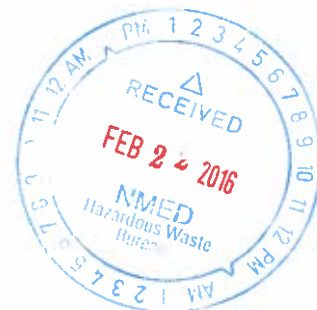




DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 377TH AIR BASE WING (AFMC)



Mr. L. Wayne Bitner
Chief, Environmental Restoration
2000 Wyoming Blvd SE
Kirtland AFB NM 87117-5600

19 February 2016

Ms. Michelle Hunter
Ground Water Quality Bureau
New Mexico Environment Department
1190 St Francis Drive
Santa Fe, New Mexico 87502

**Subject: Approval with Conditions, Request for Temporary Permission to Discharge to KAFB-7,
Kirtland Air Force Base, Bulk Fuels Facility, DP-1839**

Dear Ms. Hunter

This Kirtland Air Force Base (KAFB) Bulk Fuel Facility (BFF) letter is provided to present data in support of the conditions listed in the January 7, 2016 Ground Water Quality Bureau approval for pilot test injection of treated groundwater into KAFB-7.

Condition 1

Prior to initiating the discharge, the Permittee must verbally notify NMED of the date the temporary discharge is to commence.

The NMED will receive verbal notification prior to initiation of discharge into KAFB-7, and e-mail follow up to document the initiation of discharge.

Condition 2

Prior to occurrence, the Permittee must notify NMED in writing of any increase of the discharge volume or any process modification that would result in any significant modification in the temporary discharge of water contaminants.

The NMED will be notified in writing of any increase of discharge volume beyond 500 gpm, and of any change to the system (i.e., process modifications) that would affect the temporary discharge.

RECEIVED

FEB 19 2016

NMED
Albuquerque Field Office

KAFB4392



Condition 3

Anthropogenic chemicals in injected water shall not exceed the more stringent value of either New Mexico Water Quality control commission standards (Section 20.6.2.3103 NMAC) or the Safe Drinking Water Act maximum contaminant levels (MCLs) for drinking water. For NMWQCC listed Toxic Pollutants without 3103 standards or MCLs, injected water shall not exceed the most current Tap Water Limits in Table A-1 of the NMED Risk Assessment Guidance. The contaminants of concern (COCs) associated with the EDB plume and their applicable standard are:

- a) Benzene: 5ug/L*
- b) Ethylene dibromide (EDB): 0.05 ug/L*
- c) Iron: 1 mg/L*
- d) Manganese: 0.2 mg/L*
- e) Toluene: 750 ug/L*
- f) Total xylenes: 620 ug/L*

See description for compliance method listed in Condition 5 below.

Condition 4

The Permittee shall submit documentation demonstrating that the GWTS effluent achieves the standards specified in Condition #3 above to NMED prior to the commencement of the temporary discharge.

See description for compliance method listed in Condition 5 below.

Condition 5

After commencement of the temporary discharge, the GWTS effluent shall be sampled daily for the first week of operation with 24-hour analytical turnaround times. After the first week of operation, weekly samples shall be collected for the first month of operation with 5-day analytical turnaround times. After one month, and once it is determined that that constituents in effluent samples are not exceeding the standards specified in Condition #3, the sampling frequency may be reduced to monthly in accordance with Application Attachment D (Monitoring and Contingency Plan), Subsection 2.1.

Samples of treated discharge water (i.e., effluent) will be collected and analyzed to ensure the contaminants of concern (COCs) are below applicable standards during injection per Condition 5. Draft data will be supplied by e-mail to NMED once results are received from the analytical laboratory. Attachment A, Treatment Effectiveness Analytical Data contains COC data for the temporary Groundwater Treatment System (GWTS) which operated from June 28, 2015 to December 15, 2015 (A-1), and the full-scale GWTS that began operation on December 16, 2015 (A-2). All GWTS effluent water to date has been either non-detect or under regulatory limits.

Condition 6

Each time a new extraction well is brought on-line, the same sampling frequency specified in Condition #5 shall be utilized.

As additional extraction wells are brought on-line, the same sampling frequency will be followed per Condition 5. Currently, all extraction wells (KAFB-106228, KAFB-106233, and KAFB-106234) are operational and treated effluent will be either injected into KAFB-7 or sent to the Tijeras Arroyo Golf Course for irrigation under their respective Temporary Permission to Discharge permits.

Condition 7

Should any COCs be detected above applicable standards in the effluent of the GWTS, the pumping shall cease immediately and the Permittee shall implement the response and notification procedures specified at Application Attachment D, Section 3 (Contingency Plan), Subsection 3.2. Should the concentrations of iron or manganese exceed applicable standards, the Permittee shall propose to the NMED additional appropriate treatment methods for installation in addition to the GWTS.

Pumping will cease if concentrations of COCs in effluent samples are detected above applicable standards, and the response and notification procedure specified in the Monitoring and Contingency Plan will be implemented.

Condition 8

Injected water shall not overtop the KAFB-7 well casing liner installed in 1979.

To prevent injection water going over the top of the casing liner, a dedicated transducer has been installed in KAFB-7. This transducer is connected to the full-scale GWTS programmable logic controller (PLC) which will trigger a shutdown of the GWTS. Shutdown will be triggered when the water level in KAFB-7 reaches 2 feet below the top of the liner (470 feet below the top of the well pedestal).

Condition 9

Water levels will be monitored with transducers in associated monitoring wells (KAFB- 0523, KAFB-0524, KAFB-0507, KAFB-0508) as well as downhole in KAFB-7. System controls shall ensure shutdown of all associated components should conditions warrant.

In-Situ Level Troll 700 transducers were installed in KAFB-0507, KAFB-0508, KAFB-0523 and KAFB-0524 on January 27, 2016. Final installation of KAFB-7 transducer occurred on February 5, 2016. Manufacturer calibration logs are supplied for these transducers in Attachments B-1 and B-2. Attachment B-3 contains completed field verification of the water level and transducer reading in each well. System electrical control is in KAFB-7 and it will trigger a shutdown of the GWTS when the water level in KAFB-7 reaches 2 feet below the top of the liner (470 feet below the top of the well pedestal).

Condition 10

The injection flow-rate monitoring, inspection, and calibration shall be performed in accordance with Application Attachment D, Subsection 2.2.

Factory calibration logs are provided in the attachments listed below. A field calibration check procedure is attached for review.

- C-1 KAFB-106228
- C-2 KAFB-106233
- C-3 KAFB-106234
- C-4 GWTS Influent Pump
- C-5 GWTS Effluent Pump
- C-6 Field Calibration Check Procedure

Condition 11

The injection of treated water into KAFB-7 shall be manually supervised for the first 24 hours of injection.

When injection into KAFB-7 commences, it will be manually supervised for the first 24 hours.

Condition 12

Well KAFB-7 shall be configured as represented in Application Figure 7.

KAFB-7 configuration is as represented in the Application Figure 7 (see Attachment B-4). As the Figure indicated, the dedicated transducer was installed in KAFB-7 to a depth of 502.5 feet below the top of the well pedestal. The top of the injection valve was placed at 500 feet below the pedestal, and the top of the liner is at 468 feet below the pedestal. The Pressure Indicator Transmitter (PIT) and the Air Release Valve (ARV) were installed on the influent piping at the ground surface.

Condition 13

All equipment placed in KAFB-7 shall be decontaminated utilizing a steam pressure wash prior to insertion in the well.

All equipment was decontaminated with a steam pressure wash prior to insertion into KAFB-7. Photographic record can be found in Attachment D.

Condition 14

No chemicals shall be placed into KAFB-7 without the prior approval of NMED.

No chemicals are anticipated for KAFB-7, if in the event that chemicals would be needed, prior approval from the NMED will be obtained.

Condition 15

Access of unauthorized personnel to both the GWTS and KAFB-7 shall be restricted.

No unauthorized personnel will be allowed access to GWTS or KAFB-7.

Condition 16

NMED representatives shall be allowed to inspect any treatment works and monitoring equipment, and to sample any associated effluent. (See 20.6.2.31 07 .D)

At any time, NMED representatives will be allowed to inspect the GWTS and monitoring equipment, as well as sample any associated effluent. Prior notice from NMED personnel would help facilitate the collection of effluent samples at the GWTS.

Condition 17

A final report shall be submitted to NMED within 60 days of cessation of the temporary discharge. The report shall include the following information:

- i. Total effluent volumes from the GWTS and injection volumes to KAFB-7, with any discrepancy explained.*
- ii. Daily total injection volumes.*
- iii. Effluent sampling analytical results.*
- iv. Any operations and maintenance activities performed during the period.*
- v. A comparison of injection flow rates and associated changes to hydraulic head.*
- vi. Groundwater elevation contour map(s) illustrating the aquifer's response to injection, including maps illustrating changes to the aquifer resulting from the discharge changes referred to in Condition #2.*

The final report will be submitted to the NMED within specified timeframe with the above stated information included; except the total injection volumes will be monthly instead of daily.

We appreciate your attention to this matter. Please contact me at 505.853.3484 or at ludie.bitner@us.af.mil or Mr. Scott C. Clark at 505.846.9017 or at scott.clark@us.af.mil if you have any questions.

Sincerely,



L. Wayne Bitner
Chief, Environmental Restoration

cc:

NMED-EHD (Roberts)
NMED (McQuillan, Longmire, Agnew)
NMED-HWB (Kieling, Cobrain)
NMED-GWQB (Pullen, Hunter)
NMED-PSTB (Reuter)
NMED-OGC (Kendall)
SAF-IEE (Lynnes)
U.S.EPA Region 6 (King, Ellinger)
AFCEC-CZRXX (Bodour)
USACE-ABQ District Office (Simpler, Phaneuf)
Public Info Repository (Central New Mexico Community College), Administrative Record/Information Repository (AR/IR), and File

