test

Calculate carbon volume needed to provide adequate contact time to remve BTEX to low levels.

Flow rate, gpm	150
Contact time,	8
carbon volume, ft3	160
carbon weight, lb	4332

Note 1 - per Siemens use 5 to 8 minute contact time for BTEX

APPENDIX E

Vendor Spec Sheets for Treatment System Components

THIS PAGE INTENTIONALLY LEFT BLANK

JMM HIGH DENSITY POLYETHYLENE (HDPE) PE4710 PRODUCT SPECIFICATION

Description:

JMM manufactures High Density Polyethylene (HDPE) water pressure pipes for municipal and industrial transmission systems. Our pressure pipe is used in many types of applications such as potable water, sewer, drain, mining, irrigation, slip lining, and reclaimed water.

Materials:

JMM HDPE pressure pipe is manufactured with premium, highly engineered PE4710 resin that provides maximum performance benefits to service today's municipal and industrial water needs. The PE4710 material conforms to ASTM D3350 with the cell classification of 445574C/E and is listed with the Plastic Pipe Institute's (PPI) TR4. It is formulated with carbon black and/or ultraviolet stabilizer for maximum protection against UV rays for added assurance.

Size	Type	DR	Standard (If Applicable)
4" – 63"	IPS / DIPS	7 – 41	ASTM F714

Quality Assurance:

JMM takes great pride in the quality and workmanship of all of our products. JMM quality control programs monitor three critical aspects of the manufacturing process: the raw material, pipe production, and the finished goods. Incoming raw material is inspected and tested to ensure the material meets all applicable requirements before its release for production. During production, the pipe will be examined and pipe samples will be collected for physical verification and testing for compliance. The finished product is subjected to further visual inspection to ensure it has met all the appropriate specifications and packaging requirements. Our pipes are continuously monitored throughout the entire manufacturing process to validate that they are in accordance with all applicable specifications. Certificates of Compliance are available upon request.

Lengths & Bending Radius:

Standard laying lengths of HDPE pressure water pipe is 40/50 foot lengths. Pipe sizes under 6" may be coiled at continuous longer lengths upon request.

Marking:

The standard markings printed on JMM pipes generally consist of the JMM logo, nominal size and OD base, material code, dimension ratio, pressure class, current AWWA C906 (if applicable), ASTM F714 (if applicable), and production date (day, month, & year).

VCC 8x30 Virgin Coconut Shell Carbon

BakerCorp's VCC 8x30 mesh virgin carbon made from select grades of coconut shell. These activated carbon granules are a uniform adsorbent with well developed pore structure, allowing for a wide range of adsorbate retention. This carbon is ideal for purification of potable water, industrial wastewater treatment and groundwater treatment. This product is also suitable for refinement of organic liquids requiring purification and color reduction, such as amine and glycol solutions and will remove MTBE from groundwater.

PHYSICAL PROPERTIES:

Carbon Tetrachloride Activity:	60% minimum
Apparent Density (lbs./cu.ft.):	29 average
Total Ash Content:	3% maximum
Hardness (Ball Abrasion):	98% minimum
Iodine Number:	1,000 minimum
Moisture (as packed):	5% maximum
Mesh Size:	8x30

Standard Packaging: 1000 lb. super sacks. Other packaging available upon request.

These specifications represent general parameters and are subject to change. Please consult with BakerCorp before processing with your applications.

4306 W. 190th Street, Torrance, California 90504
Phone: 310.303.3700 ♦ Fax: 310.406.3001

PRODUCT DATA SHEET

April, 2007

4” 304 S.S. BAG FILTER SYSTEM

GENERAL INFORMATION

Single vessel mounted on a forkliftable skid. Housing is not ASME code stamped. Different filter elements are available depending on job requirements and should be specified by the customer prior to use.

WEIGHTS AND MEASURES

» Capacity*:	200 – 500 gpm (@ 5 microns and up)
» Design Press:	150 psig
» Design Temp:	225°F max.
» Height:	6'-1" (overall)
» Width:	4'-0"
» Depth:	4'-0"
» Weight:	850 lbs. (approx.)

*Capacity (flowrate) depends on factors such as liquid viscosity, micron value of the filter media, solids loading etc. Assuming water as a filtrate and factoring in pressure drop only, 500 gpm is a practical upper limit for a size #2 bag with a 10 micron rating. Clean pressure drop would be 2-3 psi. Lowering the micron rating increases the pressure drop. The minimum pressure drop for this unit at higher micron ratings is 1-2 psi. Filter bags should be changed out at 15-18 psid, or earlier if the process requires it. These units are gravity-flow capable.

SKID DESIGN

» Skid:	2″x2″ and 2″x4″ c.s. structural tubing
» Vessel Leg Supports:	3x3x.375 angle, SA-36
» Forklift Pockets:	Through front and rear framing channels (Each pocket is 21″ wide)

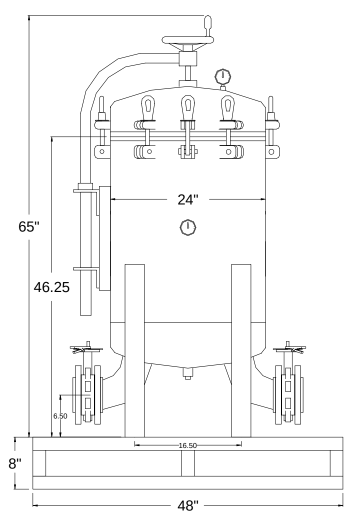
FILTER DESIGN

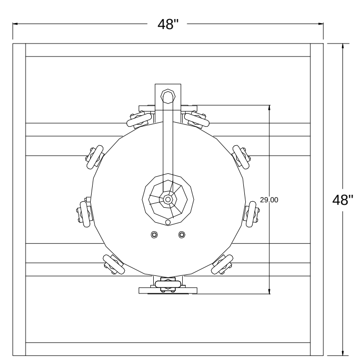
» Assembly Number:	Krystil Klear L2424304FA415-SKID
» Top Head:	Nine closure bolts and nuts with davit lift assembly. 24″ O.D., 0.25″ thk, SA-240 Gr. 304
» Shell:	24″ O.D., 0.25″ thick weld pipe, SA-312 Gr. 304
» In/Out Piping:	4″ Male Cam Lock
» Inlet & Outlet:	4″ 150# 304 S.S. RFSO flanges
» Bag Elements:	Four required: One size #2, 7-1/16″ snap ring & 30″ length required; Available fibers range from 1 to 1500 microns.
» Lid Seal:	Buna N O-ring
» In/Out Valves:	4″ 150″ butterfly with Buna seat
» Internal Hardware:	316 SS center guide post, cup & spring assemblies

TESTS / CERTIFICATIONS

» Test Performed:	OEM Hydrotested @ 195 psi. Scheduled QMS inspections after purchase by BakerCorp.

BAKERCORP™





BAKERCORP™

3020 Old Ranch Parkway • Suite 220 • Seal Beach, CA • 562-430-6262

PRODUCT DATA SHEET

July, 2009

T3A60 SELF-PRIMING PUMP

(4V CONVERSION)

GENERAL INFORMATION

Original Thompson 4V chassis fitted with the Gorman-Rupp model T3 self priming trash pump. This is a straightforward pumping system without any complicated priming system.

