MEETING MINUTES
SUPPLY WELL CS-12 BACTERIOLOGICAL ISSUES
CAMP STANLEY STORAGE ACTIVITY - BOERNE, TEXAS

Date: Thursday, 4 June 2009

Time: 9:30 A.M. – 11:00 A.M.

Place: Texas Commission on Environmental Quality
12100 Park 35 Circle, Building F – Austin, TX 78711)

Subject: CS-12 Supply Well Discussion

Attendees:

Attendee	**Organization**	**Phone**
Robert Andren	TCEQ-PDWS	(512) 239-4753
John Meyer	TCEQ-PDWS	(512) 239-6199
Jerry Salgado	TCEQ-PDWS	(512) 239-6958
Pritesh Tripathi	TCEQ-PDWS	(512) 239-3794
Glaré Sanchez	CSSA ENV	(210) 698-5208
Julie Burdey	Parsons	(512) 719-6062
Kenneth Kuhr	Parsons	(512) 719-6062
Scott Pearson*	Parsons	(512) 719-6087

**Minutes prepared by Scott Pearson, Parsons.*

The purpose of this meeting was to discuss additional design considerations for the pending water supply well (CS-12) in the North Pasture of Camp Stanley Storage Activity (CSSA) located in Boerne, Texas. As of May 2009, the well has been installed and was being prepared for commissioning. However, the supply well is suffering from bacteriological contamination, specifically total coliforms. Therefore, CSSA has requested that the TCEQ provide guidance regarding the options available to render the well usable for public water supply.

On 20 May 2009, Parsons submitted well completion, chemical, and microbial data ascertained from the well for evaluation by the TCEQ. Subsequently, the TCEQ offered potential options and arranged a meeting between the interested parties on 4 June 2009. The topics of this meeting included discussions on the project history, chemical/microbial results, and treatment options. Attachment 1 includes informational packets that were presented to the attendees.

BACKGROUND

Parsons installed a test well (TW-1) in the North Pasture of CSSA in January 2008. The well was drilled to 460 feet and depth and developed groundwater from the Lower Glen Rose (LGR) and Cow Creek (CC) members of the Middle Trinity aquifer. A pumping test was completed in February 2008, at which time chemical and microbial samples were collected. The second microbial sample collected at the end of the 48-hour pumping test found total coliform "PRESENT" in the groundwater sample. Confirmation samples collected in April 2008 did not find the presence of coliform, and the previous sample was believed to be anomalous and likely that contamination occurred at the time of sampling.

For the remainder of 2008, Parsons prepared reports and *Engineering Plans and Specifications* to convert the test well into a permanent supply well. The *Plans and Specifications Report* was submitted to the TCEQ in November 2008 and approved in January 2009 (Plan Log # 2008111-11).

In February 2009, Parsons converted the test well into the final supply well configuration with 150 feet of 10-inch surface casing and a 10-inch open borehole completion to 460 feet. During this same time, Parsons submitted a plan to the TCEQ to apply and acid treatment to the well to further enhance the porosity of the bedrock aquifer, thereby increasing its productive capacity. This approval was granted by the TCEQ in February 2009 (Plan Log # 200902-069). Shortly afterwards, the acid treatment was completed successfully, increasing the production of the well by nearly 50 percent.

In March 2009, the well was developed, the permanent pump was installed, and followed by a disinfection procedure in accordance with TCEQ/AWWA standards. The subsequent microbial sampling set yielded "PRESENT" results for both total coliforms and *e-coli*. Four additional rounds of chlorination and sampling also indicated the presence of total coliforms (but not *e-coli*). Options attempted during the latter sampling rounds included split samples to multiple laboratories for result verification, changing the sampling technician, and lowering the pump to the bottom of the well. None of these changes affected the outcome of the presence of total coliform in the groundwater.

Getting this well operational is very important to the U.S. Government. Currently, CSSA is only operating on two wells, and the prolonged drought and reduced groundwater production is affecting the military facility. CSSA includes full-time residents as well as the military operations that rely on continual water source. The facility management is concerned that the continued drought or loss of a production well could adversely affect the facility, and therefore is looking to add the new supply well as soon as possible. The TCEQ indicated that they could expedite review process of any proposed design changes to assist with the project.

OPTIONS

Parsons had previously provided CSSA with a "roadmap" (last page of Attachment 1) which included three options that may resolve the coliform issues. **OPTION 1** included a video inspection and long-term pumping scenario in attempt to return the

aquifer to its natural state after the trauma of the acid treatment and repeated chlorination attempts. The water produced from the long-term pumping alternative would be conveyed to the B-3 Bioreactor to support ongoing environmental studies. **OPTION 2** involved a study using a straddle packer system to determine intervals of origin of the microbial contamination. Based on the results, a liner would be installed to "case off" those zones if determined to be effective. Finally, **OPTION 3** instituted a treatment alternative to disinfect the groundwater by a process acceptable by the TCEQ. Each are further discussed below.

OPTION 1: Long-Term Pumping

Option 1 included a video inspection of the well to determine if the casing was compromised and identify active perched zones that may be contributing to the water column. This step has already been completed by Parsons on 12 May 2009. The video inspection did not indicate that there is a problem with the casing integrity, nor is perched groundwater leaking from the base of the casing. Currently, the static groundwater level is more than 80 feet lower than at the time of drilling in January 2008. A production interval (155-160 feet BGS) that was present at the time of drilling is currently dry. Several minor inflows were noted between 190 and 240 feet above the static water level (~265 feet). Excerpts from the January 2008 and May 2009 video logging were presented to the attendees.