ATTACHMENTS

A. Treatment Effectiveness Analytical Data

A-1. Temporary Groundwater Treatment System Data

A-2. Full-Scale Groundwater Treatment System Data

B. Transducer Factory Calibration Certificates

B-1. KAFB-7 Transducer

B-2. Observation Well Transducers

B-3. Completed Transducer Installation Forms

B-4. KAFB-7 Well Completion Diagram

C. Flow Meter Calibration Certificates

C-1. KAFB-106228

C-2. KAFB-106233

C-3. KAFB-106234

C-4. GWTS Feed Pump

C-5. GWTS Discharge Pump

C-6. Field Calibration Check Procedure

D. KAFB-7 Equipment Decontamination Photos

ATTACHMENT A

Treatment Effectiveness Analytical Data

ATTACHMENT A-1

Temporary Groundwater Treatment System Data

Attachment A-1

Temporary Groundwater Treatment System Analytical Results, June - December 2015

			LOCATION CODE			KAFB-106228-INF			KAFB-106228-EFF			KAFB-106228-INF			KAFB-106228-EFF			KAFB-106228-INF			KAFB-106228-EFF			KAFB-106228-INF			KAFB-106228-EFF			
			SAMPLE NO.			D1-106228-INF			D1-106228-EFF			D2-106228-INF			D2-106228-EFF			D3-106228-INF			D3-106228-EFF			D4-106228-INF			D4-106228-EFF			
			SAMPLE DATE			28-Jun-15			28-Jun-15			30-Jun-15			30-Jun-15			1-Jul-15			1-Jul-15			2-Jul-15			2-Jul-15			
			SAMPLE PURPOSE			REG			REG			REG			REG			REG			REG			REG			REG			
			SAMPLE DEPTH			0-0 FT			0-0 FT			0-0 FT			0-0 FT			0-0 FT			0-0 FT			0-0 FT			0-0 FT			
Chemical Class and Analytical Method ^a	Parameter	NMED Ground Water Protection Standards (Sec. 20.6.2.3103) ^b	NMED Approved Background ^c	EPA MCLs ^d	Result	VAL QUAL	LOQ	Result	VAL QUAL	LOQ	Result	VAL QUAL	LOQ	Result	VAL QUAL	LOQ	Result	VAL QUAL	LOQ	Result	VAL QUAL	LOQ	Result	VAL QUAL	LOQ	Result	VAL QUAL	LOQ		
VOCs (ug/L) Method 8260B	1,2-DIBROMOETHANE (Method 8011)	0.1	NE	0.05	0.19		0.02	ND	U	0.01	0.19		0.02	ND	U	0.01	0.19		0.02	ND	U	0.01	0.16		0.02	ND	U	0.02		
	BENZENE	10	NE	5	ND	U	1	ND	U	1	ND	U	1	ND	U	1	0.1	J	1	ND	U	1	ND	U	1	ND	U	1		
	ETHYLBENZENE	750	NE	700	ND	U	1	0.14	J	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1		
	M,P-XYLENES	620	NE	10000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	U	2	ND	U	2
	O-XYLENE	620	NE	10000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	U	1	ND	U	1	
	TOLUENE	750	NE	1000	1.5		1	0.37	J	1	0.65	J	1	ND	U	1	0.28	J	1	ND	U	1	ND	U	1	ND	U	1		
	XYLENES	620	NE	10000	ND	U	1.5	1.3	J	1.5	ND	U	1.5	ND	U	1.5	ND	U	1.5	ND	U	1.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Metals (ug/L)	IRON, DISSOLVED (Method 6010B-DISS)	1000	NE	NE	14	J	20	ND	U	20	ND	U	20	ND	U	20	ND	U	20	ND	U	20	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	IRON, DISSOLVED (Method 6020A-DISS)	1000	NE	NE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	U	100	ND	U	100		
	MANGANESE, DISSOLVED (Method 6010B-DISS)	200	NE	NE	19		2	4.6		2	7.8		2	8.6		2	3.7		2	7.8		2	N/A	N/A	N/A	N/A	N/A	N/A		
	MANGANESE, DISSOLVED (Method 6020A-DISS)	200	NE	NE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.26	J	5	7.48		5		
General Chemistry (mg/L)	PH (Method SM4500) (PH)	9	NE	NE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
	SUSPENDED SOLIDS (RESIDUE, NON-FILTERABLE) (Method SM2540D)	NE	NE	NE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
	TOTAL ORGANIC CARBON (Method SW9060)	NE	NE	NE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		

a. EPA analytical methods listed are for the most recent sampling event.

b. New Mexico Water Quality Control Commission, Water Quality Standards, New Mexico Administrative Code 20.6.2.3103.□

c. NMED-HWB Approved Background Concentrations, SNL/Kirtland AFB, Chemical Constituents in Ground Water.

d. U.S. Environmental Protection Agency, 2015, National Primary Drinking Water Regulations: List of Drinking Water Contaminants and Maximum Contaminant Levels, June.

Shading indicates the analyte was detected.

Bold indicated analyte detected greater than regulatory standard.

µg/L = microgram per liter

EFF = Effluent

EPA = Environmental Protection Agency

FT = Feet

GAC = Granular-activated carbon

INF = Influent

J = Estimated value, concentration is less than LOQ but greater than laboratory method detection limit (DL).

J- = Estimated value, concentration is less than LOQ but greater than laboratory method detection limit (DL); biased low.

KAFB = Kirtland Air Force Base

LOQ = Limit of Quantitation

MCL = Maximum contaminant level

mg/L = milligram per liter

N/A = Not analyzed

ND = Not detected

NE = Not established.

NMED = New Mexico Environment Department

NMWQCC = New Mexico Water Quality Control Commission

No. = number

U = Analyte was not detected. The reported numerical value is at or below the LOQ.

VAL QUAL = Validation qualifier

VOC = Volatile organic compound

Attachment A-1

Temporary Groundwater Treatment System Analytical Results, June - December 2015

			LOCATION CODE			KAFB-106228-INF			KAFB-106228-EFF			KAFB-106228-INF			KAFB-106228-EFF			KAFB-106228-INF			KAFB-106228-EFF			KAFB-106228-INF			KAFB-106228-EFF		
			SAMPLE NO.			D5-106228-INF			D5-106228-EFF			D6-106228-INF			D6-106228-EFF			D7-106228-INF			D7-106228-EFF			JUL15-106228-INF-1			JUL15-106228-EFF-1		
			SAMPLE DATE			3-Jul-15			3-Jul-15			4-Jul-15			4-Jul-15			5-Jul-15			5-Jul-15			29-Jul-15			29-Jul-15		
			SAMPLE PURPOSE			REG			REG			REG			REG			REG			REG			REG			REG		
SAMPLE DEPTH			0-0 FT			0-0 FT			0-0 FT			0-0 FT			0-0 FT			0-0 FT			0-0 FT			0-0 FT			0-0 FT		
Chemical Class and Analytical Method ^a	Parameter	NMED Ground Water Protection Standards (Sec. 20.6.2.3103) ^b	NMED Approved Background ^c	EPA MCLs ^d	Result	VAL QUAL	LOQ	Result	VAL QUAL	LOQ	Result	VAL QUAL	LOQ	Result	VAL QUAL	LOQ	Result	VAL QUAL	LOQ	Result	VAL QUAL	LOQ	Result	VAL QUAL	LOQ	Result	VAL QUAL	LOQ	
VOCs (µg/L) Method 8260B	1,2-DIBROMOETHANE (Method 8011)	0.1	NE	0.05	0.204		0.02	ND	U	0.02	0.262		0.02	ND	U	0.02	0.113		0.02	ND	U	0.02	0.092		0.02	ND	U	0.02	
	BENZENE	10	NE	5	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	
	ETHYLBENZENE	750	NE	700	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	
	M,P-XYLENES	620	NE	10000	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	
	O-XYLENE	620	NE	10000	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	
	TOLUENE	750	NE	1000	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	
	XYLENES	620	NE	10000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Metals (ug/L)	IRON, DISSOLVED (Method 6010B-DISS)	1000	NE	NE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	IRON, DISSOLVED (Method 6020A-DISS)	1000	NE	NE	ND	U	100	ND	U	100	ND	U	100	ND	U	100	ND	U	100	ND	U	100	ND	U	100	ND	U	100	
	MANGANESE, DISSOLVED (Method 6010B-DISS)	200	NE	NE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	MANGANESE, DISSOLVED (Method 6020A-DISS)	200	NE	NE	1.3	J	5	6.15		5	1.76	J	5	5		5	ND	U	5	7.16		5	ND	U	5	17.1		5	
General Chemistry (mg/L)	PH (Method SM4500) (PH)	9	NE	NE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	SUSPENDED SOLIDS (RESIDUE, NON-FILTERABLE) (Method SM2540D)	NE	NE	NE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	TOTAL ORGANIC CARBON (Method SW9060)	NE	NE	NE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

a. EPA analytical methods listed are for the most recent sampling event.

b. New Mexico Water Quality Control Commission, Water Quality Standards, New Mexico Administrative Code 20.6.2.3103.□

c. NMED-HWB Approved Background Concentrations, SNL/Kirtland AFB, Chemical Constituents in Ground Water.

d. U.S. Environmental Protection Agency, 2015, National Primary Drinking Water Regulations: List of Drinking Water Contaminants and Maximum Contaminant Levels, June.

Shading indicates the analyte was detected.

Bold indicated analyte detected greater than regulatory standard.

µg/L = microgram per liter

EFF = Effluent

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FT = Feet

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INF = Influent

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NMWQCC = New Mexico Water Quality Control Commission

No. = number

U = Analyte was not detected. The reported numerical value is at or below the LOQ.

VAL QUAL = Validation qualifier

VOC = Volatile organic compound

Attachment A-1

Temporary Groundwater Treatment System Analytical Results, June - December 2015

			LOCATION CODE			KAFB-106228-INF			KAFB-106228-EFF			KAFB-106228-INF			KAFB-106228-EFF			KAFB-106228-INF			KAFB-106228-EFF			KAFB-106228-INF			KAFB-106228-EFF		
			SAMPLE NO.			AUG15-106228-INF-1			AUG15-106228-EFF-1			AUG15-106228-INF-2			AUG15-106228-EFF-2			SEPT15-106228-INF-1			SEPT15-106228-EFF-1			OCT15-106228-INF-1			OCT15-106228-EFF-1		
			SAMPLE DATE			3-Aug-15			3-Aug-15			12-Aug-15			12-Aug-15			8-Sep-15			8-Sep-15			15-Oct-15			15-Oct-15		
			SAMPLE PURPOSE			REG			REG			REG			REG			REG			REG			REG			REG		
			SAMPLE DEPTH			0-0 FT			0-0 FT			0-0 FT			0-0 FT			-			-			-			-		
Chemical Class and Analytical Method ^a	Parameter	NMED Ground Water Protection Standards (Sec. 20.6.2.3103) ^b	NMED Approved Background ^c	EPA MCLs ^d	Result	VAL QUAL	LOQ	Result	VAL QUAL	LOQ	Result	VAL QUAL	LOQ	Result	VAL QUAL	LOQ	Result	VAL QUAL	LOQ	Result	VAL QUAL	LOQ	Result	VAL QUAL	LOQ	Result	VAL QUAL	LOQ	
VOCs (µg/L) Method 8260B	1,2-DIBROMOETHANE (Method 8011)	0.1	NE	0.05	0.176		0.02	ND	U	0.02	0.133		0.02	ND	U	0.02	0.075		0.02	ND	U	0.02	0.078		0.02	ND	U	0.02	
	BENZENE	10	NE	5	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	
	ETHYLBENZENE	750	NE	700	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	
	M,P-XYLENES	620	NE	10000	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	ND	U	2	
	O-XYLENE	620	NE	10000	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	
	TOLUENE	750	NE	1000	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	ND	U	1	
	XYLENES	620	NE	10000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Metals (ug/L)	IRON, DISSOLVED (Method 6010B-DISS)	1000	NE	NE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	IRON, DISSOLVED (Method 6020A-DISS)	1000	NE	NE	ND	U	100	ND	U	100	ND	U	100	ND	U	100	ND	U	100	ND	U	100	ND	U	100	ND	U	100	
	MANGANESE, DISSOLVED (Method 6010B-DISS)	200	NE	NE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	MANGANESE, DISSOLVED (Method 6020A-DISS)	200	NE	NE	ND	U	5	2.13	J	5	ND	U	5	2.16	J	5	ND	U	5	ND	U	5	ND	U	5	ND	U	5	
General Chemistry (mg/L)	PH (Method SM4500) (PH)	9	NE	NE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	SUSPENDED SOLIDS (RESIDUE, NON-FILTERABLE) (Method SM2540D)	NE	NE	NE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	TOTAL ORGANIC CARBON (Method SW9060)	NE	NE	NE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

a. EPA analytical methods listed are for the most recent sampling event.

b. New Mexico Water Quality Control Commission, Water Quality Standards, New Mexico Administrative Code 20.6.2.3103.□

c. NMED-HWB Approved Background Concentrations, SNL/Kirtland AFB, Chemical Constituents in Ground Water.

d. U.S. Environmental Protection Agency, 2015, National Primary Drinking Water Regulations: List of Drinking Water Contaminants and Maximum Contaminant Levels, June.

Shading indicates the analyte was detected.

Bold indicated analyte detected greater than regulatory standard.

µg/L = microgram per liter

EFF = Effluent

EPA = Environmental Protection Agency

FT = Feet

GAC = Granular-activated carbon

INF = Influent

J = Estimated value, concentration is less than LOQ but greater than laboratory method detection limit (DL).

