SWMU B-3 BIOREACTOR CONSTRUCTION REPORT

CDRL A011B

Prepared for:

Camp Stanley Storage Activity
Boerne, Texas

February 2007

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LIST OF ACRONYMS

BTS	Bioreactor Trench Sump
CC	Cow Creek Limestone
CSSA	Camp Stanley Storage Activity
cis-DCE	*cis-1,2*-dichloroethene
gpm	gallons per minute
HDPE	high density polyethylene
HOA	Hand or Manual, Off and Automatic
LGR	Lower Glen Rose Formation
MCL	Maximum Contaminant Level
PCE	tetrachloroethene
PVC	polyvinyl chloride
RCRA	Resource Conservation and Recovery Act
SWMU	Solid Waste Management Unit
SVE	soil vapor extraction
TCLP	Toxicity Characteristic Leaching Procedure
TCE	trichloroethene
TCEQ	Texas Commission on Environmental Quality
VOC	volatile organic compound

SECTION 1
INTRODUCTION

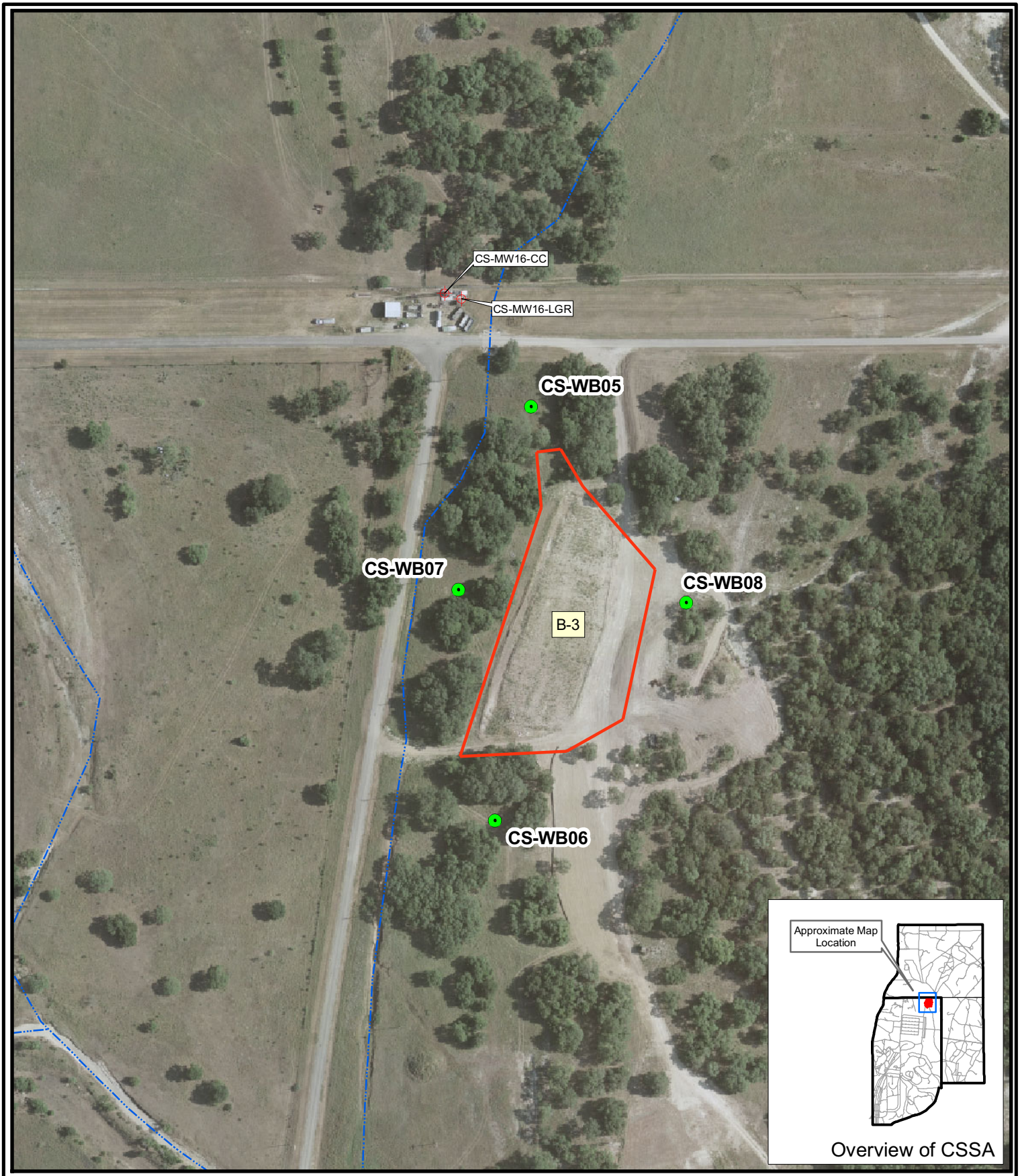
Solid Waste Management Unit (SWMU) B-3 is designated by Camp Stanley Storage Activity (CSSA) as a high priority site identified for interim remediation activities. The goal of this Pilot Study is to clean up a potential continuing source of contamination encountered in the underlying aquifer. SWMU B-3 consists of six former disposal trenches located south of Tenberg Drive and east of Salado Creek in the central portion of CSSA as shown in Figure 1.1 (Pilot Study Location Map).

1.1 Background

CSSA is located in northwestern Bexar County about 19 miles northwest of San Antonio, Texas. The installation consists of 4,004 acres immediately east of State Highway 3351 and approximately one-half mile from Interstate Highway 10. Additional background information regarding CSSA is located in CSSA's Environmental Encyclopedia **(Volume 1-1, Background Information Report)**.

Routine water well testing by the Texas State Department of Health detected the presence of dissolved tetrachloroethene (PCE), trichloroethene (TCE) and *cis*-1,2-dichloroethene (*cis*-DCE) in groundwater samples from nearby water wells CS-16 and CS-D (located approximately 400 feet and 600 feet, respectively, northwest of SWMU B-3). The detected concentrations exceeded drinking water standards, and well CS-16 was taken off-line as a post supply well. Well CS-D, which had been used as an agricultural well, was maintained as a monitoring well. Based on the proximity of the site to CS-16 and CS-D, SWMU B-3 became the focus of the volatile organic compound (VOC) plume investigation. Background information regarding the location, size, and known historical use of the site is included in the CSSA Environmental Encyclopedia (**Volume 1-2, SWMU B-3)**. This volume includes a Chronology of Actions and a Site-Specific Work Plan for SWMU B-3. Results of a geophysical survey, soil gas survey, soil boring investigation, groundwater sampling, interim removal action, and other treatability studies are also included as part of the CSSA Environmental Encyclopedia **(Volume-3-1, SWMU B-3).**

On May 5, 1999 an Administrative Consent Order was issued to CSSA pursuant to §3008(h) of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (RCRA), and further amended by the Hazardous and Solid Waste Amendments of 1984. In accordance with the Consent Order, a groundwater investigation and corrective measures for impacted groundwater is required. As part of a corrective measures study, the construction of a bioreactor was completed to address contamination released from SWMU B-3 to the underlying limestone and aquifer. This report includes by reference the information presented in the CSSA's Environmental Encyclopedia (**Volume 3-7, Hydrogeologic Conceptual Site Model**).



Aerial Photo Date: 2003

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Creeks (Dashed where intermittent)
Water Well Locations
SWMU Boundary
Westbay Wells

Figure 1.1

Pilot Study Location Map

Camp Stanley Storage Activity

PARSONS

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1.2 Pilot Study Objectives

As part of the RCRA Administrative Consent Order, a pilot study using a bioreactor was conceptualized, designed, and constructed at SWMU B-3. The bioreactor is designed to remediate the affected groundwater and unsaturated zone underlying SWMU B-3. The design included excavation, removal, and offsite disposal of affected soil, debris, and waste contained within six trenches. The waste is believed to be a likely source of contaminants impacting the underlying fractured limestone (bedrock) and groundwater.

The objective and overall goal of this pilot study is two-fold:

1. To create a bioreactor treatment cell within the excavated trenches for degrading VOCs in the affected groundwater recovered from wells CS-MW16-LGR and CS-MW16-CC; and
2. To create a liquid organic food source that would gravity drain into the bedrock underlying SWMU B-3 to promote anaerobic degradation of VOC contaminants.

This work was performed by Parsons under the U.S. Air Force Environmental Remediation and Construction Contract No. FA8903-04-D-8675, Task Order 0006. Based on the project statement of work, work plans were established to govern the fieldwork. These include:

- Work Plan Overview (**Volume 1-1**, **TO 0006 Addendum**);
- Site-Specific Work Plan(s) (**Volume 1-2**, **SWMU B-3)**;
- Field Sampling Plan (**Volume 1-4**, **TO 0006 Addendum**);
- Waste Management Plan (**Volume 1-4**, **TO 0006 Addendum**); and
- Health and Safety Plan (**Volume 1-5**, **TO 0006 Addendum**).

1.3 Report Objective

The purpose of this report is to document the activities conducted during the construction of the bioreactor. The construction of the bioreactor was accomplished in accordance with the design drawings and specifications for the project.

The general design criteria included placement of a 1:1 mixture by volume of gravel to deciduous tree mulch into the six excavated trenches at SWMU B-3. A water irrigation system was installed on top of the gravel/tree mulch in which water can be pumped from wells CS-MW16-LGR and CS-MW16-CC and delivered into each trench. The CS-MW16 wells will be used as the primary water source because of their proximity to the bioreactor. Additional details on the design and construction of the pilot study bioreactor are included in this report.

1.4 Report Organization

An Introduction, which includes project objectives, is presented in Section 1. Section 2 includes relevant information regarding the current conditions at SWMU B-3.

Section 3 includes construction details for the bioreactor at SWMU B-3. Section 4 includes references for this report. Appendices for this report include:

- Appendix A - Class V Aquifer Remediation Injection permit;
- Appendix B - Daily Field Logs, status reports; and
- Appendix C – Design Drawings of Bioreactor, including survey data.

SECTION 2
SWMU B-3 BACKGROUND AND CURRENT CONDITIONS

SWMU B-3 was a landfill area thought to have been used primarily for garbage disposal and trash burning from the 1950's through the 1980s. The trench areas were reportedly closed in 1990-1991. In 1991, chlorinated hydrocarbons were detected in groundwater from Well CS-16, approximately 500 feet north-northwest of SWMU B-3. The VOC concentrations, which were above drinking water standards, prompted several investigations aimed at identifying possible source areas that could be contributing to the contamination. SWMU B-3, along with nearby SWMU O-1 (oxidation pond), was identified as potential sources of groundwater contamination within the inner cantonment.

2.1 Environmental setting

CSSA is characterized by a rolling terrain of hills and valleys in which nearly flat-lying limestone formations have been eroded and dissected by streams draining to the east and southeast. The general morphology of this portion of Central Texas is caused by the Balcones Escarpment, which extends westward from San Antonio and northward toward Austin, Texas. Soil cover is relatively thin, and bedrock is often exposed at surface and in creek beds. The Cretaceous-age sediments of Central Texas were deposited as onlapping sequences on a submerged marine plain. CSSA is sited over older-aged deposits of the Travis Peak and Glen Rose Formations of the Trinity Group.

2.2 Hydrogeology

The primary groundwater source at CSSA and surrounding areas is the Middle Trinity Aquifer, the most prolific producer with the best quality water of the three Trinity Aquifers. The Middle Trinity Aquifer consists of the LGR Limestone, the Bexar Shale (as a facies of the Hensell Sand), and the Cow Creek (CC) Limestone. The average combined thickness of the aquifer members is approximately 460 feet. Most general purpose wells within this aquifer are completed as open holes without well screens to maximize groundwater withdrawal from the yielding portions of the aquifer. For additional information on environmental studies and hydrogeology at CSSA, see CSSA's Environmental Encyclopedia (**Volume 3-7 - Hydrogeologic Conceptual Site Model**).

Based on measurements at observation wells, the regional groundwater flow is generally to the south-southeast. The LGR typically has a southward gradient that deviates around mounding which occurs along intermittent Salado Creek near the central and northern portions of the facility (CS-MW4-LGR). The Bexar Shale exhibits the potential for either northward or southward flow, depending on the season. Likewise, the CC Limestone exhibits erratic flow paths, with seasonally radial flow from mounded areas, to a northwestward flow possibly related to off-post pumping along Ralph Fair Road.

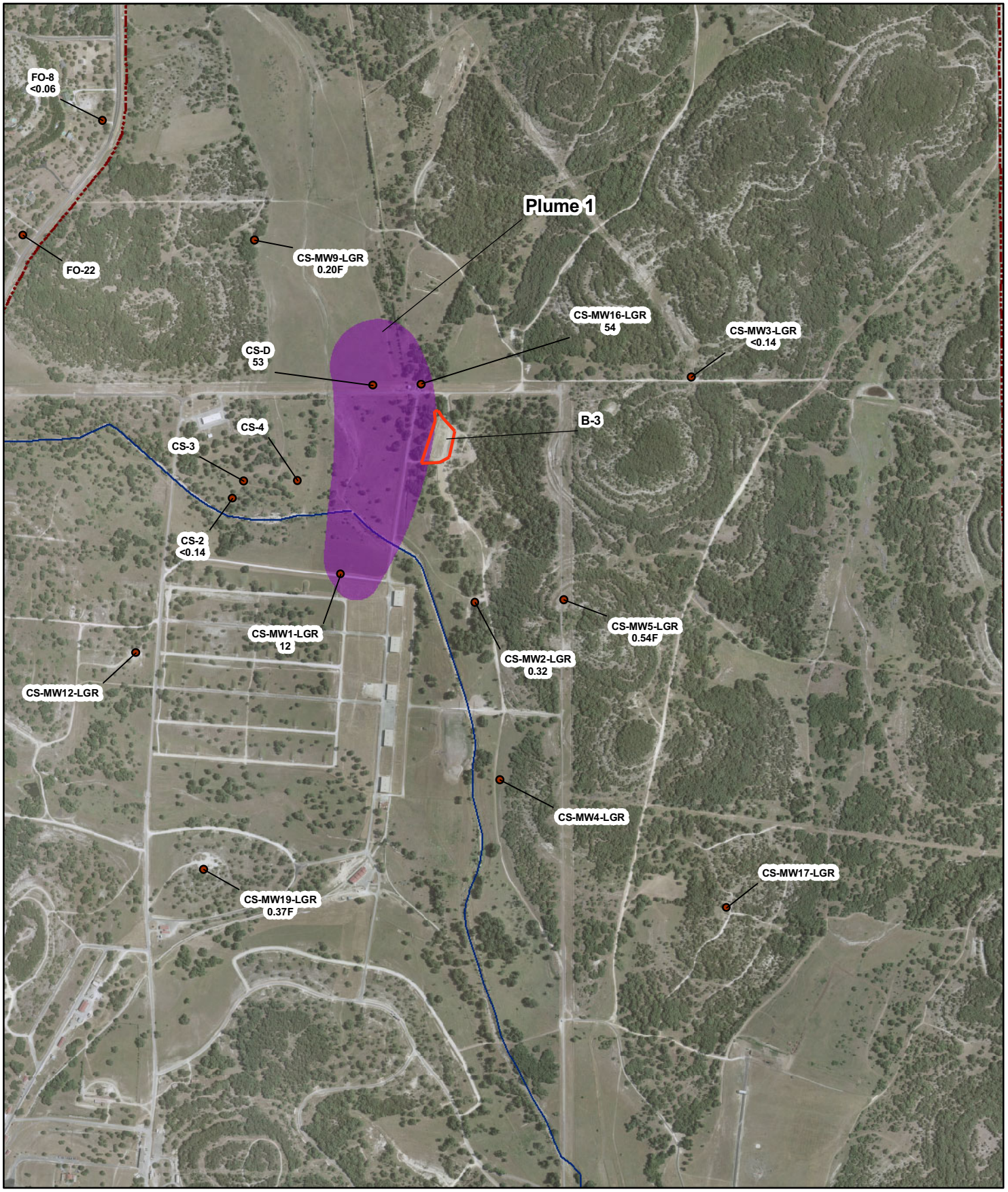
Long-term monitoring shows that groundwater response to precipitation events can be swift and dramatic. Depending on the severity of a precipitation event, the groundwater response will occur within several days, or even hours. Average precipitation events do not evoke much response from shallower wells within the LGR, yet deeper wells will respond within days. Such observations indicate that the preponderance of recharge occurs locally while CC recharge occurs elsewhere on the outcrop, and not necessarily within CSSA.

The average precipitation at CSSA is typically above 32 inches per year. The 30-year record (1971-2000) shows a mean annual rainfall average of 37.36 inches in Boerne, Texas. The CSSA weather station reported a 35.39 annual average between 1999 and 2002. Precipitation ranging from 17 inches to 52 inches has been reported within a single year.

2.3 Contaminant Distribution

Solvent contamination (PCE, TCE, and *cis*-DCE) was first detected in a water supply well at CSSA during routine monitoring by the Texas Department of Health in 1991. Contamination from past disposal activities resulted in two groundwater units, referred to as Plume 1 (B-3 and O-1) and Plume 2 (AOC-65). The release of solvents to the environment resulted in contamination of the Middle Trinity Aquifer, which is the primary drinking water source for the area. Contamination is most widespread within the LGR water-bearing unit. Locally, the Bexar Shale serves as a confining unit between the water-bearing LGR and CC Limestone. Between 1992 and 1999, CSSA undertook a series of investigations to identify potential source areas for the groundwater contamination, which identified SWMU B-3 and O-1 as likely candidates contributing to groundwater contamination within Plume 1. SWMU B-3 was a landfill where solvents were utilized as an accelerant for burning refuse, and nearby SWMU O-1 was a lined oxidation pond.

Originating from SWMUs B-3 and O-1, Plume 1 has advectively migrated southward to CS-1 at Camp Bullis, and west-southwest toward CSSA well fields (CS-9, CS-10, and CS-11) and several off-post public and private wells. VOC concentrations over maximum contaminant levels (MCLs) are present in Middle Trinity Aquifer wells near the source area. Within SWMU B-3 trenches, concentrations of *cis*-DCE in excess of 24,000 µg/L have been reported in near-surface perched wells. However, contaminant concentrations are below 1 µg/L over most of the Plume 1 area. Trace concentrations associated with Plume 1 have been detected at off-post locations. PCE concentration plumes from monitoring efforts are shown in Figure 2.1, including Plume 1 near SWMU B-3.



Legend

- Wells with concentrations in µg/L
- CSSA Boundary
- Salado Creek
- B-3 Boundary
- PCE Concentrations (µg/L)
  - 5 - maximum contaminant level

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Figure 2.1

Plume 1 - PCE Concentrations 2006

P A R S O N S

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SECTION 3
CONSTRUCTION OF THE BIOREACTOR

Bioreactor construction began after all waste (affected soil and debris) was removed from the six trenches. Backfilling of the trenches with mulch mixture and installing underground piping was initiated in July 2006 and completed in November 2006.

Permitting and regulatory authorization was necessary to for treating recovered contaminated groundwater within the bioreactor treatment cell. Therefore, based on the general design of the bioreactor, a request for a Class V Aquifer Remediation Injection Well was submitted to the Industrial and Hazardous Waste Permits Section of the Waste Permits Division at the Texas Commission on Environmental Quality (TCEQ) in May 2006. The permit application was approved July 20, 2006 and TCEQ Authorization Number 5X2600431; WWC 12002216; CN602728206/RN104431655 was assigned to the SWMU B-3 injection system. An amendment to CSSA's Class V Aquifer Remediation Injection permit was submitted November 26, 2006 to authorize the use of a sixth trench that was encountered during removal actions at SWMU B-3. A copy of the Class V Aquifer Remediation Injection Well permit authorization letter and CSSA's amendment request letter is presented in Appendix A.

Construction of the bioreactor was conducted in the following series of steps:

1. Construction of six trenches;
2. Placement of an organic-rich substrate (soybean oil);
3. Installation of twelve trench monitoring sumps and placement of gravel/tree mulch;
4. Installation of subsurface irrigation system;
5. Installation of geofabric;
6. Installation of gravel as cover for the irrigation system; and
7. Installation of water delivery pump and ancillary equipment.

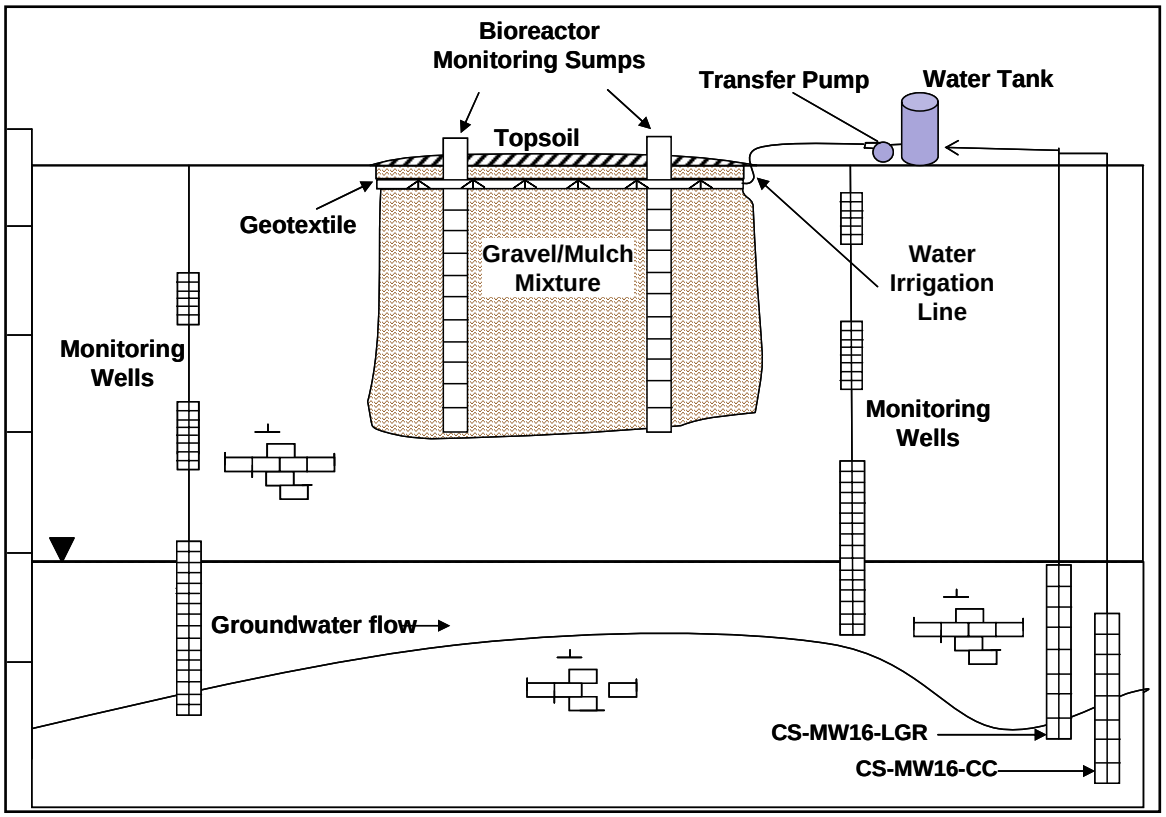
A detail description of each of the steps is summarized within Sections 3.1 – 3.7 of this report. A conceptual diagram of the bioreactor along with the major components associated with the bioreactor is depicted in Figure 3.1. During construction activities, bi-weekly status reports were prepared and submitted to EPA and TCEQ and are provided in Appendix B. The bi-weekly reports present detail summaries of the work progress. Additionally, daily construction notes are provided in Appendix B.

The general concept is to pump water approximately 400 feet from delivery wells CS-MW16-LGR and CS-MW16-CC to a 5,000-gallon storage tank. Level switches within the storage tank will be set to communicate directly with the two water delivery wells to maintain an available water supply in the water tank for the bioreactor. A transfer pump is used to pump water from the storage tank to the network of pipes that

overlay the SWMU B-3 trenches. Water from the storage tank will be sprayed into the gravel/tree mulch mixture in each trench through downward-pointing discharge nozzles located at 10-foot centers along 1.5-inch flexible high density polyethylene (HDPE) pipe. In order to prevent overfilling of the bioreactor, a level switch is included in monitoring sump 1-1 (Trench 1 - sump 1) to control the application of water from the transfer pump. This sump, 1-1 is located in the deepest portion of Trench 1, which is west and downslope of all the other trenches.