Consultation with others in the field have indicated that long-term continuous pumping can be an effective remedy to return a well back to its original condition after drilling, acidifying, and shocking procedures. CSSA has a need for a groundwater source at an environmental remediation site (B-3 Bioreactor), and is well suited to receive the purge water from such an effort. The water would be conveyed from the supply well to the Bioreactor test cell and monitored frequently for improvement in the microbial condition. There is some skepticism by the TCEQ that this is a permanent solution, and that a more aggressive remedy will be needed. Considering its history thus far, the TCEQ will require monthly monitoring for BACT analysis for CS-12 once the well is used for public water supply.

OPTION 2: Liner Casing

A second option is to install a 7-inch diameter liner casing within the existing 10-inch casing to a depth that precludes any groundwater infiltration above the current static water level. The intent of the surface casing presumes that groundwater tainted with the coliforms is entering the borehole above the current static water level of 265 feet BGS. However, all parties recognize that installing additional liner casing will be of no benefit if the microbial contamination originates from the basal LGR, BS, or CC members of the aquifer.

Parsons had also investigated the possibility of performing straddle packer tests in attempt identify the zone(s) of microbial contamination. However, the procedure would be logistically difficult, prone to cross-contaminated sampling results, and prohibitively expensive. CSSA is not planning on pursuing that action.

OPTION 3

A third option would be treatment/disinfection of the groundwater produced prior to being introduced into the distribution system. The TCEQ recommends a 4-Log removal process for the disinfection of the groundwater. The 4-log removal process would include a chlorine disinfection system that would provide the appropriate contact time to complete the disinfection. The current system design would require the addition of a storage tank for the contact time and booster pumps to inject the treated water into the distribution system. The treatment process would require daily monitoring for chlorine residual, pH, and temperature for the life of the system. Automated analysis equipment (pH, chlorine, temperature) such as what is already in place on the CSSA SCADA system is sufficient. The TCEQ will require a revised engineering plan for approval prior to construction. The plan would also require the necessary theoretical calculations and modeling of the contact time in the delivery system.

TCEQ also described the option of running a MPA filter test to determine if the well water is affected by surface water. The test involves filtering 500 gallons of well water and then analyzing the water for items that may indicate that surface water is moving into the ground water in a manner that does not allow ample purification. Items such as protozoa, bits of leaf, crustaceans, etc are the object of the analysis.

If such objects are found, additional regulatory requirements would come into play, and corrective action would be required. One of the most common corrective actions under such circumstances is the addition of a filtration process for microbial/pathogen removal

The TCEQ indicated that the engineering design could include a provision for a filtration process if ever needed. The TCEQ will help expedite the review of the revised *Plans and Specifications Report*.

ACTION ITEMS

- *Parsons will assist CSSA with preparing the scope of work to update the well design.*
- *Parsons should contact Jack Schulze with the TCEQ at (512)-239-6046 to obtain information, flowcharts, and computational spreadsheets for the requirements to model the 4-log removal contact time within a system.*
- *The revised design by Parsons will include provisions for both filtration and 4-log chlorine disinfection. The expected implementation is to construct the chlorine disinfection and add the filtration as needed.*
- *The TCEQ will contact CSSA about the possibility of collecting a 500-gallon MPA filter test sample. The TCEQ is currently updating the laboratory requirements for performing the analysis.*