J- = Estimated value, concentration is less than LOQ but greater than laboratory method detection limit (DL); biased low.

KAFB = Kirtland Air Force Base

LOQ = Limit of Quantitation

MCL = Maximum contaminant level

mg/L = milligram per liter

N/A = Not analyzed

ND = Not detected

NE = Not established.

NMED = New Mexico Environment Department

NMWQCC = New Mexico Water Quality Control Commission

No. = number

U = Analyte was not detected. The reported numerical value is at or below the LOQ.

VAL QUAL = Validation qualifier

VOC = Volatile organic compound

Attachment A-1
Temporary Groundwater Treatment System Analytical Results, June - December 2015

			LOCATION CODE		KAFB-106228-INF			KAFB-106228-EFF			
			SAMPLE NO.		DEC15-106228-INF-1			DEC15-106228-EFF-1			
			SAMPLE DATE		15-Dec-15			15-Dec-15			
			SAMPLE PURPOSE		REG			REG			
			SAMPLE DEPTH								
Chemical Class and Analytical Method ^a	Parameter	NMED Ground Water Protection Standards (Sec. 20.6.2.3103) ^b	NMED Approved Background ^c	EPA MCLs ^d							
					Result	VAL	QUAL	LOQ	Result	VAL	QUAL
VOCs (µg/L) Method 8260B	1,2-DIBROMOETHANE (Method 8011)	0.1	NE	0.05	0.237	J		0.02	ND	U	0.02
	BENZENE	10	NE	5	ND	U	1	ND	ND	U	1
	ETHYLBENZENE	750	NE	700	ND	U	1	ND	ND	U	1
	M,P-XYLENES	620	NE	10000	ND	U	2	ND	ND	U	2
	O-XYLENE	620	NE	10000	ND	U	1	ND	ND	U	1
	TOLUENE	750	NE	1000	ND	U	1	ND	ND	U	1
	XYLENES	620	NE	10000	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Metals (ug/L)	IRON, DISSOLVED (Method 6010B-DISS)	1000	NE	NE	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	IRON, DISSOLVED (Method 6020A-DISS)	1000	NE	NE	ND	U	100	ND	ND	U	100
	MANGANESE, DISSOLVED (Method 6010B-DISS)	200	NE	NE	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	MANGANESE, DISSOLVED (Method 6020A-DISS)	200	NE	NE	ND	U	5	2.47	J		5
General Chemistry (mg/L)	PH (Method SM4500) (PH)	9	NE	NE	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	SUSPENDED SOLIDS (RESIDUE, NON-FILTERABLE) (Method SM2540D)	NE	NE	NE	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TOTAL ORGANIC CARBON (Method SW9060)	NE	NE	NE	N/A	N/A	N/A	N/A	N/A	N/A	N/A

- a. EPA analytical methods listed are for the most recent sampling event.
b. New Mexico Water Quality Control Commission, Water Quality Standards, New Mexico Administrative Code 20.6.2.3103.□
c. NMED-HWB Approved Background Concentrations, SNL/Kirtland AFB, Chemical Constituents in Ground Water.
d. U.S. Environmental Protection Agency, 2015, National Primary Drinking Water Regulations: List of Drinking Water Contaminants and Maximum Contaminant Levels, June.

Shading indicates the analyte was detected.
Bold indicated analyte detected greater than regulatory standard.

µg/L = microgram per liter
EFF = Effluent
EPA = Environmental Protection Agency
FT = Feet
GAC = Granular-activated carbon
INF = Influent
J = Estimated value, concentration is less than LOQ but greater than laboratory method detection limit (DL).
J- = Estimated value, concentration is less than LOQ but greater than laboratory method detection limit (DL); biased low.
KAFB = Kirtland Air Force Base
LOQ = Limit of Quantitation
MCL = Maximum contaminant level
mg/L = milligram per liter
N/A = Not analyzed
ND = Not detected
NE = Not established.
NMED = New Mexico Environment Department
NMWQCC = New Mexico Water Quality Control Commission
No. = number
U = Analyte was not detected. The reported numerical value is at or below the LOQ.
VAL QUAL = Validation qualifier
VOC = Volatile organic compound

ATTACHMENT A-2

Full-Scale Groundwater Treatment System Data

Attachment A-2

Full-Scale Groundwater Treatment System Analytical Results, December 2015 - January 2016

				LOCATION CODE	GWTS-INF		GWTS-GAC1		GWTS-EFF		GWTS-INF		GWTS-GAC1		GWTS-EFF		GWTS-INF		GWTS-GAC1		GWTS-EFF		GWTS-INF		GWTS-GAC1		GWTS-EFF		
				SAMPLE NO	GWTS-INF-0001		GWTS-GAC1-0001		GWTS-EFF-0001		GWTS-INF-0002		GWTS-GAC1-0002		GWTS-EFF-0002		GWTS-INF-0003		GWTS-GAC1-0003		GWTS-EFF-0003		GWTS-INF-0004		GWTS-GAC1-0004		GWTS-EFF-0004		
				SAMPLE DATE	12/16/2015		12/16/2015		12/16/2015		12/18/2015		12/18/2015		12/18/2015		21-Dec-15		21-Dec-15		21-Dec-15		22-Dec-15		22-Dec-15		22-Dec-15		
				SAMPLE TIME	16:00		16:00		16:00		14:15		14:25		14:35		12:15		12:30		12:40		15:20		15:10		15:00		
				SAMPLE DAY	Wednesday		Wednesday		Wednesday		Friday		Friday		Friday		Monday		Monday		Monday		Tuesday		Tuesday		Tuesday		
				DAY NUMBER	1		1		1		2		2		2		3		3		3		4		4		4		
				SAMPLE PURPOSE	REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		
				LABORATORY	Empirical		Empirical		Empirical		Empirical		Empirical		Empirical		Empirical		Empirical		Empirical		Empirical		Empirical		Empirical		
LAB DATA DUE	12/18/2015		12/18/2015		12/18/2015		12/20/2015		12/20/2015		12/20/2015		12/23/2015		12/23/2015		12/23/2015		12/24/2015		12/24/2015		12/24/2015						
Chemical Class & Analytical Method	Parameter	NMED Ground Water Protection Standards (Sec. 20.6.2.3103)	EPA MCLs ^a	Result	LOQ	Result	LOQ	Result	LOQ	Result	LOQ	Result	LOQ	Result	LOQ	Result	LOQ	Result	LOQ	Result	LOQ	Result	LOQ	Result	LOQ	Result	LOQ		
				Final Analytical Data																									
EDB (µg/L)/SW8011	1,2-DIBROMOETHANE	0.1	0.05	0.181	0.03	ND	0.03	ND	0.03	0.18	0.0281	ND	0.0288	ND	0.0284	0.195	0.0281	ND	0.0282	ND	0.028	0.182	0.0283	ND	0.0278	ND	0.0283		
VOC (µg/L)/ SW8260B	BENZENE	10	5	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1		
	ETHYLBENZENE	750	700	ND	1	ND	1	ND	1	0.316J	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1		
	TOLUENE	750	1000	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1		
	XYLENES	620	10000	0.918J	3	ND	3	ND	3	2.89J	3	ND	3	1.08J	3	ND	3	ND	3	ND	3	ND	3	ND	3	ND	3		
Metals (µg/L)/SW6010C	IRON, DISSOLVED	1,000	NE	36.8J	100	ND	100	ND	100	239	100	ND	100	81.2J	100	37.3J	100	ND	100	30.4J	100	ND	100	ND	100	39.4J	100		
	MANGANESE, DISSOLVED	200	NE	ND	15	5.02J	15	3.55J	15	15.5	15	5.46J	15	4.3J	15	ND	15	5.56J	15	5.87J	15	ND	15	5.3J	15	18.5	15		
Field Data	Temperature (Deg.C)	---	---	17.48		17.33		13.78		17		16.4		14.7		18.3		17.3		16.3		19.3		19		18.2			
	Spec. Conductivity (us/cm)	---	---	354.2		373.5		609		393		388		542		387		388		434		397		363		391			
	pH	---	---	8.1		9.1		8.5		7.82		8.86		8.02		7.64		8.7		8.17		8.2		8.91		8.36			
	ORP (mV)	---	---	214		225		231		79.9		117.4		175.5		181.3		177		154.1		265.5		266.1		268.2			
	DO (mg/L)	---	---	6.91		0.57		7.53		7.64		1.48		6.54		7.95		3.16		6.62		7.42		2.13		6.5			

a = EPA MCLare from the EPA RSL Table, dated Nov. 2015.

ND = not detected

LOQ = Limit of Quantitation

J = analyte was detected at a trace level below the LOQ

µg/L = micrograms per liter

mg/L = milligrams per liter

Grey indicates draft data

Attachment A-2
Full-Scale Groundwater Treatment System Analytical Results, December 2015 - January 2016

			LOCATION CODE	GWTS-INF		GWTS-GAC1		GWTS-EFF		GWTS-INF		GWTS-GAC1		GWTS-EFF		GWTS-INF		GWTS-GAC1		GWTS-EFF		GWTS-INF		GWTS-GAC1		GWTS-EFF	
			SAMPLE NO	GWTS-INF-0005		GWTS-GAC1-0005		GWTS-EFF-0005		GWTS-INF-0006		GWTS-GAC1-0006		GWTS-EFF-0006		GWTS-INF-0007		GWTS-GAC1-0007		GWTS-EFF-0007		GWTS-INF-0008		GWTS-GAC1-0008		GWTS-EFF-0008	
			SAMPLE DATE	29-Dec-15		29-Dec-15		29-Dec-15		30-Dec-15		30-Dec-15		30-Dec-15		31-Dec-15		31-Dec-15		31-Dec-15		7-Jan-16		7-Jan-16		7-Jan-16	
			SAMPLE TIME	13:55		13:47		13:38		13:05		13:00		13:10		9:47		9:43		8:30		9:00		9:10		9:20	
			SAMPLE DAY	Tuesday		Tuesday		Tuesday		Wednesday		Wednesday		Wednesday		Thursday		Thursday		Thursday		Thursday		Thursday		Thursday	
			DAY NUMBER	5		5		5		6		6		6		7		7		7		Week 1		Week 1		Week 1	
			SAMPLE PURPOSE	REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		REG	
LABORATORY	Empirical		Empirical		Empirical		Empirical		Empirical		Empirical		Empirical		Empirical		Empirical		Empirical		Empirical		Empirical				
LAB DATA DUE	12/31/2015		12/31/2015		12/31/2015		1/4/2016		1/4/2016		1/4/2016		1/4/2016		1/5/2016		1/5/2016		1/5/2016		1/15/2016		1/15/2016		1/15/2016		
Chemical Class & Analytical Method	Parameter	NMED Ground Water Protection Standards (Sec. 20.6.2.3103)	EPA MCLs ^a	Result	LOQ	Result	LOQ	Result	LOQ	Result	LOQ	Result	LOQ	Result	LOQ	Result	LOQ	Result	LOQ	Result	LOQ	Result	LOQ	Result	LOQ	Result	LOQ
				Final Analytical Data																		Draft Analytical Data					
EDB (µg/L)/SW8011	1,2-DIBROMOETHANE	0.1	0.05	0.181	0.0289	ND	0.0288	ND	0.0287	0.194	0.0284	ND	0.0284	ND	0.0282	0.183	0.0287	ND	0.0286	ND	0.0287	0.176	0.0283	ND	0.0286	ND	0.0284
VOC (µg/L)/ SW8260B	BENZENE	10	5	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1
	ETHYLBENZENE	750	700	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1
	TOLUENE	750	1000	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1
	XYLENES	620	10000	ND	3	ND	3	ND	3	ND	3	ND	3	ND	3	ND	3	ND	3	ND	3	ND	3	ND	3	ND	3
Metals (µg/L)/SW6010C	IRON, DISSOLVED	1,000	NE	ND	100	ND	100	63J	100	ND	100	ND	100	ND	100	38.3J	100	ND	100	54.9J	100	ND	100	ND	100	ND	100
	MANGANESE, DISSOLVED	200	NE	ND	15	6.65J	15	9.47J	15	ND	15	6.9J	15	6.21J	15	ND	15	8.22J	15	7.8J	15	ND	15	7.05J	15	8.37J	15
Field Data	Temperature (Deg.C)	---	---	18.2	16.1	17.7	17	18.8	17.1	17.2	18.4	17.9	18.4	17.1	16.4												
	Spec. Conductivity (us/cm)	---	---	405	393	419	421	407	425	424	401	416	424	418	430												
	pH	---	---	8.05	8.81	7.38	8.1	8.75	8.02	8.05	8.54	8.42	7.94	8.3	7.87												
	ORP (mV)	---	---	114.5	115.3	113.8	172.3	171.2	142.5	186.8	182.4	194.9	151	164.7	158.16												
	DO (mg/L)	---	---	7.66	2.46	6.47	7.7	3.33	6.46	7.47	2.95	6.28	7.76	2.8	6.68												

a = EPA MCLare from the EPA RSL Table, dated Nov. 2015.
ND = not detected
LOQ = Limit of Quantitation
J = analyte was detected at a trace level below the LOQ
µg/L = micrograms per liter
mg/L = milligrams per liter