Water will be pumped into each trench to create saturated conditions within a portion of the gravel/tree mulch mixture. The capability of the bioreactor to reduce the concentrations of contaminants associated with CS-MW16-LGR and CS-MW16-CC as well as in the subsurface will be accessed through periodic sampling of groundwater monitoring wells located around SWMU B-3. To further enhance anaerobic degradation, possible future plans may call for amending the groundwater from the CS-16 wells with an organic substrate or microbes which could be added to the bioreactor via an eductor located between the transfer pump and the piping network over the trenches.

Figure 3.1 General Components of the Bioreactor



3.1 Trench Construction

Equipment and crews were mobilized on April 5, 2006 for excavating and removal of contaminated media and waste within SWMU B-3. Removal actions were completed on July 24, 2006. Removal action details are provided in a separate report (Parsons 2007). The capacity of each trench is based on surveys conducted by Baker Surveying, Inc. from Blanco, TX. The surveyed volumes are listed in Table 3.1 along with maximum depth of the trench base.

Table 3.1 Volumes and Depths of Trenches after Excavating Soils and Debris from B-3 Trenches

Trench	Volume of Trench (CF)	Average Depth of Trench Base	
		Depth below grade (Ft)	Elevation above MSL
1	73,600	12.5	1223
2	56,700	8.5	1228.5
3	30,100	7	1232.5
4	21,200	6	1234
5	32,800	7	1234.5
6	38,300	9	1225

Photos of the six trenches within SWMU B-3 are shown in Table 3.2.

3.2 Initial Placement of Organic Carbon Substrate

Augmenting the bioreactor with an organic-rich substrate was accomplished to accelerate creation of conditions within the bioreactor to enhance the anaerobic degradation process. After the affected soil had been removed, the weathered limestone was exposed in the six trenches and 220 gallons of soybean oil per trench was sprayed over the northern mid-section of Trenches 1, 2, 3, and 6. These four trenches were selected because Toxicity Characteristic Leaching Procedure (TCLP) sample results for soil samples collected from these four trenches contained elevated levels of specific VOCs above their associated limit as stated in 40 CFR 261.24 Toxicity Characteristic Table 1. The oil was applied within the low points in each of the four trenches. If CSSA requests the addition of soybean oil or similar substrate during the pilot study, the fluid can be added through an eductor that will be located between the transfer pump and the piping network or into direct locations via geoprobe or other injection method(s).

Table 3.2 Photos of trench construction at SWMU B-3


Trenches 1- 4 looking north


Trenches 1, 2 and 3 looking south


Trench 2 strata


Trench 3 and 4 looking south


Trench 5 looking north


Trench 6 looking south (veg-oil applied to bottom)

3.3 Installation of Trench Monitoring Sumps

To monitor the water level and operating/performance conditions in each trench, a minimum of one bioreactor monitoring sump was installed in each of the six bioreactor trenches at SWMU B-3. Figure 3.2 shows the locations of the sumps, which were located in the deepest points of each trench, and includes the orientations of three cross sections presented in Figure 3.3. It should be noted that regulatory and performance monitoring of the bioreactor will be conducted by monitoring both the bioreactor trench sumps and also the surrounding multi-port monitoring wells. The final site survey is shown in Figure 3.4 and includes the location of the surrounding multi-port monitoring wells. The installation of the four wells is documented in ***Draft Well Installation Report for Wells CS-WB05 to CS-WB08 and CS-B3-MW01*** (Parsons, June 2006).

Prior to placement of the gravel/tree mulch mixture into a trench, the monitoring sumps were set in a vertical position within each trench. The sump casing consists of 6-inch diameter, 5-foot long Schedule 40 PVC well screen with 0.01-inch wide slots, a 6-inch schedule 40 PVC riser with end caps. The sump casing was set so there is 2 to 3 feet above the final site grade of each trench. Final top of casing elevations for each monitoring sump is provided in the topographic survey located in Appendix C.

The bioreactor cell will be automated with a high/low level switch in the deepest portion of the bioreactor which is Bioreactor Trench Sump (BTS) 1-1 located in the northern central portion of Trench 1. The excavation of soil from Trenches 1 through 5 revealed that the base of the bioreactor slopes downward from Trench 5 to Trench 1. As shown in Figure 3.4, there are openings in the walls between Trenches 1 through 5 such that water discharged into Trench 5 will flow through the tree mulch/gravel mixture downgradient to Trench 1. Note that Trench 6 is isolated from the other five trenches. However, it is possible that water levels between Trenches 1-5 and Trench 6 could equilibrate because of suspected bedding planes in the formation. Monitoring of the sumps during operation of the bioreactor will indicate whether there is hydraulic communication between Trench 6 and Trenches 1 -5.

Table 3.3 Estimated Water Volumes with a Minimum 1-Foot Saturated Layer across the Bioreactor Base

Trenches	Water Elevation (Ft MSL)	Approximate Water Volume for a Gravel/Bark Mulch Porosity of 0.5 (Gal)	Number of Times to Refill/Discharge Water from a 5000 Gal Storage Tank
Tr-1 through Tr-5	1234.5	425,000	85
Tr-6	1243.5	118,000	24

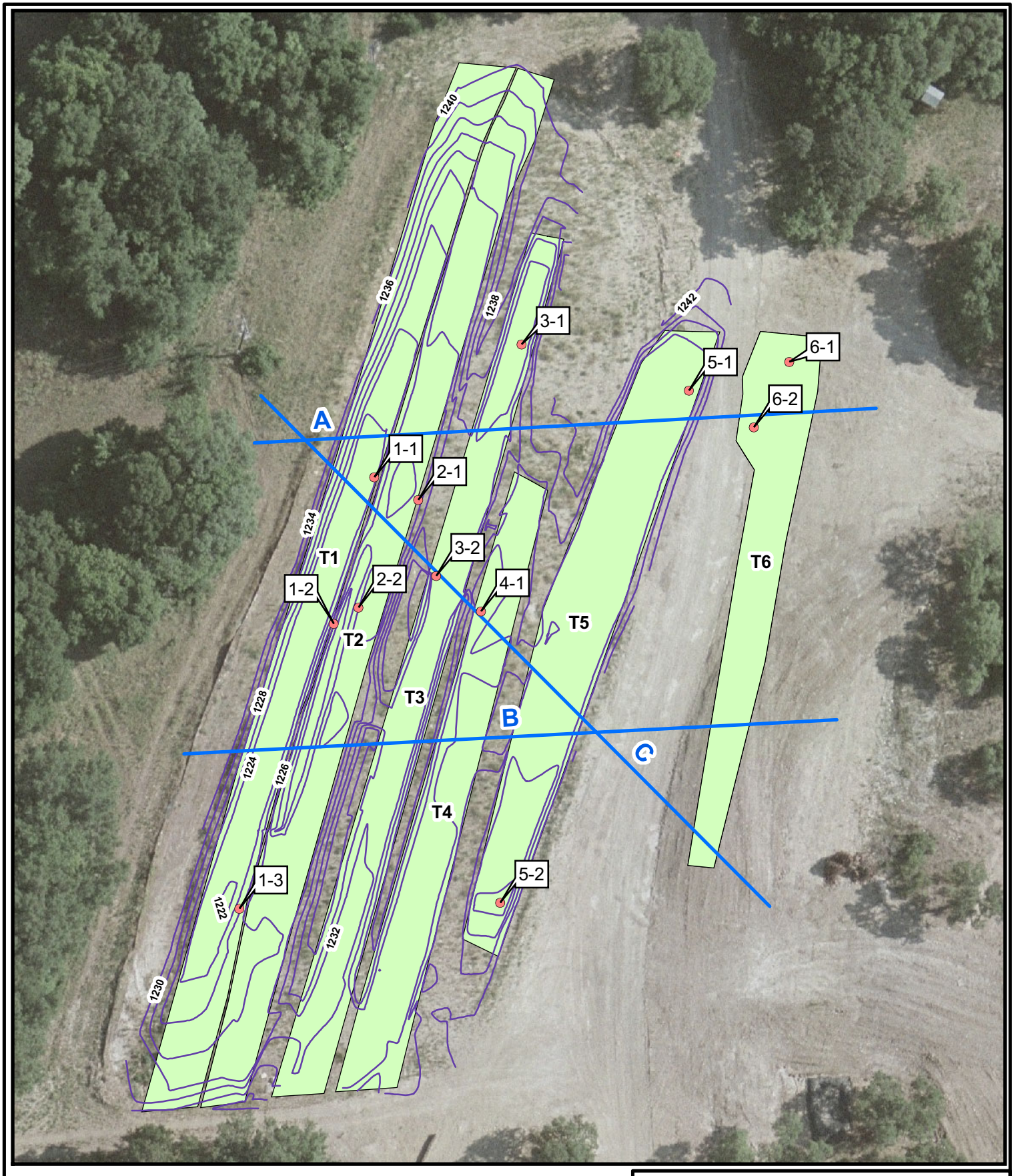


Figure 3.2

B-3 Trenches, Cross-sections and Sump Locations
Camp Stanley Storage Activity

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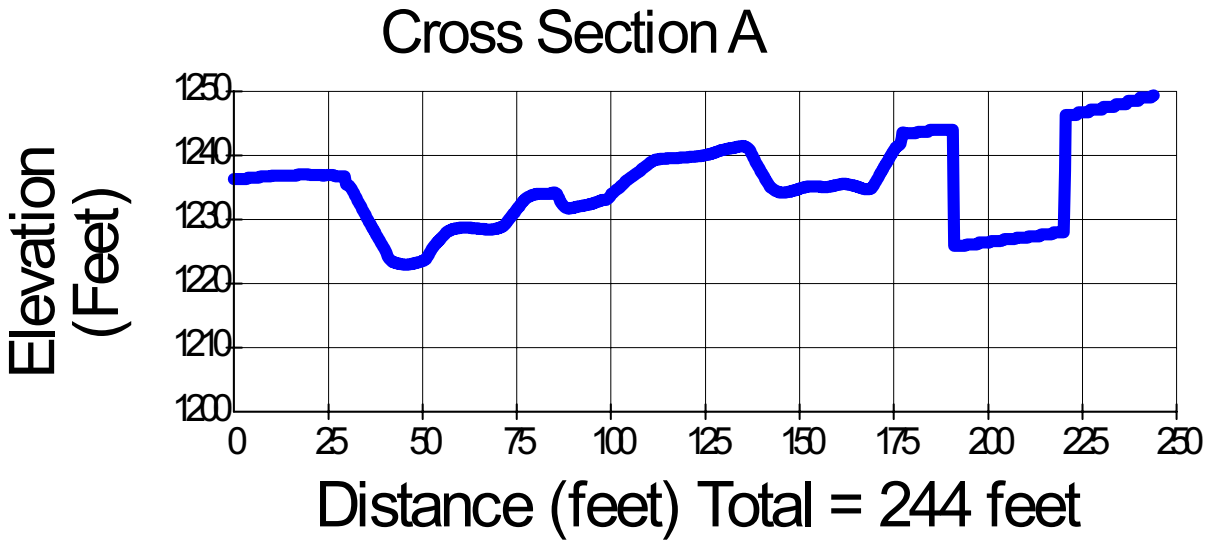
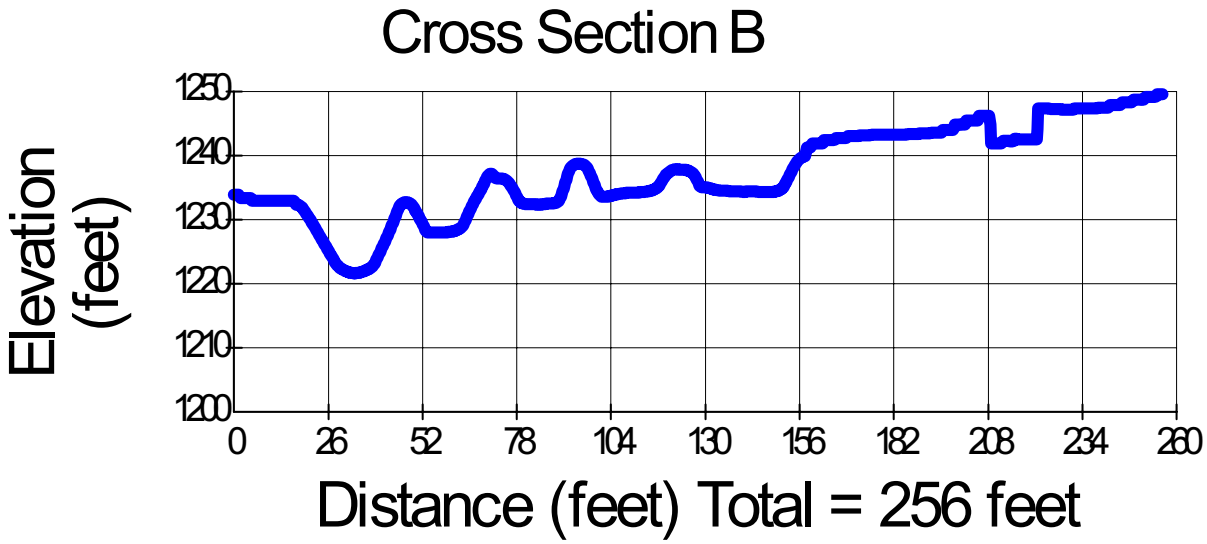
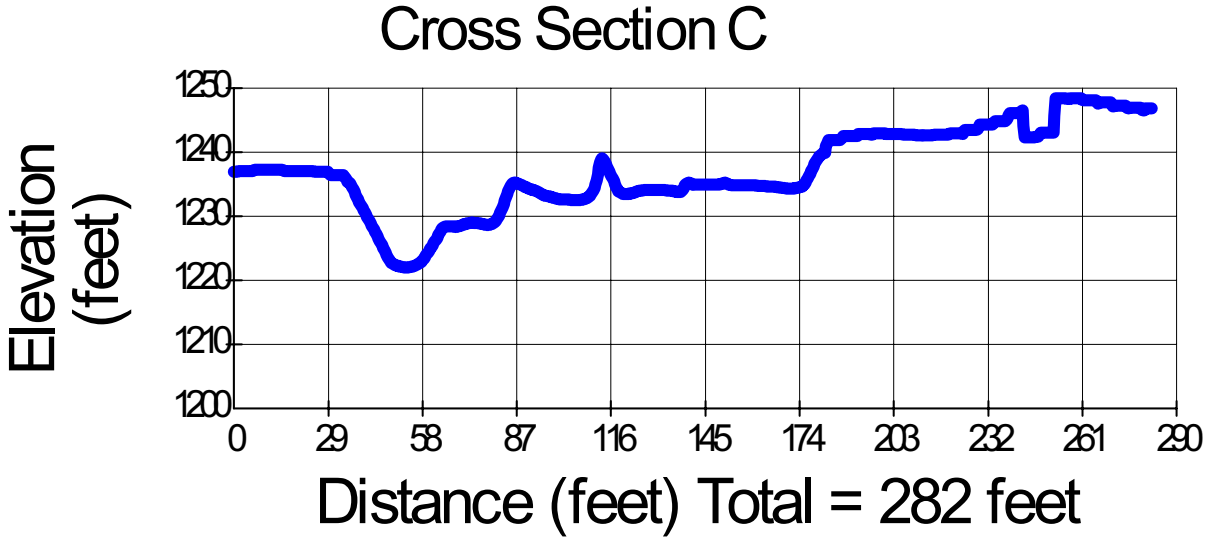
Figure 3.3 Trench Cross-Sections







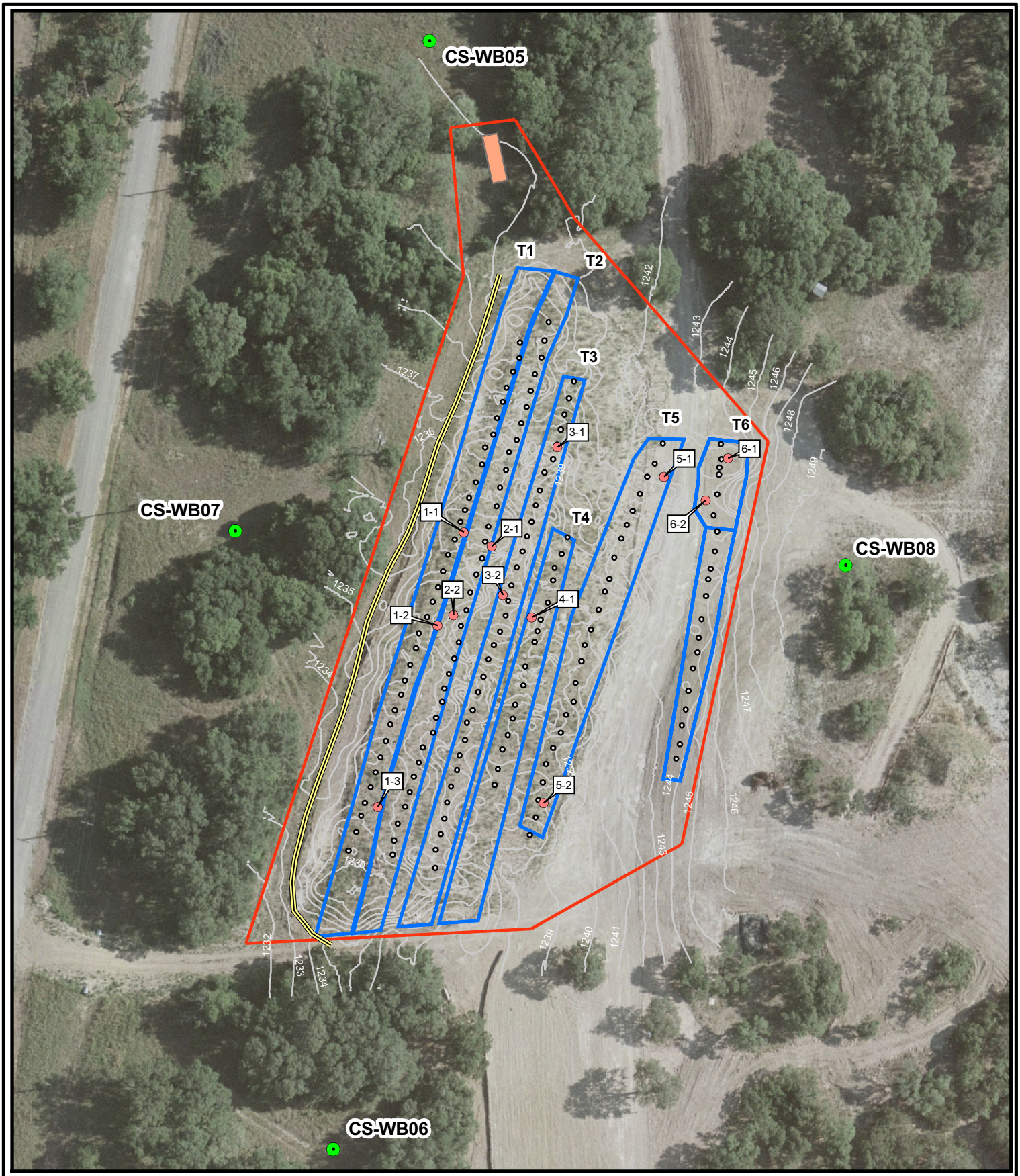


Figure 3.4

B-3 Site Survey Map
Camp Stanley Storage Activity

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3.4 Placement of the Gravel/Tree Mulch Material

The trenches were backfilled with a mixture of gravel and tree mulch at a ratio of 1:1 by volume. The materials were mixed at the surface and the mixture was placed into the trenches with special precaution being taken when placing the material around the bioreactor monitoring sumps. The source of the tree mulch was single-ground deciduous tree mulch purchased from Gardenville located in San Antonio, Texas. The predominantly quartz-based gravel ranged from 0.125 to 0.25 inches in diameter and was subangular to subrounded, and the tree mulch was approximately 2 inches in nominal size. The gravel/tree mulch mixture was placed into the trenches to a height of 2 feet below the existing site grade. A final site survey performed after completing the backfilling of the trenches with the gravel/tree mulch mixture is shown in Figure 3.4. As water saturates the mulch, the water will become organic-rich and will thus provide an energy source to drive the geochemistry of saturation liquids to reducing conditions necessary for anaerobic dechlorination of chlorinated organic compounds.

3.5 Installation of Subsurface Irrigation System

The water distribution system, consisting of 1.5-inch flexible back HDPE pipe, was placed down the center and along the top of the gravel/tree mulch layer within each trench. The HDPE pipe from each trench was connected to a 3-inch diameter polyvinyl chloride (PVC) header. To monitor the flow into each trench, a flow meter (battery-operated Model FT415) was installed on each HDPE line leading from the header to each trench. A 1.7 (0.063-inch orifice) or a 2.5 (0.094-inch orifice) gpm spray nozzle (FullJet™ Type G) was installed every 10 feet along the HDPE pipe. Six 2.5 gpm nozzles were placed into the north end of Trench 6 because of the need to add additional water to improve the capability of creating saturated conditions. The number of spray nozzles and rated flow rate are presented in Table 3.2.

Table 3.4 Number of Spray Nozzles per Trench

Trench	Approximate Trench Length	No. of Spray Nozzles	Rated Flow Rate (GPM)
1	360 ft.	34	1.7
2	360 ft.	34	1.7
3	340 ft.	32	1.7
4	200 ft.	16	1.7
5	260 ft.	24	1.7
6	200 ft.	14	1.7
		6	2.5

3.6 Installation of Geofabric

After the spray nozzles were tested the piping network was covered with a geofabric to maintain a separation between the bioreactor and fine particles that may be placed over the bioreactor. The fabric was placed over the gravel/tree mulch mixture such that the fabric extended to the edge of the bioreactor along the exterior walls of Trenches 1 through 5 and the exterior walls of Trench 6. The edge of the fabric was kept loose along the sidewall to allow for some settlement of the gravel/tree mulch material and, therefore, was not anchored along the slope. As the fabric was stretched across the trenches, the installers maintained a minimum 1-foot overlap between geofabric panels. The geofabric was cut to allow for the monitoring sumps.

An approximate 1-foot thick layer of the 0.125 to 0.25-inch gravel was placed over the geofabric. To capture water in the bioreactor during rainfall events, the final elevation of the bioreactor was set to be at least 1 foot lower than the surrounding grade. In addition, berms along the western side of the bioreactor were constructed to retain water and minimize potential for any surface runoff from the trenches during rainfall events.