PERFORMANCE DATA

» Flow (min/max):	-	50 gpm / 450 gpm
» Minimum Shutoff Head:	-	42 feet (18 psi) (1) @ 1200 rpm
» Maximum Shutoff Head:	-	132 feet (57 psi) (1) @ 2150 rpm
» Speed (min/max):	-	1200 rpm / 2150 rpm
» Maximum Suction Lift:	-	25 feet (6)
» Maximum Casing Press:	-	87 psi
» Maximum Temperature:	-	160°F
» Maximum Solids Size:	-	2½" spherical

PUMP SPECIFICATIONS

» Impeller:	-	8.75" , open type, two vanes
» Bearing Lubrication:	-	Oil
» Vacuum System:	-	None
» Mech. Seal Lubrication:	-	SAE 30 Oil lubricated

PHYSICAL SPECIFICATIONS

» Suction Size:	-	3" female NPT flange
» Discharge Size:	-	3" female NPT flange
» Total Weight:	-	3000 lbs. (2) (est.)
» Overall Height:	-	6'-3" (To top of lifting bail)
» Overall Width:	-	5'-8"
» Overall Length:	-	9'-9" (Trailer length)

MATERIAL SPECIFICATIONS

» Pump Casing:	-	Gray Iron No. 30
» Shaft Sleeve:	-	Alloy steel No. 4130
» Wear Plate:	-	Carbon steel No. 1015
» Mechanical Seal Faces:	-	Silicon carbide
» Cover Plate:	-	Gray Iron No. 30
» Pump Shaft:	-	Alloy steel No. 4140
» O-rings:	-	Buna-N
» Impeller:	-	Ductile Iron No. 65-45-12
» Check Valve Flapper:	-	Neoprene w/stl reinforcing

ENGINE SPECIFICATIONS

» Engine Make/Model:	-	John Deere 3015DF
» Crankcase Oil:	-	5.4 quarts of SAE10W40 (3)
» Safety Shutdowns:	-	High water temperature & low oil pressure
» Fuel Capacity/Type:	-	50 gallons of No. 2 diesel
» Noise Level @ BEP:	-	90-95 dbA
» Coolant Type:	-	50/50 water/antifreeze
» Idle / Rated Speed:	-	900 RPM / 3000 RPM (5)
» Number of Cylinders:	-	Three

Notes:

(1) Based on 1.0 specific gravity
(2) Includes weight of trailer, pump and engine (w/o fuel)
(3) Midrange compromise. See John Deere manual.
(4) At 2100 RPM. Run time increases with reduced speed and decreases with higher speed.
(5) **WARNING** – this is the rated speed for the ENGINE ONLY. The rated speed of the pump is only 2100 RPM.
(6) Depends on flowrate and pump speed. See pump curve.

BAKERCORP

3020 Old Ranch Parkway • Suite 220 • Seal Beach, CA • 562-430-6262

SELF-PRIMING PUMP CURVE

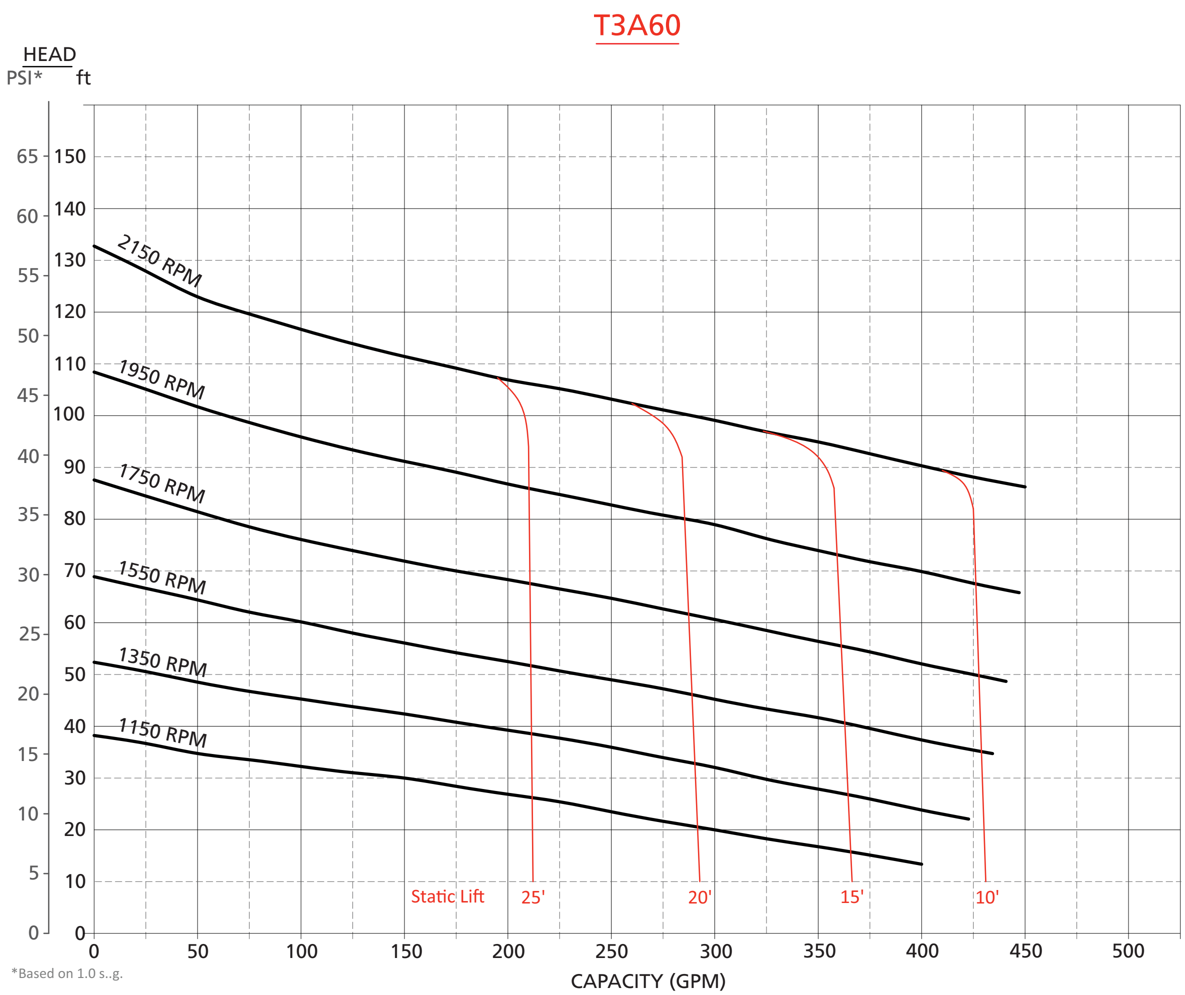
July, 2009

T3A60 SELF-PRIMING PUMP

(4V CONVERSION)

GENERAL INFORMATION

Original Thompson 4V chassis fitted with the Gorman-Rupp model T3 self priming trash pump. This is a straightforward pumping system without any complicated priming system.

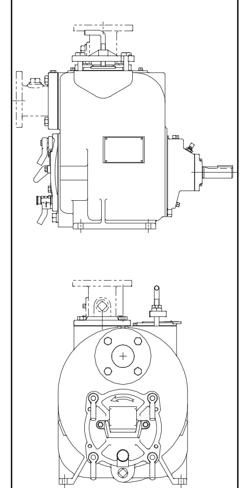


PUMP

MODEL	T3A60
CURVENO.	T3A-B-4
SUCTION	3-inch
DISCHARGE	3-inch
MAXSOLID	2-1/2 inches
IMP. DIA.	8.75 inches
SPEED	Various
MIN SPEED	1200 RPM

DRIVER

Diesel engine and electric motor driven versions are available. Consult your local BakerCorp representative for availablility.



BAKERCORP™

3020 Old Ranch Parkway • Suite 220 • Seal Beach, CA • 562-430-6262

PRODUCT DATA SHEET

January, 2007

CPC FIXED AXLE TANK

("TUFF TANK" VERSION)

GENERAL INFORMATION

This tank has a smooth interior wall and V-shaped bottom for easy cleaning.

WEIGHTS AND MEASURES

» Capacity:	500 BBL (21,000 gal.)
» Height:	10'-9" (grade to top of tank)
» Width :	8'-0"
» Length:	44'-10" overall (rear of tank to end of nose guard
» Weight:	25,500 lbs.

STRUCTURAL DESIGN

» Floor:	¼" thick ASTM A36 carbon steel, "V" bottom sloping from each side to center
» Sides/Ends:	¼" thick ASTM A36 carbon steel
» Roof Deck:	¼" thick ASTM A36 carbon steel
» Wall Frame:	¼" thick ASTM A36 carbon steel channel (on exterior side of walls)
» Roof Frame:	¼" thick ASTM A36 carbon steel channel (on exterior side of roof deck)

FEATURES

» Valves:	(2)Front & (1)Rear: 4"- wafer butterfly. Cast iron body, Buna-N seat & seals, 316 SS stem, Nylon 11 coated ductile iron disk, with plug and chain. Remote operation handle for rear valve
» Relief Valve:	16 oz./in² pressure setting, 0.4 oz./in² vacuum setting; Buna-N seal
» Front Drain & Front Supply:	4"-150# tank-side weld neck flange mated to valve and 150# FPT flange
» Rear Drain:	4"-150# tank-side weld neck flange mated to valve and 150# FPT flange

FEATURES – cont.

