



Project No. S9525-06-44A
February 6, 2013

Mr. Richard Stewart, PG
California Department of Transportation - District 6
Hazardous Waste Branch
855 M Street, Suite 200
Fresno, California 93721

Subject: GROUNDWATER MONITORING REPORT – NOVEMBER 2012
 CALTRANS MODESTO SOIL STOCKPILES
 STANISLAUS COUNTY, CALIFORNIA
 CONTRACT NO. 06A1580, TASK ORDER NO. 44, EA NO. 10-403500

Dear Mr. Stewart:

In accordance with California Department of Transportation (Caltrans) Contract No. 06A1580, Task Order (TO) No. 44, Geocon performed groundwater monitoring activities at the Caltrans Modesto Soil Stockpiles (Site) located southerly of the intersection of State Route (SR) 99 and Kansas Avenue in Stanislaus County, California. We are currently performing sampling at the Site every other month. This report presents the results of the November 2012 sampling event. The approximate site location is depicted on the attached Vicinity Map, Figure 1. The approximate site boundaries and Stockpiles 1 through 3 are shown on the Site Plan, Figure 2.

The objective of TO No. 44 is to perform groundwater sampling and analysis at the Site in accordance with protocols approved by the California Environmental Protection Agency Department of Toxic Substances Control (DTSC) as established in the *Final Work Plan, Groundwater Assessment* prepared by Shaw Environmental, Inc. and dated January 2006. The scope of services reported herein included depth to groundwater measurements, groundwater sample collection from ten groundwater monitoring wells, analysis of the water samples by a California-certified laboratory, and preparation of this report.

BACKGROUND

Project Description and History

Stockpiles 1 through 3 were generated during construction of SR 99 through Modesto around 1961 when Caltrans excavated property purchased from Food Machinery and Chemical Corporation (FMC) that contained an evaporation pond. The stockpiles were placed in their present location in anticipation of construction of the State Route 132 West Freeway/Expressway project.

During the 1930s, Barium Products Ltd. occupied property at 1200 Barium Road (now Graphics Drive) in Modesto just east of SR 99 between Woodland and Kansas Avenues. Barium Products Ltd. was a chemical manufacturing company processing a variety of ores and minerals including barite (barium sulfate) and celestite (strontium sulfate). Materials produced included barium and strontium compounds; these were used in greases, lubricating oil and pigment blanks. Sodium sulfide generated as a by-product of barite processing was sold as a caustic and used as a reagent in the mining industry.

In 1943, Barium Products Ltd. was purchased by Westvaco Chlorine Products Corporation which subsequently merged with FMC in 1948. From the 1950s to the 1970s, a liquid residue from the processing operations was discharged to unlined evaporation ponds along the western portion of the FMC Site. The approximate boundaries of the former evaporation/disposal ponds are shown on Figure 2.

In 1961, a 4.3-acre parcel at the southwest corner of the FMC site was purchased by the State of California for highway right-of-way needed to construct SR 99. An aerial photograph from 1957 shows that a portion of the southernmost pond on the FMC property was within the area purchased for right-of-way.

Soil in and around the pond was excavated during construction of SR 99 and, according to provisions of the construction contract, stockpiled within the current Caltrans right-of-way at the location of the future State Route 132 West Freeway/Expressway project. Three distinct stockpiles are present at the Site:

- Stockpile 1, located south of Kansas Avenue and west of North Emerald Avenue,
- Stockpile 2, located south of Kansas Avenue, between North Emerald Avenue and SR 99, and
- Stockpile 3, located south of Kansas Avenue and east of SR 99.

In 2006, Caltrans arranged for the installation of monitoring wells MW-1 through MW-8 at locations adjacent to the three stockpiles as shown on Figure 2. General groundwater chemistry analytical results from June and October 2006 groundwater events suggested that two distinct groundwater types are present beneath the Site. A survey of groundwater wells within a one-mile radius of the Site identified 43 existing or former wells; however, there were no active supply wells identified in the general (southeast) flow direction from the Site.

Groundwater monitoring was resumed for the Site with the March 2012 sampling of wells MW-1 through MW-8. Representatives from the DTSC observed the sample collection procedures and collected split samples which were submitted to an alternate laboratory. No notable differences in the concentrations for each reported analyte were evident.

In June 2012, Geocon arranged for the installation of monitoring wells MW-9 and MW-10 at locations that are both upgradient and adjacent to the three stockpiles as shown on Figure 2.

Geocon compared the analytical results from the five recent groundwater sampling events (March, May, June, July and September 2012) to the following water quality threshold values:

- Primary Maximum Contaminant Levels (MCLs) promulgated by the California Department of Public Health (CDPH); and
- Secondary MCLs promulgated by the CDPH.

