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Alameda County
Environmental Health

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October 4, 2010
(date)

Alameda County Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502-6577

Re: Chevron Facility #_9-7127_______

Address:_Grant Line Road and Interstate 580, Tracy, California_________________________

I have reviewed the attached report titled *Vacuum Extraction Event Report and Work Plan for Surfactant Enhanced Recovery*________________________________ and dated October 4, 2010.

I agree with the conclusions and recommendations presented in the referenced report. The information in this report is accurate to the best of my knowledge and all local Agency/Regional Board guidelines have been followed. This report was prepared by Conestoga-Rovers & Associates, upon whose assistance and advice I have relied.

This letter is submitted pursuant to the requirements of California Water Code Section 13267(b)(1) and the regulating implementation entitled Appendix A pertaining thereto.

I declare under penalty of perjury that the foregoing is true and correct.

Sincerely,

SH Frerichs

Stacie H. Frerichs
Project Manager

Enclosure: Report

CONESTOGA-ROVERS
& ASSOCIATES

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October 4, 2010 Reference No. 631656

Mr. Mark Detterman, P.G., C.E.G.
Alameda County Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502-6577

Re: Vacuum Extraction Event Report and Work Plan
for Surfactant-Enhanced Recovery
Former Chevron Service Station 9-7127
I-580 and Grant Line Road
Tracy, California
LOP Case RO0000185

Dear Mr. Detterman:

Conestoga-Rovers & Associates (CRA) has prepared this *Vacuum Extraction Event Report and Work Plan for Surfactant-Enhanced Recovery* on behalf of Chevron Environmental Management Company (Chevron) for the site referenced above. CRA previously prepared and submitted the December 2008 *Corrective Action Plan Addendum and Proposed Feasibility Study* (CAP addendum), in which a groundwater pumping test was recommended to further evaluate the hydrogeologic conditions and behavior of groundwater beneath the site, and the subsequent August 6, 2009 *Work Plan for Groundwater Pumping Test*. The information obtained from the pumping test would be used to further define the necessary scope of remediation, and to further evaluate available remedial options to address light non-aqueous phase liquid (LNAPL) at the site. However, we recently learned that the proposed redevelopment of the site (new service station) was reportedly moving forward, thus remediation needed to be expedited. Therefore, rather than perform a standard pumping test, and as a response had not been received from Alameda County Environmental Health (ACEH) regarding the above documents, the decision was made to perform a pilot test and use a vacuum extraction event to both remove LNAPL and to evaluate hydrogeologic conditions for the potential use of surfactant-enhanced recovery (SER). CRA has used SER successfully at several sites for LNAPL removal and based on the results of the vacuum event it appears feasible at this site. Presented below are the site description and background, site conditions, the details and results of the vacuum extraction event, and our work plan for the proposed SER.

SITE DESCRIPTION AND BACKGROUND

The site is a vacant lot located on the east side of Grant Line Road, just south of Interstate 580 in rural Tracy, California (Figure 1). The site is situated in the rolling foothills east of Altamonte Pass, at an elevation of approximately 320 feet above mean sea level (msl). The site is bounded by an on-ramp to Interstate 580 to the north, Grant Line Road to the west, and undeveloped (grazing) land to the south and east. Chevron operated a service station at the site from 1971 to 1986. Previous station facilities included two 10,000 gallon and one 6,000 gallon gasoline underground storage tanks (USTs), a 1,000 gallon used-oil UST, a 750 gallon heating oil UST, two dispenser islands, and a station building (Figure 2). In 1991, the station was demolished and all aboveground and belowground facilities were removed. The site has since remained vacant land. A former domestic water-supply well is present onsite that reportedly is currently used only for livestock; however, the well is not impacted.

Environmental work at the site has been ongoing since 1987 and has included the drilling of nine exploratory borings (B-1 through B-7 in 1987; B-1 in 1992; and B-3 in 1993), the installation of monitoring wells MW-1 through MW-8 both on- and offsite, confirmation soil sampling during station demolition, and a soil vapor survey. The wells are currently monitored semi-annually with the exception of MW-8, which was damaged by a vehicle. A summary of previous environmental investigation and remediation is included as Attachment A. The approximate well and boring locations are shown on Figure 2.

LNAPL has historically been present in well MW-1 (generally less than 1 foot), and during the last three monitoring events has also been observed in MW-3 (less than 1 foot). Numerous remedial technologies have been employed at the site; however, they have not succeeded in the removal of significant quantities of LNAPL.

CRA originally proposed the use of SER in the May 15, 2007 *Corrective Action Plan* (CAP). However, in a letter dated August 22, 2007, ACEH had several comments regarding the use of this technology echoing concerns the Central Valley Regional Water Quality Control Board (RWQCB) had in 2006 regarding SER at another site; primarily the need for a bench-scale test and complete site characterization to ensure adequate capture of any LNAPL mobilized by the surfactant. CRA subsequently prepared and submitted the October 19, 2007 *Additional Assessment and Revised Interim Remedial Action Plan* (IRAP) that proposed the installation of three additional wells surrounding MW-1 and the performance of a vacuum extraction test in MW-1 to evaluate the radius of influence (ROI) and any preferential flow. In lieu of bench-scale testing, several professional papers were included presenting the results of treatability studies. In a letter dated August 20, 2008, ACEH again requested a bench-scale treatability study along with a revised CAP. In the CAP addendum, CRA alternatively proposed a groundwater pumping test to further evaluate subsurface conditions. However, in light of the proposed redevelopment, a vacuum extraction event was performed to expedite remediation at the site.

GEOLOGY AND HYDROGEOLOGY

Regional and Site Geology

The San Joaquin Valley lies within the southernmost part of the Great Valley Geomorphic Province of California, which is characterized by a large elongate northwest-trending structural trough which is bounded by the Sierra Nevada to the east and the Coast Ranges to the west. Regional subsurface materials are dominated by unconsolidated to semi-consolidated continental deposits of Late Tertiary to Quaternary age. Deposits in this region include the Franciscan Formation, Older Alluvium, Flood Basin Deposits, and Younger Alluvium. The cumulative thickness of these deposits ranges from a few hundred feet on the west to approximately 3,000 feet on the east (California Department of Water Resources [DWR], California's Groundwater Bulletin 118, October 2003). The Midway Fault, an approximate north-south trending normal fault, is located approximately 300 feet east of the site.