» Top Fill Line:	3" pipe, top of tank, with cap and chain
» Top Vapor Connection:	4"-150# weld neck flange with blind flange (chained) and Buna N gasket
» Top Manway:	22" I.D., slotted hinges and 5 - ¾" T or eye bolt with wing nut fasteners, hinged to side of tank, ½" flat plate or 3/8" if domed ASTM A36 steel. Buna N gasket is thermally fused.
» Front Manway:	22" I.D., slotted hinges and 5 - ¾" T or eye bolt with wing nut fasteners, hinged away from stairs, ½" flat plate or 3/8" if domed ASTM A36 steel. Buna N gasket is thermally fused.
» Side Manway:	22" I.D., slotted hinges and 5 - ¾" T or eye bolt with wing nut fasteners, mounted on passenger side and hinged to front of tank, ½" flat plate or 3/8" if domed ASTM A36 steel. Buna N gasket, is thermally fused.
» Stairway:	Non-slip with handrails and guardrails; OSHA compliant
» Level Gauge:	Ball style with 2-8" 304 SS floats. Floor supports hold floats ½" off floor.
» Tires:	11.00 x 22.5 Nylon tubeless
» Axles:	Standard 22,500#, Rockwell automatic slack adjusters, cast drum and hub, 30 service chambers, outboard drums

SURFACE DETAILS

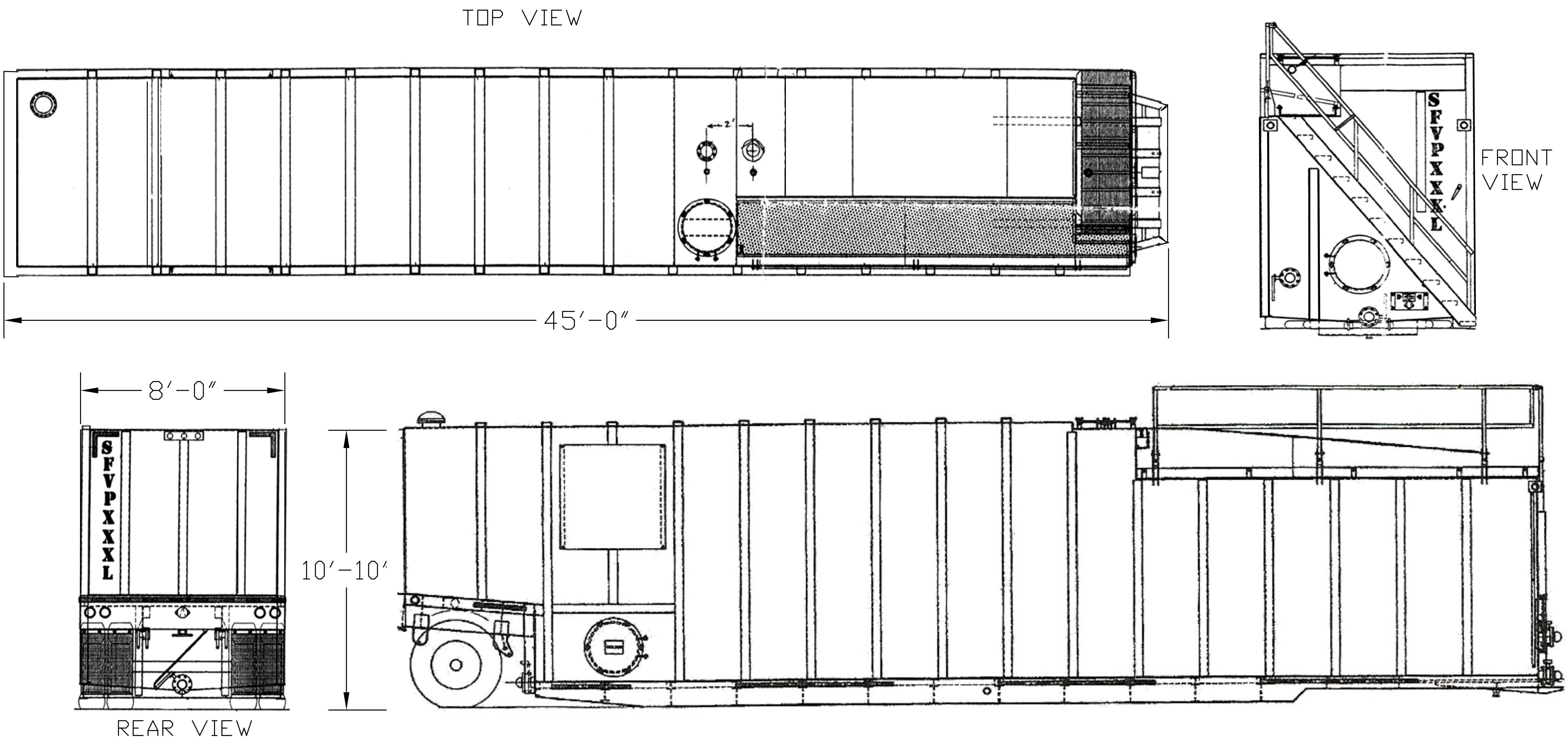
» Exterior Coating:	High gloss polyurethane paint
» Interior Coating:	Chemical resistant lining
» Safety Paint:	Safety yellow – handrails, hatch covers and trip hazard surfaces
» Decal Mounts:	Removable 10-gauge steel, 48"x48", both sides of tank at top rear. Secured with Nylock nuts or bolts with lock washers.

TESTS/CERTIFICATIONS

» Test Performed:	Hydrostatic water test after construction and major repairs; Level I, II and III inspections on a scheduled basis

BAKERCORP™

3020 Old Ranch Parkway • Suite 220 • Seal Beach, CA • 562-430-6262



SPECIFICATIONS:
1) Tank Capacity: 21,000 gallons (500 BBL)
2) Tank Weight: 25,500 lbs. (empty)

NOTES:
1. This drawing is a baseline representation for this model of tank. Variations between this drawing and the actual equipment in the field can and do exist, primarily with appurtenance locations, sizes and quantities. Consult your local BakerCorp representative if specific needs exist.
2. THIS TANK IS *NOT DESIGNED FOR TRANSPORTING LIQUIDS*. It should be moved only when empty.
3. Tanks of this type have an internal lining (coating) on the wetted surfaces.
4. This tank is equipped with a pressure/vacuum relief valve set at 1.0 1bs/sq. in. pressure and 0.4 oz/sq.in. vacuum.

BAKERCORP™ 3020 OLD RANCH PARKWAY SEAL BEACH, CA 90740-2751

REV.	DESCRIPTION	DATE	BY
G			
F			
E			
D			
C			
B			
A			

SCALE: Do Not Scale	SIZE B	ORIGINAL DWG. DATE 26JUN03
DRAWN BY: P.J.B.	APPROVED BY: –	CAT/CLASS ––
TITLE CPC FIXED AXLE TANK		SHEET 1 OF 1
DRAWING NO. S-2-M0013-1-		REV. 0

5500 Rawlings Ave., Southgate, CA 90280
Tel: 562.904-3680 ♦ Fax: 562.904-1583

Activated Carbon and Specialty Media
Pollution Control Systems and Filtration Equipment Rental

MATERIAL SAFETY DATA SHEET

DATE OF ISSUE: February 16, 2011

SECTION I- GENERAL INFORMATION

MANUFACTURER NAME: **BakerCorp 562.904.3680**
5500 Rawlings Ave, Southgate, CA 90280

CHEMICAL NAMES & SYNONYMS: Activated Carbon, Activated Coconut, Activated Charcoal, Char

TRADE NAMES & SYNONYMS: **Activated Carbon**

CHEMICAL FAMILY: Amorphous Carbon, Activated Coconut FORMULA: Carbon atom in a crystallite structure has an infinite molecular weight, Anthracite Coal, Sub-Bituminous Coal, Bituminous Coal CAS NO. 7440-440

SECTION II- HAZARDOUS INGREDIENTS

CHEMICAL NAME (Ingredients) [% TLV (Units)]: No Hazardous Ingredients

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASSES [% TLV (Units)]: LIQUIDS Activated Carbons that have adsorbed other carbon or non-carbon liquids or gasses may lower or raise the ignition point and must be laboratory checked for ignition point when expended.