The results of the previous 2012 groundwater sampling events show that both dissolved metals and general minerals have predominantly been reported at concentrations less than their respective numeric water quality threshold values. Only nitrates (expressed as nitrogen) in MW-1, MW-5, and MW-6 and total dissolved solids (TDS) in wells MW-5, MW-6, and MW-10 have been consistently reported at concentrations that exceed their respective primary or secondary MCLs of 10 and 500 milligrams per liter (mg/l). Based on the lack of polycyclic aromatic hydrocarbons (PAHs) reported for each of the

samples analyzed, we requested discontinuation of analysis for PAHs. The DTSC approved our request in November 2012. We analyzed PAHs for this sampling event, but PAH analysis will be discontinued for future events.

Hydrogeologic Characterization

The hydrogeology of the adjacent FMC site has been characterized by numerous studies since the early 1980s. The GeoTrans January 2005 report *Addendum to Comprehensive Remedial Investigations Report, FMC Corporation, 1200 Graphics Drive, Modesto, Stanislaus County, California* (GeoTrans, 2005) provides a description of the FMC site hydrogeology. This description follows:

“The site is underlain by laterally discontinuous and unconsolidated sand and silty sand associated with the Modesto and Riverbank Formations. First encountered groundwater is approximately 30 feet below ground surface (bgs) under confined to semi-confined conditions. A deeper aquifer is present at a depth of 165 feet bgs and separated from the upper zone by a blue clay aquitard. The upper water bearing unit has been divided into two zones: a shallow zone from first encountered groundwater to 120 feet bgs and a deeper zone from 140 feet bgs to the top of the aquitard. Groundwater flow within the upper zone is toward the southeast under a gradient of 0.002 ft/ft.”

Monitoring wells MW-1 through MW-10 were installed into the unconsolidated sand, silty sand and silt layers within the Modesto Formation underlying the Site. The wells were completed within the shallow zone of the upper aquifer (shallow zone).

The lithology encountered in the borings for the wells includes interbedded (laterally discontinuous) sands, silts, and clays. In the areas investigated, the unsaturated (vadose) zone was dominated by silty soils. The shallow zone groundwater beneath the stockpiles was encountered at approximately 35 feet (elevation approximately 50 feet) under unconfined to semi-confined conditions. Based on historical depth to water measurements from the Site, the groundwater flow direction in the shallow upper aquifer is generally toward the southeast with hydraulic gradients varying from 0.0006 to 0.001. The shallow aquifer conditions beneath the Site and the adjacent FMC site appear similar and representative of conditions in the local area.

NOVEMBER 2012 FIELD ACTIVITIES

This section describes the field activities performed for the November 2012 monitoring event.

Depth to Groundwater Measurements

On November 28, 2012, prior to opening the wells, Geocon observed each of the ten well boxes for signs of potential tampering. No signs of tampering were observed. The security well boxes and casing caps were noted to be properly sealed and locked. Geocon measured the depth to groundwater and the dissolved oxygen (DO) levels and oxygen-reduction potential (ORP) in monitoring wells MW-1 through MW-10 using a battery-operated water level meter, a Hanna Model No. 9143 DO meter, and an Oakton ORP meter. Depth to water measurements were obtained from a surveyed reference point at the top of the well casings (TOC).

In November 2012, depth to groundwater at the Site ranged from 32.28 (MW-1) to 41.18 (MW-5) feet below TOC. Based on the groundwater elevation data, the groundwater flow is toward the southeast at an average gradient of 0.0008, which is consistent with historical flow. A gradient rose diagram depicting historical flow direction and gradient is included on Figure 3. A summary of the TOC elevations, depth to groundwater measurements and groundwater elevations is on Table 1. Groundwater elevation contours, flow direction and gradient are depicted on Figure 3, Groundwater Elevation and Ionic Composition Map – November 2012.

Well Purging and Sampling

On November 28 and 29, 2012, Geocon purged approximately three well volumes of water (1.5 to 6 gallons) from groundwater monitoring wells MW-1 through MW-4 and MW-7 through MW-10 using a submersible pump. Wells MW-5 and MW-6 went dry after purging 0.75 gallon and 1 gallon, respectively. Geocon allowed both wells to recover, purged an additional 1.5 gallon from well MW-6, allowed the well to recover a second time, and then collected groundwater samples. The pump was decontaminated before and after each use by washing in an Alconox™ solution followed by fresh and distilled water rinses. During the well purging activities, the groundwater was monitored for pH, electrical conductivity, temperature and turbidity. This information is included on the Monitoring Well Sampling Data sheets in Appendix A.