3.7 Installation of Equipment to Operate the Bioreactor

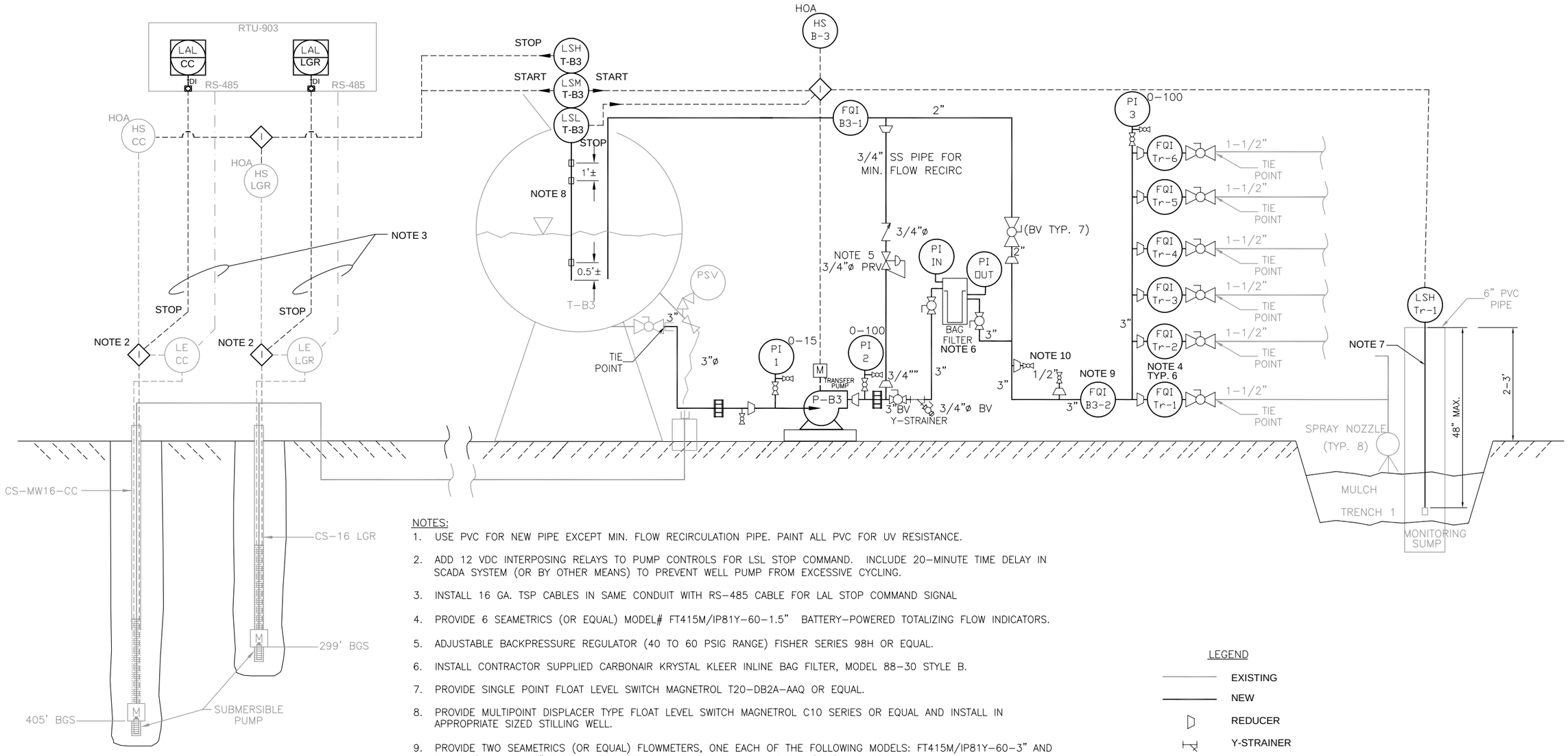
Once the bioreactor was installed, additional equipment was installed to control and maintain a flow of water from the two CS-16 wells. The design drawings depicting the equipment and the controls regulating the flow of water through the system are provided in Appendix C. The bioreactor pumping and control process diagram is provided in Figure 3.5.

3.7.1 STORAGE TANK

A 5,000-gallon former transport tanker was placed on the north side of the bioreactor, secured, and anchored. The former transport tank serves as a temporary storage vessel for groundwater from the two CS-16 wells and is intended to supply water on demand to the bioreactor. Note that monthly inspections will be conducted to monitor the possible collection of sediment in the storage tank since it is equipped with internal baffles.

3.7.2 TRANSFER PUMP

An end suction centrifugal pump was installed to pump water from the storage tank to the bioreactor based on the water level detected in the bioreactor. The pump (MODEL XT150SF-5.625-21264-1000-36-3T6 manufactured by Price) is equipped with a Wash Down Duty 10 hp motor, which is characterized as being tropicalized and having a stainless steel shaft and epoxy paint. The pump is bolted to a concrete pad connected to the storage tank with a 3-inch PVC line. A 3-inch line installed from the pump to the bag filter and then from the bag filter to the 3-inch header connects the pump to the distribution system. Since portions of the line between the storage tank and the distribution line are above ground, insulation will be placed around the line to prevent line damage under freezing weather conditions.



NOTES:

1. USE PVC FOR NEW PIPE EXCEPT MIN. FLOW RECIRCULATION PIPE. PAINT ALL PVC FOR UV RESISTANCE.
2. ADD 12 VDC INTERPOSING RELAYS TO PUMP CONTROLS FOR LSL STOP COMMAND. INCLUDE 20-MINUTE TIME DELAY IN SCADA SYSTEM (OR BY OTHER MEANS) TO PREVENT WELL PUMP FROM EXCESSIVE CYCLING.
3. INSTALL 16 GA. TSP CABLES IN SAME CONDUIT WITH RS-485 CABLE FOR LAL STOP COMMAND SIGNAL
4. PROVIDE 6 SEAMETRICS (OR EQUAL) MODEL# FT415M/IP81Y-60-1.5" BATTERY-POWERED TOTALIZING FLOW INDICATORS.
5. ADJUSTABLE BACKPRESSURE REGULATOR (40 TO 60 PSIG RANGE) FISHER SERIES 98H OR EQUAL.
6. INSTALL CONTRACTOR SUPPLIED CARBONAIR KRYSTAL KLEER INLINE BAG FILTER, MODEL 88-30 STYLE B.
7. PROVIDE SINGLE POINT FLOAT LEVEL SWITCH MAGNETROL T20-DB2A-AAQ OR EQUAL.
8. PROVIDE MULTIPOINT DISPLACER TYPE FLOAT LEVEL SWITCH MAGNETROL C10 SERIES OR EQUAL AND INSTALL IN APPROPRIATE SIZED STILLING WELL.
9. PROVIDE TWO SEAMETRICS (OR EQUAL) FLOWMETERS, ONE EACH OF THE FOLLOWING MODELS: FT415M/IP81Y-60-3" AND FT415M/IP81Y-60-2" BATTERY-POWERED TOTALIZING FLOW INDICATORS. (866) 542-9641.
10. INSTALL 1/2" ISOLATION VALVES FOR FUTURE AMENDMENT ADDITION.
11. LABEL TANK WITH STENCIL OR PLACARD "CS-16 NON-POTABLE WATER"
12. INSTALL CONTRACTOR SUPPLIED HORIZONTAL END-SUCTION CENTRIFUGAL, CLOSE-COUPLED PUMP P-B3 WITH A CAPACITY OF 120 GPM @ 145 FT.

LEGEND

- EXISTING
- NEW
- REDUCER
- Y-STRAINER
- EXPANSION JOINT OR FLEXIBLE COUPLING

744223.10 B3 P-1.DWG

Figure 3.5

Bioreactor Pumping System
Process Diagram

CSSA SWMU B3

PARSONS

3.7.3 BAG FILTER

The sprayer openings are small, a 0.063-inch orifice for the 1.7 gpm spray nozzle and a 0.094-inch orifice for the 2.5 gpm spray nozzle. Therefore, it is necessary to remove possible sediment from the water to reduce the potential for clogging of the spray heads. As shown in Figure 3.5, bag filter equipment was installed between the transfer pump and the distribution system. The bag filter equipment, manufactured by Carbon Air, consists of a single chamber with a coarse mesh basket and a bag filter fitted inside the mesh basket.

3.7.4 EDUCTOR FOR INCORPORATION OF ADDITIVE

An eductor system located down stream of the bag filter equipment may be used in the future if it is necessary to pump additional additive into the bioreactor. The container of oil or similar bacteria enhancement product can be placed near the eductor and an intake pipe will be placed in the container. The additive will be drawn into the flow system via the eductor as water passes through the piping.

3.7.5 CONTROLLERS

Two sets of controllers were installed to monitor and control the conveyance of water from the two CS-16 wells to the bioreactor. The first set of controllers maintains the flow of water between the storage tank and the two wells, CS-MW16-LGR and CS-MW16-CC. The storage tank is equipped with a high, medium, and low level switches set to communicate with each well, which is equipped with pressure transducers that are set to detect low water level (pump is turned off) and high water level (pump is restarted after well has recovered). The control equipment for these two wells is located in the GAC building and Hand or Manual, Off and Automatic (HOA) switches for each pump are located at the well heads. The second set of controllers maintains the flow of water between the storage tank and the bioreactor. The high, medium, and low level switches in the storage tank are set to also communicate with the transfer pump based on the water level detected in sump 1-1. The control equipment for the transfer pump includes an HOA switch located at the transfer pump.

3.7.5.1 CONTROLLERS TO MAINTAIN PUMPING BETWEEN CS-16 WELLS AND STORAGE TANK

Submersible pumps in Wells CS-MW16-CC and CS-MW16-LGR pump water at a combined, sustainable flow rate of 30 gpm to a 5,000-gallon storage tank for a distance of approximately 400 feet through a buried 2-inch PVC line. Note that the 30 gpm rate is an estimated average rate that may fluctuate depending on aquifer recharge resulting from rainfall events. Each well is equipped with a pressure transducer that is set to signal deactivation of the pump if the water level gets too low during the drawdown phase and will also signal the pump when the water level is high enough for the pump to restart after the recovery phase of the well. In addition to the controller associated with the water level transducer for each of the CS-16 wells, there is a second controller connected to level switches located in the 5,000-gallon storage tank. The controllers for the well transducers are located within a building adjacent to the two wells. There is an HOA

switch at each pump that should be kept in the automatic mode where both the well transducer and the storage tank level switches control the activation of the pump. The different scenarios controlling the operation of the well pumps are identified in Table 3.3.

Table 3.5 Scenarios Dictating Activation of the Submersible Pumps at CS-16

Water Level in Well	Water Level in 5000-gallon Storage Tank	Activation of Both or One CS-16 Well Based on Water Levels in Well and Storage Tank
1. During drawdown phase and above the low level turn-off depth.	Below the high level turn-off.	**On**
2. During drawdown phase and above the low level turn-off depth.	At the high level turn-off.	Off
3. During recovery phase and above the low level turn-off depth, but also below the high level restart.	Below the high level turn-off.	Off
4. During recovery phase and above the low level turnoff depth.	At the high level turn-off.	Off
5. High level is attained (*i.e.*, completion of recovery phase)	Below the high level turn-off.	**On**
6. High level is attained (*i.e.*, completion of recovery phase)	At the high level turn-off.	Off

3.7.5.2 CONTROLLERS TO MAINTAIN PUMPING WATER FROM STORAGE TANK TO THE BIOREACTOR

Water will enter the northern end of the tank and the stored water will be pumped from the tank with an end-suction centrifugal transfer pump located between the storage tank and the bioreactor. The operation of the transfer pump will be controlled by the water level indicated by a level switch in BTS 1-1 in Trench 1. This sump is located in the deepest portion of the bioreactor (Trenches 1 through 5) and should provide a representative water level elevation of the saturated conditions across the base of the bioreactor in Trenches 1 through 5. There is an HOA switch at the transfer pump that should be kept in the automatic mode where both the sump water level switch and the storage tank level switches control the activation of the transfer pump. The different scenarios controlling the operation of the transfer pump are identified in Table 3.4.

Table 3.6 Scenarios Dictating Activation/Deactivation of the Transfer Pump

Water Level in Bioreactor Sump	Water Level in 5000-Gallon Storage Tank	Response of Transfer Pump Based on Signal from a Sump or a Tank Level Switch
1. Below the high level turn-off switch and water level rising in Trench 1 with transfer pump operating.	Above the low level turn-off.	Continues operating
2. Below the high level turn-off switch and water level rising in Trench 1 with transfer pump operating.	Water level reaches the low level turn-off.	Turns off
3. Below the high level turn-off switch and water level dropping in Trench 1 with transfer pump off.	Water level rising in tank and reaches the medium-level turn-on (switch set just below the high level switch).	Turns on
4. Pump has been off and water level recedes below the sump level switch.	Water level at high-level switch.	Turns on
5. Pump has been on and water rises to the sump level switch.	Water level above low-level turn-off switch.	Turns off

3.7.6 PRESSURE GAUGES AND FLOW METERS

To monitor line pressures, pressure gauges will be located at various locations between the storage tank and the main header as shown in the design drawings in Appendix C. In addition, flow meters were installed to monitor the flows of water through the system. The monitoring and reporting of flow volumes discharged into the subsurface is required by TCEQ (see requirement No. 4 in the TCEQ letter provided in Appendix A). Photos of the bioreactor are provided in Table 3.7.

Table 3.7 Bioreactor Construction Photographs

 Mixed Bioreactor material	 Tree mulch and Gravel mixing
 Irrigation spray nozzle testing prior to being covered.	 SWMU B-3 Bioreactor looking southeast
 Bioreactor transfer tanks and pump	 Irrigation tank and distribution system

SECTION 4
REFERENCES

Parsons, June 2006 *Draft Well Installation Report for Wells CS-WB05 to CS-WB08 and CS-B3-MW01, Parsons, June 2006.*

Parsons 2007 *Draft Removal Action Report for SWMU B-3,* Parsons, February 2007.

APPENDIX A
CLASS V AQUIFER REMEDIATION INJECTION AUTHORIZATION CORRESPONDENCE

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

July 20, 2006

Mr. Jason Shirley
Installation Manager
U.S. Army, Camp Stanley Storage Activity
25800 Ralph Fair Road
Boerne, TX 78015

Re: Authorization and Registration of Class V Aquifer Remediation Injection Wells
TCEQ Authorization No. 5X2600431; WWC 12002216; CN602728206/RN104431655
Camp Stanley Storage Activity
25800 Ralph Fair Road
Boerne, TX 78015

Dear Mr. Shirley:

The Underground Injection Control (UIC) staff has completed review of the inventory/authorization form dated May 30, 2006 from Parsons requesting approval for the injection of groundwater into five infiltration galleries filled with gravel, wood chips and vegetable oil as part of the remediation process at the above site. Our consideration for this proposed project for injection has included coordination with the commission's Remediation Division. Based on our review, approval is hereby given for construction and operation of the injection wells according to the submitted plans and specifications.

In order to maintain authorization by rule for the injection operations, the project must meet all requirements set by the Remediation Division and the UIC rules provided by 30 TAC Chapter 331. Requirements for the injection include:

1. All injection wells are to be constructed to meet the standards provided in 30 TAC §331.132 and completed well logs or construction diagrams submitted to the UIC Permits Team, Industrial and Hazardous Waste Permits Section, at mail code MC-130 upon completion;

2. Operational and status changes shall be reported to and approved by the UIC Permits Team;

3. Closure (plugging) of injection wells, points and/or trenches shall comply with standards provided in 30 TAC §331.133. Closure reports including plugging reports and injection well monitoring data (injection volumes, pressures, and results) shall be submitted to the UIC Permits Team, Industrial and Hazardous Waste Permits Section, at mail code MC-130 within 60 days of completion of injection or plugging activities; and

4. Injection volumes, pressures, and concentrations of contaminants (including pH and total dissolved solids) in the injected groundwater shall be sampled bimonthly at the point of reinjection (prior to fluids being released into the trenches) and submitted to the UIC Permits Team, Industrial and Hazardous Waste Permits Section, at mail code MC-130 on a monthly basis. The concentration of contaminates in the trench bioreactor monitoring sumps and the surrounding monitoring wells shall be sampled monthly and submitted to the UIC Permits Team, Industrial and Hazardous Waste Permits Section, at mail code MC-130 on a quarterly basis. The concentrations of the contaminants shall not exceed those limits listed in 40 CFR §261.24 Toxicity characteristic table 1 that would deem them hazardous by concentration.

If you have any questions regarding this matter, please contact me at (512) 239-6075. If you will be corresponding by mail, please use mail code MC-130.

Sincerely,

Bryan S. Smith

Bryan Smith, P.G., Engineering Specialist
Industrial and Hazardous Waste Permits Section
Waste Permits Division
Texas Commission on Environmental Quality

BSS/ff

cc: Mr. Brian Vanderglas, Parsons, Austin

DEPARTMENT OF THE ARMY
CAMP STANLEY STORAGE ACTIVITY, MCAAP
25800 RALPH FAIR ROAD, BOERNE, TX 78015-4800

November 29, 2006

U-001-07

Mr. Bryan Smith
TCEQ, IHW Permits Section
Waste Permits Section
12100 Park 35 Circle, Bldg F
Austin, TX 78711-3087

Subject: Authorization and Registration of Class V Aquifer Remediation Injection Wells; Modification Request of Existing TCEQ Authorization No. 5X2600431; WWC 12002216; CN602728206/RN104431655, Camp Stanley Storage Activity, Boerne, Texas

Dear Mr. Smith:

The Camp Stanley Storage Activity (CSSA), McAlester Army Ammunition Plant, U.S. Army Field Support Command, Army Materiel Command, U.S. Army, constructed a bioreactor in an open excavation as described in our application for the subject TCEQ Authorization submitted on May 25, 2006 and approved by your letter dated July 20, 2006. The bioreactor is serving as a remediation pilot project at SWMU B-3, located in the central portion of the CSSA facility. In the Class V Injection application, the figures and text indicated that the bioreactor would be constructed in five excavated trenches present at the site.

Debris and affected soils were removed from the SWMU B-3 trenches prior to the construction of the bioreactor. As the soils were being excavated, a sixth disposal trench was encountered. After affected soils and debris had been removed from all six trenches, a bioreactor (mulch) treatment gallery was constructed in each trench. Since the original request for this authorization was for only five mulch-filled galleries, this modification letter is requesting authorization for injecting groundwater into the six trenches actually constructed at SWMU B-3 instead of five trenches originally described in our application. An updated version of Figure B.2 showing the surveyed locations of the six trenches is attached.

If you have any questions or concerns, please feel free to contact, Glaré Sanchez, Environmental Program Manager, at (210) 698-5208.

Sincerely,

Jason D. Shirley
Installation Manager

Attachment

cc: Ms. Glare Sanchez
CSSA Environmental Program Manager (ltr w/encl.)

Mr. Greg Lyssy
EPA Region 6 (ltr w/encl.)

Ms. Abigail Power
TCEQ Region 13 (ltr w/encl.)

Mr. Brian Siegfried
AFCEE/Portage (ltr only)

Ms. Julie Burdey
Parsons (ltr only)

Ms. Kimberly Vaughn
Parsons (ltr only)

Figure B.2

SWMU B-3
Trench Locations
Camp Stanley Storage Activity

PARSONS

J:\744\744223 B3 & AOC65\gis\b3-trench_sumps.mxd - 10/26/2006 @ 2:33:19 PM

APPENDIX B
DAILY FIELD LOGS, STATUS REPORTS, AND SELECTED PHOTOS

CSSA B-3 REMOVAL ACTION

BI-WEEKLY STATUS REPORT

AUGUST 10, 2006

The period for this bi-weekly status report is from July 24, 2006 through August 4, 2006 for removal actions and bioreactor construction at SWMU B-3. The status is listed below and includes current conditions as well as anticipated schedule. Photos have also been attached for reference.

Site personnel include:

- USA Environment – Rene Jones, Darrell Billiot, Brian Theis
- Parsons – Samantha Elliot, Ken Rice, Kyle Caskey

Executive Summary. Site conditions were sunny, hot and high humidity. All excavations and removal actions have been finalized and all soils have been properly disposed of at WMI's Covel Garden facility. Following is a summary of the final actions taken for the remaining stockpiles before disposal:

- Trench 3- Stockpiles 10 and 11 exceeded RCRA TCLP hazardous levels for benzene, and were successfully treated to Class 2 Non-hazardous criteria.
- Trench 5 - Stockpile 2 exceeded RCRA TCLP hazardous levels for lead and was successfully treated to Class 2 Non-hazardous criteria. Stockpile 9 exceeded Class 1 Non-hazardous criteria for lead and was disposed of as Class 1 NH waste.

Bioreactor construction was continued during this reporting and the Underground Injection Control (UIC) permit for the bioreactor was received from the TCEQ.

***Following is an overall summary of construction of the bio*-reactor**:

Delivered gravel and tree mulch were mixed within SWMU B-3 area to create the bioreactor material. Ten 5 foot sections of 6 inch well screen monitoring sumps were located at the low points within trench 1 through 5 and bioreactor material backfilled within the trench.

- Approximately 660 gallons of food grade vegetable oil was sprayed into trenches 1 through 3.
- Approximately 4,200 CY of gravel has been delivered on-site and stockpiled at the former SWMU B-10 area.
- Approximately 3,100 CY of tree mulch has been delivered on-site and stockpile near the gravel stockpile.
- Approximately 4,100 CY of bioreactor material (mixture of gravel and mulch) was placed into trenches 1 trough 5.

Anticipated Schedule for Next Week

- Excavation of trench 6 (clean filled) will be completed to apply bioreactor material.
- Continue bioreactor construction with the mixing and placement of tree mulch and gravel (bioreactor material).

Transportation efforts of the bioreactor material (gravel and tree mulch), will continue through August 11, 2006. The water irrigation system installation within the trenches will be initiated.

Photos of conditions/activities are provided below and include descriptions.

Trench 1 and Trench 2 looking north (Vegoil within the trenches)

Trench 1 and Trench 2 looking north (4 sumps installed)

Vegetable Oil applied to Trench 1

Bioreactor Monitoring Sump (Trench 5)

Trench 6 excavation

Vegetable Oil applied to Trench 1 (220 gallon tote tanks in trench 2)

CSSA B-3 BIOREACTOR CONSTRUCTION

BI-WEEKLY STATUS REPORT

AUGUST 22, 2006

The period for this bi-weekly status report is from August 7, 2006 through August 18, 2006 for the bioreactor construction at SWMU B-3. The status is listed below and includes current conditions as well as anticipated schedule. Photos have also been attached for reference.

Site personnel include:

- USA Environment – Rene Jones, Darren Billiot, Brian Theis
- Parsons – Samantha Elliot, Ken Rice, Kyle Caskey

- **Executive Summary.** Site conditions were sunny, hot with high humidity. All excavations and removal actions have been finalized and all soils have been properly disposed of at WMI's Covel Garden facility. Bioreactor construction was continued during this status period.

Following is an overall summary of construction of the bioreactor:

Delivered gravel and tree mulch were mixed within SWMU B-3 area to create the bioreactor material. Five foot sections of 6 inch well screen monitoring sumps were located at the low points within trenches 1 through 6 and bioreactor material backfilled within the trench.

- Approximately 660 gallons of food grade vegetable oil was sprayed into trenches 1 through 3. An additional 220 gallons of food grade vegetable oil was sprayed into trench 6.
- Approximately 5,000 CY of gravel has been delivered on-site and stockpiled at the former SWMU B-10 area.
- Approximately 5,000 CY of tree mulch has been delivered on-site and stockpiled near the gravel stockpile.
- Approximately 9,200 CY of bioreactor material (mixture of gravel and mulch) was placed into trenches 1 trough 6.

Anticipated Schedule for Next Two Week Period

- Complete bioreactor material placement within trenches.
- Install site security measures (cable fencing) surrounding SWMU B-3.
- Continue the installation of the planned irrigation system for the bioreactor.

Transportation efforts of the bioreactor material (gravel and tree mulch) are complete.

Photos of conditions/activities are provided below and include descriptions.

Trench 1 and Trench 2 looking south

SWMU B-3 looking northeast

Vegetable Oil applied to Trench 6

Bioreactor Monitoring Sumps (Trench 6)

Trench 6 excavation looking south

Vegetable Oil applied to Trench 6 (220 gallon tote tanks)

CSSA B-3 BIOREACTOR CONSTRUCTION

BI-WEEKLY STATUS REPORT

SEPTEMBER 12, 2006

The period for this bi-weekly status report is from August 21, 2006 through September 1, 2006 for the bioreactor construction at SWMU B-3. The status is listed below and includes current conditions as well as anticipated schedule. Photos have also been attached for reference.

Site personnel include:

- USA Environment – Rene Jones, Darren Billiot, Brian Theis
- Parsons – Ken Rice

- **Executive Summary.** Site conditions were sunny, hot with high humidity. All excavations and removal actions have been finalized and all contaminated soils have been properly disposed of at WMI's Covel Garden facility. Bioreactor construction was continued during this status period.

Following is an overall summary of construction of the bioreactor:

Delivered gravel and tree mulch were mixed within SWMU B-3 area to create the bioreactor material. Bioreactor material placement was completed with approximately 10,000 cubic yards of material placed into trenches 1 trough 6. Irrigation system installation was continued during this status period.

The planned irrigation system will deliver recovered groundwater from CS-MW16CC and CS-MW16LGR to each trench of the bioreactor. The water is expected to become organic rich from the degrading mulch which will create a reducing (anaerobic) condition in the groundwater bearing zone underneath SWMU B-3. The resulting anaerobic conditions are favorable for attenuating chlorinated solvents through natural processes.

Anticipated Schedule for Next Two Week Period

- Complete bioreactor irrigation system installation within trenches.
- Install site security measures (cable fencing) surrounding SWMU B-3.
- Testing of the irrigation system for the bioreactor.

Photos of conditions/activities are provided below and include descriptions.

Trench 3 irrigation piping

Spray nozzle (typical)

CSSA B-3 BIOREACTOR CONSTRUCTION

BI-WEEKLY STATUS REPORT

SEPTEMBER 27, 2006

The period for this bi-weekly status report is from September 11, 2006 through September 22, 2006 for the bioreactor construction at SWMU B-3. The status is listed below and includes current conditions as well as anticipated schedule. Photos have also been attached for reference.