The property was developed by cutting out of the hillside; hence, the elevation drops off on the north, east, and south sides of the site. Boring logs indicate that soil beneath the site consists primarily of fill (combinations of sand, silt and clay), silty clay, clayey sand, silty sand and gravel to a maximum depth of approximately 19 feet below grade (fbg). This soil is underlain by Franciscan Formation sediments, consisting primarily of sandstone that extends to the maximum explored depth of 40 fbg.

Regional and Site Hydrogeology

The site lies within the Tracy Sub-basin of the larger San Joaquin Valley Groundwater Basin. The Tracy Sub-basin is bounded by the Mokelumne and San Joaquin Rivers to the north, the San Joaquin-Stanislaus County line to the south, the San Joaquin River to the east, and the Diablo Coast Range to the west. The Tracy Sub-basin is drained by the San Joaquin River and is one of its major westside tributaries (DWR Bulletin 118, October 2003).

Groundwater was encountered in the borings drilled at the site at depths ranging from approximately 12 to 30 fbg within the sandstone bedrock. The depth to groundwater in the wells has ranged from approximately 23 to 31 fbg onsite and 9 to 14 fbg offsite. The groundwater flow direction is generally to the north at an approximate gradient of 0.005 to 0.08.

Previous field data of the sandstone bedding showed the strike orientation was approximately north-south to the west of the Midway Fault (site location). Based on the hydrocarbon distribution at the site, a north-south linear appearance is apparent. There appears to be a correlation between the strike of the bedrock, the groundwater flow direction, and the narrow distribution of hydrocarbons in that they all appear oriented north-south. If the fractures observed during installation of several site wells are also oriented north-south, groundwater beneath the site may be flowing within these fractures, resulting in the narrow, elongated distribution of hydrocarbons in groundwater.

SUMMARY OF PREVIOUS REMEDIAL ACTIVITIES

Soil Excavation and Aeration

In April 1991, following removal of the USTs and product piping, over-excavation of the UST and dispenser island areas was performed. The soil was aerated onsite until detected total petroleum hydrocarbons as gasoline (TPHg) concentrations did not exceed 10 milligrams per kilogram (mg/kg), and was subsequently used to backfill the excavation areas.

Bioremediation

In August 1998, Oxygen Releasing Compound® (ORC)-containing socks were placed in wells MW-1, MW-2 and MW-4 to attempt to reduce hydrocarbon concentrations via enhanced biodegradation. In July 2001, the sock in MW-1 was removed so that a passive product skimmer could be installed (see below). No information is available as to when the remaining socks were removed.

Hydrogen Peroxide Injection

In December 1999, hydrogen peroxide was injected (various concentrations ranging from 3.5 to 17.5%) into wells MW-1 and MW-3 in a further attempt to reduce concentrations in groundwater. Prior to injection, the wellheads were sealed and compressed air was injected into each well at pressures up to 25 pounds per square inch (psi) for up to 20 minutes to fracture the formation around the wells and provide a dispersed pathway for the peroxide.

Groundwater Extraction and LNAPL Removal

In 1993, weekly bailing of well MW-1 to remove LNAPL was performed; a passive skimmer was also installed. As of March 1993, approximately 2 gallons of LNAPL had been removed. The bailing frequency was then reduced to monthly.

In July 2001, a passive skimmer was again installed in MW-1 and seven groundwater vacuum extraction events were conducted in MW-1 through April 2002. Approximately 8,300 gallons of groundwater and 2 gallons of LNAPL were extracted. In July 2002, vacuum extraction from MW-3 was initiated; however, due to an increase in LNAPL thickness in MW-1, the extractions were terminated in October 2002.

In March and April 2007, three additional batch groundwater extraction events were conducted in MW-1, and a total of approximately 5,100 gallons of groundwater was removed. The LNAPL thickness in MW-1 was measured prior to each event (0.5 feet, 0.36 feet and 0.39 feet).

VACUUM EXTRACTION EVENT DETAILS AND RESULTS

The vacuum extraction event was performed on May 18, 2010 using a vacuum truck operated by Integrated Wastestream Management, Inc. (IWM) of San Jose, California, under the supervision of CRA. The details of the event are presented below.

Vacuum Extraction and Water Level Monitoring

Prior to extraction, the initial depth to water in wells MW-1, MW-2, MW-3, MW-5, and MW-7 was measured (well MW-4 could not be located). Data-logging pressure transducers were then placed in MW-2, MW-3, MW-5, and MW-7 to monitor the water levels during extraction. A transducer was not placed in MW-6 due to accessibility issues; rather this well was manually gauged periodically throughout the day with a water-level meter.

Extraction was first performed from MW-1 for 3 hours and approximately 1,200 gallons of groundwater and product were removed (average flow rate of approximately 7 gallons per minute [gpm]). The data from the transducer in MW-3 was then downloaded and it was moved to MW-1. Extraction was then performed from MW-3 for 4 hours and approximately 900 gallons was removed (average flow rate of approximately 4 gpm). Extraction was performed near the top of the water column in each well to maximize LNAPL removal. Copies of the field data sheets are included as Attachment B.

Groundwater Sampling and Laboratory Analysis

Groundwater samples were collected from MW-1 and MW-3 during and immediately after extraction in each well using disposable bailers. The groundwater samples were collected in the appropriate laboratory-supplied containers, placed in an ice-chilled cooler, and transported under chain-of-custody to Lancaster Laboratories in Lancaster, Pennsylvania for analysis. Standard field procedures for groundwater sampling are included as Attachment C. The groundwater samples were analyzed for the following constituents:

- TPHg by EPA Method 8015B.
- Benzene, toluene, ethylbenzene, and xylenes (BTEX) and methyl tertiary butyl ether (MTBE) by EPA Method 8260B.