Following well purging, groundwater samples were collected from each of the wells using disposable bailers and decanted through slow emptying devices into laboratory-provided sample containers. The groundwater samples collected for dissolved metals analysis were filtered using a hand-pressure pump through a 0.45-micron filter while filling the container. The samples were sealed, labeled, placed in a chilled cooler and subsequently transported to the laboratory using chain-of-custody protocol.

Purged groundwater was placed into one Department of Transportation-approved, 17-H, 55-gallon drum and transported offsite to Geocon's Rancho Cordova office pending receipt of analytical results and subsequent disposal at Inviro-tec Disposal facility in Lincoln, California, on December 11, 2012.

ANALYTICAL METHODS AND RESULTS

Laboratory Analysis

The groundwater samples were delivered to Advanced Technology Laboratories (ATL) for the following analyses under chain-of-custody protocol:

- Title 22 dissolved metals (including strontium) following EPA Test Methods 6020/7470;
- Dissolved calcium, magnesium, potassium and sodium by EPA Test Method 6020;
- Chloride, nitrate as nitrogen and sulfate by EPA Test Method 300.0;
- Sulfide by Standard Method (SM) 4500;
- TDS by SM 2540C;
- Total alkalinity, bicarbonate alkalinity, carbonate alkalinity by SM 2320B; and
- PAHs by EPA Test Method 8270-SIM.

Groundwater analytical results for this monitoring event are summarized on Tables 2 and 3. The laboratory reports and chain-of-custody documentation are in Appendix B.

Analytical Results

PAHs

The PAH results are summarized on Table 3. No PAHs were reported at concentrations equal to or greater than their respective practical quantitation limits (PQLs) for each of the groundwater samples collected during this monitoring event.

Dissolved Metals

Analytical results for dissolved metals along with their associated numeric water quality thresholds are summarized on Table 2. Plots of barium, lead and strontium concentrations vs. time are presented as Figures 4 through 6.

DTSC has identified barium, lead and strontium as the primary chemicals of concern in groundwater for the Site. For the November 2012 groundwater samples, barium and strontium were reported for all ten groundwater samples. Lead was not reported at concentrations equal to or greater than the PQL of 1.0 µg/l in each of the groundwater samples. The ranges of barium and strontium concentrations reported for the November sampling event are on the following table:

	Barium (µg/l)	Strontium (µg/l)
High Concentration	300 (MW-5)	1,100 (MW-1)
Low Concentration	60 (MW-3)	430 (MW-3)
Numeric Water Quality Threshold	1,000 ⁽¹⁾ /700 ⁽²⁾	4,000 ⁽²⁾

µg/l = micrograms per liter

⁽¹⁾ = California Department of Public Health Primary MCL for Drinking Water

⁽²⁾ = EPA Drinking Water Health Advisory

Antimony, beryllium, cadmium, silver, thallium, zinc and mercury were not reported at concentrations equal to or greater than their respective PQLs in samples from each well. As shown on the following table, the dissolved metals arsenic, chromium and vanadium were reported for each of the samples collected with the following ranges:

	Arsenic (µg/l)	Chromium (µg/l)	Vanadium (µg/l)
High Concentration	5.1 (MW-6)	8.0 (MW-6)	38 (MW-6)
Low Concentration	2.1 (MW-4)	0.60 (MW-10)	18 (MW-1, MW-4, MW-10)
Numeric Water Quality Threshold	10 ⁽¹⁾	50 ⁽¹⁾	50 ⁽³⁾

µg/l = micrograms per liter

⁽¹⁾ = California Department of Public Health Primary Maximum Contaminant Level for Drinking Water

⁽²⁾ = EPA Drinking Water Health Advisory

⁽³⁾ = California Department of Public Health Notification Level for Drinking Water

Although concentrations of arsenic, barium, chromium, strontium and vanadium were reported for the samples collected from each well, none of the reported concentrations exceed their respective numeric water quality thresholds for drinking water.

Nickel was reported for each sample except MW-3. Molybdenum was reported for each sample except MW-4 and MW-10. Selenium was detected in seven of the ten samples collected. Copper and manganese were detected in three of the ten samples collected. Cobalt was detected in the sample from MW-8. The following table summarizes the dissolved cobalt, copper, manganese, molybdenum, nickel and selenium concentrations reported for the listed samples:

	Cobalt (µg/l)	Copper (µg/l)	Manganese (µg/l)	Molybdenum (µg/l)	Nickel (µg/l)	Selenium (µg/l)
High Concentration	0.94 (MW-8)	2.1 (MW-8)	160 (MW-8)	6.0 (MW-6)	2.3 (MW-4 and MW-8)	3.0 (MW-10)
Low Concentration	0.94 (MW-8)	1.0 (MW-4 and MW-9)	11 (MW-4)	0.58 (MW-1)	1.3 (MW-7)	0.54 (MW-4)
Numeric Water Quality Threshold	---	1,300 ⁽¹⁾ /1,000 ⁽²⁾	50 ⁽¹⁾	---	100 ⁽¹⁾	50 ⁽¹⁾

µg/l = micrograms per liter

⁽¹⁾ = California Department of Public Health Primary Maximum Contaminant Level for Drinking Water

⁽²⁾ = California Department of Public Health Secondary Maximum Contaminant Level (taste and odor)

⁽³⁾ = EPA Drinking Water Health Advisory

Although concentrations of cobalt, copper, manganese, molybdenum, nickel and selenium were reported for the samples collected from site monitoring wells, none of the reported concentrations exceed their respective numeric water quality thresholds for drinking water with the exception of the sample from MW-8 for manganese.