ATTACHMENT 1

MEETING HANDOUTS

CS-12 BACTERIOLOGICAL ISSUES

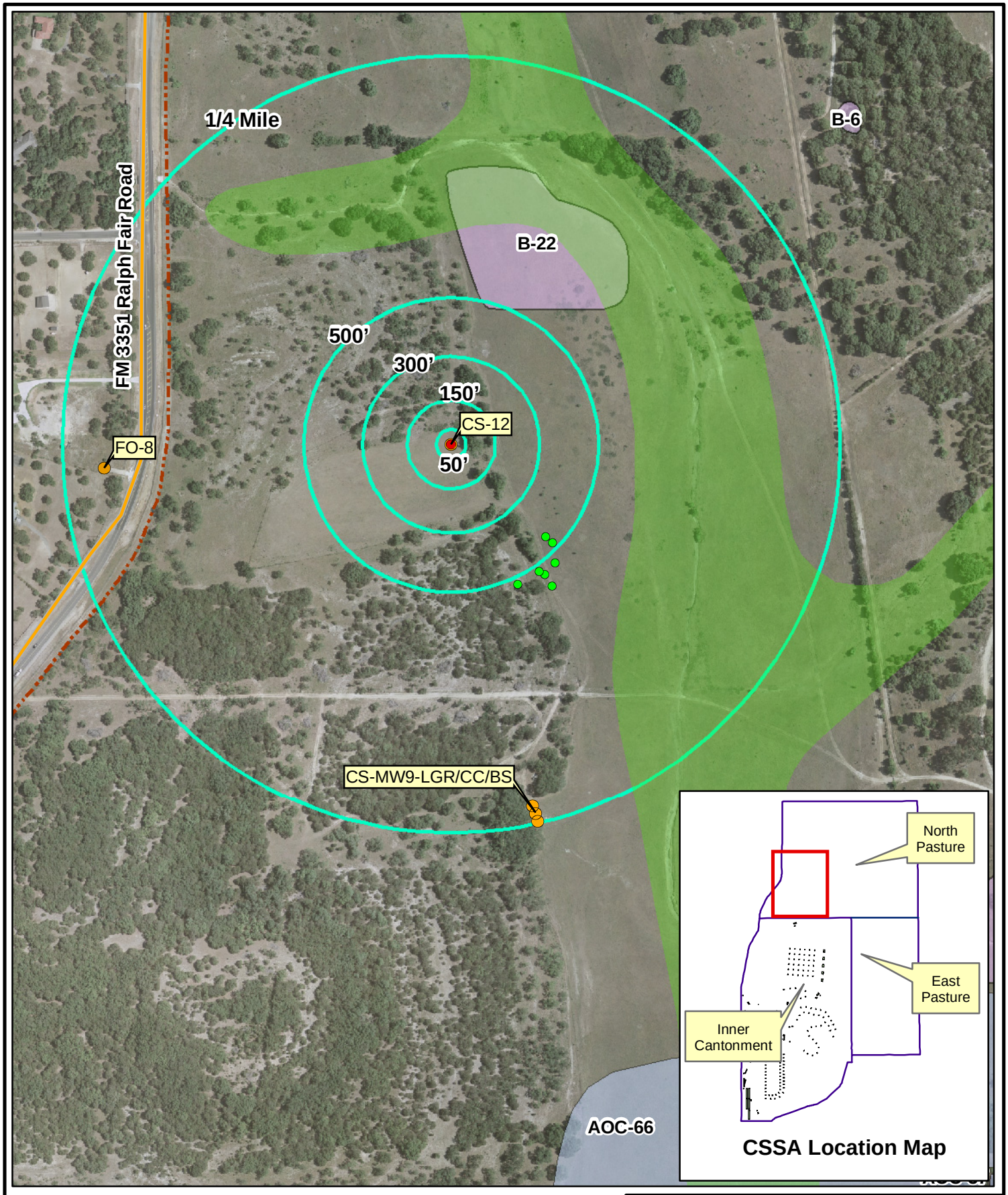
CAMP STANLEY STORAGE ACTIVITY
BOERNE, TEXAS

PLAN LOG # 200811-111 & 200902-069

June 4, 2009

PROJECT CHRONOLOGY

• JANUARY 2008:	Drill Test Well TW-1
• FEBRUARY 2008:	Pumping Test & Initial Sampling
• APRIL-MAY 2008:	Confirmation Sampling
• JUNE-OCTOBER 2008:	Submit Test Well Report to CSSA Prepare Final Design Submittal
• NOVEMBER 2008:	Submit Engineering and Specifications Plan to TCEQ
• JANUARY 2009:	Receive TCEQ Approval (Log # 200811-111)
• FEBRUARY 2009:	Convert TW-1 to CS-12 with 150' Casing and 10" Dia. Submit Acidization Treatment Plan to TCEQ Receive TCEQ Approval (Log # 200902-069)
• MARCH 2009:	Acidize Well, Develop Well, Set Pump
• MARCH 24- MAY 5, 2009:	5 Attempts of Chlorination and BACT Sampling
• JUNE 4, 2009:	Meet with TCEQ to Discuss Options



N
W E
S

0 200 400 600 800
Feet

Septic Cleanouts
Proposed Supply Well
100 Year Flood Plain
Major Road
Supply Well Buffer
CSSA Fenceline
AOC Boundaries
SWMU Boundaries