Groundwater Sample Analytical Results

The groundwater sample analytical results are presented in Table A below. Copies of the laboratory report and chain of custody documentation are included as Attachment D.

TABLE A
GROUNDWATER SAMPLE ANALYTICAL RESULTS
(concentrations in μg/L)

Well	*Sample Date*	*Sample Time*	*TPHg*	*Benzene*	*Toluene*	*Ethylbenzene*	*Xylenes*	*MTBE*
MW-1	5/18/10	1110	46,000	9,000	16,000	830	5,000	<10
		1300	15,000	2,300	6,700	1,000	7,900	<5
MW-3		1450	26,000	1,600	860	240	1,300	<1
		1750	120,000	4,900	14,000	4,000	13,000	<13

μg/L	Micrograms per liter
<	Not detected at or above stated laboratory reporting limit

Drawdown Results and LNAPL Measurements

Graphs of the transducer data from MW-1, MW-2, MW-3, MW-5, and MW-7 are included as Attachment E; the graphs show both static periods and those of extraction from each well. Please note that barometric pressure data from a nearby weather station was checked and, when accounted for in the transducer data, was shown not to have a significant effect. The transducers were programmed to record the depth to water every 30 seconds, and as seen on the graphs oscillations of varying amplitude were consistently observed in all the wells. However, the overall trends are evident on the graphs. The cause of these oscillations is unknown; it may be due to the equipment, or the idling of the vacuum truck or traffic on the adjacent freeway causing vibration of the fill material at the site. However, these oscillations have been observed at other sites and therefore we do not consider them to be significant. The gauging data from MW-6 and periodic LNAPL thickness measurements in MW-1 and MW-3 are shown on the field sheets (Attachment B).

As shown on the graphs, when extracting from MW-1, drawdown was evident in MW-3, while slight influence was observed in MW-5 and MW-7. The water level in MW-2 appeared to rise during extraction in MW-1; however, this trend was also observed prior to extraction and therefore is not attributed to extraction in MW-1. If this portion of the data is discounted, slight influence is also observed in MW-2. The water level in MW-6 appeared to remain constant during extraction in MW-1. The drawdown (and greatest influence) observed in MW-3 appears to support the previous assumption that groundwater flow is preferentially along a north-south axis between MW-1 and MW-3; likely within bedrock fracture(s).

During extraction in MW-3, the water level in MW-1 fluctuated but appeared to rise slightly overall. However, drawdown was evident in MW-2, MW-5, and MW-7, indicating more of an influence between MW-3 and these wells. Based on the manual gauging data, drawdown also appears to have occurred in MW-6 during extraction in MW-3.

Extraction in MW-1 decreased the LNAPL thickness in this well by approximately 0.2 foot; approximately half-hour after extraction ceased the thickness returned to the previous level. The LNAPL thickness in MW-3 decreased by approximately 0.15 foot following extraction in MW-1, and approximately 1 hour after beginning extraction in MW-3, no LNAPL was observed.

Mass and LNAPL Removal Estimates

Using the limited groundwater sample data, and assuming the dissolved-phase concentrations detected during extraction remained constant, an estimated 0.7 pounds of TPHg and 0.1 pound of benzene were removed during the event. The actual dissolved mass removed is likely higher as these concentrations are not indicative of LNAPL, which was present in both wells prior to extraction.

Unfortunately the vacuum truck is sealed and opaque with no visible viewing port, and due to safety concerns the top access hatch was not opened, so a measurement of the actual volume of LNAPL removed could not be collected. In addition, correlation between the LNAPL thickness in monitoring wells and surrounding fractured media is extremely difficult. Thus an estimate of the volume of LNAPL removed is beyond the scope of this report. However, some was removed as evidenced by the decreases in thickness.

Evaluation of Results

Based on the results of the vacuum extraction event, it appears that well MW-1 is in good hydrogeologic communication with well MW-3 (drawdown and a reduction in LNAPL observed), which in turn is in good communication with wells MW-5, MW-6, and MW-7. Sufficient volumes of water and/or LNAPL were also able to be extracted from MW-1 and MW-3. Therefore, it appears that any surfactant placed in MW-1 and MW-3 can be adequately recovered and the surrounding wells will provide good monitoring points. Therefore, the site appears to be a good candidate for the use of SER. CRA has successfully used SER at several sites (with RWQCB approval) including the following:

- Former Chevron 9-4585, 2413 A Street, Antioch
- Chevron 9-9270, 1080 Main Street, Alturas

SURFACTANT-ENHANCED RECOVERY WORK PLAN

The objectives of SER are to both remove residual LNAPL from the subsurface and eliminate its recurrence. SER consists of applying a low concentration solution of surfactant and water to impacted wells, and recovering the resulting mixture of groundwater, surfactant, and liberated LNAPL using groundwater extraction. Surfactants are wetting agents with the ability to lower the interfacial surface tension between two liquids (such as oil and water). Surfactants can effectively emulsify and release LNAPL adsorbed to soil, thereby allowing subsequent removal via fluid extraction. As LNAPL is present in wells MW-1 and MW-3, CRA proposes the use of SER in both wells. Specific procedures are detailed in the following sections.

Proposed Surfactant

CRA proposes using Ivey-sol®, manufactured by Ivey International Inc., as the selected surfactant for this site. Ivey-sol® is listed as non-hazardous, and is not regulated by the Department of Transportation. Ivey-sol® is non-ionic and as such is not expected to act as a germicide or cause exothermic reactions in the subsurface. It contains no salts or phosphates and is pH neutral. Ivey-sol® is water-based, non-toxic, and biodegradable; manufacturer-provided laboratory data indicates that any residual surfactant will achieve 90% degradation within 28 days. The by-products of this biodegradation process are carbon dioxide and water. Copies of the material safety data sheet (MSDS), specification sheet, and the biodegradability study for Ivey-sol® are included as Attachment F.