General Minerals/Stiff Diagrams

To further characterize the geochemistry of the groundwater, general minerals analyses were conducted and included the following constituents:

- dissolved calcium
- dissolved magnesium
- chloride
- nitrate as nitrogen
- sulfate
- dissolved potassium
- dissolved sodium
- sulfide
- total alkalinity
- TDS

General groundwater chemistry provides information regarding the origin and geochemical nature of the groundwater sampled. The analytical results for the major cation (dissolved sodium, potassium, calcium and magnesium) and anion species (chloride, bicarbonate alkalinity reported as calcium carbonate, and sulfate) were used to create Stiff diagrams. Stiff diagrams provide a graphical display of ionic content and can be used to characterize and evaluate the relative composition of groundwater and its consistency or variability. Groundwater with different cation/anion concentrations will result in Stiff diagrams of different shapes and sizes. Stiff diagrams can also help to illustrate mixing of water with different compositions or origins. The presence of more than one water type can be an indication of influences due to hydrogeologic variation or from other sources including man-made impacts.

Appendix C contains Stiff diagrams constructed using site groundwater data for November 2012. The diagrams show that groundwater sampled in each monitoring well is bicarbonate (HCO_3) dominant. However, variations in the sodium and potassium (Na+K) and calcium composition are readily apparent. The variations are seen primarily in the sodium content with the potassium concentrations being less variable. In November 2012, the samples from wells MW-1, MW-2, MW-4, MW-5, MW-7, MW-9 and MW-10 had a calcium-dominant composition while the samples from wells MW-3, MW-6 and MW-8 were sodium-dominant.

Nitrate as nitrogen and TDS were both reported for each of the groundwater samples, with nitrate as nitrogen concentrations ranging from 2.8 (MW-3) to 24 mg/l (MW-5) and TDS concentrations ranging from 340 (MW-7) to 640 mg/l (MW-5 and MW-10). The reported nitrate concentrations for MW-1, MW-5, MW-6, MW-8 and MW-10 exceed the primary MCL for nitrate of 10 mg/l, and the reported TDS concentrations for MW-4, MW-5, MW-6 and MW-10 meet or exceed the secondary MCL for TDS of 500 mg/l. Noteworthy is that MW-1 is an upgradient monitoring well; thus, the reported nitrate and TDS concentrations of 12 and 420 mg/l, respectively, may be indicative of natural background nitrate and TDS concentrations for the shallow groundwater in the vicinity of the Site. Sulfide was reported for eight of the ten samples with concentrations ranging from 0.06 (MW-4) to 0.12 mg/l (MW-1).

The analytical results for general minerals are summarized on Table 3.

Field and Laboratory Quality Assurance/Quality Control

The field quality assurance/quality control (QA/QC) implemented for the November 2012 groundwater monitoring at the Site included the collection of an equipment blank analyzed for dissolved metals. The blank was collected by pouring distilled water over a decontaminated pump and allowing the water to collect into the laboratory-provided sample container. Dissolved metals were not reported at concentrations equal to or greater than their respective PQLs for the equipment blank with the exception of sodium at 64 µg/l. The sodium concentrations reported for the samples appeared similar to those previously reported for each of the wells; therefore, it does not appear that the presence of sodium in the equipment blank has significantly influenced the sample results.

Geocon also reviewed the analytical laboratory QA/QC provided with the laboratory report. These data show that the method blank surrogate recoveries are acceptable and that concentrations of selected analytes were not reported at concentrations equal to or greater than their respective PQLs for each method blank for each analysis. Appropriate recoveries were noted for each laboratory control sample for each analysis. Several matrix spike/matrix spike duplicate (MS/MSD) analytes had recoveries or relative percent differences outside of laboratory control limits, however, the sample results were validated by the laboratory control samples. No qualification of the data is necessary and the data are considered of sufficient quality for the purposes of this report.

GeoTracker Submittal

The laboratory prepared electronic data files for submittal to the State Water Resources Control Board GeoTracker database. The GeoTracker database is accessible via the GeoTracker website at <http://geotracker.waterboards.ca.gov>. The electronic data was uploaded to GeoTracker on February 6, 2013. The confirmation numbers are 8529407560, 1558390319, 3671110033 and 4926208436.