Grey indicates draft data

Attachment A-2
Full-Scale Groundwater Treatment System Analytical Results, December 2015 - January 2016

			LOCATION CODE	KAFB-106233	KAFB-106234	GWTS-INF	GWTS-GAC1	GWTS-EFF	GWTS-INF	GWTS-GAC1	GWTS-EFF	GWTS-INF	GWTS-GAC1	GWTS-EFF	GWTS-INF	GWTS-GAC1	GWTS-EFF	GWTS-INF	GWTS-GAC1	GWTS-EFF			
			SAMPLE NO	GW2601	GW2602	GWTS-INF-0009	GWTS-GAC1-0009	GWTS-EFF-0009	GWTS-INF-0010	GWTS-GAC1-0010	GWTS-EFF-0010	GWTS-INF-0010	GWTS-GAC1-0010	GWTS-EFF-0010	GWTS-INF-0010	GWTS-GAC1-0010	GWTS-EFF-0010	GWTS-INF-0010	GWTS-GAC1-0010	GWTS-EFF-0010	GWTS-INF-0010	GWTS-GAC1-0010	GWTS-EFF-0010
			SAMPLE DATE	13-Jan-16	13-Jan-16	14-Jan-16	14-Jan-16	14-Jan-16	21-Jan-16	21-Jan-16	21-Jan-16	21-Jan-16	21-Jan-16	21-Jan-16	21-Jan-16	21-Jan-16	21-Jan-16	21-Jan-16	21-Jan-16	21-Jan-16	21-Jan-16	21-Jan-16	21-Jan-16
			SAMPLE TIME	14:36	14:52	9:28	9:40	9:53	16:08	15:58	15:40	16:08	15:58	15:40	16:08	15:58	15:40	16:08	15:58	15:40	16:08	15:58	15:40
			SAMPLE DAY	Wednesday	Wednesday	Thursday	Thursday	Thursday	Thursday	Thursday	Thursday	Thursday	Thursday	Thursday	Thursday	Thursday	Thursday	Thursday	Thursday	Thursday	Thursday	Thursday	Thursday
			DAY NUMBER	Initial Sample	Initial Sample	Week 2	Week 2	Week 2	Week 3 & Day 1	Week 3 & Day 1	Week 3 & Day 1	Week 3 & Day 1	Week 3 & Day 1	Week 3 & Day 1	Week 3 & Day 1	Week 3 & Day 1	Week 3 & Day 1	Week 3 & Day 1	Week 3 & Day 1	Week 3 & Day 1	Week 3 & Day 1	Week 3 & Day 1	Week 3 & Day 1
			SAMPLE PURPOSE	REG	REG	REG	REG	REG	REG	REG	REG	REG	REG	REG	REG	REG	REG	REG	REG	REG	REG	REG	REG
			LABORATORY	Empirical	Empirical	Empirical	Empirical	Empirical	Empirical	Empirical	Empirical	Empirical	Empirical	Empirical	Empirical	Empirical	Empirical	Empirical	Empirical	Empirical	Empirical	Empirical	Empirical
LAB DATA DUE			1/21/2016		1/21/2016		1/22/2016		1/22/2016		1/22/2016		1/26/2016		1/26/2016		1/26/2016		1/26/2016				
Chemical Class & Analytical Method	Parameter	NMED Ground Water Protection Standards (Sec. 20.6.2.3103)	EPA MCLs ^a	Result		LOQ		Result		LOQ		Result		LOQ		Result		LOQ		Result		LOQ	
				Draft Analytical Data																			
EDB (µg/L)/SW8011	1,2-DIBROMOETHANE	0.1	0.05	0.00982J	0.0284	0.112	0.0284	0.15	0.286	ND	0.0287	ND	0.0284	0.146	0.0284	ND	0.0286	ND	0.0281	ND	0.0281		
VOC (µg/L)/ SW8260B	BENZENE	10	5	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1		
	ETHYLBENZENE	750	700	0.26J	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1	ND	1		
	TOLUENE	750	1000	1.17	1	0.278J	1	ND	1	ND	1	ND	1	0.661J	1	ND	1	ND	1	ND	1		
	XYLENES	620	10000	1.54J	3	0.921J	3	ND	3	ND	3	ND	3	ND	3	ND	3	ND	3	ND	3		
Metals (µg/L)/SW6010C	IRON, DISSOLVED	1,000	NE	ND	25	ND	25	ND	100	ND	100	37.3J	100	ND	100	ND	100	ND	100	ND	100		
	MANGANESE, DISSOLVED	200	NE	69.3	3.75	8.23	3.75	ND	15	ND	15	3.69J	15	5.55J	15	25.6	15	11.5J	15	ND	15		
Field Data	Temperature (Deg.C)	---	---	18.8	16.4	18.8	18.9	18.8	18.9	18.8	14.3	10.8	17.2	18.8	14.3	10.8	17.2	18.8	14.3	10.8	17.2		
	Spec. Conductivity (us/cm)	---	---	387	701	425	431	444	490	463	570	387	701	425	431	444	490	463	570	387	701		
	pH	---	---	6.42	7.86	7.62	7.83	7.47	7.35	7.42	7.34	6.42	7.86	7.62	7.83	7.47	7.35	7.42	7.34	6.42	7.86		
	ORP (mV)	---	---	200.1	219.9	202.8	221.9	188.3	188.9	191.6	195.4	200.1	219.9	202.8	221.9	188.3	188.9	191.6	195.4	200.1	219.9		
	DO (mg/L)	---	---	8.16	3.22	7.2	1.7	6.54	7.99	3	6.96	8.16	3.22	7.2	1.7	6.54	7.99	3	6.96	8.16	3.22		

a = EPA MCLare from the EPA RSL Table, dated Nov. 2015.
ND = not detected
LOQ = Limit of Quantitation
J = analyte was detected at a trace level below the LOQ
µg/L = micrograms per liter
mg/L = milligrams per liter

Grey indicates draft data

ATTACHMENT B

Transducer Factory Calibration Certificates

ATTACHMENT B-1

KAFB-7 Transducer



Calibration Report

Report Number: 20151216-436996

221 East Lincoln Avenue, Fort Collins, CO 80524 USA
1-970-498-1500, 1-800-446-7488, FAX: 1-970-498-1598

Visit us at www.in-situ.com

Instrument Details: Well-7 Transducer

Instrument Model: Level TROLL 700
Full Scale Pressure Range: 300 PSI / 210 m / 692 ft / vented
Serial Number: 436996
Hardware Version: 5
Firmware Version: 3.03

Calibration Details:

Calibration Result: PASS
Calibration Date: 2015-12-16 17:08:46 (UTC)
Nominal Range of Applied Temperature: -5 C to +50 C
Temperature Accuracy Specification: +/- 0.1 C From -5 C to +50 C
Nominal Range of Applied Pressure: 0 PSI to 300 PSI
Pressure Accuracy Specification: +/- 0.1 %FS from -5 C to +50 C, +/- 0.05 %FS at +15 C

Post-Calibration Check:

Parameter	Applied	Reported	Deviation	Unit
Pressure	300.0010	299.9905	-0.0105	PSI
Pressure	120.0000	119.9871	-0.0129	PSI
Pressure	0.0114	0.0121	0.0007	PSI
Temperature	39.7330	39.7499	0.0169	C

Calibration Procedures and Equipment Used:

Automated calibration procedures used.

Manu Agilent Model 34970A SerialNo MY44021907

Manu Mensor Model CPC6000 SerialNo 610450

Manu Instrulab Model 3312A-14-15-24 SerialNo 31138

Manu Instrulab Model 406X-0031-01 SerialNo 1-31154

Manu Mensor Model CPC6000 SerialNo 621433

Manu Agilent Model 53131A-010 SerialNo MY47000169

Manu MENSOR Model 600 SerialNo 620225

Notes:

- Standards used in this calibration are traceable to the National Institute of Standards and Technology.
- This calibration report shall not be reproduced, except in full, without the written approval of In-Situ, Inc.
- A calibration interval of 12 to 18 months is recommended

Performed By: JD

ATTACHMENT B-2

Observation Well Transducers

Instrument Details:

Instrument Model: **Level TROLL 700**
Full Scale Pressure Range: **15 PSI vented**
Serial Number: **383745**

Calibration Details:

Calibration Result: **PASS**
Calibration Date: 2015-09-23 00:54:37 (UTC)
Nominal Range of Applied Temperature: -5 C to +50 C
Temperature Accuracy Specification: +/- 0.1 C From -5 C to +50 C
Nominal Range of Applied Pressure: 0.0 PSI to 15.0 PSI
Pressure Accuracy Specification: +/- 0.1 %FS from -5 C to +50 C, +/- 0.05 %FS at +15 C

Post-Calibration Check:

Parameter	Applied	Reported	Deviation
Pressure	15.0000	14.9984	-0.0104
Pressure	6.2998	6.3003	0.0033
Pressure	0.0003	-0.0001	-0.0027
Temperature	24.9240	24.9275	0.0035

Calibration Procedures and Equipment Used:

Automated calibration procedures used.
Manu Agilent Model 34980A SerialNo MY44014053
Manu Instrulab Model 4312A-15 SerialNo 41014
Manu Instrulab Model 832-151-01 SerialNo 12157
Manu Ruska Model 7215xi SerialNo 53143

Notes:

1. Standards used in this calibration are traceable to the National Institute of Standards and Technology.
2. This calibration report shall not be reproduced, except in full, without the written approval of In-Situ, Inc.
3. A calibration interval of 12 to 18 months is recommended.

Performed By: FM

Instrument Details:

Instrument Model: **Level TROLL 700**
Full Scale Pressure Range: **15 PSI vented**
Serial Number: **414253**

Calibration Details:

Calibration Result: **PASS**
Calibration Date: 2015-10-18 22:8:32 (UTC)
Nominal Range of Applied Temperature: -5 C to +50 C
Temperature Accuracy Specification: +/- 0.1 C From -5 C to +50 C
Nominal Range of Applied Pressure: 0.0 PSI to 15.0 PSI
Pressure Accuracy Specification: +/- 0.1 %FS from -5 C to +50 C, +/- 0.05 %FS at +15 C

Post-Calibration Check:

Parameter	Applied	Reported	Deviation
Pressure	15.0001	14.9993	-0.0055
Pressure	6.2999	6.2988	-0.0073
Pressure	0.0002	0.0004	0.0011
Temperature	24.9270	24.9274	0.0004

Calibration Procedures and Equipment Used:

Automated calibration procedures used.
Manu Agilent Model 34980A SerialNo MY44014053
Manu Instrulab Model 4312A-15 SerialNo 41014
Manu Instrulab Model 832-151-01 SerialNo 12157
Manu Ruska Model 7215xi SerialNo 53143

Notes:

1. Standards used in this calibration are traceable to the National Institute of Standards and Technology.
2. This calibration report shall not be reproduced, except in full, without the written approval of In-Situ, Inc.
3. A calibration interval of 12 to 18 months is recommended.