CS-12

Pollution Hazards Map
Proposed Supply Well
Camp Stanley Storage Activity

Parsons

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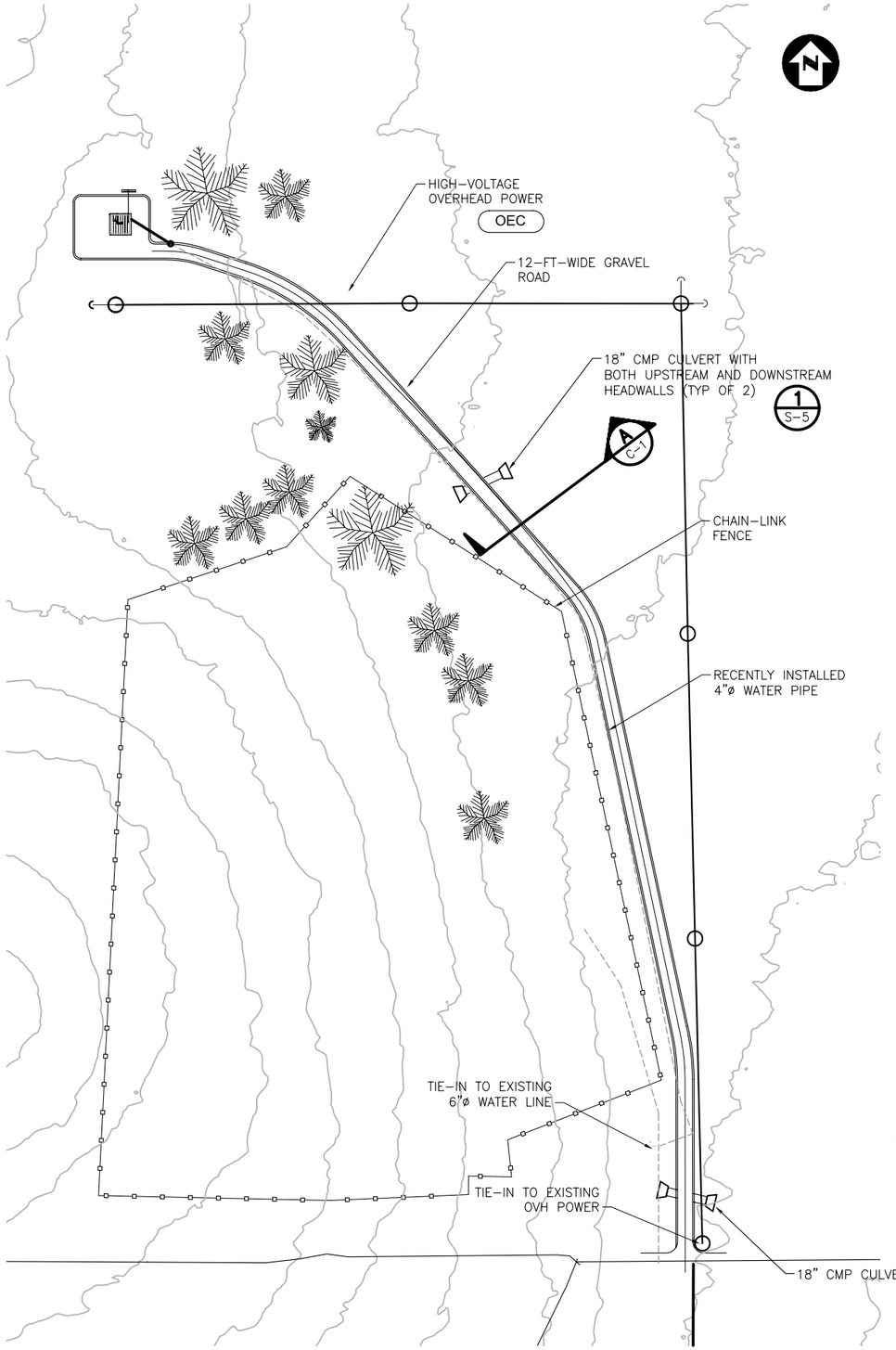
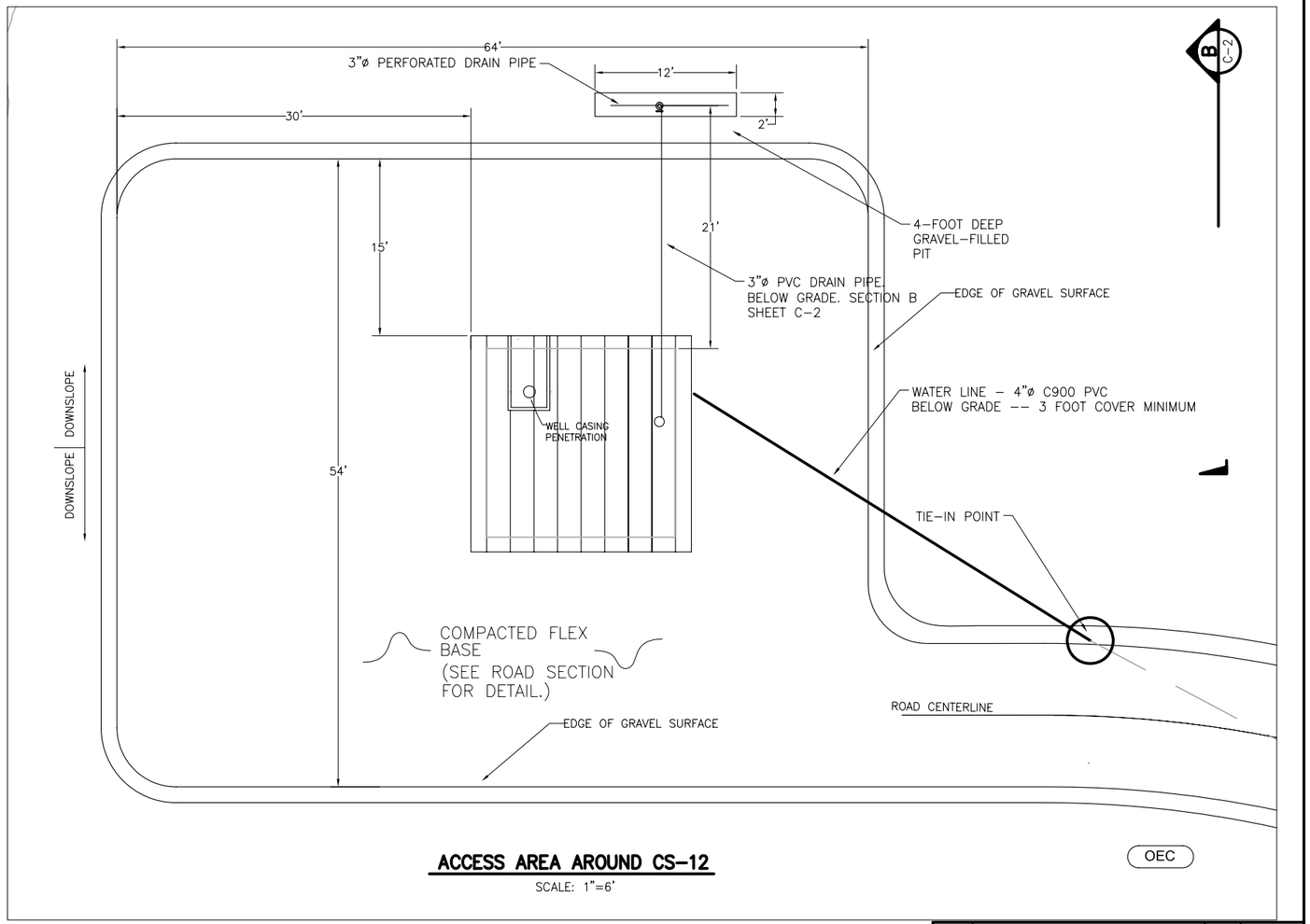