Health and Safety Plan

CRA will prepare a site- and activity-specific health and safety plan (HASP) to provide safety guidance and protect site workers. The plan will be kept onsite during field activities and will be reviewed and signed by all site workers and visitors.

Permits

CRA will obtain all necessary permits prior to surfactant application.

Surfactant Preparation and Application

CRA will prepare 50 gallon batches of a 4% surfactant solution by mixing 2 gallons of Ivey-sol® with 48 gallons of potable water onsite in 55 gallon drums or equivalent. The resulting 4% solution will be gravity fed into each well. The application rate will be controlled with a ball valve, or equivalent, to prevent overflow in the wells. CRA anticipates that the maximum volume of surfactant solution applied to each well will be between 100 and 200 gallons. These quantities are based upon the flow rates and actual volume recovered from these wells during the vacuum extraction event. However, the final volume of solution applied to each well will be determined by the rate at which the formation actually accepts the solution, and by the radial influence observed at adjacent monitoring wells. Application will cease after 6 hours at either well if the predicted volume is not accepted by the well within that timeframe. The surfactant solution will be allowed to soak in the formation overnight, for a maximum of 24 hours, to envelop and micro-emulsify the residual LNAPL prior to recovery.

Wells MW-2, MW-4, MW-5, MW-6, and MW-7 will be gauged prior to surfactant application and will be monitored for changes in water level and the presence of surfactant during the application and equilibration process. The groundwater levels will be monitored to evaluate the radial influence of the application. Field tests for the presence of surfactant will be performed in these wells prior to and during application, and prior to recovery. The test is a qualitative visual analysis, based on the observation of suds when a sample of the mixture is shaken vigorously. Based on our experience, this is the best and most reliable field method for evaluating the presence of surfactant. If foaming indicative of surfactant, or significant water level changes are observed in any of these wells, surfactant application will be stopped immediately.

Fluid Recovery

After the surfactant solution has soaked in the aquifer for no longer than 24 hours, the resulting fluid (a mixture of surfactant, LNAPL, and groundwater) will be recovered using a vacuum truck. The recovery in each well will be complete when the volume recovered is at least four times the volume of surfactant solution applied. If possible, the vacuum truck will be used to maximize drawdown and then the wells will be allowed to recover prior to further extraction. This pulsing during recovery is proposed to help maximize LNAPL recovery. Groundwater levels in the surrounding wells will be monitored during fluid recovery to evaluate the radial influence. Effluent samples will be collected during recovery to estimate the mass removed.

Groundwater Monitoring

Routine semi-annual groundwater monitoring will be continued pursuant to regulatory requirements to evaluate groundwater quality and the effectiveness of the SER. Follow-up monitoring of LNAPL in wells MW-1 and MW-3 will be performed on a monthly basis for three months following the SER event. If warranted based on the monitoring results, the need for an additional SER event will be evaluated.

Report Preparation

CRA will prepare a report documenting the activities following the completion of the SER event. This report will include a discussion of the field procedures, laboratory results, completion dates, and results of subsequent groundwater monitoring. Subsequent semi-annual monitoring reports will include an evaluation of the effectiveness of the SER.

SCHEDULE AND CLOSING

CRA will implement the proposed scope of work upon receipt of approval from ACEH or if at least 60 days have passed since submittal of this work plan with no response. Based on our experience, the best time to use this technology is during periods of high groundwater (winter or spring), providing a washing effect through the formation when the wells are dewatered. The report will be submitted approximately six weeks after completion of field activities.

We appreciate your assistance on this project and look forward to your reply. Please contact Mr. James Kiernan at (916) 889-8917 if you have any questions or need any additional information.

Sincerely,

CONESTOGA-ROVERS & ASSOCIATES

No. 7779

James P. Kiernan, P.E.

Bruce H. Eppler, P.G.

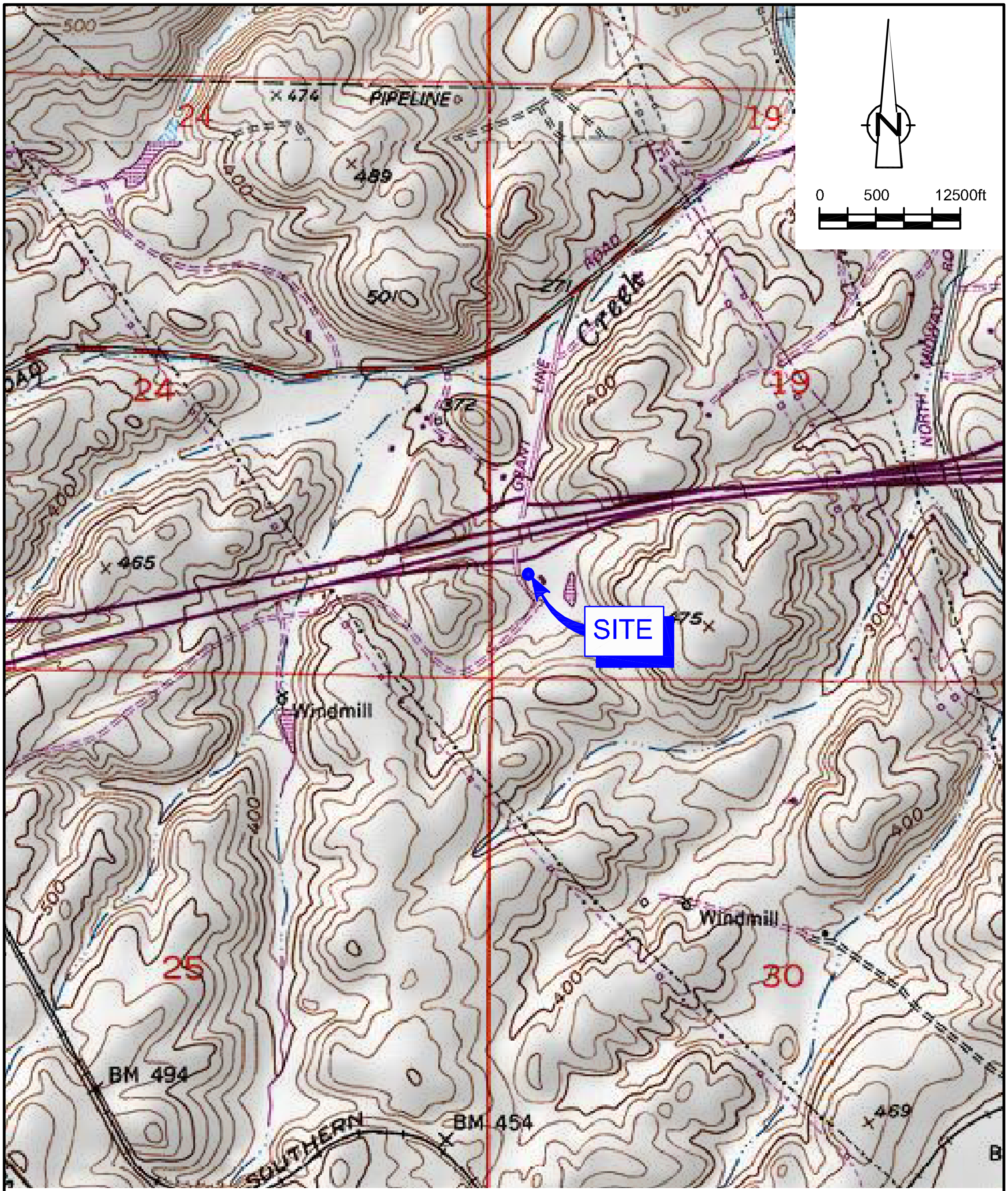
JK/jm/8
Encl.