Performed By: FM

Instrument Details:

Instrument Model: **Level TROLL 700**
Full Scale Pressure Range: **15 PSI / 11 m / 35 ft / vented**
Serial Number: **428666**

Calibration Details:

Calibration Result: **PASS**
Calibration Date: 2015-10-16 18:38:11 (UTC)
Nominal Range of Applied Temperature: -5 C to +50 C
Temperature Accuracy Specification: +/- 0.1 C From -5 C to +50 C
Nominal Range of Applied Pressure: 0.0 PSI to 15.0 PSI
Pressure Accuracy Specification: +/- 0.1 %FS from -5 C to +50 C, +/- 0.05 %FS at +15 C

Post-Calibration Check:

Parameter	Applied	Reported	Deviation
Pressure	15.0002	15.0003	0.0011
Pressure	5.9999	5.9965	-0.0230
Pressure	-0.0002	-0.0025	-0.0152
Temperature	39.1510	39.1682	0.0172

Calibration Procedures and Equipment Used:

Automated calibration procedures used.
Manu Agilent Model 34970A SerialNo MY44000743
Manu Instrulab Model 3312A-14-15-24 SerialNo 31127
Manu Instrulab Model 406X-0031-01 SerialNo 2-31154
Manu MENSOR Model 600 SerialNo 620947
Manu Agilent Model 53131A-010 SerialNo MY47000169
Manu MENSOR Model 600 SerialNo 620225

Notes:

1. Standards used in this calibration are traceable to the National Institute of Standards and Technology.
2. This calibration report shall not be reproduced, except in full, without the written approval of In-Situ, Inc.
3. A calibration interval of 12 to 18 months is recommended.

Performed By: JD

Instrument Details:

Instrument Model: **Level TROLL 700**
Full Scale Pressure Range: **15 PSI / 11 m / 35 ft / vented**
Serial Number: **429634**

Calibration Details:

Calibration Result: **PASS**
Calibration Date: 2015-10-21 10:22:38 (UTC)
Nominal Range of Applied Temperature: -5 C to +50 C
Temperature Accuracy Specification: +/- 0.1 C From -5 C to +50 C
Nominal Range of Applied Pressure: 0.0 PSI to 15.0 PSI
Pressure Accuracy Specification: +/- 0.1 %FS from -5 C to +50 C, +/- 0.05 %FS at +15 C

Post-Calibration Check:

Parameter	Applied	Reported	Deviation
Pressure	15.0002	15.0002	0.0002
Pressure	6.0001	6.0003	0.0018
Pressure	0.0001	-0.0009	-0.0063
Temperature	39.1650	39.1970	0.0320

Calibration Procedures and Equipment Used:

Automated calibration procedures used.
Manu Agilent Model 34970A SerialNo MY44000743
Manu Instrulab Model 3312A-14-15-24 SerialNo 31127
Manu Instrulab Model 406X-0031-01 SerialNo 2-31154
Manu MENSOR Model 600 SerialNo 620947
Manu Agilent Model 53131A-010 SerialNo MY47000169
Manu MENSOR Model 600 SerialNo 620225

Notes:

1. Standards used in this calibration are traceable to the National Institute of Standards and Technology.
2. This calibration report shall not be reproduced, except in full, without the written approval of In-Situ, Inc.
3. A calibration interval of 12 to 18 months is recommended.

Performed By: NJH

ATTACHMENT B-3

Completed Transducer Installation Forms



Transducer Installation

Page 1 of 1

Date 1-27-16 & 2-3-16

Personnel Trenton Richards & Evan Perez

[illegible]



Well ID Checklist

Page 1 of 1

Date 1-27-16

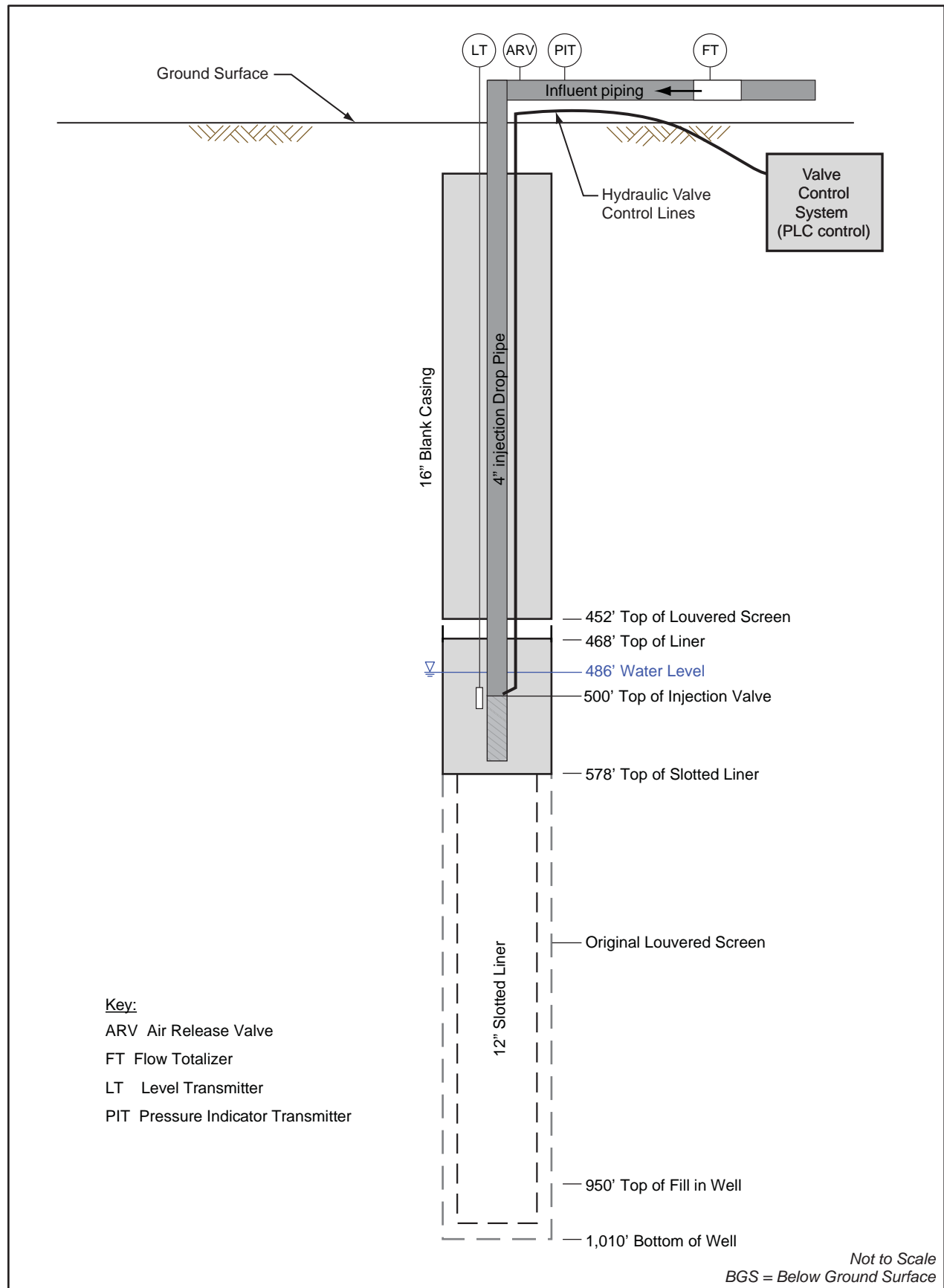
Personnel T. Richards, E. Perez

Transducer and BaroTROLL Installation Locations				
	Transducer or BaroTROLL?	Serial Number	Well ID	Comments
1	Transducer	R 27315	KAFB-0508	
2	Transducer	R 26859	KAFB-0523	
3	Transducer	R 27316	KAFB-0524	
4	Transducer	R 26391	KAFB-0507	
5	Transducer	R 436996	KAFB-7	Reinstalled 2-3-16
6		¹² 25316		
7				
8				
9				
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11				
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25				

ATTACHMENT B-4

KAFB-7 Well Completion Diagram

KAFB-7 Injection Schematic



ATTACHMENT C

Flow Meter Calibration Certificates

ATTACHMENT C-1

KAFB-106228

Final Inspection Checklist

Serial Number: 15-1854

Job Reference: 462-056614

✓ Meter Body Construction

- Tube Type / Rating
- Tube Material
- Tube Internal Diameter
- Flange Material
- Flanges Parallel
- Face-to-Face Dimension
- Cone Type
- Cone Material
- Cone Centered
- Pressure Ports Free of Burrs
- Fitting Threads Clean
- Name Plate
- Flow Arrow

✓ Standard Technical Documentation

- V-Cone Application Sizing
- Materials Of Construction Report
- Warranty Card


✓ Optional Technical Documentation

- ☒ Calibration Test Report
- ☐ Hydrostatic Pressure Test
- ☐ Dye Penetrant Examination
- ☐ X-Ray Examination
- ☐ Magnetic Particle Examination
- ☐ Certified Mill Test Reports (CMTR's)



Inspected By: _____

Date: _____


6/25/2015

V-Cone® Application Sizing

Serial #	15-1854	Fluid	WATER	
Tag		Fluid State	LIQUID	
P.O. Ref.	462-056614	End User		
Model	VH03-A1SF3	Market	Other	Mark/App Code ZZZ
		Application	Other	

Description	Wafer-Cone 3"
Note	

C_d	0.8872	q max. Flowrate	250	GPM	McCrometer Eng.	AlBa
P_f	150 psiG	Re max. Reynolds	2.901e+05			
T_f	75 °F	V max. Velocity	12.14	fps		
ρ	62.13 lb/ft3	ΔP max. Dp	160.16	inWC		
μ	0.9353 cP	ΔP min. Dp	1.6016	inWC		
G		D Meter I.D.	2.9000	in		
Z		d Cone O.D.	2.2038	in		
Y		β Beta Ratio	0.6500			
k		Turn Down	10			

C_p						
M_w	18.015					
P_b						
T_b						
Z_b						
P_{atm}	14.696 psi					
P_c	3198.8 psi					
T_c	705.16 °F					
F_a	1.000					
a_{PE}	D 6.7e-06 d 6.7e-06					
P_v	0.4302 psi					
P_{loss}	2.818 psi					

	Re	C_d	Velocity fps	Gas. Exp. Y	ΔP inWC	Flowrate GPM
1	2.901e+05	0.8872	12.14		160.16	250.00
2	2.611e+05	0.8872	10.93		129.73	225.00
3	2.321e+05	0.8872	9.715		102.50	200.00
4	2.031e+05	0.8872	8.500		78.479	175.00
5	1.741e+05	0.8872	7.286		57.658	150.00
6	1.451e+05	0.8872	6.072		40.041	125.00
7	1.160e+05	0.8872	4.857		25.625	100.00
8	8.703e+04	0.8872	3.643		14.415	75.000
9	5.802e+04	0.8872	2.429		6.4065	50.000
10	2.901e+04	0.8872	1.214		1.6016	25.000

← Entered value.