Site personnel include:

- USA Environment – Rene Jones, Darren Billiot, Brian Theis
- Parsons – Ken Rice

- **Executive Summary.** Site conditions were partly cloudy, hot with high humidity and scattered showers. All excavations and removal actions have been finalized. Bioreactor construction was continued during this status period.

Following is an overall summary of construction of the bioreactor:

Irrigation system installation was continued during this status period and all trenches now have piping and spray nozzles installed for delivery of water. The planned irrigation system is expected to deliver groundwater from CS-MW16CC and CS-MW16LGR to each trench of the bioreactor in accordance with CSSA's Class V Aquifer Remediation Injection Wells (TCEQ Authorization No. 5X2600431). The groundwater will be transferred to a 5,000 gallon tank on SWMU B-3 which will be pumped to the trench(s) as necessary to facilitate the treatment of the contaminated groundwater through natural attenuation.

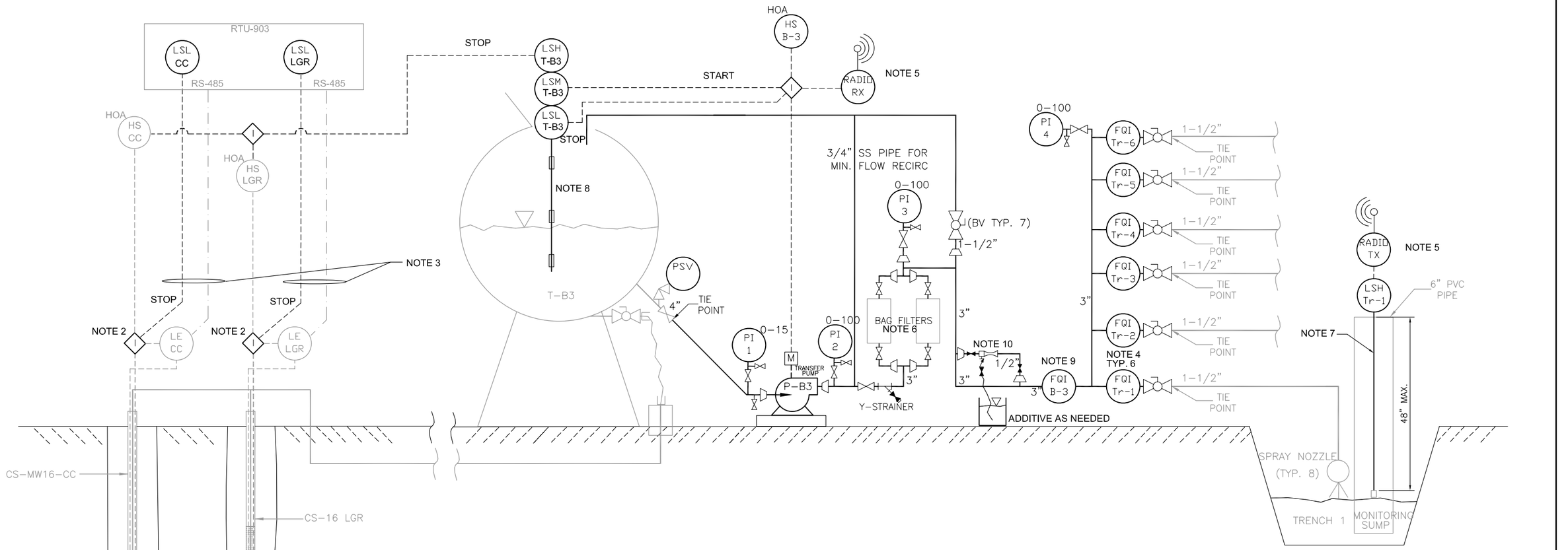
The design of the irrigation system is complete and a schematic is attached for reference. The operations and control of the irrigation system will allow continuous operations of the irrigation system while protecting equipment (pumps) and ensuring that injected groundwater remains in the bioreactor. The irrigation system is expected to be capable of delivering approximately 120 gallons per minute of groundwater to the bioreactor. The only remaining task to complete with the irrigation system is the installation of the groundwater delivery pump, the associated controls, and commissioning of the system.

Anticipated Schedule for Next Period

- Complete bioreactor irrigation system and associated controls for delivery of groundwater to the bioreactor trenches and site security measures.

SWMU B-3 Irrigation Tank

SWMU B-3 site security



NOTES:

1. USE PVC FOR NEW PIPE AND PAINT FOR UV RESISTANCE
2. ADD 12 VDC INTERPOSING RELAYS TO PUMP CONTROLS FOR LSL STOP COMMAND.
3. INSTALL 16 GA. TSP CABLES IN SAME CONDUIT WITH RS-485 CABLE FOR LSL STOP COMMAND SIGNAL
4. PROVIDE 6 SEAMETRICS (OR EQUAL) MODEL# FT415M/IP81Y-60-1.5" TOTALIZING FLOW INDICATORS.
5. PROVIDE PHOENIX CONTACT MOD# MCR-RAD TRANSMITTER AND RECEIVER IN APPROPRIATE ENCLOSURES.
6. RELOCATE EXISTING BAG FILTERS.
7. PROVIDE SINGLE POINT FLOAT LEVEL SWITCH MAGNETROL T20-DB2A-AAQ OR EQUAL.
8. PROVIDE MULTIPOINT DISPLACER TYPE FLOAT LEVEL SWITCH MAGNETROL C10 SERIES OR EQUAL.
9. PROVIDE 1 SEAMETRICS (OR EQUAL) MODEL# FT415M/IP81Y-60-3" TOTALIZING FLOW INDICATOR.
10. RELOCATE EXISTING EDUCTOR FOR AMENDMENT ADDITION AS NEEDED.
11. LABEL TANK WITH STENCIL OR PLACARD "CS-16 NON-POTABLE WATER"
12. PROVIDE PUMP P-B3 WITH A CAPACITY OF 120 GPM @ 200 FT. IN A HORIZONTAL END-SUCTION CENTRIFUGAL, CLOSE-COUPLED CONFIGURATION WITH A SOLID 316SS SHAFT (NO SLEEVES), A SINGLE CARTRIDGE STYLE MECHANICAL SEAL WITH SILICON CARBIDE-TUNGSTEN CARBIDE FACES AND VITON O-RINGS (CHESTERTON 155 OR EQUAL) AND EQUIPPED WITH AN ALL 316SS SPIRALTRAC THROAT BUSHING VERSION N, INSTALLATION TYPE A. PRE-PIPE SEAL FOR FLUSH PLAN 12. SUPPLY A 460 V, 60 HZ, 3-PHASE NON-OVERLOADING CONTINUOUS DUTY, TEFC TYPE MOTOR WITH A 1.15 SF AND CLASS F INSULATION. PERMANENTLY LUBRICATED BEARINGS WITH L-10 LIFE=100,000 HOURS.

EXISTING

NEW

PRELIMINARY DRAFT

REV.	DESCRIPTION	BY:	DATE:
A	ISSUED FOR CSSA REVIEW AND APPROVAL	HCD	9/2006

REVISIONS

SCALES SHOWN ON THIS DRAWING ARE APPLICABLE ONLY TO B SIZE DRAWING

CAMP STANLEY STORAGE ACTIVITY
FACILITY UPGRADES

Contract No. FA-8903-04-D-8675 Task Order No. 006

CONTRACTOR :

PARSONS Job No. 744223 WBS 10000

Drawing Title :

CSSA SWMU B3
BIOREACTOR PUMPING SYSTEM
PROCESS DIAGRAM

Designed : RH	Drawn : HCD	Rev: A
Checked : KL	Approved : KRR	

Scale :	Date :	Drawing No. :
NONE	SEPTEMBER 2006	P-SWMU B3

744223.10 CSSA SWMU B-3 BIOREACTOR PROCESS DIAGRAM.DWG

CSSA B-3 BIOREACTOR CONSTRUCTION

STATUS REPORT

NOVEMBER 28, 2006

The period for this status report is from September 25, 2006 through November 24, 2006 for the bioreactor construction at SWMU B-3. The status is listed below and includes current conditions as well as anticipated schedule. Photos have also been attached for reference.

Site personnel include:

- USA Environment – Rene Jones, Darren Billiot, Brian Theis
- Parsons – Ken Rice

- **Executive Summary.** Site conditions were mostly partly cloudy, hot and some rain. All excavations and removal actions have been finalized. Bioreactor construction was continued during this status period.

Following is an overall summary of construction of the bioreactor:

Irrigation system installation was completed during this status period with the initial testing of the water delivery system. The planned irrigation system is expected to deliver groundwater from CS-MW16CC and CS-MW16LGR to each trench of the bioreactor in accordance with CSSA's Class V Aquifer Remediation Injection Wells (TCEQ Authorization No. 5X2600431). The anticipated delivery rate is initially anticipated at 35 gallons per minute (gpm) but will have a design capacity of 120 gpm.

We tested the irrigation system using potable water [from a tanker-trailer] and a rental pump, and found it meets the design criteria for delivery of water to each trench. The ground cover for the trench irrigation system was installed using pea gravel to promote infiltration of rain water. Per Mr. Bryan Smith of TCEQ, the use of pea gravel was deemed acceptable as cover for meeting Class V injection permit for the site irrigation system. An operations and maintenance plan is being prepared that complies with TCEQ UIC monitoring requirements and also specifies performance monitoring requirements. Additionally, an amendment to the UIC authorization will be requested since the bioreactor was constructed in a total of six trenches instead of the five trenches identified in the original UIC authorization application. The remaining task to complete with the irrigation system is the installation of the groundwater delivery pump, and the associated controls.

Site security measures consisting of 3/8 inch steel wound cable surrounding the entire site supported by 6 foot by 3 inch diameter steel pipe, 2 feet of the pipe are below grade surface, was completed. Additionally, an approximately 2 foot berm was place on the west side of B-3 to prevent water from exiting the site through surface drainage.

Anticipated Schedule for Next Period

- Complete bioreactor pump installation for irrigation system and associated controls for delivery of groundwater to the bioreactor trenches.
- Add layer of mulch on surface of bioreactor.

Photos of conditions/activities are provided below and include descriptions.

Trench 1 and Trench 2 looking south (irrigation lines within the trenches)

Trench 1 and Trench 2 looking south (geofabric and gravel layer)

Geofabric layer in Trench 5

SWMU B-3 site looking southwest

Spray Nozzle (typical)

Water tank with rented pump

Test flow meter

Test pressure gauge (pressure reading prior to nozzles)

Test pressure gauge (pressure reading after nozzles)

Irrigation system distribution header

Trench 1 & 2 looking north (berm construction on west side)

Site security (cable fencing)

7/24/06 Monday Hot, sunny.

0700 arrive on-site. Health + Safety
insects, heat, hydration.

0800 Completed loading of Trench 5
with bioreactor material

0900 USA working on metal recycling
and demo of 90-1.

1200 Continue w/ preparation for
TCEQ Visit

1700 left site

KK

7/25/06 Tuesday Hot + Sunny

0700 Arrive on-site health and safety heavy equipment, heat stress,

USA - Rene Jones, Red
Parsons - Ken Rice, Brian Vanderglas

Today's objective back fill Trench 4 with bioreactor material.

0800 Set sump into trench 4.

0900 Brian Vanderglas on-site discussed placement on sumps. Decided to just place one sump into trench 4 and will place 3 sumps into trench 1.

1000 Trench 4 Bioreactor material placement will stop short on southend. Plan to place more material into trench 1 and 2.

1015 Abbi and Mara from TCEQ Arrive on-site for visit

7/25/06 Cont.

1130 Abbi & Mara left site.

1230 Marked w/ spray paint positions for monitoring dump.

1430 Coordinated w/ base on use of IT24 w/ forks. Eddie has it in use a Cast pasture. Unavailable till Friday.

1500 Joe O. indicated that we may be able to use backhoe w/ forks. Will have that availble in morning.

1530 USA left site

MR

7/26/06 Wed. sunny, hot, humid.

0700 Arrive on-site Health & Safety brief. Heavy Equipment, Heat Stress and truck traffic.

Today's objective - transport contaminated Soils out and gravel in with bioreactor backfill on trench 3.

0730 Spoke w/ Mr. Cedar regarding use of Machine w/ forks. Mr. Cedar indicated that there are no machine available. Work will be accomplish with rental equipment. Veg oil will be applied tommorrow Us.ing rental Equipment w/ forks attached to front-end loader.

0830 Sent draf bi-weekly Status to reviewers

1030 Final bi-weekly status for W/E 7/10 - 7/21 was sent to TCEQ, + EPA

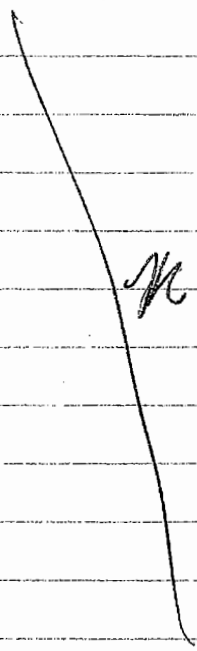
07/26/06 Wed. Cont.

11:30 Lunch

12:00 back to loading trucks, and spreading bioreactor material.

To DO:
Mr. Angel's Phone #
Hot Work permit for Bldg 90-1 demo
Lengths of HDPE
Material fabric order

14:00 left Site



7/27/06 Thur.

0700 Arrived on-site, H+S - Insects, slip, trips + falls, truck traffic.

Today's objective: Move waste soil and apply ~~Vegetable~~ oil to trench 1-3.

0800 Spoke to Letty (WMI) regarding additional ~~profiles~~ manifests for CG-44005 (Clean), CG-44040 (Oily soil) and CG-44202 (Clean). Left site to obtain manifest from WMI.

0100 Spoke w/ Sheif Wise regarding truck traffic.

- Expect to run trucks (waste), ~~tomorrow~~ tommorrow with mulch trucks.
- Expect to transport Mulch for three weeks.

7/27/06 Thursday

1100 Kyle is transporting one Veg oil Containers to trench 2.

1130 Lunch

1200 Kyle to transport remaining 2 Veg oil Containers to trench 2 + 3

1300 Rigged up Sprayer and initated Veg oil application to trench 1 (Eric)

1500 Applied Veg-oil to trench 2

1600 Applied Veg-oil to trench 3

1700 Cleaned equipment and left site.

USA	Parsons
Rene, Red	Ken, Kyle, Eric T.

(2) Loader — Sign (off-rent as of today)
Excavator
Water truck
Skid Steer

7/28/06 Friday Hot, Humid

0700 Arrive on-site - H+S - Truck traffic
Safety awareness

USA
Rene, Ted, Brian

Parsons
Ken, Kyle

Todays objective, Need rest of soil/waste to cover Cavalero, receive mulch, mix

0800 Spoke w/ Chief wise regarding truck traffic. Should be complete with truck waste hauling shortly after lunch

0900 Spoke with USA regarding ordering filter fabric and HDPE water line

1000 Met Casey Will (USA) to go over reminders of project requirements.

1130 Lunch

1230 Returned and sent e-mail regarding traffic expected with mulch (7/31 - 8/11)

7/26/06 Court

1300 Ken left state

7-29-06 BLDG 90-1 KKC

0630 USA CREW ARRIVES.
* TODAY'S OBJECTIVE:
DEMOLITION OF BLDG 90-1.
* SITE PERSONNEL
KYLE CASKEY - PARSONS
RENE JONES
BRIAN THEIS - USA
RED
* SITE EQUIPMENT
FRONT END LOADER
SKID LOADER
CUTTING TORCH
BACK-HOE & FIRE TRUCK
* H+S BRIEFING
1. CUTTING TORCH SAFETY.
2. WEAR PROPER PPE
3. HEAVY EQUIPMENT SAFETY.
0645 START DEMO
1400 DEMO COMPLETE, LEFT SITE
- 2 BOXES OF DEBRIS LEFT FROM DEMO. TO BE PICKED UP TUESDAY

7/31/06 B-3 Bioreactor Installation

0730 - Arrive at CSSA

- personnel: Sam Elliott (Parsons)
(0630) Rene Jones, Red Bilot (USA)
- Health + Safety Tailgate: Heat Stress, Heavy Equip.
- weather: 70 - 98°, partly cloudy
- today's objective: mix mulch + gravel, Rene to pick up PVC for well screens
- water truck to be cleaned up and picked up - off rental today
- Equipment: Loader (2)
excavator (track hoe)
water truck (out today) off rent Friday
skid steer - off rent, pick up Wed or. Thurs.
~~track hoe~~ (SV)
- 3 mulch trucks today only, Rene called to complain to mulch company

1500 - USA leaves site

J. Elliott 7/31/06

8/1/06 B-3 Bioreactor Installation

0630 - personnel: S. Elliott (Parsons)
Rene Jones & Red, ~~& Brian~~ (USA)

- Health & Safety Tailgate: pinch points
- weather: 70-95°, hot & sunny
- today's objective: mix mulch, haul in mulch, install sumps in T1 & T2
- spoke to Rene about trench & excavation for tomorrow, gonna try to get pics or GPS point to pin point the spot

1530 - USA leaves to pick up supplies for bullet trap cleaning tomorrow morning (8 hours)

- equipment same

1 operator
1 super
1 Trackhoe
1 Skid Ster
1 Loader
other loader on mulch

8/1/06

8/2/06 Bioreactor Installation

~~0630~~ (4) 0700 - personnel: S. Elliott (Parsons)
Rene Jones, Red, + Brian (USA)

- weather: hot + sunny 70-100°
- Health + Safety Tailgate: heat stress, bugs, heavy equipment ops.
- today's objective: continue mixing mulch, clean ballet traps in East Pasture, set sumps

1130 - dug slit trench to determine where trench 6 is, see photos
- filled trench back in; too close to the road; safety hazard for trucks delivering mulch
- took track hoe off rent for now, it will remain at the site for a week

1400 - mulch continues to be delivered and mixed
Rene off-post to pick up more caplings for sump installation

0430 - USA leaves site 2 hours range, 8 hours 8-3

8/2/06

Equipment
1 Supervisor (8)
1 operator ~~(10)~~ 9
1 tech ~~(10)~~ 9
1 Skid Ste
1 loader
other loader on mulch
1 Trackhoe

8/3/06 Bioreactor Installation

- personnel: S. Elliott (Parsons)

0630 Rene, Red & Brian (USA)

- weather: hot & sunny 75-100°
- Health & Safety Tailgate: precaution when heavy trucks are unloading
- today's objective: continue receiving mulch, mixing, and installing sumps
- equipment: loaders (2)

1300 - just got ahold of Gardenville, no mulch trucks today, promised 5 trucks tomorrow

- all 4 sumps have now been installed in Trenches 1 & 2
- 2 sumps ~~remain~~ (8) still to be installed in Trench 3

1630 - USA leaves site

1 super (10 hours)
1 operator "
1 tech "
1 skid ster
1 loader
other loader on mulch

S. Elliott
8/3/06

8-4-06 B-3 KKC

0730 USA ARRIVES
* TODAY'S OBJECTIVES
1. MIX MULCH
2. PLACE MULCH
* 3 TRUCKS *
* CREW
Kyle Caskey
Rene Jones
Red
* H+S TAILGATE Meeting - CAUTION while DRIVING LOADERS over UNLEVEL TERRIAN
* SITE EQUIPMENT
2 LOADERS, & skid steer
0745 START WORK. KKC WILL BE ON SCADA most of the DAY.
1300 ONLY got 3 trucks of MULCH in today. Rene SHUT down the JOB due to LACK of TRUCK
8-7-06

8/7/06 Bioreactor Installation

630 - personnel: USA - Rene, Brian, Red
Parsons - S. Elliott

- weather: rained last night, 75-90° 60% chance of rain this afternoon
- Health & Safety meeting: slips, trips, & falls; operating heavy equipment when its slippery
- Today's Objective: place mulch in trenches, haul in mulch & mix
- Equipment: 2 loaders (one on mulch)
  skid steer
  1 super
  1 operator
  1 tech
- received 4 mulch trucks today

1600 - USA leaves site

S. Elliott
8/7/06

8/8/06 Bioreactor Installation

0630 - personnel: S. Elliott (Parsons)
Rene, Red, + Brian (USA)
- weather: 75-95°, humid hot, did not rain last nite as forcasted
- Health + Safety: lift twice, use leggs
- Todays objective: receive mulch trucks, mix mulch + gravel, fill trenches
- Equipment: 2 loaders (1 on mulch)
1 skid Steer
1 supervisor
1 operator
1 tech

1130 - spoke to Roy Thomas the City Administrator of Fair Oaks about mulch they have to get rid of, its about a year old, gonna run it by Ken + John Hall to see if it would work approx. 300^3 yds per K. Caskey
- Rene went by to look, he says ~ 700 cu. yds.
- R. Thomas - 678-0900
- decided its too late in the project to set up moving mulch from Fair Oaks
- 9 truck loads of mulch today, 2 loads were 90^3 yds

1630 - USA leaves

S. Elliott 8/8/06

8/9/06 Bioreactor Installation

- personnel: S. Elliott (Parsons)

0630 Rene, Red, & Brian (USA)

- weather: humid & hot 75-99°
- Health & Safety Meeting: electrical hazards
- Today's Objective: receive mulch trucks, mix mulch & gravel, fill trenches
- Equipments/Ops.: 2 loaders (1 on mulch)
  1 skid ster
  1 supervisor
  1 operator
  1 tech
- Vanderglas out to see site
- went by to look at Fair Oaks mulch again, the turn to get the trucks in the gate is way too tight, not feasible with the trucks drivers we use

1600 - USA leaves site

S. Elliott
8/9/06

8/10/06 Bioreactor Installation

- personnel: S. Elliott (Parsons)

0700 Rene & Red (USA)

- weather: 95-99° humid & hot
- Health & Safety Meeting: heat stress
- Today's Objective: mix last of mulch, install last of sumps
- Equipment/Ops.: 2 loaders (1 on mulch)
  1 skidster
  1 supervisor
  1 operator
- continue mixing last of mulch, may start trench 6 after lunch or 2morrow morning
- lunch

1415 - Red went home, he had a really bad headache

- Rene stayed and mixed mulch for a while

1530 - Rene leaves site

S. Elliott

8/11/06 Bioreactor Installation

- personnel: S. Elliott

0700 Rene, Red, + Brian (USA)

- weather: 75-100°, humid + hot
- Health + Safety Tailgate: heavy equipment operations
- Today's Objective: dig Trench 6
- Equipment/Ops: 2 loaders (1 on mulch)
  1 skidster
  1 supervisor
  1 operator
  1 tech
  Trackhoe free today per Rene

* Rene spent 1 hour changing filters on another TO *

- dug about 50 ft. of trench, looks like it is turning east instead of west as indicated in photos, will stop for today so Ken can look at it Monday b4 we proceede.
- barricaded roads to site, parked equipment around hole at T6, notified security that large hole will be left open over weekend

1415 - USA leaves site

S. Elliott

8/14/06 Bioreactor installation Sunny, Hot, Humid

Personell: Rene, Red, Brian USA
Ken Parsons

Site Objective Continue w/ Bioreactor Mixing and installation. Apply Veg oil to trench 6 and continue excavation of trench 6.

Equipment: Loader(2) (1 on mixing)
Excavator

0630 Arrive on-site: Health and Safety heavy equipment, hearing protection, heat stress

0900 Apply Veg-oil to trench 6

1300 Geofabric arrives and received by USA Tolerca to B-3, Discussion w/ Tim Oak Community regarding Mulch.

1500 Ready AOL-70 (Bldg 66) for pressure washing.

1630 left site

MR

8/15/06 Bioreactor Installation & AOC 70 efforts

0700 Arrive on-site Sunny, Hot, Humid, Same personell & equipment as 8/14/06

Object: Continue w/ Bioreactor mixing and placement and pressure Wash Bldg 66 (AOC-70)

0800 Set up and initiate AOC-70 Cleaning

1000 Sample AOC-70 Rinsate for Herb. / Pesticides and total lead.

1100 Sampled Collected Wash water for TCLP Herb/pesticides and lead.

Sampled Bldg 90 paint chips from flooring (Tom T. @ 1100 8/14)

1500 Sampled B-34 for TCLP lead. Sampled AOC 70 — WC1 (Waste Characterization).

1530 Sampled Creosote Management area (near AOC 54) for total SVOCs.

1600 left site

8/16/06 Wed. Hot, Dry 100°F

0830 Arrive onsite, Crew not at B-3 Site. Casey / Neal / Rene @ East Pasture. Brian T. on-site later today

Objective: backfill trench 6 w/ Bioreactor material

	USA	Parsons
	Rene	Ken
Loaders (2)	Red	
	Brian	

0845 CSSA meeting (G, S, T, B, C, Ky, Sam, T)

Chris B. - Cast pasture activities

Brenda - Removing 2 AST (Bld. 200 & Bldg 45)

210-296-5298 Casey Wills - Review work by Clean Harbor

Sum on GW reports & changing Gac filters

SCADA - All towers & housing units in. Meters are next and will need lots of coordination.