Figure 1	Vicinity Map
Figure 2	Site Plan

Attachment A	Summary of Previous Environmental Investigation and Remediation
Attachment B	Field Data Sheets
Attachment C	Standard Field Procedures
Attachment D	Laboratory Report
Attachment E	Transducer Data
Attachment F	Surfactant Information

cc: Ms. Stacie Frerichs, Chevron (electronic copy only)
Mr. Ardavan Onsori, DM Livermore, Inc.

FIGURES



SOURCE: TOPO! MAPS.

figure 1

VICINITY MAP
FORMER CHEVRON SERVICE STATION 9-7127
GRANT LINE ROAD AND INTERSTATE 580
Tracy, California

631656-124(005)GN-WA001 JAN 05/2010

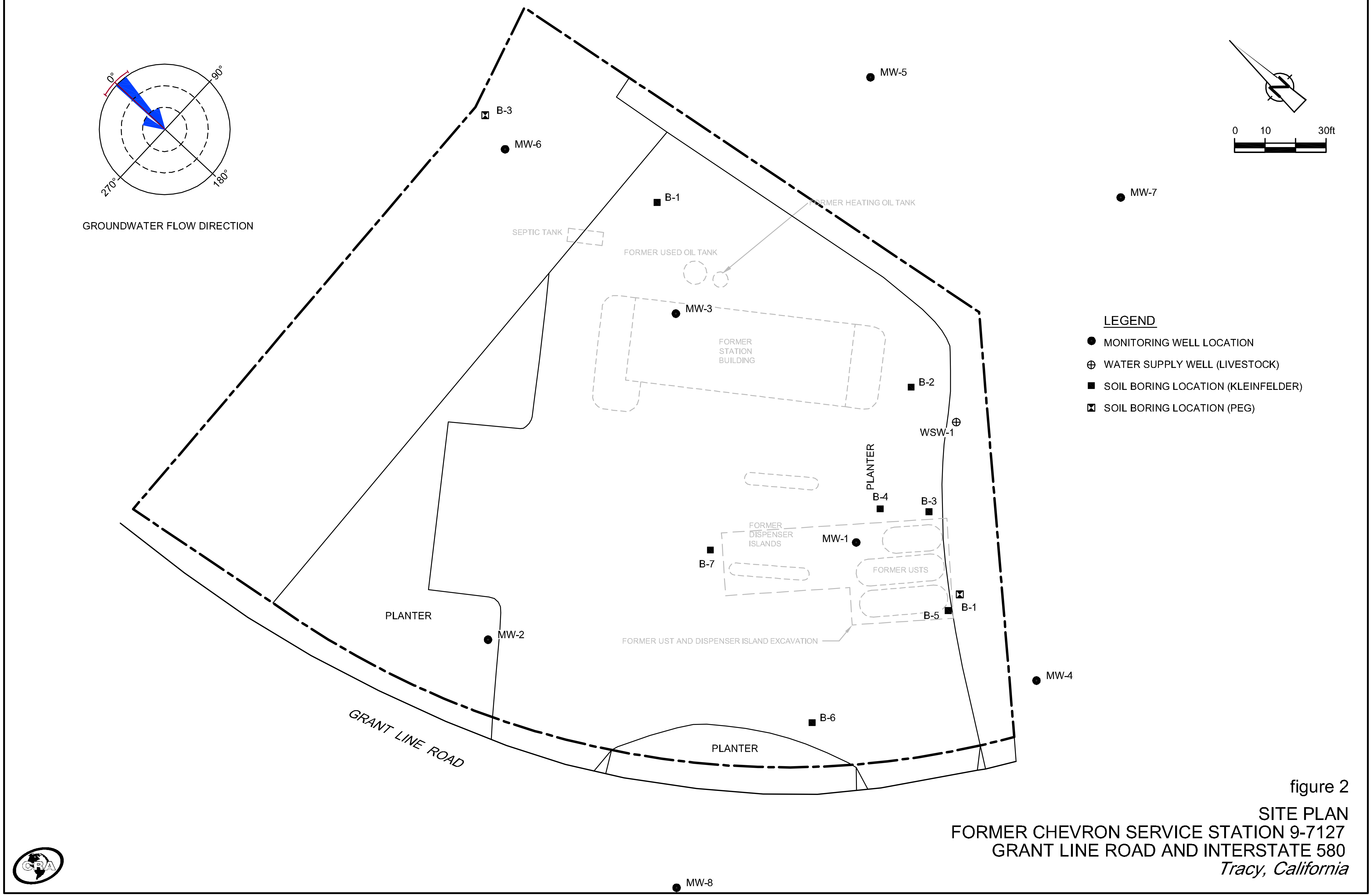


figure 2

SITE PLAN
FORMER CHEVRON SERVICE STATION 9-7127
GRANT LINE ROAD AND INTERSTATE 580
Tracy, California

631656-601(PRES001)GN-WA002 JAN 23/2009

ATTACHMENT A

SUMMARY OF PREVIOUS ENVIRONMENTAL INVESTIGATION AND REMEDIATION

SUMMARY OF PREVIOUS ENVIRONMENTAL INVESTIGATION AND REMEDIATION
FORMER CHEVRON STATION 9-7127
I-580 AND GRANT LINE ROAD, TRACY, CA

October 1987 Soil Vapor Investigation

In October 1987, EA Engineering, Science, and Technology, Inc. (EA) conducted a soil vapor investigation at the site. Soil vapor samples were collected from 13 onsite (V1 through V12, and V-14) and two offsite (V13 and V15) locations at depths ranging from 3 to 12 feet below grade (fbg). Total hydrocarbons were detected in several of the samples at concentrations ranging from 10 (V9 at 8 fbg) to 28,500 parts per million (ppm) (V4 at 3 fbg). Benzene was detected in several of the samples at concentrations ranging from 1 (V3 at 5 fbg) to 3,200 ppm (V4 at 3 fbg). Toluene was detected in several of the samples at concentrations ranging from 10 (V3 at 3 and 5 fbg) to 5,200 ppm (V4 at 3 fbg). Based on the results of the investigation, it was concluded that light non-aqueous phase liquid (LNAPL) may be present in the area of the tank field and pump island. Details of this investigation were presented in EA's November 13, 1987 *Report of Investigation*.

December 1987 Subsurface Investigation

In December 1987, Kleinfelder, Inc. (Kleinfelder) advanced seven onsite exploratory borings (B-1 through B-7). One soil sample was collected from each boring (sample depths ranging from 5 to 20 fbg) and analyzed for total petroleum hydrocarbons as gasoline (TPHg), benzene, toluene, ethylbenzene and xylenes (BTEX). Low concentrations of TPHg (up to 76 milligrams per kilogram [mg/kg]) and BTEX (up to 2.0 mg/kg) were detected in the samples collected from borings B-2, B-3, B-5, and B-7. Elevated concentrations of TPHg (2,300 mg/kg) and BTEX (up to 140 mg/kg) were detected in the sample collected from boring B-4. Water samples were also collected from taps supplied by an onsite water well in December 1987 and January 1988. The samples were analyzed for purgeable aromatics; which were not detected with the exception of benzene at 2 micrograms per liter (µg/L) and 4 µg/L. Details of this investigation were presented in Kleinfelder's January 6, 1988 *Final Report: Subsurface Environmental Investigation at Chevron Service Station #7127.*