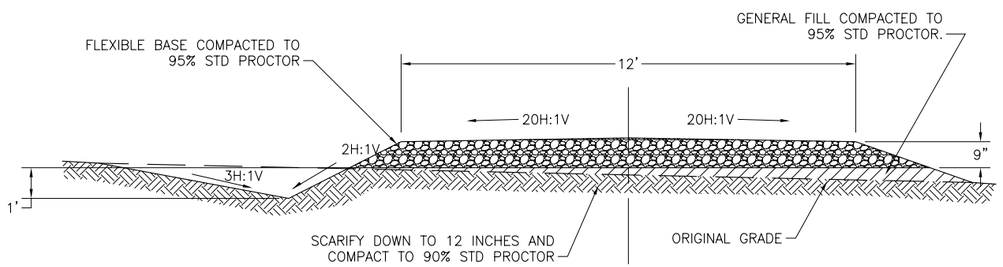
ROAD AND UTILITIES

SCALE: 1" =60'



ACCESS AREA AROUND CS–12

SCALE: 1"=6'



ROAD CROSS SECTION

A C–1

SCALE: 1" = 1'

NOTES:

1. APPLY SEED, FERTILIZER, AND MULCH WITHIN A 30–FOOT WIDE BAND ALONG EDGES OF ALL SURFACES THAT HAVE RECEIVED FLEXIBLE BASE. COMPLY WITH TXDOT STANDARD SPECIFICATION (1993) ITEM 164. SEED MIX FOR DISTRICT 15. APPLY CELLULOSE FIBER MULCH AT A RATE OF 2,500 POUNDS PER ACRE. IF OUTSIDE OF THE SPECIFIED PLANTING DATES, APPLY SOIL RETENTION BLANKET, PER TxDOT SPEC ITEM 169, TYPE A.

REV.	DESCRIPTION	BY:	DATE:
B	FOR CSSA REVIEW AND APPROVAL	KMK	02/06/09
A	FOR CSSA REVIEW AND APPROVAL	KMK	08/22/08

REVISIONS

SCALES SHOWN ON THIS DRAWING ARE APPLICABLE ONLY TO ANSI D SIZE DRAWING

CAMP STANLEY STORAGE ACTIVITY
FACILITY UPGRADES

Contract No. W91278–06–D–0026 Task Order No. DY02

CONTRACTOR :

PARSONS Job No. 745953 WBS 02000

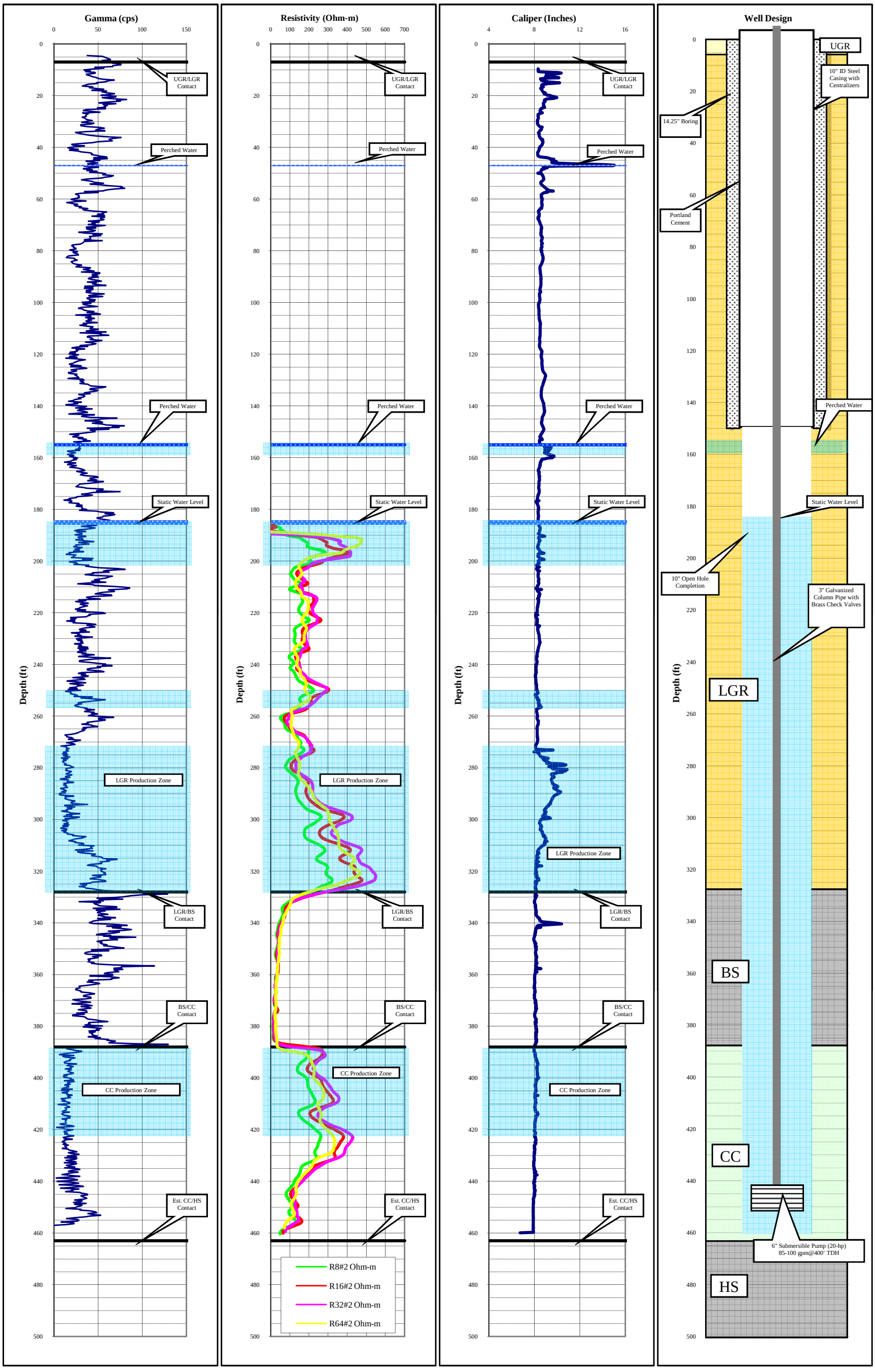
Drawing Title :