SECTION III- PHYSICAL DATA

BOILING POINT (DEG F): 4200
SPECIFIC GRAVITY (H2O-1): 1.8-2.1
VAPOR PRESSURE (MM HG) N/A
PERCENT VOLATILE BY VOLUME: none
VAPOR DENSITY (AIR=1): N/A
EVAPORATION RATE: none
SOLUBILITY IN WATER: insoluble
IGNITION TEMPERATURE: 600 deg C
APPEARANCE & ODOR: Odorless, black granular solid

SECTION IV- FIRE HAZARD & EXPLOSIVE DATA

FLASH POINT (method used): none

FLAMMABLE LIMITS: Lower Explosive Limit: N/A Upper Explosive Limit: N/A

EXTINGUISHED MEDIA: Use media for class A fires: Foam, multipurpose dry chemical and water type extinguishers.

SPECIAL FIRE FIGHTING PROCEDURES: none

UNUSUAL FIRE & EXPLOSION HAZARDS: Provide for the handling of dry flowing solids in grounded equipment to prevent build up of static electric charge especially when explosive dust or vapor mixtures may exist in confined areas. Also provide for pressure relief devices following the principles set forth in the National Fire Protection Association Explosion Preventing Guide
NFPS68-1854.

SECTION V- HEALTH HAZARD DATA
THRESHOLD LIMIT VALUE: Avoid exposure to dust levels 15 mg per cubic meter.
(Federal), 10 mg per cubic meter (California State).
EFFECTS OF OVEREXPOSURE: Temporary dryness to mucous membrane causing coughing and minor nose and throat irritation.
EMERGENCY AND FIRST AID PROCEDURES: Wash mouth with water-no other treatment required.
Use protective respiratory equipment to avoid inhaling carbon dust.

SECTION VI- REACTIVITY DATA
STABILITY: UNSTABLE→ STABLE→ **X**
CONDITIONS TO AVOID: Activated Carbon is chemically inert
INCOMPATABILITY (Materials to avoid): none
HAZARDOUS DECOMPOSITION PRODUCTS: none
HAZARDOUS POLYMERIZATION: MAY OCCUR→ WILL NOT OCCUR→**X**

SECTION VII- SPILL OR LEAK PROCEDURES
STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Spills can create nuisance dust and house keeping problems. Vacuuming is best clean up procedure.
WASTE DISPOSAL METHOD: Wet or dry activated carbon is best disposed of by landfill.

SECTION VIII-PROTECTION INFORMATION
RESPIRATORY PROTECTION (Specify Type): Respiratory classifications table G-2 part 1910.93 (OESHA) Rules & Regulations.
VENTILATION: LOCAL EXHAUST: Vacuum to control dust
PROTECTIVE GLOVES: None required
EYE PROTECTION: For airborne dust
OTHER PROTECTIVE EQUIPMENT: Protective clothing should be worn during handling to protect against airborne dust.

SECTION IX- SPECIAL PRECAUTIONS
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: Packaged activated carbon is not resistant to weather or outside storage and requires indoor Type I and Type II storage facilities.
OTHER PRECAUTIONS: Check oxygen content of atmosphere of any vessel containing activated carbon before allowing entry of personnel.

SECTION X- TRANSPORTATION DATA
PROPER SHIPPING (Article) NAME: Steam Activated Carbon, Non-Regulated ***OR*** Carbon, Activated, Non-Regulated
DOT CLASSIFICATION: NMFC 40560 / DOT MARKING: N/A / DOT PLACARD: N/A
EMERGENCY ACCIDENT PRECAUTIONS AND PROCEDURES:
Contact: BakerCorp
Phone: 562.904.3680
PRECAUTIONS TO BE TAKEN IN TRANSPORTATION: N/A

The information contained herein is based on data considered accurate in light of current formulation. However, no warranty is expressed or implied regarding the accuracy of this data or the results to be obtained from the use thereof.

5500 Rawlings Ave, Southgate, California 90280
Phone: 562.904.3680 ♦ Fax: 562.904.1583

Light Towers - Narrow Body

Light Towers

Versatile light towers deliver exceptional lighting

The LTN series of narrow body light towers are ideally suited for illuminating general job sites, site prep, concrete pours, specialty events, paring lots road work and bridge work. A 30-foot adjustable tower rotates 360 degrees for optimum lighting flexibility. Quiet operation, the quietest in its class with sound levels as low as 67 dB(A) at 23 feet, offers maximum versatility for almost any applications. Large fuel tank allows for continuous lighting/run time.

- Elliptical light fixtures offer excellent job site illumination that is diffused and more uniform without the harsh spotlight effect of standard light fixtures.
- Lockable impact resistant plastic doors are rust and dent proof. Full-length doors also provide maximum accessibility for easy servicing.
- Four-point jack stands provide for easy leveling, stability on uneven terrain and superior wind stability.
- Mast-mounted base winch can be cranked while the operator is standing (eliminates bending) for improved ergonomics and easy operation. Some models feature dual power winches for quick set-up.
- Fully equipped highway-ready trailer offers a 2-inch ball hitch, 13-inch tires, four ties downs, DOT lighting, VIN number and chains.

Light Towers - Narrow Body

Light Towers

Technical specifications

	LTN 6L	LTN 6C	LTN 6K	LTN 8K
Operating data				
Illumination coverage at 5 fc (54 lux) ft^2	12,960	12,960	12,960	12,960
Lamp type	Metal Halide	Metal Halide	Metal Halide	Metal Halide
Mast height ft	30	30	30	30
L x W x H in	180.4 x 59.3 x 73.2	180.4 x 59.3 x 73.2	180.4 x 59.3 x 73.2	180.4 x 59.3 x 73.2
Sound level (LwA) at 23 ft (7 m) dB(A)	67	68	68	70
Power kW	6	6	6	8
Frequency Hz	60	60	60	60
Voltage V	120	120	120/240	120/240
Power factor cos Φ 1~	1	1	1	1
Voltage control %	6	6	6	6
Idle to full load %	10	10	10	10
Engine / Motor				
Generator insulation (class)	H	H	H	H
RPM / speed rpm	1,800	1,800	1,800	1,800
Generator model	Brushless	Brushless	Brushless	Brushless
Engine / Motor type	Liquid-cooled 3-cylinder diesel engine	Liquid-cooled 3-cylinder diesel engine	Liquid-cooled 3-cylinder diesel engine	Liquid-cooled 3-cylinder diesel engine
Engine / Motor manufacturer	Kohler	Caterpillar	Kubota	Kubota
Displacement in^3	62.7	67	61.1	68.5
Operating performance hp	13.4	15.3	13.1	15.4
at rpm rpm	1,800	1,800	1,800	1,800
Rated performance	ISO 3,046 IFN	ISO 3,046 IFN	ISO 3,046 IFN	ISO 3,046 IFN
Tank capacity US gal	32.5	32.5	32.5	32.5
Fuel consumption US gal/h	0.45	0.44	0.42	0.41

Information on suitable accessories can be found on our website.

The right to make changes is reserved in the interests of ongoing further developments. You can find more information on the engine power in the operator's manual. The actual power output figures may vary due to specific operating conditions.

PRODUCT DATA SHEET

January, 2007

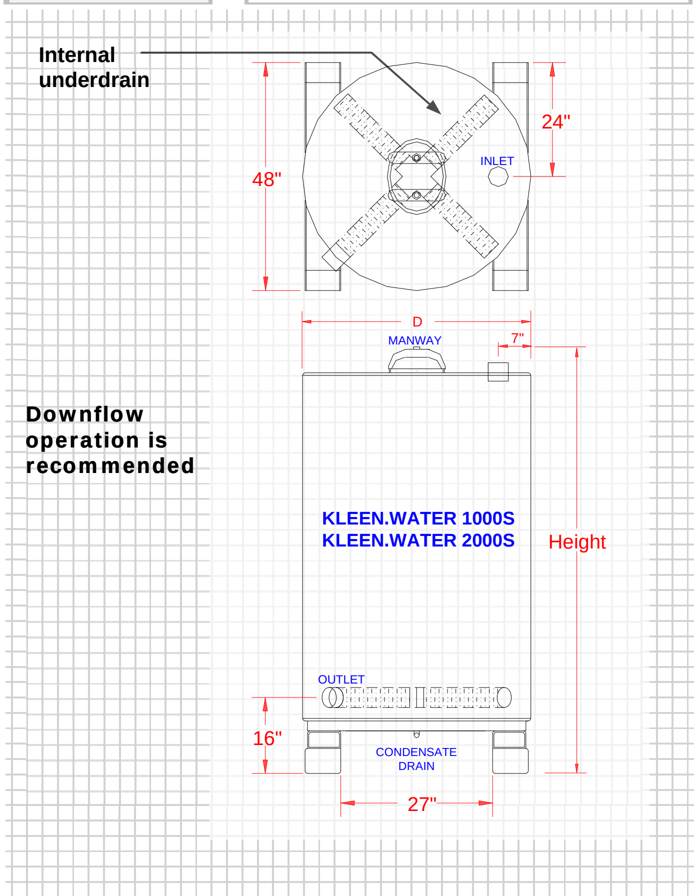
KLEEN.WATER 1000S & 2000S

GENERAL INFORMATION

These units are designed for the efficient purification of contaminated water or liquid streams. These filters have the ability to remove contaminants to non-detectable levels. The vessels are constructed of heavy-duty mild steel and are lined with a double-layer epoxy coating.