CONCLUSIONS AND RECOMMENDATIONS

With the exception of manganese detected in the sample from MW-8, none of the reported dissolved metals concentrations for the groundwater samples collected in November 2012 exceeded their respective numeric water quality threshold values.

With the exception of nitrate, none of the reported general minerals for the groundwater samples collected in November 2012 exceeded their respective California primary MCLs. TDS was reported at concentrations exceeding the secondary MCL of 500 mg/l for the samples collected from wells MW-5, MW-6 and MW-10.

Barium and strontium were reported for the November 2012 groundwater samples at concentrations similar to historical levels and remained significantly less than their numeric water quality thresholds. The remaining dissolved metals were also reported at concentrations similar to historical levels. Lead was not reported at concentrations equal to or greater than the PQL of 1.0 µg/l in each of the groundwater samples.

Stiff diagrams for the 2012 groundwater sampling events show that very slight changes in ionic content have occurred since groundwater sampling resumed at the Site in March 2012. Water samples from wells MW-1, MW-2, MW-4, MW-5, MW-7 and MW-9 have consistently been reported as calcium-dominant, and those from wells MW-3, MW-6 and MW-8 as sodium-dominant. The ionic content reported for well MW-10 was sodium-dominant in June 2012, calcium-dominant in July 2012, and remained calcium-dominant for the September and November 2012 monitoring events.

We appreciate the opportunity to provide our services on this project. Please contact us if you have any questions concerning the contents of this Report or if we may be of further service.

Sincerely,

GEOCON CONSULTANTS, INC.



Rebecca L. Silva
Project Manager



John E. Juhrend, PE, CEG
Principal/Senior Engineer



- (1) Addressee
- (1) Caltrans, Sam Haack
- (1) DTSC, Randy Adams
- (1) CVRWQCB, Steve Meeks

- Attachments:
- Figure 1, Vicinity Map
 - Figure 2, Site Plan
 - Figure 3, Groundwater Elevation and Ionic Composition Map – November 2012
 - Figure 4, Barium Concentrations vs. Time
 - Figure 5, Lead Concentrations vs. Time
 - Figure 6, Strontium Concentrations vs. Time

 - Table 1, Groundwater Elevation Data
 - Table 2, Summary of Groundwater Analytical Results – Title 22 Metals (Dissolved)
 - Table 3, Summary of Groundwater Analytical Results – General Minerals and PAHs
 - Table 4, Well Construction Details

 - Appendix A, Monitoring Well Development and Sampling Data Sheets
 - Appendix B, Laboratory Reports and Chain-of-custody Documentation
 - Appendix C, Stiff Diagrams

MONITORING WELL SAMPLING DATA

Project Name: Caltrans Modesto Soil Stockpiles	Project Number: S9525-06-44A
Well No.: MW-1	Date: 11/28/12
Well Diameter: 2 in.	Field Personnel: JE/MO
Casing Length: 44 feet	Screened Casing Length: 10 feet
Well Elevation: 80.39 feet above MSL	Water Elevation: 47.66 feet above MSL

PURGE CHARACTERISTICS	
Water Depth Before Purging: 32.28 ft.	2 in. = .1632 gal/ft. 4 in. = .6528 gal/ft.
Calculated Water Column Volume: 1.91 gal.	Volumes Purged: 3.1
Start Purging Time: 0940	End Purging Time: 0944
Total Time: 4 min.	Flow Measurement: 5-gal bucket
Total Volume Purged: 6 gal.	Avg. Flow Rate: 1.5 gpm
Dissolved Oxygen: 4.42 mg/l	Free Product: (N); Thickness: inches

SAMPLING CHARACTERISTICS				
Purging Method: Submersible Pump			Sampling Method: Disposable Bailer	
Laboratory Analysis: General Minerals, Title 22 Dissolved Metals, PAHs				
TIME	TEMPERATURE (°C)	CONDUCTIVITY (µmhos/cm)	pH	Gallons Purged
0941	16.6	767	6.83	2
0942	18.3	721	6.82	4
0944	18.1	728	6.85	6
0955				Sample

Comments: Turbid first 3 gallons, water cleared. No odor.
ORP = 161 millivolts, Turbidity = 764 ntu at start of purge, 288 ntu at end.