Table based on one flow condition (P, T, Z, k ...) V40 Version 2.0

Record Start Date	6/16/2015
Print Date	06-24-2015





McCROMETER

V-Cone Calibration Report

Serial Number: 15-1854 Test Number: 15-1854
 Model: VH03-A1SF3 Calibration Date: 6/24/2015
 Report Date: 6/24/2015
 Sold To: Null

Description: Wafer-Cone 3"

Notes: Wafer-Cone 3"

Inside Diameter (in): 2.9 Beta Ratio: 0.65
 Cone Outside Diameter (in): 2.2038 Average Cf: 0.8872

Calibration Report

	Reynolds Number Interval:	SLBF Cf:
1	223991 - 204486	0.8949
2	204486 - 184981	0.8943
3	184981 - 165476	0.8935
4	165476 - 145971	0.8926
5	145971 - 126466	0.8913
6	126466 - 106961	0.8897
7	106961 - 87456	0.8874
8	87456 - 67951	0.8839
9	67951 - 48446	0.8781
10	48446 - 28941	0.8665

Approved By: Vince H. Morton

Vince H. Morton

Test Fluid: Water

Test Stand Instrumentation Traceability Kit Number: V0121

Standard Used: Primary

Test Data

	Water Temperature (°C)	Test Time (seconds)	Collected Mass (kilograms)	Air Temperature (°C)	Barometric Pressure (kPa)	Relative Humidity (%)	Differential Pressure (kPa)	Rate of Flow Reference (m³/sec)	Reynolds Number (×1/1000)	Combined Uncertainty (%) at 95% confidence
1	25.60	31.676	360.953	21.79	95.80	52.96	20.5717	0.01141	224	0.15
2	25.80	31.975	215.146	21.79	95.80	52.96	7.2187	0.00674	133	0.15
3	25.80	46.454	67.987	21.79	95.80	52.96	0.3719	0.00147	29	0.15

This calibration was performed using standards traceable to the National Institute of Standards and Technology (NIST), USA. Certificates of traceability for the individual test measurements listed in this report are documented and serialized by the Test Stand Instrumentation Traceability Kit Number identified above and are available upon request. Combined Uncertainty to a 95% confidence level is developed for each test point according to the methods described in the ANSI/NCSL Z540-2-1997. Methods and procedures used in this calibration are in accordance with the McCrometer Flow Laboratory Technical Manual, revision 2.0.

ATTACHMENT C-2

KAFB-106233

Tag Name / ID: KAFB-106233 FIT-7001		Transducer/Transmitter Calibration/Verification	Manufacture Seimens/McCrometer
Contract ID 15-111	ISA S20 Sheet		Model Number 7MF4433-1EA22/VH03-A1SF3
Ambient Conditions Temperature 60 °C (°F) Pressure n/a mm Hg Humidity n/a %		Loop Number 1 <input type="checkbox"/> Initial Calibration <input checked="" type="checkbox"/> Verification	Serial Number 1X-FD09-9047929/153398 Calibration Range 0 to 162 ^{DP} 0 to 250 gpm
1. Visual Inspection: Mechanical connections <input checked="" type="checkbox"/> Finish <input checked="" type="checkbox"/> Nameplate/ID Tag <input checked="" type="checkbox"/> Mounted at correct height <input checked="" type="checkbox"/> 2. Electrical: Conduit Connections <input checked="" type="checkbox"/> Terminal/Wire Labels <input checked="" type="checkbox"/> Conduit ID <input type="checkbox"/> 3. Calibration Proof test at: zero 4. Action: Direct <input checked="" type="checkbox"/> Indirect <input type="checkbox"/> Linear <input type="checkbox"/> Non-linear <input type="checkbox"/> Square Root <input checked="" type="checkbox"/> 5. Loop Voltage 24 VDC 4-Wire <input type="checkbox"/> 2-Wire <input checked="" type="checkbox"/> 6. Load Impedance N/A ohms max @ 24 vdc			

Calibration Points									
%	Input DP	Expected Output (mADC)	Meter EU GPM	As Found Data			As Left Data		
				Output	Output	Maximum	Output	Output	Maximum
				Increase	Decrease	Output Error	Increase	Decrease	Output Error
0	0.00	4.00	0.00	0	0	± 0	0	0	± 0
10	-					±			±
20	-					±			±
25		8.00	62.50	0	0	± 0	0	0	± 0
30	-					±			±
40	-					±			±
50	40.29	12.00	125.00	0	0	± 0	0	0	± 0
60	-		-			±			±
70	-		-			±			±
75		16.00	187.50	0	0	± 0	0	0	± 0
80	-		-			±			±
90	-		-			±			±
100	161.80	20.00	250.00	0	0	± 0	0	0	± 0

Test Equipment Used	Model No:	Serial No:	Calibration/Certification Date
<input checked="" type="checkbox"/> Fluke 789	789	14970085	February 7, 2016
<input checked="" type="checkbox"/> Emerson Filed Calibrator	375	12061955	N/A
<input type="checkbox"/>			
<input type="checkbox"/>			
<input type="checkbox"/>			
<input type="checkbox"/>			
<input type="checkbox"/>			
<input type="checkbox"/>			
<input type="checkbox"/>			

Comments Mcrometer Vcone Fitted with Seimens DP transmittter and setup per Vcone cal parameteres
Zero of transmitter performed in field after media introduced to flow meter and stablized
Span verified in field with actual field conditions and flow rate and visual DP recorded in Hart Communicator

Print Name: Robbie Satriana
 Signed By: Robbie Satriana
 Approved By: Preston Patterson

DCN 1/14/2016
 Date 1/14/2016
 Date 1/27/2016



I&C Solutions LLC
4485 Irving Blvd
Albuquerque, NM 87114
505-821-8960 fax 505-821-8970

Final Inspection Checklist

Serial Number: 15-3398

Job Reference: 9914535

✓ Meter Body Construction

- Tube Type / Rating
- Tube Material
- Tube Internal Diameter
- Flange Material
- Flanges Parallel
- Face-to-Face Dimension
- Cone Type
- Cone Material
- Cone Centered
- Pressure Ports Free of Burrs
- Fitting Threads Clean
- Name Plate
- Flow Arrow

✓ Standard Technical Documentation

- V-Cone Application Sizing
- Materials Of Construction Report
- Warranty Card

✓ Optional Technical Documentation

- ☒ Calibration Test Report
- ☐ Hydrostatic Pressure Test
- ☐ Dye Penetrant Examination
- ☐ X-Ray Examination
- ☐ Magnetic Particle Examination
- ☐ Certified Mill Test Reports (CMTR's)

Inspected By: PS

Date: 11/24/15

V-Cone® Application Sizing

Serial #	15-3398	Fluid	WATER	
Tag		Fluid State	LIQUID	
P.O. Ref.	9914535	End User		
Model	VH03-A1SF3	Market		Mark/App Code
		Application		

Description	3" Wafer
Note	

C_d	0.8844	q max. Flowrate	250	GPM	McCrometer Eng.	MBB
P_f	150 psiG	Re max. Reynolds	2.901e+05			
T_f	75 °F	V max. Velocity	12.14	fps		
ρ	62.13 lb/ft3	ΔP max. Dp	161.18	inWC		
μ	0.9353 cP	ΔP min. Dp	1.6118	inWC		
G	1.000	D Meter I.D.	2.9000	in		
Z		d Cone O.D.	2.2038	in		
Y		β Beta Ratio	0.6500			
k		Turn Down	10			
C_P						
M_w	18.015					
P_b						
T_b						
Z_b						
P_{atm}	14.696 psi					
P_c	3198.8 psi					
T_c	705.16 °F					
F_a	1.000					
a_{PE}	D 6.7e-06 d 6.7e-06					
P_v	0.4302 psi					
P_{loss}	2.836 psi					

	Re	C_d	Velocity fps	Gas. Exp. Y	ΔP inWC	Flowrate GPM
1	2.901e+05	0.8844	12.14		161.18	250.00
2	2.611e+05	0.8844	10.93		130.56	225.00
3	2.321e+05	0.8844	9.715		103.15	200.00
4	2.031e+05	0.8844	8.500		78.977	175.00
5	1.741e+05	0.8844	7.286		58.024	150.00
6	1.451e+05	0.8844	6.072		40.295	125.00
7	1.160e+05	0.8844	4.857		25.789	100.00
8	8.703e+04	0.8844	3.643		14.506	75.000
9	5.802e+04	0.8844	2.429		6.4471	50.000
10	2.901e+04	0.8844	1.214		1.6118	25.000

⇐ Entered value.

Table based on one flow condition (P, T, Z, k ...) V40 Version 2.0

Record Start Date	11/6/2015
Print Date	11-24-2015





McCrometer

V-Cone Calibration Report

Serial Number: 15-3398 Test Number: 15-3398
 Model: VH03-A1SF3 Calibration Date: 11/23/2015
 Report Date: 11/23/2015
 Sold To: Null
 Description: 3" Wafer
 Notes: 3" Wafer
 Inside Diameter (in): 2.9 Beta Ratio: 0.65
 Cone Outside Diameter (in): 2.2038 Average Cf: 0.8844

Calibration Report

	Reynolds Number Interval:	SLBF Cf:
1	214162 - 196852	0.8878
2	196852 - 179542	0.8875
3	179542 - 162232	0.8871
4	162232 - 144922	0.8866
5	144922 - 127612	0.8860
6	127612 - 110302	0.8852
7	110302 - 92992	0.8841
8	92992 - 75682	0.8827
9	75682 - 58372	0.8804
10	58372 - 41062	0.8765

Approved By: Luis Leon Pacheco
 Luis Leon Pacheco

Test Fluid: Water

Test Stand Instrumentation Traceability Kit Number: V0128

Standard Used: Primary

Test Data

	Water Temperature (°C)	Test Time (seconds)	Collected Mass (kilograms)	Air Temperature (°C)	Barometric Pressure (kPa)	Relative Humidity (%)	Differential Pressure (kPa)	Rate of Flow Reference (m ³ /sec)	Reynolds Number (× 1/1000)	Combined Uncertainty (%) at 95% confidence
1	20.80	30.809	375.358	20.04	95.70	34.82	23.8364	0.01218	214	0.37
2	20.80	30.766	225.298	20.04	95.70	34.82	8.6268	0.00732	129	0.22
3	20.80	30.780	71.954	20.04	95.70	34.82	0.9117	0.00234	41	0.21

This calibration was performed using standards traceable to the National Institute of Standards and Technology (NIST), USA. Certificates of traceability for the individual test measurements listed in this report are documented and serialized by the Test Stand Instrumentation Traceability Kit Number identified above and are available upon request. Combined Uncertainty to a 95% confidence level is developed for each test point according to the methods described in the ANSI/NCSL Z540-2-1997. Methods and procedures used in this calibration are in accordance with the McCrometer Flow Laboratory Technical Manual, revision 2.0.