WEIGHTS AND MEASURES

» Max. Flowrate:	*1000S:* 80 gpm *2000S:* 100 gpm
» Max. Pressure:	15 psi
» Max. Temp:	150°F
» Height:	*1000S:* 66″ *2000S:* 92″
» Diameter:	46″
» Shipping Wt*: (drum + media) (** Media dependent*)	*1000S:* 1900 lbs. – 2900 lbs. *2000S:* 3050 lbs. – 5050 lbs.



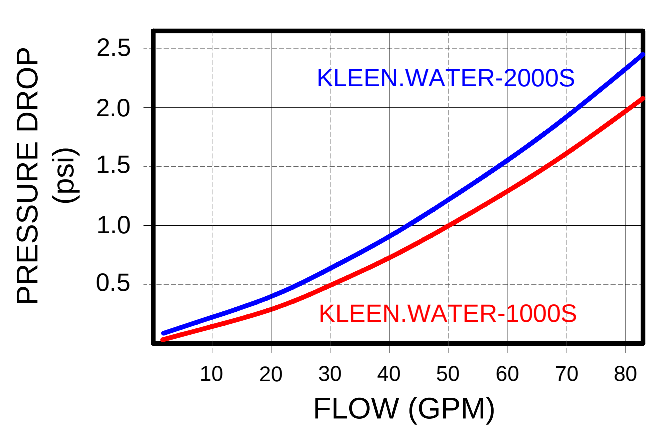
FILTER MEDIA

» Types:	▪Activated Carbon ▪Organoclay ▪Ion Exchange Resin ▪Specialty Media
» Volume:	*1000S:* 34 cu. ft *2000S:* 68 cu. ft.
» Weight*: (** Media dependent*)	*1000S:* 1000 lbs. – 2000 lbs. *2000S:* 2000 lbs. – 4000 lbs.

MISCELLANEOUS

» Inlet:	4″ FNPT
» Outlet:	4″ FNPT
» Interior Coating:	Double-layered epoxy coating
» Internals:	PVC underdrain
» Media Access:	Top manway (neoprene gasket)

PRESSURE DROP DATA



NOTES:

1. Wet activated carbon preferentially removes oxygen from air. In closed or partially closed containers and vessels, oxygen depletion may reach hazardous levels. If workers are to enter a vessel containing carbon, appropriate procedures for potentially low oxygen spaces must be followed, including all federal and state requirements.

BAKERCORP™

3020 Old Ranch Parkway • Suite 220 • Seal Beach, CA • 562-430-6262

McCrometer, Inc., 3255 W. Stetson Ave., Hemet, CA 92545
PH: 951-652-6811   Fax: 951-652-3078
E-Mail: info@mccrometer.com   WebSite: http://www.mccrometer.com

McCROMETER Mc PROPELLER-TYPE FLOW METER SPECIFICATION

PREPARED BY:
[ENTER COMPANY AND CONTACT INFORMATION HERE]
[ENTER ADDRESS]
[ENTER CITY, STATE & ZIP]

Phone: [ENTER PHONE]
FAX: [ENTER FAX]
e-mail: [ENTER E-MAIL ADDRESS]

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

The contractor shall furnish and install a McCrometer Mc brand propeller-type flow meter model
[ENTER MODEL] or equal for [ENTER METER APPLICATION].

Note: Refer to the appropriate McCrometer Mc Propeller Meter Product Data Sheet for a detailed description of and configuration options for this meter.

1.2 DESIGN RQUIREMENTS

A. The nominal size of the meter shall be [ENTER LINE SIZE] inches.
B. Corrosion-resistant materials shall be used throughout the mechanical enclosure.
C. Except for the register assembly, no aluminum materials shall be used and all non-stainless steel surfaces shall be treated with a fusion-bonded impervious coating.
D. All rotating members, except members in the register assembly, shall be mounted on stainless steel radial ball bearings. Sleeve type or ceramic bearings are not acceptable.
E. Head loss shall not exceed [ENTER HEADLOSS] inches of water at a maximum flow of [ENTER MAXIMUM FLOW] gallons per minute.
F. Flow meter system accuracy shall be +/-2% of true flow rate within the range specified.

1.3 SUBMITTALS

A. McCrometer Mc Installation and Operation Manual or equivalent
B. McCrometer Warranty Statement or equivalent.

PART 2 - PRODUCT CONFIGURATION

2.1 METER BODY

A. The meter shall comply with the applicable provisions of the American Water Works Association Standard NO. C704-91 for cold water meters applicable to the types of meters described in the bidding schedule as well as the specifications of the invitations for bids. In the event of conflict, the specifications herein shall prevail.
B. The impeller shall be made of a plastic or other corrosion-resistant material of a rigid but resilient nature that will not flex or otherwise change in dimension under a high flow of water and be capable of withstanding temperatures of up to 160(F without slumping or warping.
C. Impellers will be factory tested and adjusted to maintain an accuracy of +/-2% over the normal flow range and remain accurate without the use of change gears.
D. The impeller shall be mounted on a non-corrosive shaft and bearing assembly and shall have a provision for sustaining thrusts at maximum flows. The impeller shall be magnetically coupled to connecting shafts through a sealed housing to eliminate corrosion and friction.
E. The drive mechanism from the impeller coupling to the register shall be a flexible driveline and shall be lubricated and sealed at the factory.
F. The meter instrument shall be driven by axial alnico magnets located on the impeller shaft and on the same axis and shall be completely sealed from water pressure.

2.2 REGISTER

A. The register shall be on a common axis with the impeller support and shall be rigidly supported by the housing support plate or drop pipe.
B. The register shall consist of an instantaneous indicator and totalizer which shall be mounted perpendicular to the direction of flow and which can be viewed through a transparent cover.
C. The totalizer shall be six-digit, straight-reading, driven by a positive direct drive mechanism from the impeller coupling, and shall register [ENTER TOTALIZATION UNITS(for example, acre feet, cubic feet, gallons, cubic meters, etc.)].
D. The flow indicator shall show flows instantaneously and be driven by a magnet drag mechanism from the impeller coupling.
E. The flow rate indicator shall indicate flow in [ENTER INDICATING UNITS (for example, gallons per minute, cubic feet per second, liters per second, etc.)].
F. The register assembly shall be factory lubricated and sealed water-tight for infrequent submersion.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's written instructions and approved submittals.
B. Locate meter as recommended by manufacturer with respect to other piping components to ensure flow meter will meet specified accuracy.

Website:

Please visit our website at www.jmm.com for more information.