8/16/06 Wed. (Cont.)

Julie/Brian V. needs to look into purchasing Chlorination skids.

Look into letter to TCEQ regarding Creosote Mgt. area. - Julie.
No further Action

1000 Talking into Fair Oaks mulch for possible delivery to B-3 bioreactor

1200 lunch

1400 left site

8/23/06 Uniform Waste Manifesting Training

No work @ B-3 8/17 - 8/22, Crew @ east pasture
Arrive on-site 0745
plan for B-3 is to move bio-reactor material into trenches, (2) loaders Rene, Red, Brian.

0900 Uniform Haz. Waste Manifest training @ Residence Inn downtown SA.
Objective (For WMI Website)
1. Regulatory Compliance Topics
within WMDisposal.com topics are provided addressing regulatory Compliance.
e.g. D003 waste codes what, how, etc.

2. Ready Access to FAQ
e.g. Where are WMI facilities located
? pricing included

3. Streamline Profile forms
? does the suggested analysis have to be completed as suggested.

4. Expedited Profiles
done in electronic form (html for entry) pdf in view. Additionally will have Electronic Signature available and ability to attach Lab data.

8/23/06 Cont.

4. cont. e-Signature efforts are inplace on the WMDisposal.com website and has the ability to transfer to other users in the event of a personnell change.

? Multilevel sort profile # / State / Approval

Dr. Charles Lowery on Uniform Haz Waste manifest.

Goals.

How will:

manifest affect you: designated by EPA + DOT

- designated for Haz. + Nt 1. Twenty items to be completed. The new manifest is a simpler document to complete

- Standardize content in appearance + content. define tracking procedures for rejected Waste and container residues.

- Enable electronically - Not happened

8/23 Cont training

Final Rule - March 4, 2005 + effective 9/6/2006

Revisions - EPA + DOT bulk containers 110 gal - 119 gal
Whole numbers on volumes

Generator # EPA - Haz. -
State Gen. - NH
if together EPA goes in #1 State in #14

#2. add continuation sheet, never leave blank

#3. Emerg. response - add for entire load if not. place NA + record in Line 9b

#4. Manifest #. - EPA registered + approved to generate #. 9 numerical & 3 characters (only from authorized printers).

#5 Generator detail phone # must be available 24 hrs./day to get to persons responsible

#6 Transporters. - EPA id # - Haz State id # NJ
Mixed State id in #14

5/27

≠ 8 designated Facility

#9. DOT trained personnell only to complete.

#9a HM - as defined by DOT place an 'X'

#9b Shipping Name - proper shipping name as defined by 49 CFR 172. name, haz. class, ID#, and packing group.
Reportable Quanity (RQ) exceedance can be placed on #9a.

#10. If same waste in two or more types of containers then use additional liner to specify containers.

#11 Total Quanity - 1. Must be whole number.
~~with dot~~ 2. Cannot use container size.

#12 Units. - Table II
Do not use higher #'s for lower weights
i.e. 1 Ton use 2,000 lbs.
Also. Gallons or Liters for liquids only
Estimates are ok just use whole #'s
No discrepency. if less 10% over, or
# of drums accurate; No need to
be accurate on weight #.

4001 309 H

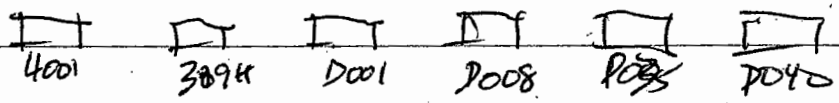
D001 F, K, U, P
↓
D004 ?

8/23

#13 Six boxes

State of Texas Waste codes on first two boxes (i.e. 4 digits/box). That leave 2 for EPA. Generator must pick most representive of the Waste. That is, Max of 6 waste codes. Block 14 is designated for id of proper shipment.
Must communicate w/ disposal facility if more Waste codes then allowed or permitted.

#96. If Emerg. Response #



F001 Solvent
~~D035~~ PCE
D040 ~~Tce~~ D008 lead
D001 - Ben
4001309H

#14. RACM load has to have transporter address

8/23

#14 rejected loads where disposal facility places old manifest #'s

#15. Generator's Certification
LQG - certifies Waste Minimization plan and selected best disposal methods.

SQG - Certifys

Exception Reports. - 35 days Not in hand
Call disposal facility
45 d or 60 days - send Report to EPA.

Transporter Rep
1. Review 1-15 for completness

"No discrepiencies" Pain in the butt.

#18 Discrepincies - all necessary discrepeincy are id. rejected loads are requir to put (see 40 CFR 264.72)

#19 All manifest are signed and disposal codes applied by disposed facility

8/23 Cont.

Discrepancies,

Drums, gallons.
Batch only Count, Bulk 10% of total Weights.

Load Rejection

1. Residue - greater than RCRA empty. New manifest created by disposal facility.

2. Partial load rejection - new manifest.

3. Full Reject. - if transporter on-site can use original manifest. if not - new manifest

At Sub-Title D facilities rej. must occur before load is received.

1330 Arrive back on-post met w/ Glaze regarding B-3 Work.

1500 left site.

8/24 Bioreactor Installation / Misc. efforts

0700 Arrive on-site: Rene, Red, Brian.

Bioreactor fitting efforts completed late 8/23. Rene

Objective: Manage / Load Bldg 47 into Roll-offs for disposal. (LG-29508 (-9))

Health and Safety: Current stockpiled material from Bldg 47 (accomplish by CSSA) is under electrical lines. Electrical Hazards, Heat stress, Heavy equipment.

0800 CSSA personnel on-site @ Bldg 47 to finish Demo work. Manifest for 2 boxes provided to USA.

Equipment: (USA) Loader (CSSA) (2) Backhoe - Breaker

personell: Rene, Red, Brian.

900 Rene (USA) Working on sizing material for shipment to WMI. Breaker ram developed leak at seal. Schedule for repair

8/24 Cont. Misc.

1000 First truck arrives to pick up Demo material from Bldg. 47. Dropped additional roll-off.

1200 Second load picked up for transport to WMI, USA in East Pasture.

Received results from AOC 70 Rinsate 1 sample. Analytical results indicate ~~that~~ No residual PDE, DDT and Herbicides remain.

Scheduled for re-cleaning on Tuesday 8/29.

1400 left site. No-work on B-3 scheduled for 8/25 or 8/28 (Mon.) (Fri.)

8/29 Bioreactor Installation Clear, hot.

0700 Arrive on-site

UST	Parsons
Rene, Red, Brian	Ken

Health and Safety: Heat exhaustion, fluid intake.

Equipment: 1 loader

0730 UST initiated irrigation pipe installation. Ken to work Bldg 66 (AOC 70) and collect Rinsate Sample.

1130 Lunch - Borgers

1200 Continue with irrigation system installation

1600 UST left site.

8/31/06 B.O. reactor Installation

0730 Arrive onsite

USA — Parsons

Rene, Red, Brian — Ken

Eq: (1) Header

Health and safety: Small tool (hand on)
Safety moment,

0800 Scheduled spray nozzle installation on 10' centers within each trench. Rene to build pad for line from tank

0900 Worked on PR for additional funding for USA and cost tracking spreadsheet

1130 met w/ Casey + Renee
lunch

1300 left site

M

9/5/06 Bio-reactor Installation

0900 Arrive on-site ~~weather~~ rain.

USA	Parsons	Equipment
Rene, Red	Ken	Mini Excavator (backhoe)

0930 due to steady rain work was called off for today.

1000 returned to office to prepare paperwork on project related requirements.

1130 lunch

1230 Continued w/ B-3 documentation and material receiving paperwork.

1400 left site

JR

09/86 Bioreactor installation Clear, 70°F

0730 Arrive onsite

USA — Parsons

Rene, Rudy, Brian — Ken

Health and Safety moment for insect avoidance and back safety.

0800 Rene left post to receive additional parts for irrigation system.

1200 USA & East Penthouse

09/07 Bioreactor Installation Clear, Cool, Dry

0730 Arrive on-site

USA — Parsons

Rene, Red — Ken

Equipment: Mini excavator

Plan to work on irrigation system installation.

1200 Kirk Lawson Site Visit

1430 left Site USA to leave 1500.

KR

09/01/06 Bio-reactor Construction rain, cool

0700 USA Changing Filters at Bldg 90.
(Rene, Red, Brian)

0900 USA at B-3 installing flow emitters

1200 Work stopped due to rain

1400 Met with Roy Thomas (Fair Oaks Mgr) regarding potential mulch delivery to CSSA. Mr. Thomas indicated that he has an operator and a backhoe available to help. However he has no transport available, but he is ok with any schedule with a couple of days notice. Mr Thomas also indicated that in a couple of weeks there should be an additional 200 cy of fresh mulch added to the pile and it's ours if we want it. I told Mr. Thomas that I would get back to him regarding schedule,

1630 left site

MR

9/12/06 Bio-reactor Construction overcast, hot

0700 Health and Safety: heat stress and fluid intake.

Objective: Continue to install emitters in remaining trenches 4, 5 and 6.

Mini excavator ½ day (afternoon)

0800 loader still off rent for a couple more days.

1000 emitters installed in all trenches working w/ min excavator to dig holes for emitters to be placed into

1400 Water levels.

T6 - MS (South) 1 inch
T5 - MS (South) 2 inches
T4 - MS 1 inch
T3 - MS (South) 1 inch
T2 - MS (North) 1 inch
T1 - MS (North) 1 inch

1630 Left site

9/13/06 Bioreactor Installation Clear, Sunny, hot

0730 Arrive on-site

Rene, Red, Brian Ken

Health and Safety: hand tools, power tool safety.

Mini excavator

Objective: Complete water line installation

0930 Mini arrive on-site - previous one now located in East pasture.

1000 Rene left site for training efforts. Brian and Red still available. Chris GPS surveys and trench 6.

1306 Crew completing trench work for delivery pipes to trenches.

1400 Left site

RL

9/22/06 Bioreactor Installation Clear; Warm

0930 Arrive on site. Crew at B-3 working on site Security Measures

Crew - Rene, Red, Brian Larson

Objective - Continue install cable fencing.

equipment 1 loader 1 tractor

0900 Rene off site for job supplies
Red + Brian to load rolloff for disposal on TO 209

1100 Back on B-3

1330 Called Chip Bolling to set up review for Hot Work permit 210-295-7600
Teresa B. 210-336-1225

1400 Set up Water truck for Hot work tomorrow

left site

9/23/06 Bioreactor Construction Cloudy, Cool

Arrive 6:45 am

Safety Meeting : USA Red, Brian T. Parsons Ken

Fire Safety: Lined out work for cutting holes in post. Brian T will be operating cutting torch and Red will be fire watch.

Fire extinguisher (2) on-site

Water truck on-site

Brian to start on SW corner going east (toward T6) then move to far West (Near T1) to cut on posts.

Objective: Cut holes in post for cable fencing clean site.

Equipment: loader

0830 Performed porosity experiment

T1 - 1/5 gal mulch / 2.5 gal water = 50%

T2 - " = 50%

T3 - 1 gal mulch / 2.21 gal water = 48%

T_4 - 5 gal mulch / 2.4 gal water = 48%

T_5 - 5 gal mulch / 2.5 gal water = 50%

T_6 - 5 gal mulch / 2.52 gal. water = 51%

Average Porosity ~ 50%.

9:00 USA preparing to use Cutting torch.

0930 Site visit w Glare and Stephanie noted Asphalt material in soil re-use pile.

1330 left site

KR

9/29/06 Bioreactor Construction

Sunny, Warm

0700 USA Arrived onsite

Rene, Ned, Brian

Object - finish Cable fencing

0930 Ken and Brian arrive on-post spoke with Rene regarding site visit plan.

1000 Site tour with T3M #4 participants

1030 Review new AST site

1100 Returned to meeting

1400 Meeting Adjourned

Rene + Company completed B-3 Cable fencing.

1430 Left Site

TM

10/2/06 Bioreactor Construction

0900 Arrived on-site w/ USA

Objective: Weld entrance/exit on Corner posts and complete out Monitoring Sumps.

USA: Parsons

Rene, Red, Brian Ken

Safety Brief: - Hot work issues

Completed Emergency / Non-routine Hot Work checklist for welding work.

1030 Reviewed planned activities, complete temporary Hookup of tank with rented pump. Anticipate commissioning System on Wed. Casey to look into renting gas powered pump Capable of 120 gpm discharge.

1300 Left site to get materials for tomorrow

↑ Ur

10/3 Bioreactor Installation (~~Tuesday~~) Clear, Hot

0730 Arrive on-site prepared for objective

Objective - Fill water tank @ B-3 w/ fire water. Install header system (Temp.) for water distribution

0800 VSA on-site Rene, Reed, Brian J.

0900 Rene off-post shopping for supplies (Pvc pipe and fittings)

Reed + I configure GAC unit transfer line to bring water from 'horse neck' (fire water) to GAC bldg. then backflow toward tank in Well transfer line. Using 1½" fire hose and backflow preventer.

1330 Initiated tank filling, working good.

1400 Header system configuration complete w/ all six trench irrigation lines completed into header

1500 VSA left site

10/3 (cont) Bioreactor Installation.

1530 Tank full - disconnected fire hose from horseneck water line and removed backflow preventor. Returned unit (backflow) to original location near Bldg. 31. El. notified of unit return.

1630 left site

10/4 Bioreactor Installation (wet) pt. Cloudy, Warm

0800 USA ARRIVES on-site to start today objective:

Objective Complete hook up of pump (rented) and transfer line to trench irrigation system header. Iniate irrigation system test.

1000 Ken arrives on-site; Safety briefing on pump operation and physical hazards of irrigation system.

Samantha GPS coordinate gathering for spray nozzels in each trench, corner posts of cable fencing and sump locations.

1230 USA initate site cleanup of old trash and hose near tank

1330 Initiated water irrigation through each trench for visual confirmation

1600 Completed testing (visual); need cleanout of nozzles in trenches 3 and 5 and 6.

1700 left site

10/5 Bioreactor Installation (Thur.) clear

0900 Arrive on-site; Safety percautions on small engines and pressurized lines.

Objective: Continue to test and go irrigation system

USA: Rene, Red, Brian
Parson: Ken, Samantha

0900 USA replacing nozzles which had blockage

Trench 1 - 34 nozzels
Trench 2 - 34 nozzels
Trench 3 - 32 nozzels
Trench 4 - 16 nozzels
Trench 5 - 24 nozzels
Trench 6 - 19 nozzels - note 4 @ 2.5 gpm @ 35 psi

159 nozzels

Nozzels rate for 1.6 gallons/min. @ 35 psi

Added 1 nozzel to T6 within Northern part.
Now total is 160 nozzels

10/5 cont..

0930 Tank running low (1/4 full) need additional water for pressure test

0945 Start filling tank from CSSA water line (notified Elk of intent permission granted)

1000 USA Completing sump build out

1100 Completed filling tank

1130 Lunch

1200 Start testing T1 plan to take Pressure and flow, P_{N1} = Pressure North end Trench 1, P_{S1} = Pressure South end of Trench 1, F_{W1} = Flow @ P_{N1} for Trench 1

1230 Trench 1 - 34 nozzles @ 1.4 gpm

F_{W1} = 48 gpm : 47.6 gpm

P_{N1} = 30 psi

P_{S1} = 24 psi

Three nozzles leaking, repaired on spot. Looks good

10/5 Cont.

Trench 2

F_{W_2} = 44 gpm — 34 nozzels @ 1.4 gpm @ 30 psi
P_{N_2} = 30 psi — ≈ 47.6 gpm
P_{S_2} = 22 psi — note Valve on end of trench leaking (~~stripped~~ tpk), O ring pinch

One nozzel leaking → corrected in field

Trench 3

F_{W_3} = 44 gpm — 32 nozzels @ 1.4 gpm @ 30 psi
P_{N_3} = 30 psi — ≈ 44.8 gpm
P_{S_3} = 24 psi

~~Two~~ nozzels leaking - corrected in field

Trench 4

F_{W_4} = 26 gpm — 16 nozzels @ 1.6 gpm @ 35 psi
P_{N_4} ≈ 35 psi — ≈ 25.6 gpm
P_{S_4} ≈ 30 psi

No leaking nozzels

Trench 5

24 nozzels

F_{W_5} = 33.5 gpm
P_{N_5} ≈ 30 psi
P_{S_5} ≈ 26 psi

10/5 Cont.

Trench 6 20 nozzles w/ 4 nozzels @ 2.7 gpm @ 35 psi
16 nozzels @ 1.6 gpm @ 35 psi

Q_{W_6} = 34 gpm

P_{N_6} = 37 psi

P_{S2} = 27 psi

No leaks

1400 USA Cleaned site and left site.

1430 Site visit w/ Brian V. and Bob Edwards to review irrigation system.

1500 Meeting (scheduled) w/ Bob, Brian and Steve.

1530 Ken left site

Notes from Meeting:

Assumption: Migration will be Vertically and be in reducing Conditions.

note:
USA on-post to remove water pump to front gate 10/6. KM.

10/9 Mon. Bioreactor Construction

Cool, Clear morning; Warm afternoon

0730 Arrive on-site USA crew changing pre-filters at Bldg. 90

0800 Objective: Fill holes located at nozzels with rock

Equipment; loader

Brian, Red, Renek - Ken

0900 Crew on B-3 working to fill objectives

Ordered a mini excavator for tomorrow to help with cover work expected to start tomorrow.

1200 Lunch

1330 First trench complete, working on second trench

10/9 Cont. Bioreactor Construction

1430 Continue w/ backfilling of pea gravel in trench 2.

Removing testing equipment and storing in GAC building (TPDES outfall 02)

1530 left site, USA continuing to work

10/10 Tuesday Bioreactor Construction

Overcast and Rain expected

0800 Arrive on-site USA already on-site

Safety: Working in adverse weather conditions; heavy equipment

USA - Rene, Red, Brian
Parsons - Ken
Equipment - Loader, Mini excavator
Objective - Continue to fill holes w/ pea gravel and dig electrical trench from pole to tank and 1st Sump in trench 1

0900 Completed backfilling holes in trench 2 with pea gravel.

1000 USA loaded roll-off with leaded copper material for recycling.

1030 Rain

1130 USA left site

10/11 Wed. Bioreactor Construction

0700 Arrive onsite: Weather pt. Cloudy, cool - turn to sunny in afternoon

0730 USA Rene, Red, Brian T

Safety: Buck safety working with hand tools

Objective continue to fill in trench spray nozzle holes with rock.

0800 Equipment: Loader, mini excavator

Working on trench 3 rock placement

1000 Completed trench 3 + going on to trench 4.

~ to ~~0900~~ - Glare Questioned if purged GW from CS-09 has to be managed. Indicated that it probably does in accordance with RFI from WMP and can be managed thru sump outfall 001

Called Abbigail at TCEQ to discuss appropriate management methods.

10/11 Wed. Bioreactor Construction

Mobi will receive specific work planning for GW from CS-9 (lead, mercury) and purge details of Compliance with CSSA discharge 001 permit limits.

1130 WSA Completed trench 4 going onto trench 5

1200 Lunch

1300 TO-209 - following is example of CS-09 purge water management

Given: CSSA CS-9 GW = ~~0.45~~ 45 mg/l of Pb

Discharge 001 rate 6000 GPD

Purge water = 1,200 G

Discharge limitation (70%) for lead : 21 mg/L Average

0.006 MGD x 45 ppm x 8.32 lbs/Gall = 2.25 lbs/Pb

2.25 lb/lead % 8.32 lb/gal X 0.0072MGD = 0.001944 ppm

∴ Discharge in Compliance.

10/11 Wed. Bioreactor Constr. Contd

1400 USA almost completed trench 5 backfill expecting to complete trench 5 and 6 backfilling by End of day.

1930 Plan to start to install geofabrick material on trench 1 + 2 on Thursday and cover with rock

Ken Rice left site

10/16

Note USA on-site with mini excavator and loader on Thursday 10/12 + Friday 10/13 installing geofabrick liner.

10/16 Mon. Bioreactor Construction. Rain, wet

0900 Arrive on-site USA already in progress. Safety moment, Lightning Avoidance and working in wet slick conditions (just don't mess w/ either)

1000 USA working on trench 2 and are spreading soil between trench 2 + trench 3 over the geofabric & pea gravel material

1100 Rain cont. Called work off for the day. Spoke w/ Glare + Bob regarding potential sampling req. for B-3. meeting on Thurs. 10am

1300 Worked on Bioreactor paper work. for QC plan

1500 left site

Equipment: Mini excav. + Loader

USA Rene, Red, Brian, Person Ken

10/12 Tuesday Bioreactor Construction clear, cool Warming

0730 Arrive on-site
USA - Rene, Red, Brian T.

Objective Continue with pea gravel cover on trenches 1 + 2.

0800 Rene + Ken reviewing USA invoicing for month of Sept.

Safety: Working around heavy equipment.

Equipment: Mini excavator, Loader, Skid steer 190 Skid

0900 ~~Called Pat~~ Shut down covering activities and continue with just pea gravel cover. Brian V to call Bryan Smith at TCEQ regarding UIC cover requirements

1000 Cont. Working on pea gravel cover of trench 1+2

1130 Lunch

1230 Crew Continues to spread gravel over trench 1.

10/17 tue. Cont.

1400 USA finished gravel placement on trench 1, Working on fabric Placement for trench 4.

1600 Completed fabric Placement for trench 4. moving on to trench 3 then to trench 6. Schedule trench 5 for last.

1700 USA continue with fabric placement appears we will have enough fabric and pea gravel.

1830 KR left site USA continueing till dark.

VR

10/18 Wed. Bioreactor Construction Clear, cool
Warming expected

0730 Arrive on site - USA personnel
Rene, Red, Brian T. - Equipment Service 10/12

Safety - Working in hot weather and
heavy equipment

Objective - Complete fabric placement
in Trench 6 and Trench 5 and
cover fabric w/ pea gravel.

0830 Rene indicates we should be complete
with fabric placement and cover. Still
waiting on correspondence from Bryan
Smith on UIC cover system required.

0900 Meeting w/ CSSA and Parsons for
work efforts.

- Julie to provide Memo on requirements for
Public water supply system for CSSA.

- Finalize TO207 - GW monitoring WP
Fish & Wildlife burn management plan.
UXO Management issues -
Clearance of road and EP.

10/18 Wed. (Cont.) Bioreactor Construction

- Nov. 17 - Dec. 4th EP Berm & East Outer Road and UXO training to occur

- Teresa to provide Chris with report on Lead & Asbestos Survey on Bldg 78 (Welding shop near Motor pool).

- Stephanie to send DHL report on effluent results dated Oct. 11, 2006. to Ken.

- Julie to schedule meeting with Bob Brinkman next week for issues on qtrs 11.

- SVE sampling @ AOC 65 this friday.

- Do Posters!!! for meeting.

1030 USA Completed fabric placement in all trenches.

1130 lunch

1200 USA applying ~~fabric~~ Tire pea gravel in trench 5.

10/18 Wed. Bioreactor Construction

1330 Brian Vanderglas called and indicated that pea gravel is sufficient cover for UIC permit conditions. Bryan Smith (TCEQ) indicated that the nozzels just need to be covered.

1300 USA continues to place pea gravel

1330 left site

TR

10/19 Thurs Bioreactor Construction Cool, pt. Cloudy

0730 Arrive on-site USA Jesse and placing gravel on trench 5.

USA - Rene, Reed, Brian T.
Equipment Mini Excavator, Loader, Skid Steer

Objective: Continue to place pea gravel ~ 4-6" thickness on bioreactor material in each trench

0900 Complete pea gravel installation on trench 5.

Observed water levels in trench 1-3 and trench 6-1 dumps

trench 1-3 ~ 3" of water
trench 6-1 ~ 4" of water

Water is warm

1000 Placing gravel in trench 3. Meeting to discuss Bioreactor Sampling RSVer in Ulm. w/ Bob Edwards + Kirk Lawson.

10/19 cont.