ATTACHMENT C-3

KAFB-106234

Tag Name / ID: KAFB-106234 FIT-7002		Transducer/Transmitter Calibration/Verification	Manufacture Seimens/McCrometer	
Contract ID 15-111	ISA S20 Sheet		Model Number 7MF4433-1EA22/VH03-A1SF3	
Ambient Conditions Temperature 60 °C (°F) Pressure n/a mm Hg Humidity n/a %		Loop Number 1	Serial Number 1X-FD09-9047930/153399	
		<input type="checkbox"/> Initial Calibration <input checked="" type="checkbox"/> Verification	Calibration Range 0 to 162 ^{DP} 0 to 250 gpm	
1. Visual Inspection: Mechanical connections <input checked="" type="checkbox"/> Finish <input checked="" type="checkbox"/> Nameplate/ID Tag <input checked="" type="checkbox"/> Mounted at correct height <input checked="" type="checkbox"/> 2. Electrical: Conduit Connections <input checked="" type="checkbox"/> Terminal/Wire Labels <input checked="" type="checkbox"/> Conduit ID <input type="checkbox"/> 3. Calibration Proof test at: zero 4. Action: Direct <input checked="" type="checkbox"/> Indirect <input type="checkbox"/> Linear <input type="checkbox"/> Non-linear <input type="checkbox"/> Square Root <input checked="" type="checkbox"/> 5. Loop Voltage 24 VDC 4-Wire <input type="checkbox"/> 2-Wire <input checked="" type="checkbox"/> 6. Load Impedance N/A ohms max @ 24 vdc				

Calibration Points									
%	Input DP	Expected Output (mADC)	Meter EU GPM	As Found Data			As Left Data		
				Output	Output	Maximum	Output	Output	Maximum
				Increase	Decrease	Output Error	Increase	Decrease	Output Error
0	0.00	4.00	0.00	0	0	± 0	0	0	± 0
10	-					±			±
20	-					±			±
25		8.00	62.50	0	0	± 0	0	0	± 0
30	-					±			±
40	-					±			±
50	40.55	12.00	125.00	0	0	± 0	0	0	± 0
60	-		-			±			±
70	-		-			±			±
75		16.00	187.50	0	0	± 0	0	0	± 0
80	-		-			±			±
90	-		-			±			±
100	162.20	20.00	250.00	0	0	± 0	0	0	± 0

Test Equipment Used	Model No:	Serial No:	Calibration/Certification Date
<input checked="" type="checkbox"/> Fluke 789	789	14970085	February 7, 2016
<input checked="" type="checkbox"/> Emerson Field Calibrator	375	12061955	N/A
<input type="checkbox"/>			
<input type="checkbox"/>			
<input type="checkbox"/>			
<input type="checkbox"/>			
<input type="checkbox"/>			
<input type="checkbox"/>			
<input type="checkbox"/>			
<input type="checkbox"/>			
<input type="checkbox"/>			
<input type="checkbox"/>			
<input type="checkbox"/>			

Comments Mcrometer Vcone Fitted with Seimens DP transmittter and setup per Vcone cal parameteres
Zero of transmitter performed in field after media introduced to flow meter and stablized
Span verified in field with actual field conditions and flow rate and visual DP recorded in Hart Communicator

Print Name: Robbie Satriana
 Signed By: Robbie Satriana
 Approved By: Preston Patterson

DCN 1/9/2016
 Date 1/9/2016
 Date 1/27/2016



I&C Solutions LLC
4485 Irving Blvd
Albuquerque, NM 87114
505-821-8960 fax 505-821-8970

Final Inspection Checklist

Serial Number: 15-3399

Job Reference: 9914535

✓ Meter Body Construction

- Tube Type / Rating
- Tube Material
- Tube Internal Diameter
- Flange Material
- Flanges Parallel
- Face-to-Face Dimension
- Cone Type
- Cone Material
- Cone Centered
- Pressure Ports Free of Burrs
- Fitting Threads Clean
- Name Plate
- Flow Arrow

✓ Standard Technical Documentation


- V-Cone Application Sizing
- Materials Of Construction Report
- Warranty Card

✓ Optional Technical Documentation

- ☒ Calibration Test Report
- ☐ Hydrostatic Pressure Test
- ☐ Dye Penetrant Examination
- ☐ X-Ray Examination
- ☐ Magnetic Particle Examination
- ☐ Certified Mill Test Reports (CMTR's)

 Inspected By: _____

Date: _____


11/24/15

V-Cone® Application Sizing

Serial #	15-3399	Fluid	WATER	
Tag		Fluid State	LIQUID	
P.O. Ref.	9914535	End User		
Model	VH03-A1SF3	Market		Mark/App Code
		Application		

Description	3" Wafer
Note	

C _d	0.8816	q max. Flowrate	250	GPM	McCrometer Eng.	MBB
P _f	150 psiG	Re max. Reynolds	2.901e+05			
T _f	75 °F	V max. Velocity	12.14	fps		
ρ	62.13 lb/ft3	ΔP max. Dp	162.20	inWC		
μ	0.9353 cP	ΔP min. Dp	1.6220	inWC		
G	1.000	D Meter I.D.	2.9000	in		
Z		d Cone O.D.	2.2038	in		
Y		β Beta Ratio	0.6500			
k		Turn Down	10			
C _P						
Mw	18.015					
P _b						
T _b						
Z _b						
P _{atm}	14.696 psi					
P _c	3198.8 psi					
T _c	705.16 °F					
F _a	1.000					
aPE	D 6.7e-06 d 6.7e-06					
P _v	0.4302 psi					
P _{loss}	2.854 psi					

	Re	Cd	Velocity fps	Gas. Exp. Y	ΔP inWC	Flowrate GPM
1	2.901e+05	0.8816	12.14		162.20	250.00
2	2.611e+05	0.8816	10.93		131.38	225.00
3	2.321e+05	0.8816	9.715		103.81	200.00
4	2.031e+05	0.8816	8.500		79.479	175.00
5	1.741e+05	0.8816	7.286		58.393	150.00
6	1.451e+05	0.8816	6.072		40.551	125.00
7	1.160e+05	0.8816	4.857		25.952	100.00
8	8.703e+04	0.8816	3.643		14.598	75.000
9	5.802e+04	0.8816	2.429		6.4881	50.000
10	2.901e+04	0.8816	1.214		1.6220	25.000

← Entered value.

Table based on one flow condition (P, T, Z, k ...) V40 Version 2.0

Record Start Date	11/6/2015
Print Date	11-24-2015





McCROMETER

V-Cone Calibration Report

Serial Number: 15-3399 Test Number: 15-3399
 Model: VH03-A1SF3 Calibration Date: 11/23/2015
 Report Date: 11/23/2015
 Sold To: Null
 Description: 3" Wafer
 Notes: 3" Wafer
 Inside Diameter (in): 2.9 Beta Ratio: 0.65
 Cone Outside Diameter (in): 2.2038 Average Cf: 0.8816

Calibration Report

	Reynolds Number Interval:	SLBF Cf:
1	214258 - 197004	0.8860
2	197004 - 179750	0.8856
3	179750 - 162496	0.8851
4	162496 - 145242	0.8845
5	145242 - 127988	0.8837
6	127988 - 110734	0.8827
7	110734 - 93480	0.8813
8	93480 - 76226	0.8794
9	76226 - 58972	0.8765
10	58972 - 41718	0.8716

Approved By: Luis Leon Pacheco
 Luis Leon Pacheco

Test Fluid: Water

Test Stand Instrumentation Traceability Kit Number: V0128

Standard Used: Primary

Test Data

	Water Temperature (°C)	Test Time (seconds)	Collected Mass (kilograms)	Air Temperature (°C)	Barometric Pressure (kPa)	Relative Humidity (%)	Differential Pressure (kPa)	Rate of Flow Reference (m ³ /sec)	Reynolds Number (× 1/1000)	Combined Uncertainty (%) at 95% confidence
1	20.90	30.756	374.409	20.04	95.70	34.82	23.8877	0.01217	214	0.37
2	20.90	30.891	226.918	20.04	95.70	34.82	8.7422	0.00734	129	0.22
3	20.80	31.004	73.557	20.04	95.70	34.82	0.9471	0.00237	42	0.21

This calibration was performed using standards traceable to the National Institute of Standards and Technology (NIST), USA. Certificates of traceability for the individual test measurements listed in this report are documented and serialized by the Test Stand Instrumentation Traceability Kit Number identified above and are available upon request. Combined Uncertainty to a 95% confidence level is developed for each test point according to the methods described in the ANSI/NCSL Z540-2-1997. Methods and procedures used in this calibration are in accordance with the McCrometer Flow Laboratory Technical Manual, revision 2.0.

ATTACHMENT C-4

GWTS Influent Pump

Tag Name / ID: GWTS Influent Pump FIT-3102		Transducer/Transmitter Calibration/Verification	Manufacture Endress Hauser/McCrometer	
Contract ID N/A	ISA S20 Sheet		Model Number DD141-200-02/VH03-A1SF3	
Ambient Conditions Temperature 60 °C (°F) Pressure n/a mm Hg Humidity n/a %		Loop Number 3000	Serial Number E15-01718/15-1023	
		<input type="checkbox"/> Initial Calibration <input checked="" type="checkbox"/> Verification	Calibration Range 0 to 159 ^{DP} 0 to 500 gpm	
1. Visual Inspection: Mechanical connections <input checked="" type="checkbox"/> Finish <input checked="" type="checkbox"/> Nameplate/ID Tag <input checked="" type="checkbox"/> Mounted at correct height <input checked="" type="checkbox"/> 2. Electrical: Conduit Connections <input checked="" type="checkbox"/> Terminal/Wire Labels <input checked="" type="checkbox"/> Conduit ID <input type="checkbox"/> 3. Calibration Proof test at: zero 4. Action: Direct <input checked="" type="checkbox"/> Indirect <input type="checkbox"/> Linear <input type="checkbox"/> Non-linear <input type="checkbox"/> Square Root <input checked="" type="checkbox"/> 5. Loop Voltage 24 VDC 4-Wire <input type="checkbox"/> 2-Wire <input checked="" type="checkbox"/> 6. Load Impedance N/A ohms max @ 24 vdc				

Calibration Points									
%	Input DP	Expected Output (mADC)	Meter EU GPM	As Found Data			As Left Data		
				Output	Output	Maximum	Output	Output	Maximum
				Increase	Decrease	Output Error	Increase	Decrease	Output Error
0	0.00	4.00	0.00	0	0	± 0	0	0	± 0
10	-					±			±
20	-					±			±
25		8.00	125.00	0	0	± 0	0	0	± 0
30	-					±			±
40	-					±			±
50	39.81	12.00	250.00	0	0	± 0	0	0	± 0
60	-		-			±			±
70	-		-			±			±
75		16.00	375.00	0	0	± 0	0	0	± 0
80	-		-			±			±
90	-		-			±			±
100	159.24	20.00	500.00	0	0	± 0	0	0	± 0

Test Equipment Used	Model No:	Serial No:	Calibration/Certification Date
<input type="checkbox"/> Fluke 789	789	14970085	February 7, 2016
<input checked="" type="checkbox"/> Emerson Filed Calibrator	375	12061955	N/A
<input type="checkbox"/>			
<input type="checkbox"/>			
<input type="checkbox"/>			
<input type="checkbox"/>			
<input type="checkbox"/>			
<input type="checkbox"/>			
<input type="checkbox"/>			
<input type="checkbox"/>			
<input type="checkbox"/>			

Comments This was a rescale only from 0-400GPM to 0-500GPM directed by customer, performed a zero only

Span verified in field with actual field conditions and flow rate and visual DP recorded in Hart Communicator

Print Name: Robbie Satriana
 Signed By: Robbie Satriana
 Approved By: Preston Patterson

DCN 2/2/2016
 Date 2/2/2016
 Date 2/2/2016



I&C Solutions LLC
 4485 Irving Blvd
 Albuquerque, NM 87114
 505-821-8960 fax 505-821-8970

V-Cone® Application Sizing

Serial #	15-1023	Fluid	WATER	
Tag		Fluid State	LIQUID	
P.O. Ref.	518505	End User		
Model	VM04QE03F-E1HS-V3	Market		Mark/App Code
		Application		

Description	4" VM meter
Note	

C_d	0.8138	q max. Flowrate	500	GPM	McCrometer Eng.	MaBa
P_f	175 psiG	Re max. Reynolds	3.922e+05			
T_f	70 °F	V max. Velocity	12.56	fps		
ρ	62.18 lb/ft3	ΔP max. Dp	159.24	inWC		
μ	0.9957 cP	ΔP min. Dp	1.5924	inWC		
G		D Meter I.D.	4.0330	in		
Z		d Cone O.D.	2.9460	in		
Y		β Beta Ratio	0.6829			
k		Turn Down	10			
C_p						
M_w	18.015					
P_b						
T_b						
Z_b						
P_{atm}	14.696 psi					
P_c	3198.8 psi					
T_c	705.16 °F					
F_a	1.000					
a_{PE}	D 6.7e-06 d 6.7e-06					
P_v	0.3633 psi					
P_{loss}	2.565 psi					

	Re	C_d	Velocity fps	Gas. Exp. Y	ΔP inWC	Flowrate GPM
1	3.922e+05	0.8138	12.56		159.24	500.00
2	3.530e+05	0.8138	11.30		128.98	450.00
3	3.138e+05	0.8138	10.05		101.91	400.00
4	2.745e+05	0.8138	8.790		78.027	350.00
5	2.353e+05	0.8138	7.534		57.325	300.00
6	1.961e+05	0.8138	6.279		39.810	250.00
7	1.569e+05	0.8138	5.023		25.479	200.00
8	1.177e+05	0.8138	3.767		14.332	150.00
9	7.844e+04	0.8138	2.511		6.3696	100.00
10	3.922e+04	0.8138	1.256		1.5924	50.000

← Entered value.