CSSA SUPPLY WELL CS–12
ACCESS ROAD AND UTILITIES
SITE PLANS

Designed : K. KUHR	Drawn : K. KUHR	Rev:
Checked : WSP	Approved :	B

Scale :	Date :	Drawing No. :
AS NOTED	AUGUST 22, 2008	C-1

CS-12
Proposed North Pasture Supply Well Design
Camp Stanley Storage Activity - Boerne, TX



J:\745\745953 CSSA DY02\02000 Supply Well\Permitting\Engineering Report\Draft\Figures&Tables\TW-1 Geophysical.xls

TW-1 Analytical Sampling Results
February-April 2008
Camp Stanley Storage Activity-Boerne, Texas

PARAMETERS	SAMPLING EVENT					ANALYTICAL LIMITS		REGULATORY LIMITS		
	1/31/2008	2/1/2008		4/30/2008		MDL	RL	MCL	Action Level	SCL
	Normal	Normal	Duplicate	9:45	14:45					
SVOCs (µg/L)										
All	<MDL	<MDL	<MDL			Varies	Varies			Varies
VOCs (µg/L) - Detections Only										
hexachlorobutadiene	0.23F [1]	0.30F	<MDL	<MDL	<MDL	0.17	1.1			
m&p-xylene	0.12F	<MDL	<MDL	<MDL	<MDL	0.07	0.5	10,000		
p-isopropyltoluene	0.11F [1]	<MDL	<MDL	<MDL	<MDL	0.05	1.2			
sec-butylbenzene	0.1F [1]	<MDL	<MDL	<MDL	<MDL	0.05	1.3			
PCE	0.12F[1]	<MDL	<MDL	<MDL	<MDL	0.06	1.4	5		
toluene	1.98	0.96F	0.88F	0.10F	0.10F	0.06	1.1	1,000		
METALS (mg/L) - Detections Only										
Aluminum (SDWR)		0.2	0.14F	6.37	2.15	0.02	0.2			0.2
Arsenic		<MDL	<MDL	0.0099F	0.00745F	0.00022	0.03	0.01		
Barium		0.0309	0.0308	0.0398	0.0348	0.0003	0.005	2		
Chromium		<MDL	<MDL	0.009F	0.003F	0.001	0.01	0.1		
Copper		<MDL	<MDL	0.01	0.004F	0.003	0.01			1.0
Iron (SDWR)		0.17F	0.12F	6.39	1.58	0.03	0.2			0.3
Lead		0.0054F	0.0065F	0.0131F	0.0036F	0.0019	0.025		0.015	
Manganese (SDWR)		0.003F	0.002F	0.153	0.027	0.001	0.005			0.05
Mercury		<MDL	<MDL	<MDL	<MDL	0.0001	0.001	0.002		
Nickel		0.003F	0.003F	0.029	0.008F	0.001	0.01			
Zinc (SDWR)		0.116	0.115	0.304	0.163	0.008	0.05			5
ANIONS & TDS (mg/L)										
TDS (SDWR)		317	311				10			1,000
Chloride (SDWR)		12.66	12.58			0.08	1.0			300
Fluoride		0.51F	0.50F			0.10	1.0	4		
Nitrate		4.81	4.81			0.03	1.0	10		
Sulfate (SDWR)		19.14	19.08			0.26	1.0			300
pH		7.80	7.37							≥7.0
RADIONUCLIDES (pCi/L)										
Radium-226		2.24	1.10			0.75	1.00	5		
Gross Alpha		3.36	3.75			2.46	3.00	15		
Total Uranium (mg/L)[2]		0.00148	0.00148			0.022	2.00	0.030 mg/L		
Coliform										
Total Coliform	Not Found	Found	NA	Not Found	Not Found			<5%/month		
E-Coli	Not Found	Not Found	NA	Not Found	Not Found			<5%/month		

[1] Analyte was also reported in the Method Blank

[2] Total Uranium was reported in pCi/L. To match the TCEQ PWS evaluation requirement, the result has been converted to mg/L by the following: result/0.6872/1000

F - The analyte was positively identified but the numerical value is below the Reporting Limit (RL)

SDWR = Secondary Standard - not enforceable.