Note: Information provided here is a general guideline of JMM PE products. JMM reserves the right to modify any information as necessary. For more detailed information, please contact your JMM sales representative. Always follow project specifications and adhere to local rules, codes and regulations

HDPE IRON PIPE SIZE (IPS) PRESSURE PIPE PE4710

		DR 7 (333 psi)			DR 7.3 (318 psi)			DR 9 (250 psi)			DR 9.3 (241 psi)			DR 11 (200 psi)			DR 13.5 (160 psi)		
Pipe Size	Avg OD	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft
1/2	0.840	0.120	0.59	0.12	0.115	0.60	0.11	0.093	0.64	0.10	0.090	0.65	0.09	0.076	0.68	0.08	0.062	0.71	0.07
3/4	1.050	0.150	0.73	0.19	0.144	0.75	0.18	0.117	0.80	0.15	0.113	0.81	0.15	0.095	0.85	0.12	0.078	0.88	0.10
1	1.315	0.188	0.92	0.29	0.180	0.93	0.28	0.146	1.01	0.23	0.141	1.02	0.23	0.120	1.06	0.20	0.097	1.11	0.16
2	2.375	0.339	1.66	0.95	0.325	1.69	0.91	0.264	1.82	0.77	0.255	1.83	0.74	0.216	1.92	0.64	0.176	2.00	0.53
3	3.500	0.500	2.44	2.06	0.479	2.48	1.98	0.389	2.68	1.66	0.376	2.70	1.61	0.318	2.83	1.39	0.259	2.95	1.16
4	4.500	0.643	3.14	3.40	0.616	3.19	3.28	0.500	3.44	2.75	0.484	3.47	2.67	0.409	3.63	2.30	0.333	3.79	1.91
5 3/8	5.375	0.768	3.75	4.85	0.736	3.81	4.68	0.597	4.11	3.92	0.578	4.15	3.81	0.489	4.34	3.29	0.398	4.53	2.73
5	5.563	0.795	3.88	5.20	0.762	3.95	5.02	0.618	4.25	4.20	0.598	4.29	4.08	0.506	4.49	3.52	0.412	4.69	2.92
6	6.625	0.946	4.62	7.36	0.908	4.70	7.12	0.736	5.06	5.96	0.712	5.11	5.79	0.602	5.35	4.99	0.491	5.58	4.15
7	7.125	0.976	5.06	8.23	0.976	5.06	8.23	0.792	5.45	6.89	0.766	5.50	6.70	0.648	5.75	5.78	0.528	6.01	4.80
8	8.625	1.232	6.01	12.48	1.182	6.12	12.06	0.958	6.59	10.09	0.927	6.66	9.81	0.784	6.96	8.46	0.639	7.27	7.03
10	10.750	1.536	7.49	19.40	1.473	7.63	18.74	1.194	8.22	15.68	1.156	8.30	15.24	0.977	8.68	13.14	0.796	9.06	10.92
12	12.750	1.821	8.89	27.28	1.747	9.05	26.36	1.417	9.75	22.07	1.371	9.84	21.44	1.159	10.29	18.49	0.944	10.75	15.36
14	14.000	2.000	9.76	32.90	1.918	9.93	31.78	1.556	10.70	26.61	1.505	10.81	25.85	1.273	11.30	22.30	1.037	11.80	18.52
16	16.000	2.286	11.15	42.97	2.192	11.35	41.51	1.778	12.23	34.75	1.720	12.35	33.76	1.455	12.92	29.12	1.185	13.49	24.19
18	18.000	2.571	12.55	54.37	2.466	12.77	52.53	2.000	13.76	43.97	1.935	13.90	42.73	1.636	14.53	36.84	1.333	15.17	30.61
20	20.000	2.857	13.94	67.13	2.740	14.19	64.85	2.222	15.29	54.28	2.151	15.44	52.77	1.818	16.15	45.49	1.481	16.86	37.79
24	24.000	3.429	16.73	96.68	3.288	17.03	93.39	2.667	18.35	78.18	2.581	18.53	75.98	2.182	19.37	65.52	1.778	20.23	54.44
26	26.000							2.889	19.88	91.75	2.796	20.07	89.17	2.364	20.99	76.89	1.926	21.92	63.89
28	28.000							3.111	21.40	106.40	3.011	21.62	103.42	2.545	22.60	89.15	2.074	23.60	74.09
30	30.000							3.333	22.93	122.13	3.226	23.16	118.72	2.727	24.22	102.35	2.222	25.29	85.04
32	32.000													2.909	25.83	116.46	2.370	26.98	96.76
34	34.000													3.091	27.45	131.48	2.519	28.66	109.26
36	36.000													3.273	29.06	147.41	2.667	30.35	122.49

		DR 15.5 (138 psi)			DR 17 (125 psi)			DR 19 (111 psi)			DR 21 (100 psi)			DR 26 (80 psi)			DR 32.5 (64 psi)		
Pipe Size	Avg OD	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft
1/2	0.840	0.054	0.73	0.07	0.062	0.71	0.07	0.044	0.75	0.05	0.062	0.71	0.07	0.062	0.71	0.07	0.062	0.71	0.07
3/4	1.050	0.068	0.91	0.09	0.062	0.92	0.08	0.055	0.93	0.08	0.062	0.92	0.08	0.062	0.92	0.08	0.062	0.92	0.08
1	1.315	0.085	1.14	0.14	0.077	1.15	0.13	0.069	1.17	0.12	0.063	1.18	0.11	0.062	1.18	0.11	0.062	1.18	0.11
2	2.375	0.153	2.05	0.47	0.140	2.08	0.43	0.125	2.11	0.39	0.113	2.14	0.35	0.091	2.18	0.29	0.073	2.22	0.23
3	3.500	0.226	3.02	1.02	0.206	3.06	0.94	0.184	3.11	0.84	0.167	3.15	0.77	0.135	3.21	0.63	0.108	3.27	0.51
4	4.500	0.290	3.88	1.68	0.265	3.94	1.55	0.237	4.00	1.39	0.214	4.05	1.27	0.173	4.13	1.03	0.138	4.21	0.83
5 3/8	5.375	0.347	4.64	2.40	0.316	4.71	2.21	0.283	4.78	1.99	0.256	4.83	1.81	0.207	4.94	1.48	0.165	5.03	1.19
5	5.563	0.359	4.80	2.58	0.327	4.87	2.36	0.293	4.94	2.13	0.265	5.00	1.94	0.214	5.11	1.58	0.171	5.20	1.27
6	6.625	0.427	5.72	3.65	0.390	5.80	3.35	0.349	5.89	3.02	0.315	5.96	2.74	0.255	6.08	2.24	0.204	6.19	1.81
7	7.125	0.460	6.15	4.23	0.419	6.24	3.88	0.375	6.33	3.49	0.340	6.40	3.18	0.274	6.54	2.59	0.219	6.66	2.09
8	8.625	0.556	7.45	6.19	0.507	7.55	5.68	0.454	7.66	5.12	0.411	7.75	4.66	0.332	7.92	3.80	0.265	8.06	3.06
10	10.750	0.694	9.28	9.62	0.632	9.41	8.82	0.566	9.55	7.95	0.512	9.66	7.24	0.413	9.87	5.90	0.331	10.05	4.77
12	12.750	0.823	11.01	13.53	0.750	11.16	12.41	0.671	11.33	11.18	0.607	11.46	10.17	0.490	11.71	8.30	0.392	11.92	6.69
14	14.000	0.903	12.09	16.31	0.824	12.25	14.97	0.737	12.44	13.49	0.667	12.59	12.28	0.538	12.86	10.00	0.431	13.09	8.08
16	16.000	1.032	13.81	21.30	0.941	14.01	19.55	0.842	14.21	17.61	0.762	14.38	16.03	0.615	14.70	13.07	0.492	14.96	10.54
18	18.000	1.161	15.54	26.95	1.059	15.75	24.75	0.947	15.99	22.29	0.857	16.18	20.28	0.692	16.53	16.54	0.554	16.83	13.36
20	20.000	1.290	17.26	33.28	1.176	17.51	30.53	1.053	17.77	27.52	0.952	17.98	25.03	0.769	18.37	20.43	0.615	18.70	16.47
24	24.000	1.548	20.72	47.92	1.412	21.01	43.99	1.263	21.32	39.63	1.143	21.58	36.06	0.923	22.04	29.42	0.738	22.44	23.72
26	26.000	1.677	22.44	56.24	1.529	22.76	51.61	1.368	23.10	46.51	1.238	23.38	42.31	1.000	23.88	34.53	0.800	24.30	27.86
28	28.000	1.806	24.17	65.22	1.647	24.51	59.87	1.474	24.88	53.94	1.333	25.17	49.07	1.077	25.72	40.05	0.862	26.17	32.33
30	30.000	1.935	25.90	74.87	1.765	26.26	68.74	1.579	26.65	61.92	1.429	26.97	56.36	1.154	27.55	45.98	0.923	28.04	37.09
32	32.000	2.065	27.62	85.23	1.882	28.01	78.18	1.684	28.43	70.45	1.542	28.73	64.11	1.231	29.39	52.31	0.985	29.91	42.22
34	34.000	2.194	29.35	96.21	2.000	29.76	88.27	1.790	30.21	79.54	1.619	30.57	72.36	1.308	31.23	59.06	1.046	31.78	47.63
36	36.000	2.323	31.08	107.86	2.118	31.51	98.98	1.895	31.98	89.17	1.714	32.37	81.12	1.385	33.06	66.22	1.108	33.65	53.42