MONITORING WELL SAMPLING DATA

Project Name: Caltrans Modesto Soil Stockpiles	Project Number: S9525-06-44A
Well No.: MW-2	Date: 11/28/12
Well Diameter: 2 in.	Field Personnel: JE/MO
Casing Length: 40 feet	Screened Casing Length: 10 feet
Well Elevation: 81.25 feet above MSL	Water Elevation: 47.55 feet above MSL

PURGE CHARACTERISTICS	
Water Depth Before Purging: 33.22 ft.	2 in. = .1632 gal/ft. 4 in. = .6528 gal/ft.
Calculated Water Column Volume: 1.11 gal.	Volumes Purged: 3.2
Start Purging Time: 0910	End Purging Time: 0913
Total Time: 3 min.	Flow Measurement: 5-gal bucket
Total Volume Purged: 3.5 gal.	Avg. Flow Rate: 1.2 gpm
Dissolved Oxygen: 5.85 mg/l	Free Product: (N); Thickness: inches

SAMPLING CHARACTERISTICS				
Purging Method: Submersible Pump			Sampling Method: Disposable Bailer	
Laboratory Analysis: General Minerals, Title 22 Dissolved Metals, PAHs				
TIME	TEMPERATURE (°C)	CONDUCTIVITY (µmhos/cm)	pH	Gallons Purged
0911	13.7	496	7.73	1
0912	15.7	589	6.47	2
0913	17.2	592	6.98	3.5
0925				Sample

Comments: First 3 gallons silty, light brown. Water changed to slightly turbid after 3 gallons.
No odors.
ORP = 117 millivolts, Turbidity = 525 ntu at start of purge, 27 ntu at end.

MONITORING WELL SAMPLING DATA

Project Name: Caltrans Modesto Soil Stockpiles	Project Number: S9525-06-44A
Well No.: MW-3	Date: 11/28/12
Well Diameter: 2 in.	Field Personnel: JE/MO
Casing Length: 41 feet	Screened Casing Length: 10 feet
Well Elevation: 81.82 feet above MSL	Water Elevation: 46.93 feet above MSL

PURGE CHARACTERISTICS	
Water Depth Before Purging: 34.69 ft.	2 in. = .1632 gal/ft. 4 in. = .6528 gal/ft.
Calculated Water Column Volume: 1.03 gal.	Volumes Purged: 3.4
Start Purging Time: 1100	End Purging Time: 1103
Total Time: 3 min.	Flow Measurement: 5-gal bucket
Total Volume Purged: 3.5 gal.	Avg. Flow Rate: 1.2 gpm
Dissolved Oxygen: 7.93 mg/l	Free Product: (N); Thickness: inches

SAMPLING CHARACTERISTICS				
Purging Method: Submersible Pump			Sampling Method: Disposable Bailer	
Laboratory Analysis: General Minerals, Title 22 Dissolved Metals, PAHs				
TIME	TEMPERATURE (°C)	CONDUCTIVITY (µmhos/cm)	pH	Gallons Purged
1101	17.2	539	7.23	1
1102	18.0	539	7.05	2
1103	18.9	538	7.00	3.5
1120				Sample

Comments: Clear, no odor
ORP = 191 millivolts, Turbidity = 58 ntu at start of purge, 28 ntu at end of purge.

MONITORING WELL SAMPLING DATA

Project Name: Caltrans Modesto Soil Stockpiles	Project Number: S9525-06-44A
Well No.: MW-4	Date: 11/28/12
Well Diameter: 2 in.	Field Personnel: JE/MO
Casing Length: 42 feet	Screened Casing Length: 10 feet
Well Elevation: 82.47 feet above MSL	Water Elevation: 47.19 feet above MSL

PURGE CHARACTERISTICS	
Water Depth Before Purging: 34.84 ft.	2 in. = .1632 gal/ft. 4 in. = .6528 gal/ft.
Calculated Water Column Volume: 1.17 gal.	Volumes Purged: 3.4
Start Purging Time: 1020	End Purging Time: 1023
Total Time: 3 min.	Flow Measurement: 5-gal bucket
Total Volume Purged: 4 gal.	Avg. Flow Rate: 1.3 gpm
Dissolved Oxygen: 5.97 mg/l	Free Product: (N); Thickness: inches

SAMPLING CHARACTERISTICS				
Purging Method: Submersible Pump			Sampling Method: Disposable Bailer	
Laboratory Analysis: General Minerals, Title 22 Dissolved Metals, PAHs				
TIME	TEMPERATURE (°C)	CONDUCTIVITY (µmhos/cm)	pH	Gallons Purged
1021	15.6	677	6.90	2
1022	17.4	734	6.76	3
1023	18.6	755	6.72	4
1035				Sample

Comments: Clear after 4 gallons. No odor.
ORP = 183 millivolts, Turbidity = 88 ntu at start of purge, 10 ntu at end.