1100 meeting w/ Bob Edwards, Chris Beal, and Kirk Lawson, Samantha ~~Edwards~~ Ker

- Bob discussed the PHC requirements for sampling at Wells and Sumps

- Site Visit

1150 Record g.w. parameters at Bioreactor Sumps 1-3 & 6-1

	1-3	6-1	6-1 (2nd)
Temp	27.4	28.5	24.5
SC	2.107	0.669	0.773
DO	2.75	3.5	2.91
pH	6.72	6.4	6.38
ORP	-118	—	-91.8

Discussed which ~~well~~ bioreactor sumps to test for DHE (Dehalococcoides ethenogenes)

1) Sump 1-2
2) WB-05
3) MW-1

} Do these now

4) ~~Sump~~ Sump 6-1
5. Sump 4-1

} Do these later

10/19 Cont.

1245 Lunch

1430 Kirk Lawson continue with discussions on B-3 sampling and monitoring. Ken off-post.

Note:

USA on-site placing gravel over filter fabric and initiating construction of berm on West side of Trench 1 on 10/20, 10/23 + 10/24.

- Equipment: Mini, Skid Steer, Loader
- personnell: Rene, Red, Brian T.

10/25 Wed. Bio reactor Construction Rain

0700 Arrive on-site
Safety; working in adverse weather
Ust, Rene, Brian T. Equipment: Loader, Mini Excavator

0800 Site too wet to continue with berm construction. Moving on to Pump test of irrigation system

1000 Pump plumbed

1030

Trench 1	Trench 4
F_1 43 gpm	F_4 = 26 gpm
P_{N1} = 28 psi	P_{N4} = 32 psi
Trench 2	**Trench 5**
F_2 = 43 gpm	F_5 = 34 gpm
P_{N2} = 28 psi	P_{N5} = 32 psi
Trench 3	**Trench 6**
F_3 = 42 gpm	F_6 = 46 gpm
P_{N3} = 24 psi	P_{N6} = 26 psi

1430 Collected CS-9 purge water for VOC, SVOC, Total metals & PCBs

10/25 Weld. Bioreactor Construction

1300 USA Off-site

1500 left site

Note: USA rained out thursday 10/26. and off of Friday 10/27.

10/30 MR

MR

10/30 Mon. Bioreactor Construction

Cool, Clear

0700 USA Arrived on-site

Objective - Complete berm build and start on pipe header system.

USA: Rene, Red, Brian T
Parsons - Ken

Equipment, Loader, Mini Excavator

0930 Ken Arrives on-site; discussed objective for week.

Anticipate Berm Completed by 10/31 and Underground conduit ~~to be~~ Completed by Thurs. 10/4. Pipe Header should be completed by end of day Today.

1000 Spoke with Henry Drew on Underground Utility work anticipated by USA. Procurement package to SCI for B-3 Bioreactor control is to include only Above ground efforts. USA will perform Underground work.

10/30 (Cont.) Bio reactor Construction

~~11:45~~ lunch - Hot work permit.

12:30 Spoke to Scott Pearson on work with USA in support of SCI.

1400 4" pipe Support Cut and Welded working on holes in support for 1 1/2" down pipes.

1430 ~~Left~~ Left Site

Note:

USA on-site
11/1 - 11/3 installing Underground Utility Conduit.

11/6 mon. Bioreactor Construction Pt. Cloudy
Scattered Showers

0800 Arrive on-site met w/ Rene to line out today's work and go over last weeks efforts.

Objective today is to clean site and gather materials for off-site disposal. Complete header system.

Last week:

Completed conduit installation on 3" line placement for bioreactor irrigation system. Additionally, completed berm for west-end.

USA Rene, Red - Parsons Ken

0900 Spoke with Brian Vandenglan regarding completion efforts. Brian wants estimated cost for completion of B-3 construction.

Estimated through Oct. 06 - $37,500

Total - $85,500

Need to include NOV. 06 costs

11/6 cat Bioreactor Construction

12:30 Reviewed billing w/ Rene

Billing

10/2 7:30 am 3 pm - 7.0 R, RJ B
Loader, Welder $60/day,

10/3 8 - 3:30 7.0 RRB — Loader

10/4 7 - 4:30 - 9.0 RRB - Loader, $ pump?

10/5 7 - 2:30 7.0 RRB - Loader, pump

10/6 1.5 hr RJ Pump removal

10/9 12:30 - 4 - 3.5 RRB, Loader

add 2 hrs 10/10 6:30 - 12:30 6 hrs RRB, Loader + mini,

10/11 6:30 - 4:30 10 RRB Loader, mini

10/12 5:30 3:00 pm 9 RRB Loader, mini

10/13 6:30 4 pm 9 RRB Loader, mini

10/16 7 - 11 - 4 RRB (-1) Loader, mini

10/17 7:30 - 1900 - 12 RRB Loader mini

10/18 7 - 4:30 9 RRB 11.5 Loader, mini, SCBA (1.5 R time)

10/19 7 - 4:30 9 RRB Loader, mini, Bobcat.

10/24 7 - 5 9.5 RRB, 8 RJ Loader, mini
7 - 3:30

10/25 (mon) 7 - 7:30 8 RRB, Loader, mini, Bobcat

10/25 7 - 1 5 RB Loader, mini, Pump

10/30 6 - 4 9.5 RRB, Loader, mini, welder

10/31 7 - 4 8.5 RRB, Loader, mini, welder

Load on Filter Change 11/3 10 - 3 4.5 RR, Loader, mini, box $12/day
$91.75/hr

Continue next page

Billings (Cont.)

11-01	-	630 : 33 - 8.5	RR	Loader, mini
11/2	-	6 - 4:30 - 9	RR	Loader, mini
11/6	-	7 -	RR	Loader, mini
11/7	-		RR	

1430 Gathered recycle (metal) materials for placement into CSSA roll-off for recycling at Nevel.

1630 Completed site clean-up activities still need to paint posts on west side.

1700 left site

VM

11/7 Bioreactor Construction

0830 Arrive on-site

USA	Person	Equipment
Rene, Red	Ken	Loader, mini

Objective; complete post painting and move out equipment

0930 Moving excavated materials on ~~back~~ east side for consolidation. Approximately 800 cy remaining on-site.

1130 Lunch

1200 Covered excavated trenches w/ mini left ~ 3' on ends of pipes for final completion.

1530 left site

11/16 Fri. Bioreactor Construction Clear, Cool

MS-1-3		MS 6-1	
Temp.	26.67	Temp	28.74
Cond.	2.161	Con	0.771
DO	3.8	DO	3.29
pH	6.81	pH	6.36
ORP	-114.4	ORP	-79.6

0730 Arrive on-site.

Objective: Baker surveying to complete topo of B-3 after construction.

Parsons	Baker
Ken,	Vince, Mike

0830 Baker initiated topo survey.
need: (1) elevations on monitoring sumps and surrounding areas including areas just outside (and inside) of fencing.
(2) locations of power pole, water tank and delivery of the lines of water (3" PVC), Header system and electrical conduit stub outs.

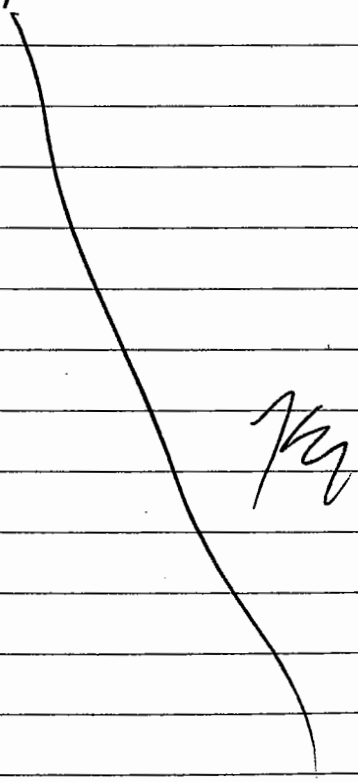
11/16 Fri. Bioreactor Const. (Cont.)

1130 Baker Survey complete with their activities

1300 Gathered data of Monitoring Sump fluids. (See previous page) On Sump MS-1-3 and MS 6-1.

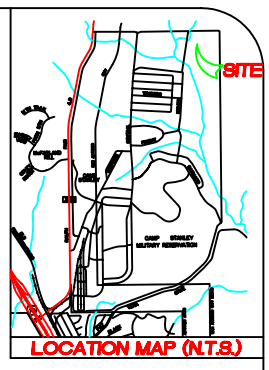
1430 Applied Annual Grass seed to B-3 site. Needs more!

1500 left site



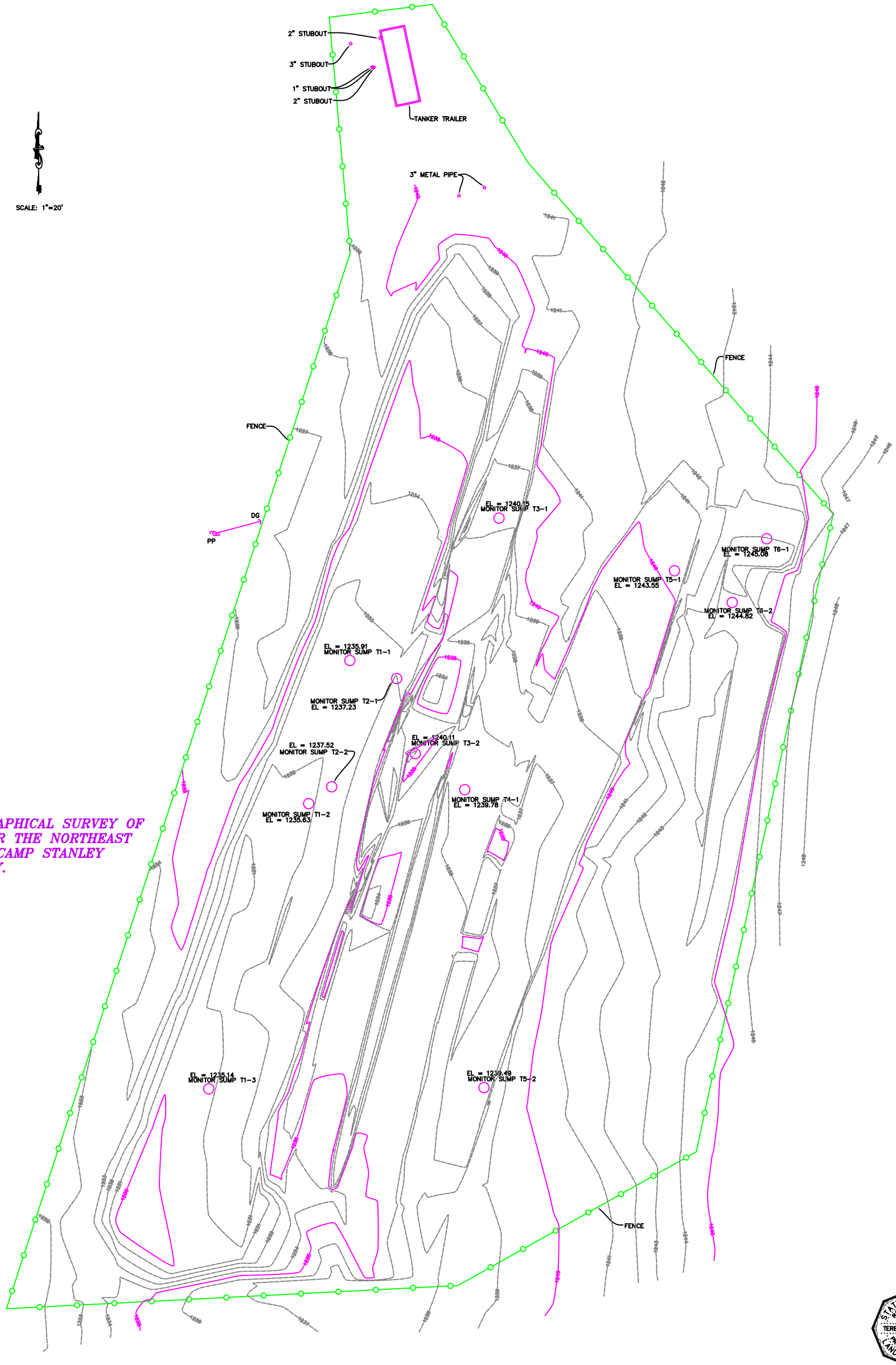
APPENDIX C
DESIGN/AS-BUILT DRAWINGS OF BIOREACTOR INCLUDING SURVEY DATA

NOTES:
1) BASIS OF BEARING IS:
COORDINATE SYSTEM – UTM
HORIZONTAL DATUM – NAD83
VERTICAL DATUM – NAVD88
ZONE – 14 NORTH
GEOIM MODEL – GEOID 03
COORDINATE UNITS – US FEET
HEIGHT UNITS – US FEET
2) NO CURRENT TITLE OPINION OF COMMITMENT FOR TITLE INSURANCE WAS FURNISHED AT THE TIME OF SURVEY; THEREFORE, NO CERTIFICATION IS MADE THAT ALL EASEMENTS AND DEDICATIONS OR OTHER ENCUMBRANCES ARE SHOWN ON THIS SURVEY.
3) CORRESPONDING METES AND BOUNDS DESCRIPTION NOT PREPARED.
4) IMPROVEMENTS ARE SHOWN.



LOCATION MAP (N.T.S.)

SCALE: 1"=20'



PLAT SHOWING:
UPDATED TOPOGRAPHICAL SURVEY OF SIX DITCHES NEAR THE NORTHEAST CORNER OF THE CAMP STANLEY STORAGE FACILITY.

BAKER SURVEYING, INC.
PH. (830) 833-2250
FAX. (830) 833-2257
2250 US 281 N.
BLANCO TX. 78606

Texas Society of Professional Surveyors MEMBER

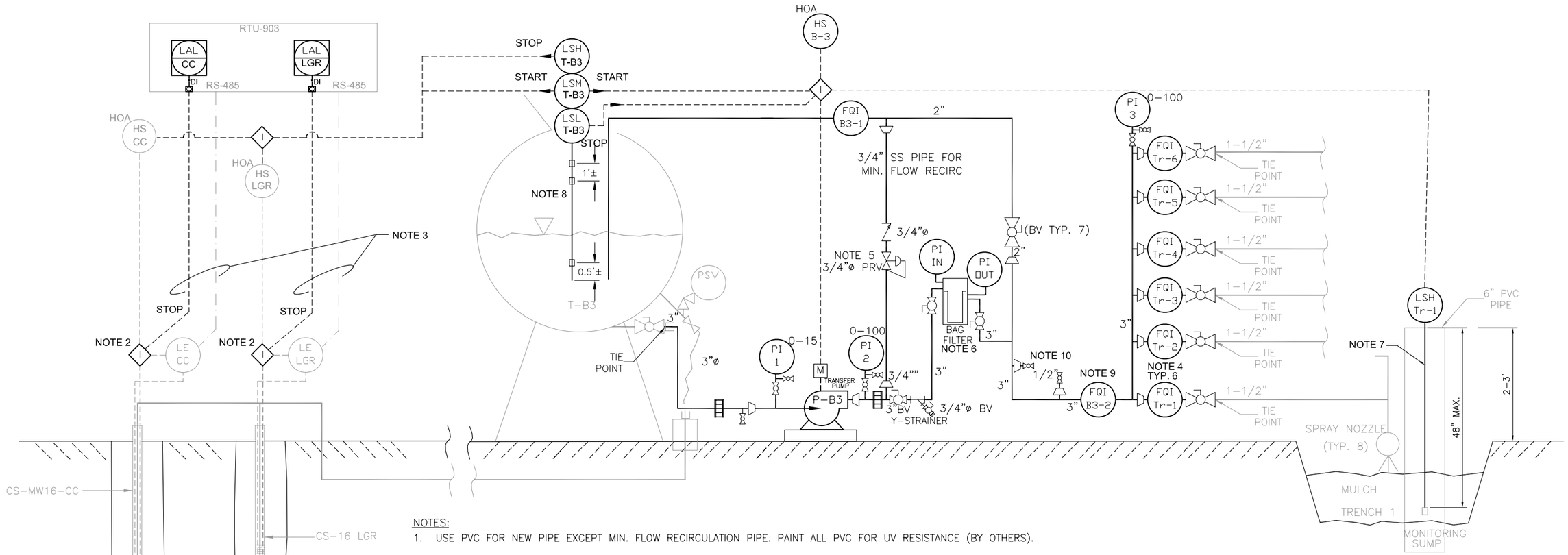
PREPARED FOR:
PARSONS
CAMP STANLEY STORAGE FACILITY
25800 RALPH FAIR ROAD
ENVIRONMENTAL OFFICE
BOERNE, TEXAS 78015-4800
210-722-4364

STATE OF TEXAS REGISTERED TERESA A. SEIDEL 5672 PROFESSIONAL LAND SURVEYOR

STATE OF TEXAS :
COUNTY OF BLANCO:

I, TERESA A. SEIDEL, DO HEREBY CERTIFY THAT THIS PLAT WAS PREPARED FROM AN ACTUAL SURVEY MADE ON THE GROUND BY PERSONS WORKING UNDER MY SUPERVISION.

TERESA A. SEIDEL
REGISTERED PROFESSIONAL LAND SURVEYOR NO. 5672
SURVEYED: JULY 17, 2006
PROJECT NO.: 06-034 PARSONS
DWG No.: N:\Draw 2006\06-034 PARSONS TOPO\DWG.
REVISED: JANUARY 3, 2007



NOTES:

1. USE PVC FOR NEW PIPE EXCEPT MIN. FLOW RECIRCULATION PIPE. PAINT ALL PVC FOR UV RESISTANCE (BY OTHERS).
2. ADD 12 VDC INTERPOSING RELAYS TO PUMP CONTROLS FOR LSL STOP COMMAND. INCLUDE 20-MINUTE TIME DELAY IN SCADA SYSTEM (OR BY OTHER MEANS) TO PREVENT WELL PUMP FROM EXCESSIVE CYCLING.
3. INSTALL 16 GA. TSP CABLES IN SAME CONDUIT WITH RS-485 CABLE FOR LAL STOP COMMAND SIGNAL
4. PROVIDE 6 SEAMETRICS (OR EQUAL) MODEL# FT415M/IP81Y-60-1.5" BATTERY-POWERED TOTALIZING FLOW INDICATORS.
5. ADJUSTABLE BACKPRESSURE REGULATOR (40 TO 60 PSIG RANGE) FISHER SERIES 98H OR EQUAL.
6. INSTALL CONTRACTOR SUPPLIED CARBONAIR KRYSTAL KLEER INLINE BAG FILTER, MODEL 88-30 STYLE B (BY OTHERS).
7. PROVIDE SINGLE POINT FLOAT LEVEL SWITCH MAGNETROL T20-DB2A-AAQ OR EQUAL.
8. PROVIDE MULTIPOINT DISPLACER TYPE FLOAT LEVEL SWITCH MAGNETROL C10 SERIES OR EQUAL AND INSTALL IN APPROPRIATE SIZED STILLING WELL.
9. PROVIDE TWO SEAMETRICS (OR EQUAL) FLOWMETERS, ONE EACH OF THE FOLLOWING MODELS: FT415M/IP81Y-60-3" AND FT415M/IP81Y-60-2" BATTERY-POWERED TOTALIZING FLOW INDICATORS. (866) 542-9641.
10. INSTALL 1/2" ISOLATION VALVES FOR FUTURE AMENDMENT ADDITION (BY OTHERS).
11. LABEL TANK WITH STENCIL OR PLACARD "CS-16 NON-POTABLE WATER"
12. INSTALL CONTRACTOR SUPPLIED HORIZONTAL END-SUCTION CENTRIFUGAL, CLOSE-COUPLED PUMP P-B3 WITH A CAPACITY OF 120 GPM @ 145 FT (BY OTHERS).

LEGEND

- EXISTING
- NEW
- REDUCER
- Y-STRAINER
- EXPANSION JOINT OR FLEXIBLE COUPLING

STATE OF TEXAS
HENRY C. DRESS
81023
REGISTERED PROFESSIONAL ENGINEER

REV.	DESCRIPTION	BY:	DATE:
0	ISSUED FOR CONSTRUCTION	HCD	1/2007
B	ISSUED FOR BID	HCD	12/2006
A	ISSUED FOR CSSA REVIEW AND APPROVAL	HCD	10/2006

REVISIONS

SCALES SHOWN ON THIS DRAWING ARE APPLICABLE ONLY TO B SIZE DRAWING

CAMP STANLEY STORAGE ACTIVITY
FACILITY UPGRADES

Contract No. FA-8903-04-D-8675 Task Order No. 006

CONTRACTOR :

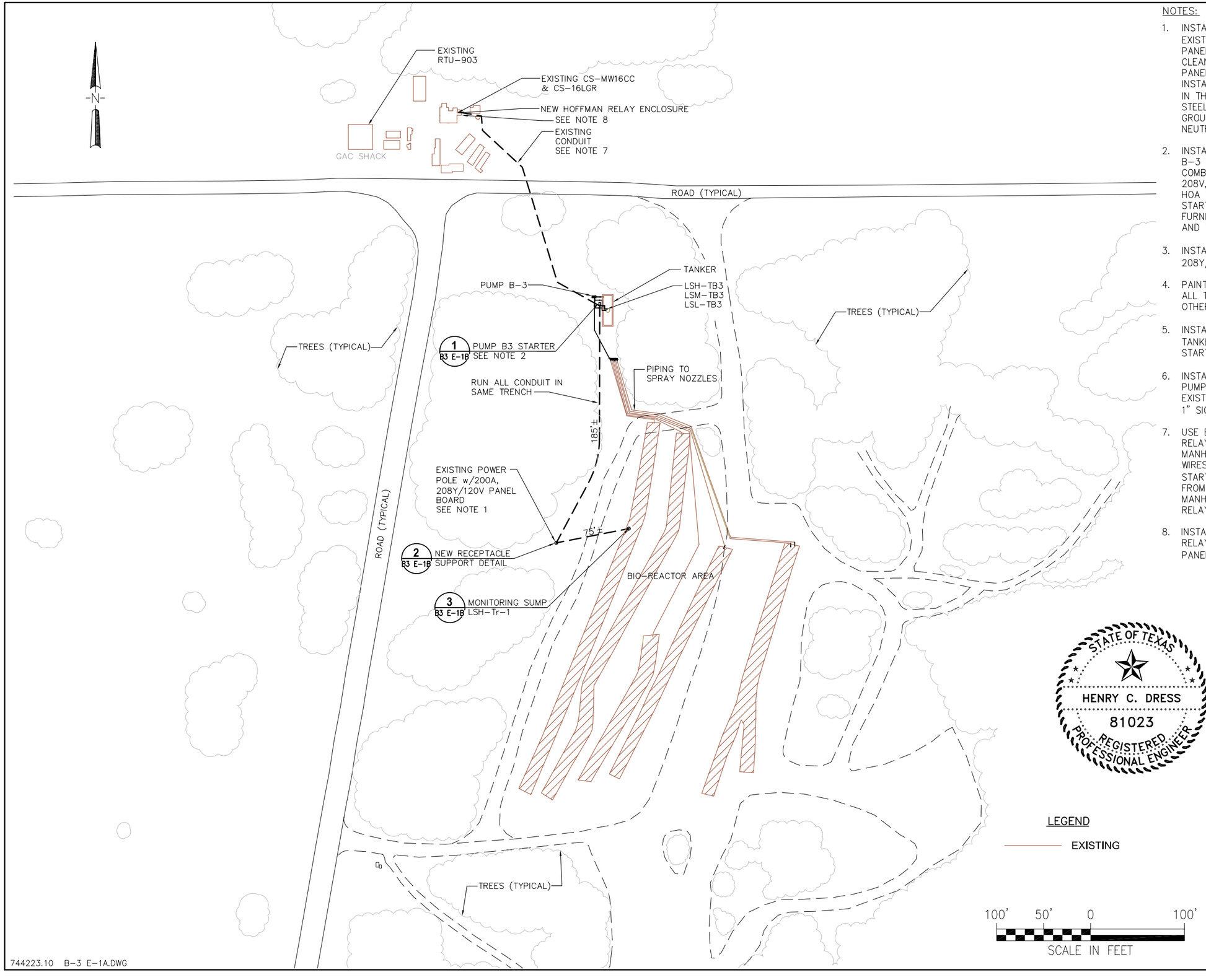
PARSONS Job No. 744223 WBS 10000

Drawing Title :