HDPE IRON PIPE SIZE (IPS) PRESSURE PIPE PE4710

		DR 17 (125 psi)			DR 19 (111 psi)			DR 21 (100 psi)			DR 26 (80 psi)			DR 32.5 (64 psi)			DR 41 (50 psi)		
Pipe Size	Avg OD	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft
36	36.000	2.118	31.510	98.98	1.895	31.983	89.17	1.714	32.366	81.12	1.385	33.064	66.22	1.108	33.651	53.42	0.878	34.139	42.63
42	42.000	2.471	36.761	134.72	2.211	37.314	121.37	2.000	37.760	110.43	1.615	38.576	90.08	1.292	39.261	72.68	1.024	39.830	58.03
48	48.000	2.824	42.013	175.97	2.526	42.644	158.52	2.286	43.154	144.25	1.846	44.086	117.68	1.477	44.869	94.95	1.171	45.517	75.79
54	54.000	3.177	42.265	222.64	2.842	47.975	200.63	2.571	48.549	182.51	2.077	49.597	148.95	1.622	50.477	120.20	1.317	51.208	95.92
63	63.000							3.000	56.640	248.46	2.423	57.863	202.72	1.938	58.891	163.53	1.537	59.742	130.56

HDPE DUCTILE IRON PIPE SIZE (DIPS) PRESSURE PIPE PE4710

		DR 7 (333 psi)			DR 9 (250 psi)			DR 11 (200 psi)			DR 13.5 (160 psi)			DR 17 (125 psi)		
Pipe Size	Avg OD	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft
4	4.800	0.686	3.346	3.87	0.533	3.670	3.13	0.436	3.876	2.62	0.356	4.045	2.18	0.282	4.202	1.76
6	6.900	0.946	4.894	7.99	0.767	5.274	6.46	0.627	5.571	5.41	0.511	5.817	4.50	0.406	6.039	3.64
8	9.050	1.293	6.309	13.75	1.006	6.917	11.12	0.823	7.305	9.32	0.670	7.630	7.74	0.532	7.922	6.25
10	11.100	1.586	7.738	20.68	1.233	8.486	16.72	1.009	8.961	14.01	0.822	9.357	11.64	0.653	9.716	9.41
12	13.200	1.886	9.202	29.24	1.467	10.090	23.65	1.200	10.656	19.82	0.978	11.127	16.47	0.776	11.555	13.30
14	15.300	2.186	10.666	39.29	1.700	11.696	31.77	1.391	12.351	26.63	1.133	12.898	22.12	0.900	13.392	17.88
16	17.400	2.486	12.130	50.81	1.933	13.302	41.09	1.582	14.046	34.44	1.289	14.667	28.61	1.024	15.229	23.13
18	19.500	2.786	13.594	63.82	2.167	14.906	51.61	1.773	15.741	43.25	1.444	16.439	35.92	1.147	17.068	29.04
20	21.600				2.400	16.512	63.32	1.964	17.436	53.07	1.600	18.208	44.09	1.271	18.905	35.64
24	25.800				2.867	19.722	90.34	2.345	20.829	75.69	1.911	21.749	62.90	1.518	22.582	50.84
30	32.000							2.909	25.833	116.46	2.370	26.976	96.76	1.880	28.014	78.18
36	38.300										2.837	32.286	138.62	2.253	33.524	112.02
42	44.500													2.618	38.950	151.24
48	50.800													2.988	44.465	197.05

		DR 19 (111 psi)			DR 21 (100 psi)			DR 26 (80 psi)			DR 32.5 (64 psi)		
Pipe Size	Avg OD	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft
4	4.800	0.253	4.264	1.59	0.229	4.315	1.44	0.185	4.408	1.18	0.148	4.486	0.95
6	6.900	0.363	6.130	3.28	0.329	6.203	2.98	0.265	6.338	2.43	0.212	6.451	1.96
8	9.050	0.476	8.041	5.64	0.431	8.136	5.13	0.348	8.312	4.18	0.278	8.461	3.37
10	11.100	0.584	9.862	8.48	0.529	9.979	7.72	0.427	10.195	6.29	0.342	10.375	5.08
12	13.200	0.695	11.727	11.99	0.629	11.867	10.91	0.508	12.123	8.91	0.406	12.339	7.18
14	15.300	0.805	13.593	16.11	0.729	13.755	14.66	0.588	14.053	11.95	0.471	14.301	9.65
16	17.400	0.916	15.458	20.83	0.829	15.643	18.96	0.669	15.982	15.46	0.536	16.264	12.49
18	19.500	1.026	17.325	26.16	0.929	17.531	23.81	0.750	17.910	19.42	0.600	18.228	15.67
20	21.600	1.137	19.190	32.10	1.029	19.419	29.22	0.831	19.838	23.84	0.665	20.190	19.24
24	25.800	1.358	22.921	45.80	1.229	23.195	41.68	0.992	23.697	33.99	0.794	24.117	27.44
30	32.000	1.684	28.430	70.45	1.524	28.769	64.11	1.231	29.390	52.31	0.985	29.912	42.22
36	38.300	2.016	34.026	100.93	1.824	34.433	91.84	1.473	35.177	74.92	1.179	35.801	60.43
42	44.500	2.342	39.535	136.25	2.119	40.008	123.96	1.712	40.871	101.17	1.370	41.596	81.59
48	50.800	2.674	45.131	177.55	2.419	45.672	161.55	1.954	46.658	131.83	1.563	47.486	106.34

PE 4710 JMM HDPE Typical Primary Properties

Property	Unit	Test Procedure	Typical Value
Material Designation	---	PPI-TR4	PE 4710
Cell Classification	---	ASTM D3350	** 445574C
Density [4]	g/cm^3	ASTM D1505	0.959
Melt Index [4]	g/10 minutes	ASTM D1238	<0.15
Flexural Modulus [5]	psi	ASTM D790	> 120,000
Tensile Strengt [5]	psi	ASTM D638	> 3,600
SCG (PENT) [7]	Hours	ASTM F1473	>100
HDB @ 73.4ºF (23°C)[4] HDB @ 140°F (60°C)	psi psi	ASTM D2837 ASTM D2837	1600 1000
HDS (hydrostatic design stress) @ 73.4ºF HDS @ 140ºF	psi psi	PPI-TR4 PPI-TR4	1000 630
Color; UV Stabilize [C]	---	---	Black with minimum 2% carbon black
Brittleness Temperature	°F	ASTM D746	<-180

** Note: Cell Classification is 445576E for all Blue / Green / Gray Polyethylene Pipes.

J-M Manufacturing Company, Inc.
building essentials for a better tomorrow™

APPENDIX F

Analyte Lists for Groundwater Sampling

THIS PAGE INTENTIONALLY LEFT BLANK

Analytes Sampled for During Regular Quarterly Groundwater Sampling at the Kirtland AFB BFF Site

Parameter	Method	NMQCC Standard (ug/L)	EPA MCL (ug/L)	EPA Tapwater (ug/L)
EDB				
1,2-DIBROMOETHANE	SW8011		0.05	0.0065
General Chemisty				
CHLORIDE	E300.0	250000		
SULFATE	E300.0	600000		
NITROGEN, NITRATE-NITRITE	E353.2		10000	
ALKALINITY, BICARBONATE (AS CACO3)	SM2320B			
ALKALINITY, CARBONATE (AS CACO3)	SM2320B			
AMMONIA (AS N)	SM4500NH3BG			
SULFIDE, TOTAL	SM4500S2CF			
Metals				
CALCIUM	SW6010B			
LEAD	SW6010B	50	15	
MAGNESIUM	SW6010B			
POTASSIUM	SW6010B			
SODIUM	SW6010B			
Dissolved Metals				
IRON, DISSOLVED	SW6010B-DISS	1000		11000
MANGANESE, DISSOLVED	SW6010B-DISS	200		320
SVOCs				
1,1-BIPHENYL	SW8270D			0.83
1,2-DIPHENYLHYDRAZINE	SW8270D			0.067
1-METHYL NAPHTHALENE	SW8270D			0.97
2,4,5-TRICHLOROPHENOL	SW8270D			890
2,4,6-TRICHLOROPHENOL	SW8270D			3.5
2,4-DICHLOROPHENOL	SW8270D			35
2,4-DIMETHYLPHENOL	SW8270D			270
2,4-DINITROPHENOL	SW8270D			30
2,4-DINITROTOLUENE	SW8270D			0.2
2,6-DINITROTOLUENE	SW8270D			0.042
2-CHLORONAPHTHALENE	SW8270D			550
2-CHLOROPHENOL	SW8270D			71
2-METHYLNAPHTHALENE	SW8270D			27
2-METHYLPHENOL	SW8270D			
2-NITROANILINE	SW8270D			150
2-NITROPHENOL	SW8270D			