MONITORING WELL SAMPLING DATA

Project Name: Caltrans Modesto Soil Stockpiles	Project Number: S9525-06-44A
Well No.: MW-5	Date: 11/28/12-11/29/12
Well Diameter: 2 in.	Field Personnel: JE/MO
Casing Length: 45 feet	Screened Casing Length: 10 feet
Well Elevation: 87.78 feet above MSL	Water Elevation: 46.59 feet above MSL

PURGE CHARACTERISTICS	
Water Depth Before Purging: 41.18 ft.	2 in. = .1632 gal/ft. 4 in. = .6528 gal/ft.
Calculated Water Column Volume: 0.62 gal.	Volumes Purged: 1.2
Start Purging Time: 1130	End Purging Time: 1134
Total Time: 4 min.	Flow Measurement: 5-gal bucket
Total Volume Purged: 0.75 gal.	Avg. Flow Rate: gpm
Dissolved Oxygen: 4.36 mg/l	Free Product: (N); Thickness: inches

SAMPLING CHARACTERISTICS				
Purging Method: Submersible Pump			Sampling Method: Disposable Bailer	
Laboratory Analysis: General Minerals, Title 22 Dissolved Metals, PAHs				
TIME	TEMPERATURE (°C)	CONDUCTIVITY (µmhos/cm)	pH	Gallons Purged
11/28 1134	16.4	954	7.11	0.75
11/29 0840				Sample

Comments: Water had slight silt, no odor. Well went dry at 0.75 gallon.
Not enough water in well to sample all bottles at 0840. Had to come back at 1120 to sample remainder.
ORP = 207 millivolts, Turbidity = 511 ntu

MONITORING WELL SAMPLING DATA

Project Name: Caltrans Modesto Soil Stockpiles	Project Number: S9525-06-44A
Well No.: MW-6	Date: 11/29/12
Well Diameter: 2 in.	Field Personnel: JE/MO
Casing Length: 46.5 feet	Screened Casing Length: 10 feet
Well Elevation: 84.52 feet above MSL	Water Elevation: 46.53 feet above MSL

PURGE CHARACTERISTICS	
Water Depth Before Purging: 38.19 ft.	2 in. = .1632 gal/ft. 4 in. = .6528 gal/ft.
Calculated Water Column Volume: 1.36 gal.	Volumes Purged: 1.8
Start Purging Time: 0910	End Purging Time: 0920
Total Time: 10 min.	Flow Measurement: 5-gal bucket
Total Volume Purged: 2.5 gal.	Avg. Flow Rate: gpm
Dissolved Oxygen: 6.53 mg/l	Free Product: (N); Thickness: inches

SAMPLING CHARACTERISTICS				
Purging Method: Disposable Bailer			Sampling Method: Disposable Bailer	
Laboratory Analysis: General Minerals, Title 22 Dissolved Metals, PAHs				
TIME	TEMPERATURE (°C)	CONDUCTIVITY (µmhos/cm)	pH	Gallons Purged
0912	18.3	896	6.90	1
0914	19.0	934	7.04	2
0920	19.1	926	7.23	2.5
0925				Sample

Comments: Dry at 1 gallon. Turbid, no odor. Quick recharge. Dry again at 2.5 gallons, then sampled.
ORP = 173 millivolts, Turbidity = 729 ntu at start of purge, 362 ntu at end.

MONITORING WELL SAMPLING DATA

Project Name: Caltrans Modesto Soil Stockpiles	Project Number: S9525-06-44A
Well No.: MW-7	Date: 11/29/12
Well Diameter: 2 in.	Field Personnel: JE/MO
Casing Length: 48 feet	Screened Casing Length: 10 feet
Well Elevation: 83.74 feet above MSL	Water Elevation: 46.14 feet above MSL

PURGE CHARACTERISTICS	
Water Depth Before Purging: 37.35 ft.	2 in. = .1632 gal/ft. 4 in. = .6528 gal/ft.
Calculated Water Column Volume: 1.74 gal.	Volumes Purged: 3.2
Start Purging Time: 0943	End Purging Time: 0946
Total Time: 3 min.	Flow Measurement: 5-gal bucket
Total Volume Purged: 5.5 gal.	Avg. Flow Rate: 1.8 gpm
Dissolved Oxygen: 6.70 mg/l	Free Product: (N); Thickness: inches

SAMPLING CHARACTERISTICS				
Purging Method: Submersible Pump			Sampling Method: Disposable Bailer	
Laboratory Analysis: General Minerals, Title 22 Dissolved Metals, PAHs				
TIME	TEMPERATURE (°C)	CONDUCTIVITY (µmhos/cm)	pH	Gallons Purged
0944	18.1	534	7.04	2
0945	18.5	517	7.02	4
0946	18.1	518	7.00	5.5
0955				Sample

Comments: Clear, no odor.
ORP = 182 millivolts, Turbidity = 877 ntu at start of purge, 29 ntu at end