January 1988 through March 1991 Domestic Well Monitoring

In January 1988, groundwater samples were collected from a tap and the onsite water supply well; benzene was detected in the tap samples at 1.0 µg/L and 1.1 µg/L. Benzene was not detected in the well sample. In February 1989, samples collected from a tap and the well did not contain TPH or BTEX. Benzene concentrations detected in tap and well samples collected in March and April 1989 ranged from 1.4 to 7 µg/L. In May 1989, Gettler-Ryan Inc. (G-R) installed a carbon adsorption treatment system on the wellhead and began weekly sampling. Samples collected from the well and treatment system influent, mid, and effluent samples in August 1989 did not contain TPH or BTEX. From August 1989 to March 1991, 26 samples were collected from the well. TPHg and benzene generally were not detected in the samples with the exception of TPHg in one sample at 320 µg/L and benzene in one sample at 0.07 µg/L. Details of this work were presented in Kleinfelder's March 8, 1988 *Summary of Domestic Water Sampling Activities and Analytical Results* and August 2, 1989 *Domestic Water Contaminant Source Evaluation*, and Pacific Environmental Group's (PEG's) March 22, 1993 untitled report.

April 1991 Tank, Product Piping, and Dispenser Island Removal

In April 1991, the station was demolished and all aboveground and underground facilities were removed. Blaine Tech Services, Inc. (Blaine Tech) supervised the removal of two 10,000 gallon and one 6,000 gallon gasoline underground storage tanks (USTs), one 1,000 gallon used-oil UST, one 750 gallon heating oil UST, two dispenser islands, and associated product piping. No holes were observed in the fiberglass tanks upon removal. Ten soil samples were collected from the gasoline UST excavation (sample depths of 12.5 to 15 fbg) and beneath the product piping and the dispenser island (sample depths of 2.5 to 4 fbg); several of the samples contained elevated concentrations of TPHg (up to 5,700 mg/kg), benzene (up to 30 mg/kg), and lead (up to 80 mg/kg). Therefore, over-excavation of the gasoline UST pit and product piping trenches was conducted. The final confirmation soil samples contained TPHg and benzene up to 710 mg/kg and 0.085 mg/kg, respectively. Soil samples were also collected at 11 fbg beneath the used-oil and heating oil USTs. TPHg, BTEX, TPH as diesel (TPHd), total oil and grease (TOG), and volatile organic compounds (VOCs) were not detected in the sample collected beneath the used-oil UST; the detected metals concentrations were consistent with background levels. Only low concentrations of TPHg (170 mg/kg) and xylenes (2.7 mg/kg) were detected in the sample collected beneath the heating oil UST; and the detected metals concentrations were consistent with background levels. The excavated soil was aerated onsite until detected TPHg concentrations did not exceed 10 mg/kg; the soil was then used to backfill the excavations. Details of this investigation were presented in Blaine Tech's June 24, 1991 *Multiple Event Sampling Report.*