Analytes Sampled for During Regular Quarterly Groundwater Sampling at the Kirtland AFB BFF Site

Parameter	Method	NMQCC Standard (ug/L)	EPA MCL (ug/L)	EPA Tapwater (ug/L)
3,3'-DICHLOROBENZIDINE	SW8270D			0.11
3-METHYLPHENOL AND 4-METHYLPHENOL	SW8270D			
3-NITROANILINE	SW8270D			
4,6-DINITRO-2-METHYLPHENOL	SW8270D			
4-BROMOPHENYL PHENYL ETHER	SW8270D			
4-CHLORO-3-METHYLPHENOL	SW8270D			
4-CHLOROANILINE	SW8270D			0.32
4-CHLOROPHENYL PHENYL ETHER	SW8270D			
4-NITROANILINE	SW8270D			3.3
4-NITROPHENOL	SW8270D			
ACENAPHTHENE	SW8270D			400
ACENAPHTHYLENE	SW8270D			400
ACETOPHENONE	SW8270D			1500
ANTHRACENE	SW8270D			1300
ATRAZINE	SW8270D		3	0.26
BENZALDEHYDE	SW8270D			1500
BENZIDINE	SW8270D			0.000092
BENZO(A)ANTHRACENE	SW8270D			0.029
BENZO(A)PYRENE	SW8270D	0.7	0.2	0.0029
BENZO(B)FLUORANTHENE	SW8270D			0.029
BENZO(GHI)PERYLENE	SW8270D			
BENZO(K)FLUORANTHENE	SW8270D			0.29
BENZOIC ACID	SW8270D			58000
BIS(2-CHLOROETHOXY)METHANE	SW8270D			46
BIS(2-CHLOROETHYL)ETHER	SW8270D			0.012
BIS(2-CHLOROISOPROPYL)ETHER	SW8270D			0.31
BIS(2-ETHYLHEXYL)PHTHALATE	SW8270D		6	4.8
BUTYL BENZYL PHTHALATE	SW8270D			14
CAPROLACTAM	SW8270D			7700
CARBAZOLE	SW8270D			
CHRYSENE	SW8270D			2.9
DIBENZO(A,H)ANTHRACENE	SW8270D			0.0029
DIBENZOFURAN	SW8270D			5.8
DIETHYL PHTHALATE	SW8270D			11000
DIMETHYL PHTHALATE	SW8270D			
DI-N-BUTYL PHTHALATE	SW8270D			670

Analytes Sampled for During Regular Quarterly Groundwater Sampling at the Kirtland AFB BFF Site

Parameter	Method	NMQCC Standard (ug/L)	EPA MCL (ug/L)	EPA Tapwater (ug/L)
DI-N-OCTYL PHTHALATE	SW8270D			160
FLUORANTHENE	SW8270D			630
FLUORENE	SW8270D			220
HEXACHLOROBENZENE	SW8270D		1	0.042
HEXACHLOROBUTADIENE	SW8270D			0.26
HEXACHLOROCYCLOPENTADIENE	SW8270D		50	22
HEXACHLOROETHANE	SW8270D			0.79
INDENO(1,2,3-CD)PYRENE	SW8270D			0.029
ISOPHORONE	SW8270D			67
NAPHTHALENE	SW8270D			0.14
NITROBENZENE	SW8270D			0.12
N-NITROSO-DI-N-PROPYLAMINE	SW8270D			0.0093
N-NITROSODIPHENYLAMINE	SW8270D			10
PENTACHLOROPHENOL	SW8270D		1	0.035
PHENANTHRENE	SW8270D			
PHENOL	SW8270D	5		4500
PYRENE	SW8270D			87
TPH				
DIESEL RANGE ORGANICS	SW8015B			
GASOLINE RANGE ORGANICS	SW8015B			
VOCs				
1,1,1,2-TETRACHLOROETHANE	SW8260B			0.5
1,1,1-TRICHLOROETHANE	SW8260B	60	200	7500
1,1,2,2-TETRACHLOROETHANE	SW8260B	10		0.066
1,1,2-TRICHLOROETHANE	SW8260B	10	5	0.24
1,1-DICHLOROETHANE	SW8260B	25		2.4
1,1-DICHLOROETHENE	SW8260B	5	7	260
1,1-DICHLOROPROPENE	SW8260B			
1,2,3-TRICHLOROBENZENE	SW8260B			5.2
1,2,3-TRICHLOROPROPANE	SW8260B			0.00065
1,2,4-TRICHLOROBENZENE	SW8260B		70	0.99
1,2,4-TRIMETHYLBENZENE	SW8260B			15
1,2-DIBROMO-3-CHLOROPROPANE	SW8260B		0.2	0.00032
1,2-DIBROMOETHANE	SW8260B	0.1	0.05	0.0065
1,2-DICHLOROBENZENE	SW8260B		600	280
1,2-DICHLOROETHANE	SW8260B	10	5	0.15

Analytes Sampled for During Regular Quarterly Groundwater Sampling at the Kirtland AFB BFF Site

Parameter	Method	NMQCC Standard (ug/L)	EPA MCL (ug/L)	EPA Tapwater (ug/L)
1,2-DICHLOROPROPANE	SW8260B		5	0.38
1,3,5-TRIMETHYLBENZENE	SW8260B			87
1,3-DICHLOROBENZENE	SW8260B			
1,3-DICHLOROPROPANE	SW8260B			290
1,4-DICHLOROBENZENE	SW8260B		75	0.42
2,2-DICHLOROPROPANE	SW8260B			
2-BUTANONE	SW8260B			4900
2-CHLOROTOLUENE	SW8260B			180
2-HEXANONE	SW8260B			34
4-CHLOROTOLUENE	SW8260B			190
4-METHYL-2-PENTANONE	SW8260B			1000
ACETONE	SW8260B			12000
BENZENE	SW8260B	10	5	0.39
BROMOBENZENE	SW8260B			54
BROMOCHLOROMETHANE	SW8260B			83
BROMODICHLOROMETHANE	SW8260B		80	0.12
BROMOFORM	SW8260B		80	7.9
BROMOMETHANE	SW8260B			7
CARBON DISULFIDE	SW8260B			720
CARBON TETRACHLORIDE	SW8260B	10	5	0.39
CHLOROBENZENE	SW8260B		100	72
CHLOROETHANE	SW8260B			
CHLOROFORM	SW8260B	100	80	0.19
CHLOROMETHANE	SW8260B			190
CIS-1,2-DICHLOROETHENE	SW8260B		70	28
CIS-1,3-DICHLOROPROPENE	SW8260B			
DIBROMOCHLOROMETHANE	SW8260B		80	0.15
DIBROMOMETHANE	SW8260B			7.9
DICHLORODIFLUOROMETHANE	SW8260B			190
ETHYLBENZENE	SW8260B	750	700	1.3
HEXACHLOROBUTADIENE	SW8260B			0.26
ISOPROPYLBENZENE	SW8260B			
METHYL TERT-BUTYL ETHER	SW8260B			12
METHYLENE CHLORIDE	SW8260B	100	5	9.9
NAPHTHALENE	SW8260B			0.14
N-BUTYLBENZENE	SW8260B			780

Analytes Sampled for During Regular Quarterly Groundwater Sampling at the Kirtland AFB BFF Site

Parameter	Method	NMQCC Standard (ug/L)	EPA MCL (ug/L)	EPA Tapwater (ug/L)
N-PROPYLBENZENE	SW8260B			530
P-ISOPROPYLTOLUENE	SW8260B			
SEC-BUTYLBENZENE	SW8260B			1600
STYRENE	SW8260B		100	1100
TERT-BUTYLBENZENE	SW8260B			510
TETRACHLOROETHENE	SW8260B		5	9.7
TOLUENE	SW8260B	750	1000	860
TRANS-1,2-DICHLOROETHENE	SW8260B		100	86
TRANS-1,3-DICHLOROPROPENE	SW8260B			
TRICHLOROETHENE	SW8260B	100	5	0.44
TRICHLOROFLUOROMETHANE	SW8260B			1100
VINYL CHLORIDE	SW8260B	1	2	0.015
XYLENES	SW8260B		10000	190