MONITORING WELL SAMPLING DATA

Project Name: Caltrans Modesto Soil Stockpiles	Project Number: S9525-06-44A
Well No.: MW-8	Date: 11/29/12
Well Diameter: 2 in.	Field Personnel: JE/MO
Casing Length: 45 feet	Screened Casing Length: 10 feet
Well Elevation: 83.85 feet above MSL	Water Elevation: 45.81 feet above MSL

PURGE CHARACTERISTICS	
Water Depth Before Purging: 38.37 ft.	2 in. = .1632 gal/ft. 4 in. = .6528 gal/ft.
Calculated Water Column Volume: 1.08 gal.	Volumes Purged: 3.2
Start Purging Time: 1015	End Purging Time: 1021
Total Time: 6 min.	Flow Measurement: 5-gal bucket
Total Volume Purged: 3.5 gal.	Avg. Flow Rate: gpm
Dissolved Oxygen: 5.88 mg/l	Free Product: (N); Thickness: inches

SAMPLING CHARACTERISTICS				
Purging Method: Disposable Bailer		Sampling Method: Disposable Bailer		
Laboratory Analysis: General Minerals, Title 22 Dissolved Metals, PAHs				
TIME	TEMPERATURE (°C)	CONDUCTIVITY (µmhos/cm)	pH	Gallons Purged
1017	17.9	646	6.97	1
1019	18.3	652	6.90	2
1021	18.2	646	6.96	3.5
1030				Sample

Comments: Clear. No odor.
ORP = 215 millivolts, Turbidity = 123 ntu at start of purge, 21 ntu at end.

MONITORING WELL SAMPLING DATA

Project Name: Caltrans Modesto Soil Stockpiles	Project Number: S9525-06-44A
Well No.: MW-9	Date: 11/28/12
Well Diameter: 2 in.	Field Personnel: JE/MO
Casing Length: 40 feet	Screened Casing Length: 10 feet
Well Elevation: 82.53 feet above MSL	Water Elevation: 46.89 feet above MSL

PURGE CHARACTERISTICS	
Water Depth Before Purging: 35.65 ft.	2 in. = .1632 gal/ft. 4 in. = .6528 gal/ft.
Calculated Water Column Volume: 0.71 gal.	Volumes Purged: 3.5
Start Purging Time: 1200	End Purging Time: 1203
Total Time: 3 min.	Flow Measurement: 5-gal bucket
Total Volume Purged: 2.5 gal.	Avg. Flow Rate: 0.8 gpm
Dissolved Oxygen: 3.97 mg/l	Free Product: (N); Thickness: inches

SAMPLING CHARACTERISTICS				
Purging Method: Submersible Pump			Sampling Method: Disposable Bailer	
Laboratory Analysis: General Minerals, Title 22 Dissolved Metals, PAHs				
TIME	TEMPERATURE (°C)	CONDUCTIVITY (µmhos/cm)	pH	Gallons Purged
1201	17.3	662	7.27	1
1202	18.3	674	7.07	2
1203	19.3	693	6.93	2.5
1215				Sample

Comments: Slightly silty, turbid, no odor.
ORP = 212 millivolts, Turbidity = 392 ntu at start of purge, 41 ntu at end

MONITORING WELL SAMPLING DATA

Project Name: Caltrans Modesto Soil Stockpiles	Project Number: S9525-06-44A
Well No.: MW-10	Date: 11/29/12
Well Diameter: 2 in.	Field Personnel: JE/MO
Casing Length: 40 feet	Screened Casing Length: 10 feet
Well Elevation: 83.97 feet above MSL	Water Elevation: 46.79 feet above MSL

PURGE CHARACTERISTICS	
Water Depth Before Purging: 37.34 ft.	2 in. = .1632 gal/ft. 4 in. = .6528 gal/ft.
Calculated Water Column Volume: 0.43 gal.	Volumes Purged: 3.5
Start Purging Time: 1051	End Purging Time: 1057
Total Time: 6 min.	Flow Measurement: 5-gal bucket
Total Volume Purged: 1.5 gal.	Avg. Flow Rate: gpm
Dissolved Oxygen: 5.07 mg/l	Free Product: (N); Thickness: inches

SAMPLING CHARACTERISTICS				
Purging Method: Disposable Bailer		Sampling Method: Disposable Bailer		
Laboratory Analysis: General Minerals, Title 22 Dissolved Metals, PAHs				
TIME	TEMPERATURE (°C)	CONDUCTIVITY (µmhos/cm)	pH	Gallons Purged
1053	18.6	967	6.71	0.5
1055	19.4	964	6.77	1
1057	19.0	947	6.62	1.5
1110				Sample

Comments: Clear. No odor.
ORP = 217 millivolts, Turbidity = 317 ntu at start of purge, 81 ntu at end.