CS-12 Analytical Sampling Results - Detections Only
March 2009
Camp Stanley Storage Activity-Boerne, Texas

PARAMETERS	SAMPLE EVENT 3/25/2009 Normal	SAMPLE EVENT 3/25/2009 Duplicate	REGULATORY LIMITS MCL	REGULATORY LIMITS SCL
VOCs (µg/L) - Detections Only				
Chloroform	**1.49**	**1.45**		
Toluene	**0.54F**	**0.55F**	**1,000**	
METALS (mg/L) - Detections Only				
Aluminum (SDWR)	**0.65**	**0.61**		**0.2**
Barium	**0.0339**	**0.0344**	**2**	
Calcium	**83.04**	**85.43**		
Chromium	**0.002F**	**0.002F**	**0.1**	
Iron (SDWR)	**0.44**	**0.40**		**0.3**
Magnesium	**23.46**	**24.16**		
Manganese (SDWR)	**0.015**	**0.016**		**0.05**
Nickel	**0.003F**	**0.003F**		
Potassium	**2.27**	**2.31**		
Sodium	**13.21**	**13.44**		
Zinc (SDWR)	**0.298**	**0.306**		**5**
ANIONS & TDS (mg/L)				
TDS (SDWR)	**359.0**	**361.0**		**1,000**
Chloride (SDWR)	**20.31**	**20.22**		**300**
Fluoride	**0.43F**	**0.42F**	**4**	
Nitrate	**4.68J**	**4.75J**	**10**	
Sulfate (SDWR)	**14.45**	**14.47**		**300**
pH	**7.33**	**7.56**		**≥7.0**
RADIONUCLIDES (pCi/L)				
Radium-226	**0.944**	**0.695**	**5**	
Radium-228	**0.200**	**0.403**	**5**	
Gross Alpha	**1.29**	**1.93**	**15**	
Total Uranium (mg/L)[1]	**0.0016298**	**0.0018481**	**0.030 mg/L**	

QA NOTES AND DATA QUALIFIERS:

(NO CODE) - Confirmed identification.

F - The analyte was positively identified but the associated concentration is estimation above the MDL and below the RL.

J - The analyte was positively identified; the quantitation is an estimation.

[1] Total Uranium was reported in pCi/L. To match the TCEQ PWS evaluation requirement, the result has been converted to mg/L by the following: result/0.6872/1000

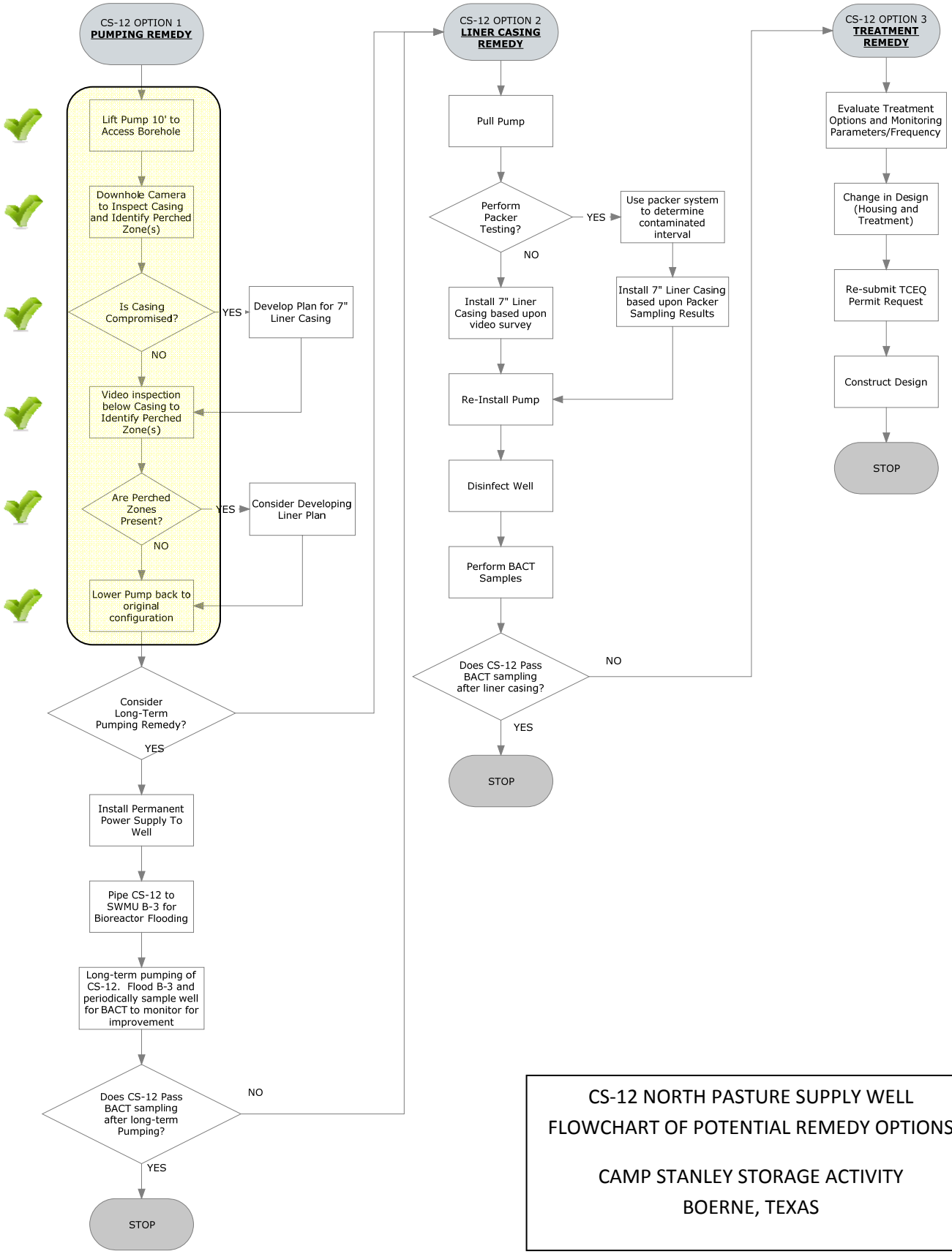
SDWR = Secondary Standard - not enforceable.