December 1992 Monitoring Well Installation and January through March 1993 Water-Supply Well Sampling

In December 1992, PEG advanced exploratory boring B-1 and installed monitoring wells MW-1 through MW-3. The borings were advanced to total depths ranging from 22 to 40 fbg. The wells were screened at intervals of 22 to 37 fbg (MW-1), 21 to 36 fbg (MW-2), and 22 to 37.5 fbg (MW-3). A total of nine soil samples were collected at various depths from borings B-1 and MW-1 and analyzed for TPHg and BTEX. TPHg was only detected in three of the samples at concentrations of 4 mg/kg (B-1 at 12.5 fbg), 2,600 mg/kg (MW-1 at 24 fbg), and 8,100 mg/kg (MW-1 at 29 fbg). Benzene was only detected in the sample collected from boring MW-1 at 29 fbg (21 mg/kg). Toluene (up to 560 mg/kg), ethylbenzene (up to 150 mg/kg), and xylenes (up to 840 mg/kg) were also detected in several of the soil samples. The initial groundwater samples collected from wells MW-2 and MW-3 were analyzed for TPHg and BTEX. TPHg and BTEX were detected in well MW-3 at concentrations of 19,000 μg/L, 8,900 μg/L, 660 μg/L, 380 μg/L, and 720 μg/L, respectively. Xylenes (0.6 μg/L) were the only analyte detected in the groundwater sample collected from well MW-2. Well MW-1 was not sampled due to the presence of LNAPL. PEG performed weekly sampling of the water-supply well from January through March 1993; TPHg and BTEX generally were not detected in the samples with the exception of low concentrations of toluene (3 μg/L) and xylenes (2 μg/L) in January 1993. Details of this work were presented in PEG's March 22, 1993 untitled report.

1993 LNAPL Removal

In 1993, weekly bailing of well MW-1 to remove LNAPL was performed by PEG; a passive skimmer was also installed in the well. As of March 1993, approximately 2 gallons of product had been removed. The bailing frequency was then reduced to monthly.

May 1993 Monitoring Well Installation

In May 1993, PEG advanced exploratory boring B-3 and installed wells MW-4 and MW-5 to evaluate groundwater quality up-, cross-, and downgradient of the site. Wells MW-4 and MW-5 were screened at depths of 22 to 36.5 fbg and 5 to 24.5 fbg, respectively. Soil samples were collected at depths of 10 fbg and 15 fbg from the boring for well MW-5 and analyzed for TPHg and BTEX; which were not detected. A grab-groundwater sample was collected from boring B-3 and analyzed for TPHg and BTEX; TPHg, benzene, and toluene were detected at 96 μg/L, 1 μg/L, and 0.5 μg/L, respectively. The initial groundwater sample collected from well MW-4 contained TPHg and benzene at 300 μg/L and 56 μg/L, respectively. TPHg and BTEX were not detected in the initial groundwater sample collected from well MW-5. Details of this investigation were presented in PEG's December 3, 1993 untitled report.

October 1994 Comprehensive Site Evaluation

In October 1994, Weiss Associates (WA) performed a comprehensive site evaluation. Based on historical soil and groundwater data, WA concluded that the hydrocarbon source areas had been removed from the site and that the plume was primarily contained onsite. However, to determine the full extent of the hydrocarbon plume beneath the site, WA recommended the installation of an additional offsite monitoring well north of the site. Further details were presented in WA's October 13, 1994 *Comprehensive Site Evaluation and Proposed Future Action Plan.*

October 1995 Monitoring Well Installation

In October 1995, PEG installed monitoring wells MW-6 through MW-8 to further evaluate the offsite extent of impacted groundwater. Wells MW-6, MW-7, and MW-8 were screened at intervals of 6.5 to 30 fbg, 4.5 to 25 fbg, and 20 to 40 fbg, respectively. A total of nine soil samples were collected at various depths from the well borings and analyzed for TPHg and BTEX; which were not detected in any of the samples. TPHg and BTEX were also not detected in the initial groundwater samples collected from the wells. Details of this investigation were presented in PEG's January 25, 1996 *Groundwater Investigation Report*.

June 1997 Risk-Based Assessment

In June 1997, a Risk-Based Corrective Action (RBCA) Tier 2 Assessment was completed for the site. The results indicated that groundwater ingestion could pose a risk to human health due to the elevated TPHg and benzene concentrations in wells MW-1, MW-3, and MW-4. The assessment also indicated that the onsite water supply well was a potential receptor for residual concentrations of petroleum hydrocarbons in the subsurface. Further details were presented in PEG's June 27, 1997 *Risk-Based Corrective Action-Tier 2* report.

1998-2001 Bioremediation

In August 1998, Oxygen Releasing Compound® (ORC)-containing socks were installed in wells MW-1, MW-2 and MW-4 to attempt to reduce hydrocarbon concentrations via enhanced biodegradation. In July 2001, the sock in MW-1 was removed so that a passive product skimmer could be installed. No information is available as to when the ORC socks in the remaining two wells were removed.

December 1999 Hydrogen Peroxide Injection

In December 1999, Cambria Environmental Technology, Inc. (Cambria [now CRA]) injected hydrogen peroxide into wells MW-1 and MW-3 to attempt to reduce hydrocarbon concentrations in groundwater beneath the site. Various concentrations of hydrogen peroxide were injected in the wells. Details of the work were documented in Cambria's March 30, 2000 *Hydrogen Peroxide Injection* report.

May 2001 Corrective Action Plan

In May 2001, Delta Environmental Consultants, Inc. (Delta) submitted an interim corrective action plan (CAP). Delta recommended that the onsite water supply well be destroyed and that LNAPL be hand-bailed from MW-1 on a monthly basis for two quarters, after which the LNAPL thickness would be re-evaluated. Further details were presented in Delta's May 7, 2001 *Interim Corrective Action Plan*.