CSSA SWMU B3
BIOREACTOR PUMPING SYSTEM PROCESS DIAGRAM

Designed : RH	Drawn : HCD	Rev: 0
Checked : KL	Approved : KRR	
Scale : NONE	Date : SEPTEMBER 2006	Drawing No. : B3 P-1

744223.10 B3 P-1.DWG



NOTES:

1. INSTALL 1-70A, 3P AND 4-15A, 1P CIRCUIT BREAKERS IN EXISTING 200A, 208Y/120V, 3PH, 4W CUTLER HAMMER PANELBOARD. PANELBOARD INTERIOR SHALL BE THROUGHLY CLEANED & ALL DEBRIS SHALL BE REMOVED. REFURBISH PANELBOARD BY INSTALLING NEUTRAL & GROUND BUSSES. INSTALL COVER PLATES FOR ALL EXPOSED LIVE PARTS. INSTALL IN THE VICINITY OF PANELBOARD 3/4"ø x10'-0" COPPERCLAD STEEL GROUND ROD AND CONNECT WITH #4 AWG BARE COPPER GROUNDING ELECTRODE CONDUCTOR TO PANELBOARD. BOND NEUTRAL & GROUND BUS.
2. INSTALL CIRCUIT BREAKER COMBINATION STARTER FOR PUMP B-3 IN THE VICINITY OF TANKER TRUCK NEAR PUMP B-3. COMBINATION C.B STARTER SHALL BE FVNR TYPE, RATED FOR 208V, 3PH, 60HZ, OPERATION AND SHALL BE COMPLETE WITH HOA SELECTOR SWITCH AND START BUTTON ON ITS COVER. STARTER SHALL BE NEMA SIZE 2 IN NEMA 4 ENCLOSURE AND FURNISHED WITH A 208Y-120V CONTROL POWER TRANSFORMER AND THERMAL UNITS. SQD. CLASS 8539 OR EQUAL.
3. INSTALL 3#6 AND 1#8G IN EXISTING 1" PVC CONDUIT FROM 208Y/120V, 3PH, 4W PANELBOARD TO PUMP B-3 STARTER.
4. PAINT ALL EXPOSED PVC CONDUIT WITH UV RESISTANT PAINT. ALL TRENCHING, BACKFILL AND UNDERGROUND CONDUIT BY OTHERS.
5. INSTALL 4#14 IN 3/4" SCH 40 MIN. PVC CONDUIT FROM TRUCK TANKER LSH/LSM/LSL-T-B3 FLOAT SWITCHES TO PUMP P-B3 STARTER.
6. INSTALL 2#10 IN EXISTING 1" PVC CONDUIT FROM LSH TR-1 TO PUMP P-B3 STARTER. ALSO INSTALL 2#10 AND 1#10G FROM EXISTING POWER PANEL TO PUMP P-B3 STARTER IN EXISTING 1" SIGNAL WIRE CONDUIT AT POWER POLE.
7. USE EXISTING CONDUIT TO ROUTE 6#14 FROM NEW HOFFMAN RELAY ENCLOSURE TO NEW LEVEL SWITCHES AT TANKER MANHOLE VIA PUMP STARTER. PULL OUT EXISTING SOLID CORE WIRES FROM EXISTING CONDUIT. EXTEND CONDUIT TO P-B3 STARTER. RUN NEW CONDUITS (6#14 3/4"C AND 4#14 3/4"C) FROM P-B3 STARTER TO LEVEL SWITCHES AT TANKER MANHOLE. EXTEND CONDUIT ON OPPOSITE END TO HOFFMAN RELAY ENCLOSURE.
8. INSTALL 1-15A, 1-P, 120VAC POWER CIRCUIT TO HOFFMAN RELAY ENCLOSURE FROM WELL 16 AREA POWER DISTRIBUTION PANEL, 2#12, 1#12G 3/4" RGS CONDUIT.

STATE OF TEXAS
HENRY C. DRESS
81023
REGISTERED PROFESSIONAL ENGINEER

REV.	DESCRIPTION	BY:	DATE:
0	ISSUED FOR CONSTRUCTION	HCD	1/2007
B	ISSUED FOR BID	HCD	12/2006
A	ISSUED FOR CSSA REVIEW AND APPROVAL	HCD	11/2006

REVISIONS

SCALES SHOWN ON THIS DRAWING ARE APPLICABLE ONLY TO B SIZE DRAWING

CAMP STANLEY STORAGE ACTIVITY
FACILITY UPGRADES

Contract No. FA-8903-04-D-8675 Task Order No. 006

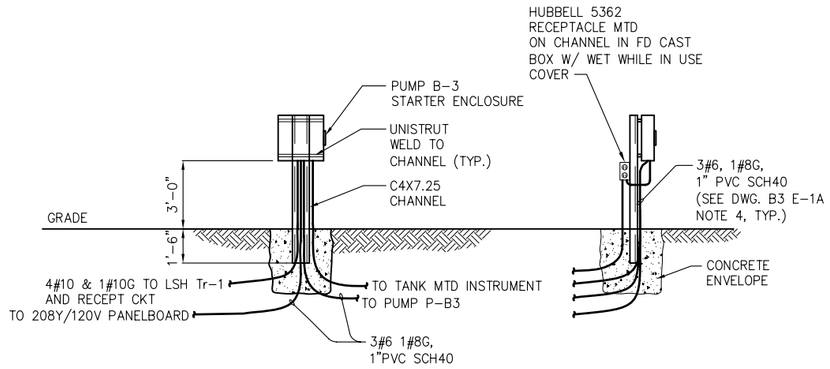
CONTRACTOR :
PARSONS Job No. 744223 WBS 10000

Drawing Title :

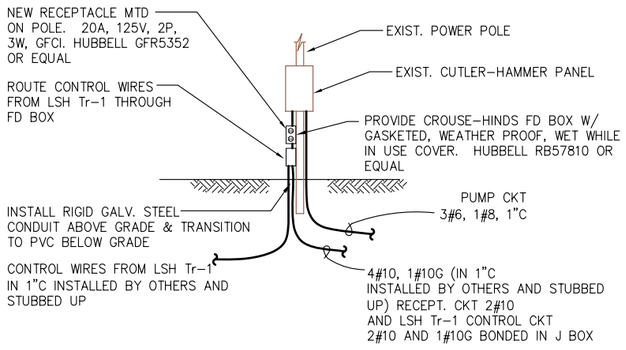
CSSA SWMU B3 BIOREACTOR PUMPING SYSTEM ELECTRICAL PLAN AND OVERVIEW

Designed : PS	Drawn : PS	Rev: 0
Checked : HCD	Approved : KRR	
Scale : NONE	Date : AUGUST 2006	Drawing No. : B3 E-1A

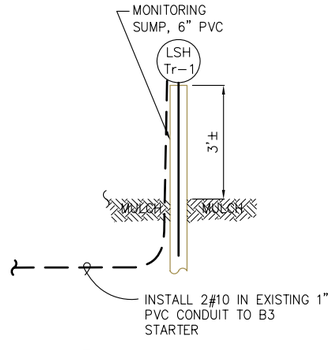
744223.10 B-3 E-1A.DWG



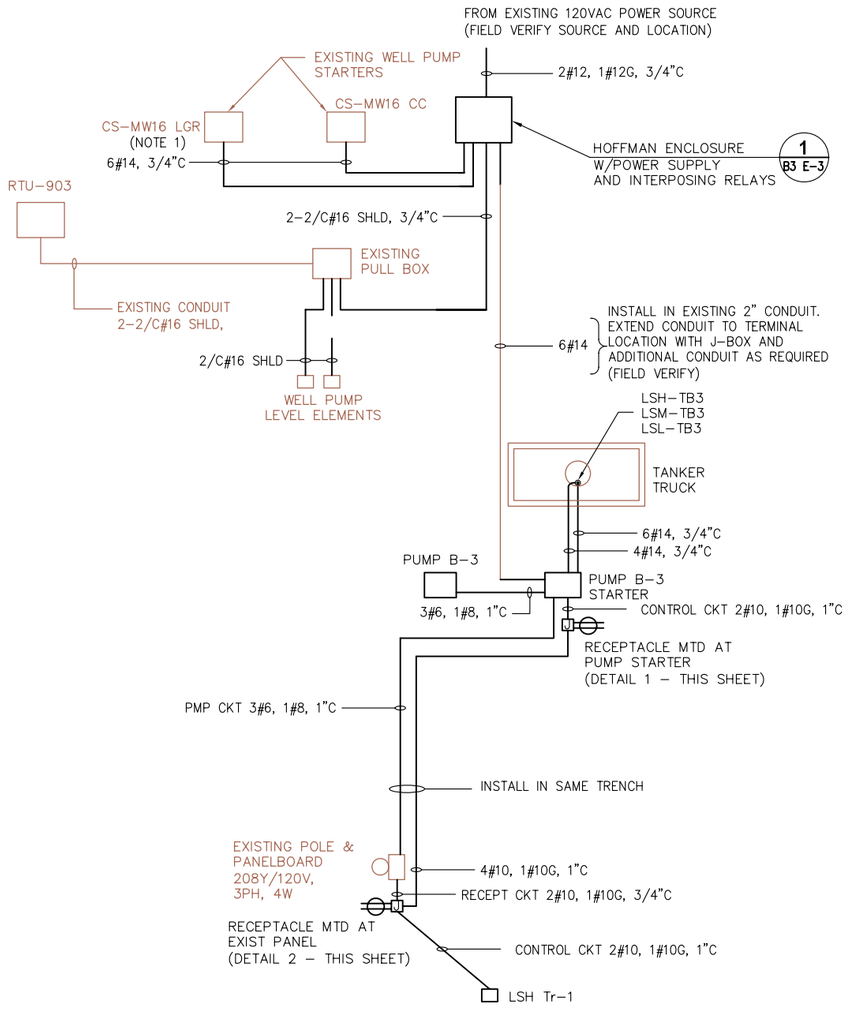
1 B3 E-1A **PUMP B-3 STARTER SUPPORT DETAIL**
SCALE: NOT TO SCALE



2 B3 E-1A **NEW RECEPTACLE SUPPORT DETAIL**
SCALE: NOT TO SCALE



3 B3 E-1A **LSH MOUNTING DETAILS**
SCALE: NOT TO SCALE



BIOREACTOR SYSTEM INTERCONNECTION DIAGRAM
SCALE: NOT TO SCALE

LEGEND

EXISTING

NOTES:

1. INSPECT AND CLEAN EXISTING PUMP 16 LGR CONTACTOR.
2. STANCHION HOLES, TRENCHING, BACKFILL AND UNDERGROUND CONDUIT BY OTHERS. STANCHION, CONCRETE ENVELOPE AND ALL CONDUCTORS AND SIGNAL WIRE IN BOTH ABOVEGROUND AND UNDERGROUND CONDUIT SHALL BE INCLUDED IN THE WORK.
3. INSTALL SIGNAL TO LSH Tr-1 FROM SWITCH TO PUMP STARTER.
4. ALL RACEWAY BELOW GRADE SHALL BE SCHEDULE 40 PVC CONDUIT. WHERE RACEWAY TRANSITIONS TO ABOVE GRADE AND ALL RACEWAY INSTALLED ABOVE GRADE SHALL BE RIGID GALVANIZED STEEL CONDUIT.

STATE OF TEXAS
HENRY C. DRESS
81023
REGISTERED
PROFESSIONAL ENGINEER

REV.	DESCRIPTION	BY:	DATE:
0	ISSUED FOR CONSTRUCTION	HCD	1/2007
B	ISSUED FOR BID	HCD	12/2006
A	ISSUED FOR CSSA REVIEW AND APPROVAL	HCD	11/2006

REVISIONS

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CAMP STANLEY STORAGE ACTIVITY
FACILITY UPGRADES

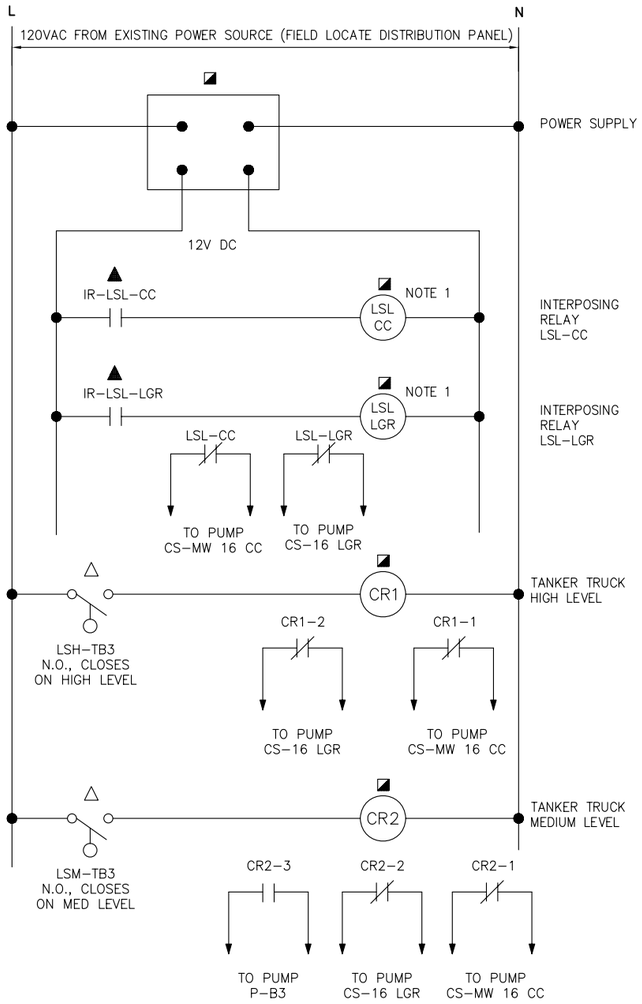
Contract No. FA-8903-04-D-8675 Task Order No. 006

CONTRACTOR :
PARSONS Job No. 744223 WBS 10000

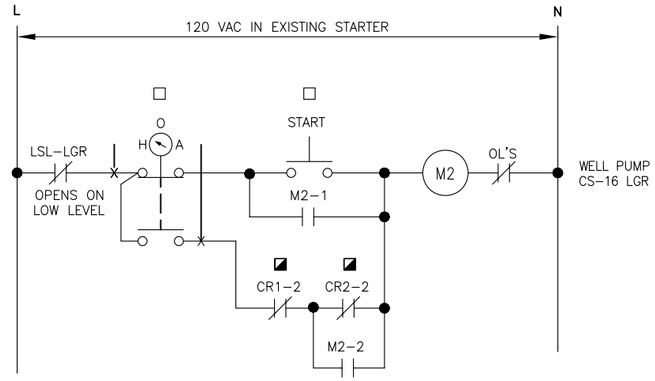
Drawing Title :
CSSA SWMU B3
BIOREACTOR PUMPING SYSTEM
ELECTRICAL INTERCONNECTION
DIAGRAM AND DETAILS

Designed : RH	Drawn : BH	Rev: 0
Checked : KL	Approved : KRR	
Scale : NONE	Date : SEPTEMBER 2006	Drawing No. : B3 E-1B

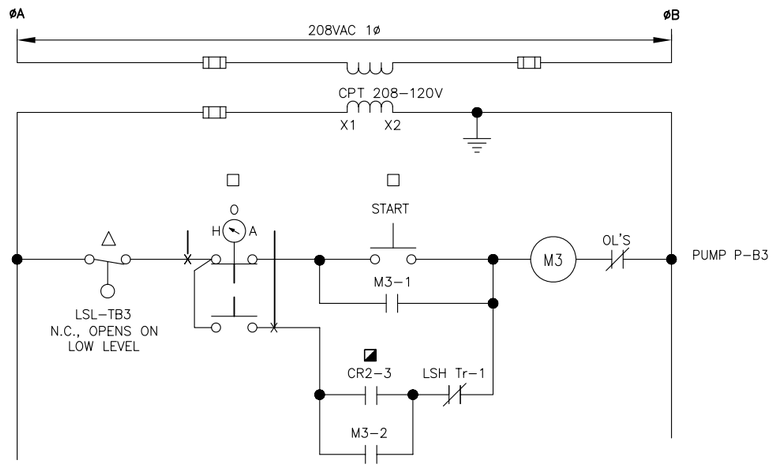
744223.10 B3 E-1B.DWG



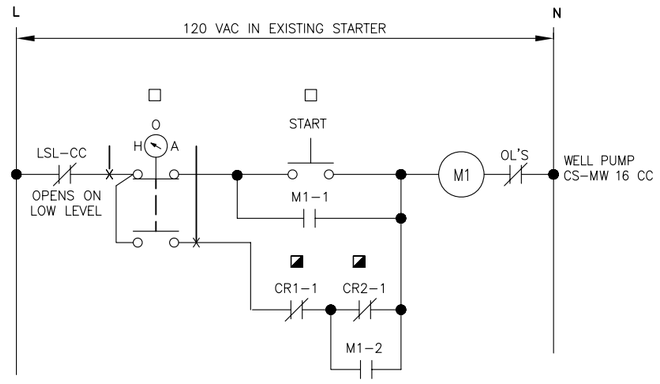
CONTROL SCHEMATIC



WELL PUMP CS-16 LGR SCHEMATIC



PUMP P-B3 SCHEMATIC



WELL PUMP CS-MW 16CC SCHEMATIC

LEGEND:

- ▲ — CONTACT OR DEVICE IS LOCATED IN RTU-903
- ◪ — COMPONENT OR CONTACT LOCATED IN NEMA 4 HOFFMAN RELAY ENCLOSURE SEE DWG. B3 E-3 DETAIL 1
- △ — LOCATED AT TANKER TRUCK
- □ — LOCATED ON STARTER DOOR

NOTE:

1. CONFIGURE A MINIMUM 20-MINUTE TIME DELAY ON WELL PUMP LOW LEVEL USING SCADA OR OTHER MEANS TO PREVENT SHORT CYCLING.

STATE OF TEXAS
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CAMP STANLEY STORAGE ACTIVITY
FACILITY UPGRADES

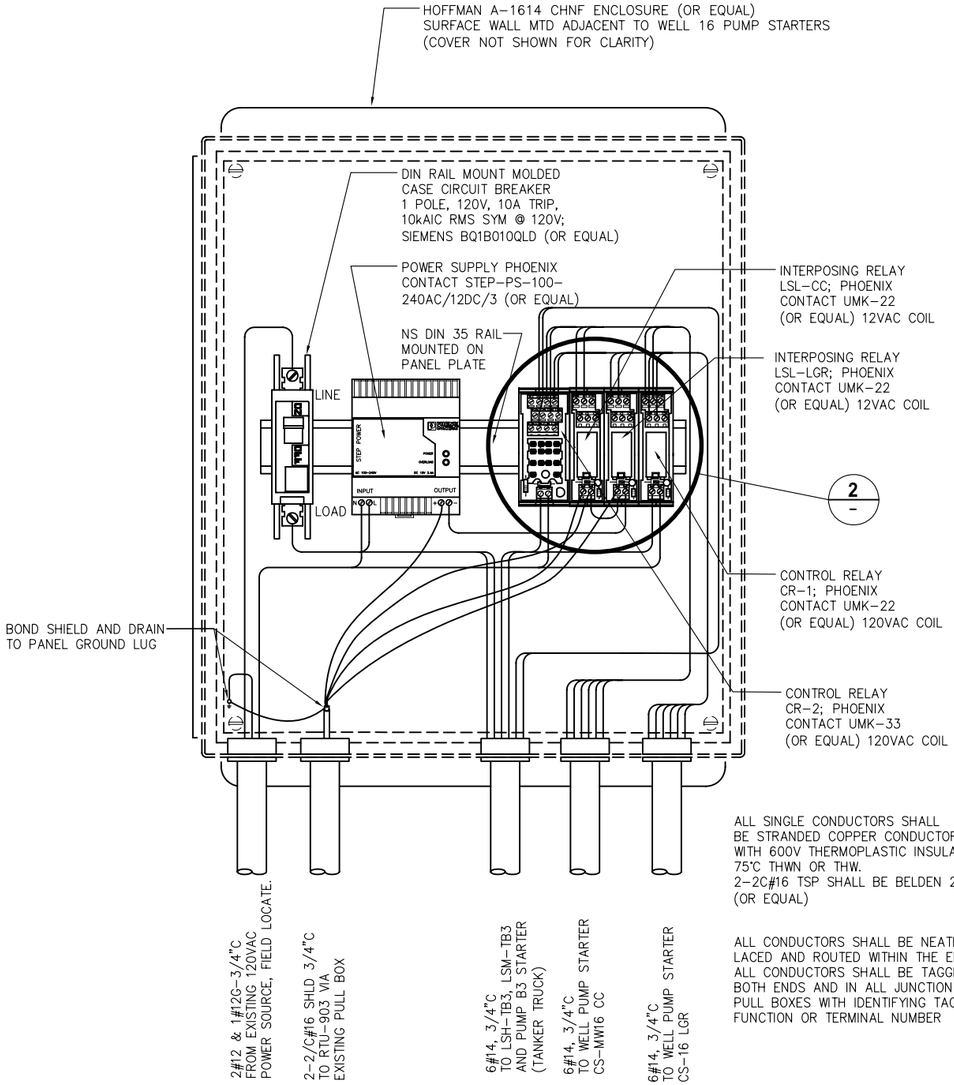
Contract No. FA-8903-04-D-8675 Task Order No. 006

CONTRACTOR :
PARSONS Job No. 744223 WBS 10000

Drawing Title :
CSSA SWMU B3
BIOREACTOR PUMPING SYSTEM
ELECTRICAL MOUNTING
DETAILS AND SCHEMATICS

Designed : RL	Drawn : BH	Rev: 0
Checked : HCD	Approved : KRR	
Scale : NONE	Date : SEPTEMBER 2006	Drawing No. : B3 E-2

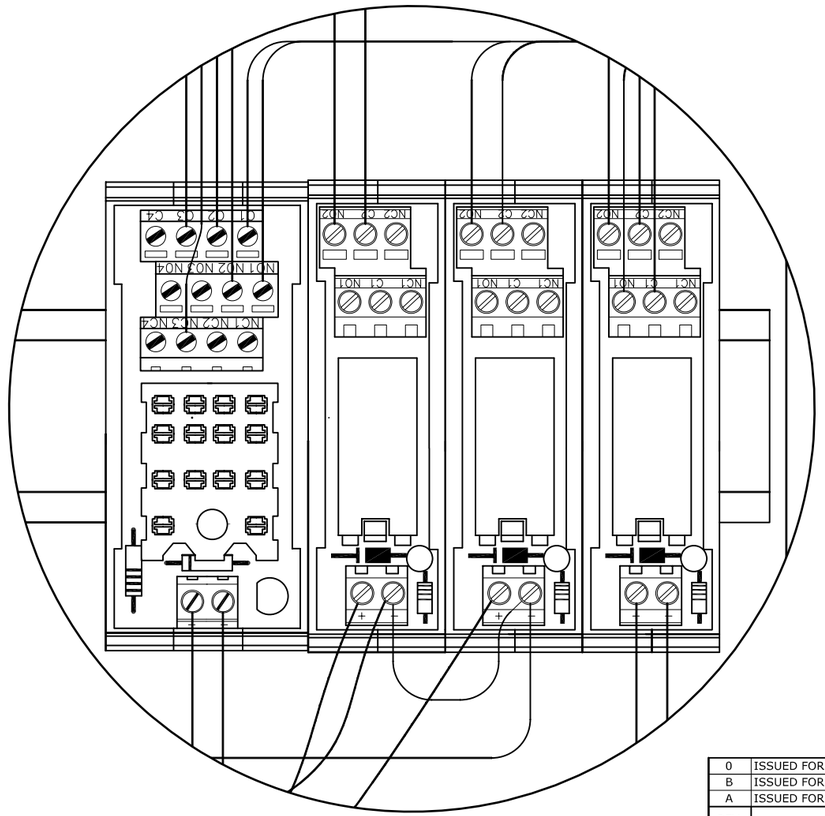
744223.10 B3 E-2.DWG



ALL SINGLE CONDUCTORS SHALL BE STRANDED COPPER CONDUCTOR WITH 600V THERMOPLASTIC INSULATION 75°C THWN OR THW.
2-2C#16 TSP SHALL BE BELDEN 22409 (OR EQUAL)