CS-12 Bacteriological Sampling Summary
January 2008-May 2009
Camp Stanley Storage Activity-Boerne, Texas

PARAMETERS	Date	1/31/2008	2/1/2008	4/30/2008		February 2009	March 2009	3/18/2009	3/23/2009	3/24/2009	3/25/2009	3/26/2009	3/30/2009	4/1/2009	4/2/2009	4/3/2009	4/10/2009	4/15/2009	4/15/2009	4/16/2009	4/17/2009	4/24/2009	4/24/2009	4/24/2009	4/24/2009	4/27/2009	4/29/2009	4/30/2009	5/1/2009	5/5/2009
	Lab	San Antonio Testing	San Antonio Testing	San Antonio Testing	San Antonio Testing					San Antonio Testing	San Antonio Testing	San Antonio Testing		San Antonio Testing	San Antonio Testing	San Antonio Testing		San Antonio Testing	Bexar Met. Health District	San Antonio Testing	San Antonio Testing	San Antonio Testing		San Antonio Testing	San Antonio Testing		San Antonio Testing	San Antonio Testing	San Antonio Testing	San Antonio Testing
	Method	SM9223	SM9223	SM9223	SM9223					SM9223	SM9223	SM9223		SM9223	SM9223	SM9223		SM9223	SM9223	SM9223	SM9223	SM9222B		SM9222B	SM9222B		SM9223	SM9223	SM9223	SM9222B
	Time	14:00	10:45	9:45	14:45					14:30	14:05	14:45		16:00	16:00	15:00		15:30	Split Sample	11:30	11:30	9:14		11:19	14:40		16:00	16:00	16:00	9:55
		Pumping Test (Not Chlorinated)		Confirmation Samples						1st Attempt				2nd Attempt				3rd Attempt				Switch Sampling Personnel					4th Attempt			
Total Coliform		Not Found	Found	Not Found	Not Found	Convert Test Well	Acidization, Well Development, and Set Pump	Chlorinate	Chlorinate	Not Found	Found	Found	Chlorinate	Found	Found	Found	Chlorinate	Found	Found	Found	Found	Found (5,100 CFU/100ml)	Lower Pump to 453'	Found (5,600 CFU/100ml)	Found (7,800 CFU/100ml)	Chlorinate	Not Found	Found	Found	(<1 CFU/100ml) No Growth Confirmation
E-Coli		Not Found	Not Found	Not Found	Not Found					Not Found	Found	Found		Not Found	Not Found	Not Found		Not Found	Not Found	Not Found	Not Found	NA		NA	NA		Not Found	Not Found	Not Found	No Growth Confirmation
Approx. Static Water Level:		191'	191'	~215'	~215'					~265'	~265'	~265'		~270'	~270'	~270'		~270'	~270'	~270'	~270'	~270'		~270'	~270'		~270'	~270'	~270'	~270'

Evaluation of Typical Causes of Bacteriological Contamination at CSSA

Typical Cause	Evaluation
Close proximity to a sewage disposal system or leaky sewer pipe	Unlikely. Fecal coliform/e-coli was not consistently detected, North Pasture Building has not been used, and well is 450' from septic field. TCEQ requires minimum 50' from septic tank and 150' from septic drain field.
Improperly sealed or abandoned wells nearby	Unlikely. No known abandoned wells or improperly sealed wells in North Pasture
Contamination during construction	Careful construction methods used. Geoprojects (Well Subcontractor) has installed numerous water wells. Potable water used as injection water during drilling..
Poor protection from surface activity including rain and flooding (related to poor construction)	Well is outside of flood plain, and is protected from surface activity. Recent drought; water levels are ~60' deeper than last year. No livestock in North Pasture, no solid waste disposal in area.



CS-12 NORTH PASTURE SUPPLY WELL
FLOWCHART OF POTENTIAL REMEDY OPTIONS

CAMP STANLEY STORAGE ACTIVITY
BOERNE, TEXAS