Table based on one flow condition (P, T, Z, k ...) V40 Version 2.0

Record Start Date	3/31/2015
Print Date	01-25-2016



ATTACHMENT C-5

GWTS Discharge Pump

Tag Name / ID: Discharge Flowmeter FIT-3108		Transducer/Transmitter Calibration/Verification	Manufacture Endress Hauser/McCrometer	
Contract ID N/A	ISA S20 Sheet		Model Number DP141-200-02/VH03-A1SF3	
Ambient Conditions Temperature 60 °C (°F) Pressure n/a mm Hg Humidity n/a %		Loop Number 3000	Serial Number E15-01717/15-1022	
		<input type="checkbox"/> Initial Calibration <input checked="" type="checkbox"/> Verification	Calibration Range 0 to 161 ^{DP} 0 to 500 gpm	
1. Visual Inspection: Mechanical connections <input checked="" type="checkbox"/> Finish <input checked="" type="checkbox"/> Nameplate/ID Tag <input checked="" type="checkbox"/> Mounted at correct height <input checked="" type="checkbox"/> 2. Electrical: Conduit Connections <input checked="" type="checkbox"/> Terminal/Wire Labels <input checked="" type="checkbox"/> Conduit ID <input type="checkbox"/> 3. Calibration Proof test at: zero 4. Action: Direct <input checked="" type="checkbox"/> Indirect <input type="checkbox"/> Linear <input type="checkbox"/> Non-linear <input type="checkbox"/> Square Root <input checked="" type="checkbox"/> 5. Loop Voltage 24 VDC 4-Wire <input type="checkbox"/> 2-Wire <input checked="" type="checkbox"/> 6. Load Impedance N/A ohms max @ 24 vdc				

Calibration Points									
%	Input DP	Expected Output (mADC)	Meter EU GPM	As Found Data			As Left Data		
				Output	Output	Maximum Output Error	Output	Output	Maximum Output Error
				Increase	Decrease		Increase	Decrease	
0	0.00	4.00	0.00	0	0	± 0	0	0	± 0
10	-					±			±
20	-					±			±
25		8.00	125.00	0	0	± 0	0	0	± 0
30	-					±			±
40	-					±			±
50	40.13	12.00	250.00	0	0	± 0	0	0	± 0
60	-		-			±			±
70	-		-			±			±
75		16.00	375.00	0	0	± 0	0	0	± 0
80	-		-			±			±
90	-		-			±			±
100	160.58	20.00	500.00	0	0	± 0	0	0	± 0

Test Equipment Used	Model No:	Serial No:	Calibration/Certification Date
<input type="checkbox"/> Fluke 789	789	14970085	February 7, 2016
<input checked="" type="checkbox"/> Emerson Filed Calibrator	375	12061955	N/A
<input type="checkbox"/>			
<input type="checkbox"/>			
<input type="checkbox"/>			
<input type="checkbox"/>			
<input type="checkbox"/>			
<input type="checkbox"/>			
<input type="checkbox"/>			
<input type="checkbox"/>			
<input type="checkbox"/>			

Comments This was a rescale only from 0-400GPM to 0-500GPM directed by customer, performed a zero only

Span verified in field with actual field conditions and flow rate and visual DP recorded in Hart Communicator

Print Name: Robbie Satriana
 Signed By: Robbie Satriana
 Approved By: Preston Patterson

DCN 2/2/2016
 Date 2/2/2016
 Date 2/2/2016



I&C Solutions LLC
4485 Irving Blvd
Albuquerque, NM 87114
505-821-8960 fax 505-821-8970

V-Cone® Application Sizing

Serial #	15-1022	Fluid	WATER	
Tag		Fluid State	LIQUID	
P.O. Ref.	518506	End User		
Model	VM04QE03F-E1HS-V3	Market		Mark/App Code
		Application		

Description	4" VM meter
Note	

C_d	0.8104	q max. Flowrate	500	GPM	McCrometer Eng.	MaBa
P_f	175 psiG	Re max. Reynolds	3.922e+05			
T_f	70 °F	V max. Velocity	12.56	fps		
ρ	62.18 lb/ft3	ΔP max. Dp	160.58	inWC		
μ	0.9957 cP	ΔP min. Dp	1.6058	inWC		
G		D Meter I.D.	4.0330	in		
Z		d Cone O.D.	2.9460	in		
Y		β Beta Ratio	0.6829			
k		Turn Down	10			
C_P						
M_w	18.015					
P_b						
T_b						
Z_b						
P_{atm}	14.696 psi					
P_c	3198.8 psi					
T_c	705.16 °F					
F_a	1.000					
aPE	D 6.7e-06 d 6.7e-06					
P_v	0.3633 psi					
P_{loss}	2.587 psi					

	Re	C_d	Velocity fps	Gas. Exp. Y	ΔP inWC	Flowrate GPM
1	3.922e+05	0.8104	12.56		160.58	500.00
2	3.530e+05	0.8104	11.30		130.07	450.00
3	3.138e+05	0.8104	10.05		102.77	400.00
4	2.745e+05	0.8104	8.790		78.683	350.00
5	2.353e+05	0.8104	7.534		57.808	300.00
6	1.961e+05	0.8104	6.279		40.145	250.00
7	1.569e+05	0.8104	5.023		25.693	200.00
8	1.177e+05	0.8104	3.767		14.452	150.00
9	7.844e+04	0.8104	2.511		6.4231	100.00
10	3.922e+04	0.8104	1.256		1.6058	50.000

← Entered value.

Table based on one flow condition (P, T, Z, k ...) V40 Version 2.0

Record Start Date	3/31/2015
Print Date	01-25-2016



ATTACHMENT C-6

Field Calibration Check Procedure

Procedure for Checking the Calibration of a Flow Meter at the Kirtland AFB Bulk Fuels Facility Groundwater Treatment System

“Bucket and Stopwatch Procedure”, Rev. 0 – Date: February 1, 2016

Background. To perform a “bucket and stopwatch” test to check the calibration of the various meters associated with the treatment system, we can use the geometry of the influent or effluent tanks themselves to measure the volume of water that has been introduced (or removed) very accurately over a given interval of time. These tanks are right and vertical cylinders with uniform sides of a known diameter. The diameter of the tank is given on the nameplate as 10.17 feet; therefore, the radius of these tanks is half of the diameter, or 5.085 feet.

The cross section area of the cylinder is given by: $\text{Area} = \pi r^2 = \pi (5.085 \text{ ft})^2 = 81.23 \text{ ft}^2$. A one-foot thick slice of this cross sectional area contains 81.23 ft^3 . One cubic foot of water is equivalent to 7.4805 gallons of water. Multiplying the volume (in cubic feet) of a one-foot section of this cylinder by this factor yields:

$$81.23 \text{ ft}^3 \times 7.4805 \text{ Gallons/ft}^3 = 607.64 \text{ gallons in this one foot slice of the tank column.}$$

We can measure a difference in height in the tank over a specific time interval and quantify the amount of water involved by multiplying the difference in tank height by the factor - **607.64 gallons/ft.**

Procedure. The procedure for checking the calibration on a given meter in the treatment system will be as follows. To determine the **ACTUAL flow rate**, shut down all the other flows and run water only through the meter to be tested into the influent tank (or out of the effluent tank) until steady state is achieved. Then for a planned interval, in this example we will use fifteen minutes, perform the test. The test will start at $t=0$ when the beginning water level is recorded. The test ends at $t=15$ minutes when the final water level is recorded. The difference in water levels (expressed in feet) will be multiplied by 607.64 gallons/ft. The resulting total amount of gallons will be divided by 15 minutes and the answer expressed as GPM. This test will be repeated three times and the results averaged to calculate the **ACTUAL flow rate**.

To check the calibration of the meter, the **OBSERVED readings** (that the meter is reporting) needs to be compared with the actual flow rate. To determine the **OBSERVED reading** there are two methods depending upon the style of meter. Both methods will be employed. For totalizing meters, they can be read directly as the value at $t=0$ and $t=15$ minutes and the difference calculated. For instantaneous output meters, they will need to be witnessed and recorded at regular intervals, i.e. every 30 seconds and their values recorded manually and averaged over the 15 minute test period.

The final step in the calibration/check procedure is to compare the relative percent difference (RPD) between the **OBSERVED flow rate** with the **ACTUAL flow rate**.

The formula for RPD is as follows:

$$\% \text{ Difference} = (\text{Observed Flow Rate} - \text{Actual Flow Rate}) / (\text{Actual Flow Rate}) \times 100\%$$

As per the NMED requirements, to be considered a successful check, the RPD should be less than 10 percent. If the check is greater than 10 percent RPD, the flow meter in question will be taken off line and calibrated by a certified technician.

Calibration Form. The attached form summarizes the data collected during the above procedure and it will be used to calculate the actual and observed flow rates for the three tests and the RPD.



Flow Meter Calibration Check Sheet

Kirtland Air Force Base Bulk Fuels Facility Groundwater Treatment System

Flow Meter

Meter PID #

Location

"Bucket"

(T-110 or T-116)

Make

Model

Serial Number

1. Observed Readings:

Volume (from totalizer, in gallons)

Initial Reading

(gallons)

Final Reading

(gallons)

Total Observed Volume (gal)

(Total Observed = Final - Initial), in gallons

Instantaneous Flow Readings (units of GPM recorded at 30 second intervals), Test 1, 2, 3:

OBSERVED Flow Rates (GPM), three tests:

Test 1:

Test 2:

Test 3:

Average OBSERVED Flow Rate (Tests 1, 2, 3):

GPM

2. Actual Flow and Rate:

Final height of water in tank		inches
Initial height of water in tank		inches
Height difference		inches
Height difference		feet
Actual Volume (multiply by 607.6 gal/ft)		gallons
Duration of Test (minutes)		minutes

ACTUAL Flow Rate (GPM), three tests:

Test 1:

Test 2:

Test 3:

Average ACTUAL Flow Rate (Tests 1, 2, 3):

GPM

3. Relative Percent Difference (RPD):

Volume:

$$RPD = (\text{Observed Volume} - \text{Actual Volume}) / \text{Actual Volume} \times 100 \%$$

gallons

Flow Rate:

Note: RPD < 10% to pass.

$$RPD = (\text{Observed Flow Rate} - \text{Actual Flow Rate}) / \text{Actual Flow Rate} \times 100\%$$

GPM

Note: RPD < 10% to pass.

Date Tested:

Date QC'd:

Tested By:

QC'ed By:

ATTACHMENT D

KAFB-7 Equipment Decontamination Photos



Photo 1. Decontamination of KAFB-7 Piping Exterior



Photo 2. Decontamination of KAFB-7 Piping Interior



Photo 3. Completed Decontamination of Piping



Photo 4. Decontamination of Injection Piping