ALL CONDUCTORS SHALL BE NEATLY LACED AND ROUTED WITHIN THE ENCLOSURE. ALL CONDUCTORS SHALL BE TAGGED ON BOTH ENDS AND IN ALL JUNCTION AND PULL BOXES WITH IDENTIFYING TAGS AS TO FUNCTION OR TERMINAL NUMBER

1 / B3 E-1B — RELAY ENCLOSURE DETAIL
SCALE: NOT TO SCALE



2 / - — CONNECTION DETAIL
SCALE: NOT TO SCALE

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FACILITY UPGRADES

Contract No. FA-8903-04-D-8675 Task Order No. 006

CONTRACTOR :
PARSONS Job No. 744223 WBS 10000

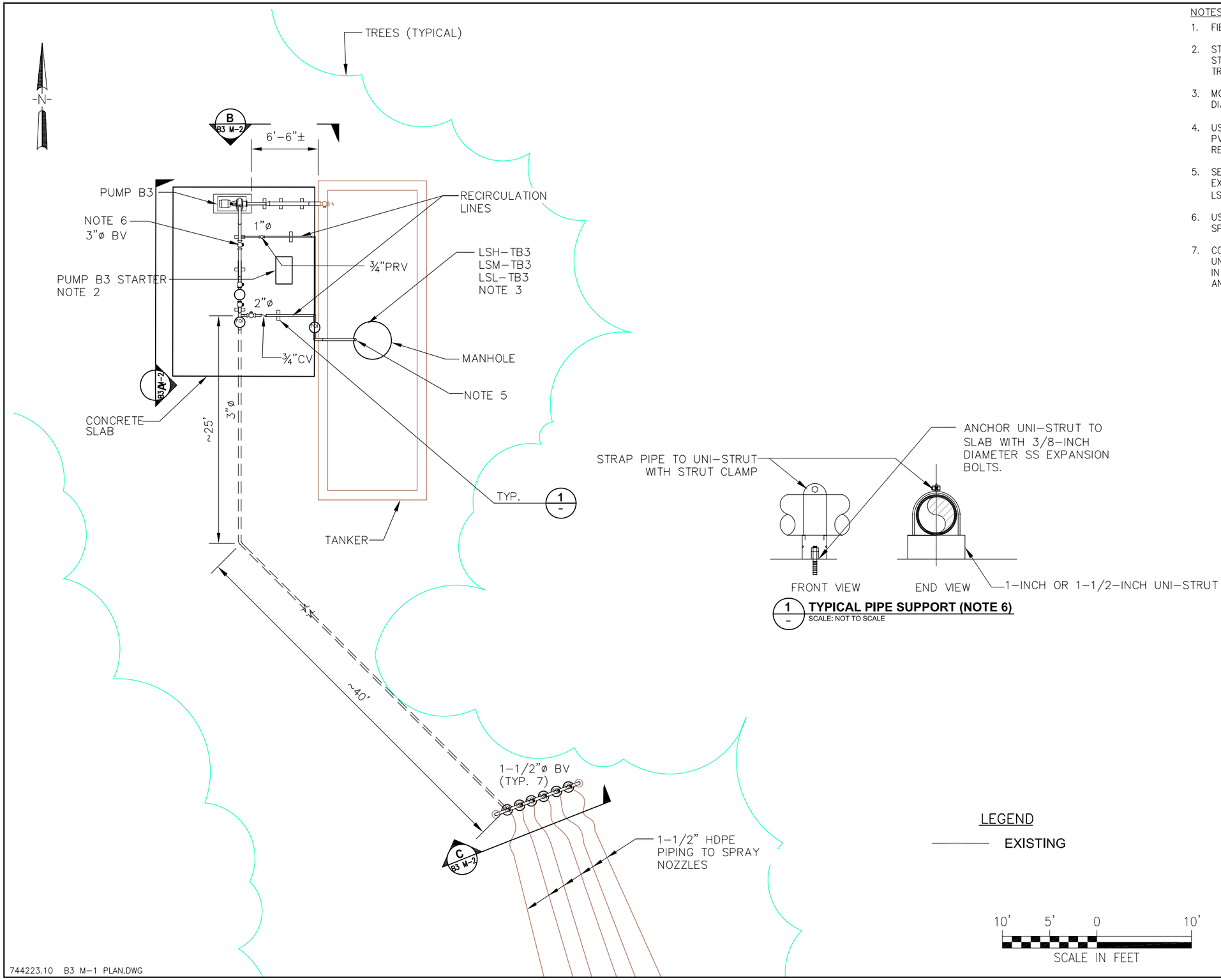
Drawing Title :

CSSA SWMU B3
BIOREACTOR PUMPING SYSTEM
ELECTRICAL CONNECTION DETAILS

Designed : RL	Drawn : BH	Rev: 0
Checked : KL	Approved : KRR	
Scale : NONE	Date : SEPTEMBER 2006	Drawing No. : B3 E-3

STATE OF TEXAS
HENRY C. DRESS
81023
REGISTERED PROFESSIONAL ENGINEER

744223.10 B3 E-3.DWG



1 — TYPICAL PIPE SUPPORT (NOTE 6)
SCALE: NOT TO SCALE

NOTES:

1. FIELD ROUTE PIPE TO APPROXIMATE LAYOUT SHOWN.
2. STANCHON MOUNT CIRCUIT BREAKER COMBINATION STARTER FOR PUMP B-3 IN THE VICINITY OF TANKER TRUCK NEAR PUMP B-3.
3. MOUNT T-B3 LEVEL SWITCHES IN STILLING WELL, 3-INCH DIAMETER PIPE ATTACHED TO MANHOLE PENETRATION.
4. USE CLASS 200 (SDR 21 OR THICKER) SOLVENT WELDED PVC PIPE. PAINT ALL EXPOSED PVC PIPE WITH UV RESISTANT PAINT.
5. SECURE RECIRCULATION PIPE TO MANHOLE RING AND EXTEND PIPE INTO TANK SAME DEPTH AS LSL-TB3(APPROXIMATELY 6 FEET).
6. USE TYPICAL STRUT STRAP OR EQUAL WITH SUPPORT SPACING NO GREATER THAN 5 FEET APART.
7. CONSTRUCT VALVE AND METER MANIFOLD USING UNI-STRUT OR EQUAL TO ARRANGE VALVES AND METERS IN ORGANIZED MANNER TO FACILITATE METERING READING AND VALVE OPERATION.

LEGEND

EXISTING

STATE OF TEXAS
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CAMP STANLEY STORAGE ACTIVITY
FACILITY UPGRADES

Contract No.FA-8903-04-D-8675 Task Order No. 006

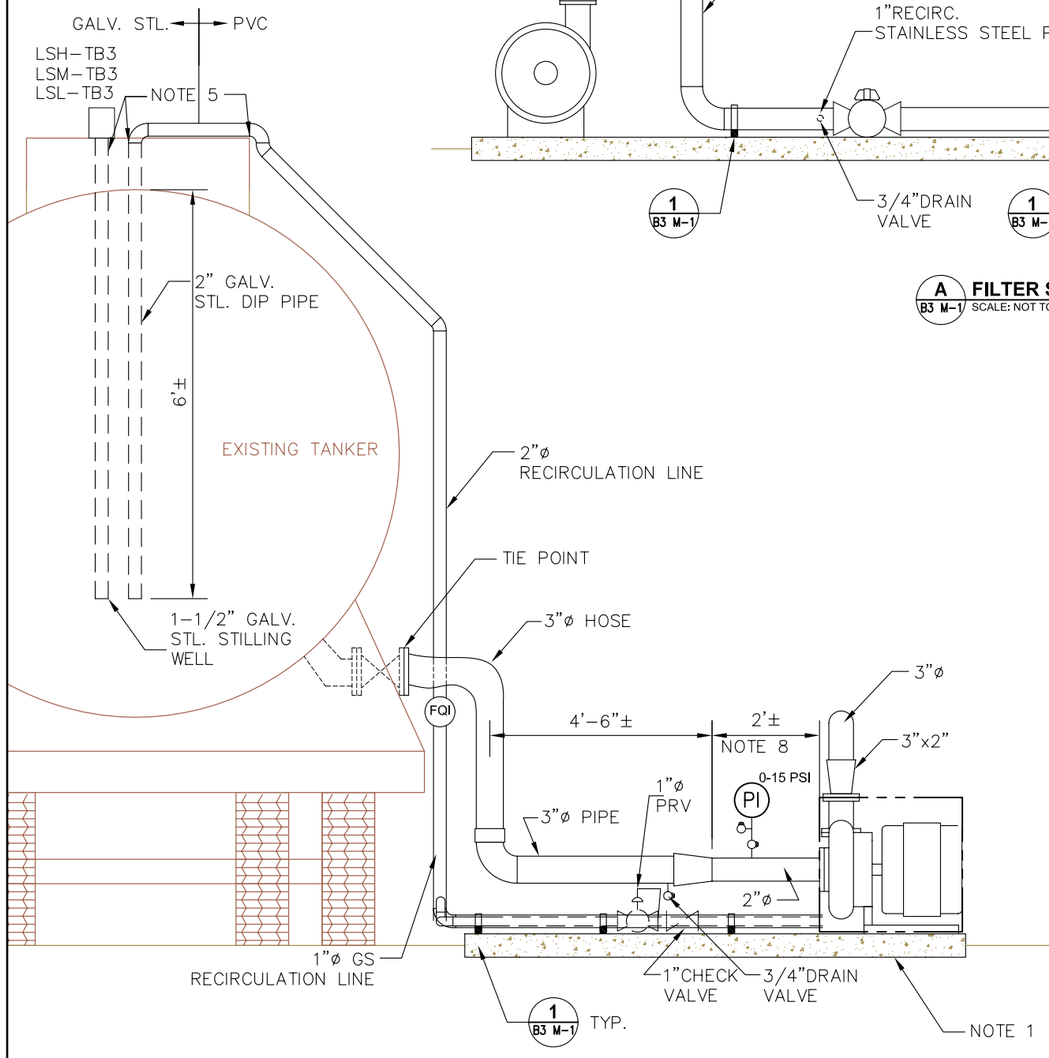
CONTRACTOR :
PARSONS Job No. 744223 WBS 10000

Drawing Title :

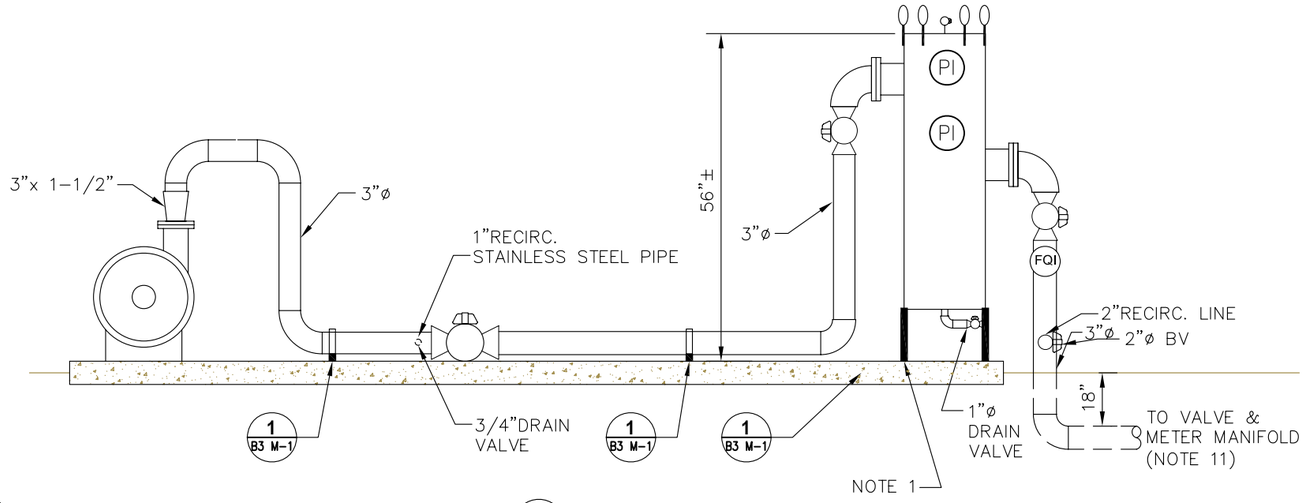
CSSA SWMU B3
BIOREACTOR PUMPING SYSTEM
MECHANICAL PLAN

Designed : RH	Drawn : HCD	Rev: 0
Checked : KL	Approved : KRR	
Scale : NONE	Date : AUGUST 2006	Drawing No. : B3 M-1

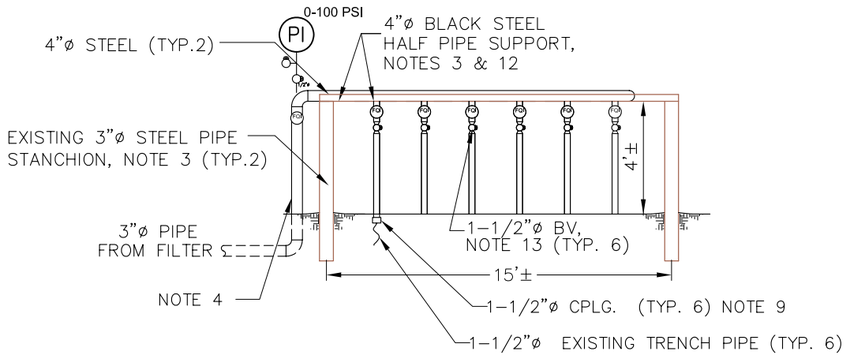
744223.10 B3 M-1 PLAN.DWG



B PUMP SECTION
B3 M–1 SCALE: NOT TO SCALE



A FILTER SECTION
B3 M–1 SCALE: NOT TO SCALE



C VALVE & METER SECTION
B3 M–1 SCALE: NOT TO SCALE

LEGEND

EXISTING

NOTES:

1. 6–INCH THICK CAST IN PLACE CONCRETE SLAB. ANCHOR PUMP SECURELY TO CONCRETE BASE USING 3/8" DIAMETER SS EXPANSION BOLTS.
2. INSTALL PIPE SUPPORTS ON PVC PIPE SO MAXIMUM HORIZONTAL SPAN IS < 5 FEET.
3. PRIME AND PAINT ALL CARBON STEEL SURFACES.
4. PAINT ALL EXPOSED PVC PIPE WITH UV RESISTANT PAINT.
5. USE PIPE STRAPS OR OTHER MEANS OF SUPPORT TO RIGIDLY ATTACH, SECURE AND ANCHOR PVC PIPE TO TANKER.
6. PROCURE AND SECURELY ATTACH 8' STEP LADDER TO TANKER OR FABRICATE WOODEN STAIRS TO ALLOW EASY ACCESS TO MANHOLE LADDER.
7. PRESSURE INDICATING GAUGE, ASHCROFT TYPE 1259 WITH 316SS TUBE, TIP AND SOCKET, 1/2" NPT WITH 4–1/2" DIAL. BLOCK AND BLEED VALVES SHALL BE BRASS BALL VALVES WITH 1/2"NPT ENDS.
8. MAINTAIN MINIMUM STRAIGHT RUN PIPE UPSTREAM OF PUMP.
9. CONNECT PVC DROP PIPES TO EXISTING HDPE TRENCH PIPES.
10. PLUG ALL DRAINS VALVES WITH THREAD PLUG.
11. FIELD ROUTE UNDERGROUND LINE TO VALVE & METER MANIFOLD LOCATION. SEE CONTINUATION IN SECTION C.
12. USE 4–INCH DIAMETER HALF STEEL PIPE SUPPORT FOR FULL LENGTH OF PVC PIPE BETWEEN STANCHIONS. WELD HALF PIPE SUPPORT TO 3–INCH STANCHION AND DRILL 2" HOLES IN NEW HALF PIPE SUPPORT FOR DROP LEG TO EACH METER VALVE AND BRANCH PIPE TO THE INDIVIDUAL TRENCHES.
13. USE PVC BALL VALVES AND EQUALLY SPACE DROP PIPES, 2'±

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CAMP STANLEY STORAGE ACTIVITY
FACILITY UPGRADES

Contract No.FA–8903–04–D–8675 Task Order No. 006

CONTRACTOR :
PARSONS Job No. 744223 WBS 10000

Drawing Title :
CSSA SWMU B3
BIOREACTOR PUMPING SYSTEM
MECHANICAL SECTION & DETAILS

STATE OF TEXAS
HENRY C. DRESS
81023
REGISTERED
PROFESSIONAL ENGINEER

Designed : HCD	Drawn : HCD	Rev: 0
Checked : KL	Approved : KRR	
Scale : NONE	Date : AUGUST 2006	Drawing No. : B3 M-2

744223.10 SWMU B3 M–2 SECTION.DWG

SECTION 16010
GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE

A. The electrical work covers the new equipment and modifications to implement the Camp Stanley Storage Activity SWMU Bioreactor pumping system. Work includes furnishing all material, equipment, components, tools and labor for a complete electrical installation.

B. This section summarizes the general requirements for all electrical work.

1.2 DEFINITIONS

A. Provide: Furnish and completely install, and connect.

B. Product Data: Catalog cuts and descriptive literature.

C. Shop Drawings: Factory prepared specific to the installation.

D. Indicated: Shown on the Contract Drawings.

E. Noted: Indicated or specified elsewhere.

1.3 LOCAL CONDITIONS

A. Power will be supplied from an existing distribution network at the site.

1.4 QUALITY ASSURANCE

A. Provide complete electrical installation in accordance with the latest revised edition of National Electrical Code (NFPA 70), Life Safety Code (NFPA 101), and in accordance with all applicable state and local laws, ordinances and codes. Obtain all necessary permits and have all work inspected by appropriate authorities having jurisdiction (AHJ).

B. Qualifications of Manufacturers. Furnish manufacturer's electrical equipment of the types and sizes specified which have successfully operated for not less than the past two years except where specific types are named by manufacturer and catalog number or designation.

C. Codes and Standards. Provide electrical equipment and materials, including installation, conforming to the following codes and standards as applicable. The equipment and materials shall bear labels to indicate manufacturing conformance to the specified standards or equal. Where two or more codes or standards are at variance, conform to the more restrictive requirement.

1. NFPA 70; National Electrical Code (NEC).
2. American National Standards Institute (ANSI).
3. American Society for Testing and Materials (ASTM).
4. Institute of Electrical and Electronics Engineers (IEEE).
5. Insulated Cable Engineers Association (ICEA).
6. National Electrical Manufacturers Association (NEMA).
7. National Electrical Testing Association (NETA), Section 16T, Electrical Acceptance Tests.
8. National Fire Protection Association (NFPA).

9. Occupational Safety and Health Act (OSHA).
10. Underwriters' Laboratories, Inc. (UL).
11. NFPA 101, Life Safety Code.

1.5 SUBMITTALS

A. Shop Drawings

1. Submit, for the Contractor's approval, shop drawings to the extent required in this Section.
2. Complete equipment descriptive, operation and installation data shall be submitted with the shop drawings. Shop drawings shall be clear, neat, orderly, legible and in the final format. Hand drawn sketches, redrawn copies of contract drawings and other preliminary type drawings are not acceptable and will be rejected without review. Shop drawings shall include the following.
   a. Dimensions and weights of equipment.
   b. Nameplate data including the nameplate material, heights of letters, inscriptions and method of mounting.
   c. Details showing enlarged views of small parts when required.
   d. Arrangements of equipment and nameplates.
   e. Plans showing the equipment assembly, space requirements, conduit hub sizes, clearances and locations for conduits and anchor bolts.
   f. Elevations showing all parts, devices, components and nameplates, positions and arrangements of the equipment. Show as many elevations as necessary to clearly depict component and device arrangements.
   g. Schematic and elementary wiring diagrams, of each unit of each equipment, showing numbered terminal points, numbered wires and numbered interconnections to other equipment and remote devices.
   h. Connection wiring diagrams, of each unit of each equipment, showing numbered terminal points, numbered wires and numbered interconnections to other equipment and remote devices.
   i. Include numbering of external wiring in the instruction manual.
   j. Complete catalog information of all parts and components of electrical equipment.
   k. Symbols and Legend sheet to describe all symbols used on shop drawings.

B. Resubmittals. When a resubmittal is required the Manufacturer shall submit all previously accepted material in addition to the corrected or added information. Corrected and/or additional information shall be clearly identified. It is intended that each resubmittal be a complete and stand-alone document.

C. Materials List. Submit material lists, for the Contractor's review and approval, within 30 days of Notice to Proceed. Include all products electrical products described in the contract documents, including the equipment described in shop drawings. List only those products named in the Contract Documents or approved substitutions.

D. Technical Data. Submit descriptive and instruction manuals to the extent required under this Section .

E. Manufacturers' Certified Reports. The equipment manufacturer, or his authorized representative shall submit a written report with respect to his equipment certifying that (1) the equipment has been properly installed, wired and connected under his supervision, (2) the equipment is in accurate alignment, (3) he was present when the equipment was placed in operation, (4) he has checked, inspected and adjusted the equipment as necessary, (5) the equipment has been operated under full load conditions and operated satisfactorily and (6) the equipment is fully covered under the terms of the guarantee. Reports shall be submitted for the following equipment: Instruments, Relays, and Power Supplies.

F. Accessory and Maintenance Materials. Furnish items as specified herein. Deliver to Contractor as directed with an itemized list in a letter of transmittal accompanying each shipment.

1. Special Tools and Accessories. Furnish special tools, instruments and accessories for maintaining equipment requiring periodic repair and adjustment. Also, furnish special lifting and handling devices for equipment requiring such devices.
2. Maintenance Materials and Spare Parts. Deliver in manufacturer's original containers labeled to completely describe contents and equipment for which it is furnished.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery. Deliver electrical materials and equipment in manufacturers' original cartons or containers with seals intact, as applicable.

1.7 GUARANTEE AND WARRANTEES

A. Guarantee all work of Division 16 in accordance with Subcontract Warranty requirements.

PART II - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Provide new materials and equipment as required to complete all indicated and specified electrical work, including incidental items inferable from the contract documents that are necessary to complete the work. Provide materials and equipment of latest design, standard products of established manufacturers. For uniformity, only one manufacturer is acceptable for each type of product. Manufacture individual parts to standard sizes and gauges so that repair parts can be installed in the field. Make like parts of duplicate units interchangeable.

B. Prohibited Materials. Aluminum conductors are not acceptable.

C. Indoor Equipment. Enclosures for electrical equipment installed indoors shall be rated NEMA 1.

D. Outdoor Equipment. Outdoor electrical equipment shall be weatherproof, NEMA 4 or as indicated.

E. Factory Finishes. Unless otherwise specified, the sheet metal surfaces of equipment enclosures shall be phosphatized and coated with a rust resisting primer. Over the primer, apply a corrosion resistant baked enamel finish on the interior and exterior metal surfaces. The color shall be ANSI No. 49 medium light gray. Furnish hardware with a corrosion resistant finish. Finish cast iron outlet bodies, boxes, covers and fittings with cadmium zinc electroplate covered with aluminum cellulose lacquer.

2.2 SOURCE QUALTIY CONTROL

A. Factory Tests. Factory tests are required for all electrical equipment and assemblies. Perform tests in accordance with codes and standards specified as applicable to the equipment.

PART III – EXECUTION

3.1 INSTALLATION

A. The complete installation is to be accomplished by skilled electrical tradesmen, with certified or suitably qualified individuals performing all special systems installation and testing. All workmanship shall be of the highest quality, sub-standard work will be rejected. Any portions of the work rejected as above shall be immediately repaired and/or replaced as required to satisfy the contractor and the requirements of the contract.

B. Schedule the work and cooperate with all trades to avoid delays, interferences, and unnecessary work. If any conflicts occur, necessitating departures from the Contract Drawings and Specifications, details of departures and reasons therefore shall be submitted immediately for the Contractor's consideration.

3.2 CERTIFICATION AND TESTING

A. Prior to request for final review, test all systems and repair or replace all defective work. Submit, with request for final review, written certification that all electrical systems are complete and operational.

B. At the time of final review of electrical work, demonstrate the operation of electrical systems. Furnish labor, apparatus and equipment for system demonstration.

C. After final review and acceptance, turn over to the Contractor all keys for electrical equipment locks. Present to the Contractor or the Contractor's designated representative, demonstrations and oral instructions for proper operation and maintenance of the electrical equipment and systems.

END OF SECTION 16010