2001-2002 Remedial Activities

In July 2001, a passive product skimmer was again installed in MW-1 to attempt to remove LNAPL from this well and seven groundwater vacuum extraction events were conducted through April 2002. Approximately 8,300 gallons of groundwater and 2.19 gallons of LNAPL were extracted from MW-1 during this time. In July 2002, vacuum extraction of impacted groundwater from MW-3 was initiated. However, due to an increase in LNAPL thickness in MW-1, vacuum extractions from MW-1 and MW-3 were terminated in October 2002.

April 2003 Remedial Action Plan and Feasibility Study

In April 2003, Delta submitted a remedial action plan (RAP) and feasibility study for the site. Data from the study indicated that groundwater beneath the site is in a perched zone at approximately 10 to 40 fbg, with underlying confining bedrock. The impacted soil appeared to be confined to just above the groundwater table, within the capillary fringe approximately 25 to 30 fbg, in the vicinity of the former USTs. Potential remedial technologies evaluated included excavation, soil vapor extraction (SVE), groundwater extraction, and natural attenuation. Due to the depth of the source and site lithology, excavation and SVE were not considered viable options for the site. Delta recommended removal of LNAPL from MW-1 using an active mechanical skimmer in conjunction with natural attenuation as the most feasible remedial options for the site. Further details were presented in Delta's April 30, 2003 *Remedial Action Plan and Feasibility Study*.

2007 Groundwater Extraction

In March and April 2007, CRA conducted three additional batch groundwater extraction events in well MW-1, and a total of approximately 5,100 gallons of groundwater were extracted. The LNAPL thickness in MW-1 was measured prior to each batch extraction event; the results were 0.5 feet, 0.36 feet and 0.39 feet.

May 2007 CAP

In May 2007, CRA submitted a CAP which evaluated three remedial alternatives for the site: oxygen injection, batch groundwater extraction, and surfactant injection. The recommended alternative was surfactant injection followed by groundwater extraction. Details were presented in CRA's May 15, 2007 *Corrective Action Plan.*

October 2007 Interim Remedial Action Plan (IRAP)

In October 2007, CRA submitted a revised IRAP that proposed the installation of three additional monitoring wells around MW-1 to better evaluate hydrocarbon distribution, hydrogeologic characteristics, and potentially facilitate the remediation of groundwater and vapors from fractures in the bedrock beneath the site. In addition, CRA proposed injection of a surfactant solution to emulsify LNAPL found in formation pore spaces. Emulsification of the LNAPL would increase the ability to remove it using enhanced vacuum fluid recovery (EVFR). Details were presented in CRA's October 19, 2007 *Additional Assessment and Revised Interim Remedial Action Plan.*

December 2008 CAP Addendum and Proposed Feasibility Study

In December 2008, CRA submitted a CAP addendum and proposed feasibility study in which a groundwater pumping test was recommended to further evaluate the hydrogeologic conditions and behavior of groundwater beneath the site. The information obtained from the pumping test would then be used to further define the necessary scope of remediation, and to further evaluate available remedial options to address LNAPL at the site. Upon agency approval, a work plan presenting the details of the pumping test would be prepared. Further details were presented in CRA's December 2008 *Corrective Action Plan Addendum and Proposed Feasibility Study*.

ATTACHMENT B

FIELD DATA SHEETS

TABLE 1
PUMP OUT TEST FIELD DATA
FORMER CHEVRON 9-7127
I-580 AND GRANT LINE ROAD
TRACY, CALIFORNIA

WELL ID: MW-1

TIME	DEPTH TO WATER (FT)	DEPTH TO PRODUCT (FT)	PRODUCT THICKNESS (FT)	TOTAL DEPTH (FT)
	~~31.5~~	~~29.65~~	~~.95~~	
	30.15	29.65	.5	

WELL ID: MW1

TIME	DEPTH TO WATER (FT)	DEPTH TO PRODUCT (FT)	PRODUCT THICKNESS (FT)	TOTAL DEPTH (FT)
9:00	30.52	29.78	0.74	~28'
11:15	31.18	30.27	0.79	
13:05	30.67	30.11	0.56	
13:30	30.70	30.00	0.70	
MW-3				
8:20	30.60	29.9	0.70	~28'
13:35	30.65	30.10	0.55	~28'
14:50	30.39	N/A	0	

> 1200 gallons
in 2 3hrs
~ 500 gph

MW-1 start extracting at 10^{00}
end at 13^{00}
MW-3 start extracting at 13:50
end at 17:50

631656

TABLE 1
PUMP OUT TEST FIELD DATA
FORMER CHEVRON 9-7127
I-580 AND GRANT LINE ROAD
TRACY, CALIFORNIA

WELL ID: MW-6

TIME	DEPTH TO WATER (FT)	DEPTH TO PRODUCT (FT)	PRODUCT THICKNESS (FT)	TOTAL DEPTH (FT)
10:20	13.17	—	—	—
11:50	13.17	—	—	—
13:42	13.17	—	—	—
15:45	13.21			
16:45	13.21			

WELL ID: ______

TIME	DEPTH TO WATER (FT)	DEPTH TO PRODUCT (FT)	PRODUCT THICKNESS (FT)	TOTAL DEPTH (FT)
MW-	2 28.2	@ 8^{10}		
MW-	5 14.14	@ 8^{45}		
MW-	7 14.40	@ 9^{00}		

ATTACHMENT C

STANDARD FIELD PROCEDURES

Conestoga-Rovers & Associates

STANDARD FIELD PROCEDURES FOR GROUNDWATER MONITORING AND SAMPLING

This document presents standard field methods for groundwater monitoring, purging and sampling, and well development. These procedures are designed to comply with Federal, State and local regulatory guidelines. CRA's specific field procedures are summarized below.

Groundwater Elevation Monitoring

Prior to performing monitoring activities, the historical monitoring and analytical data of each monitoring well shall be reviewed to determine if any of the wells are likely to contain non-aqueous phase liquid (NAPL) and to determine the order in which the wells will be monitored (i.e. cleanest to dirtiest). Groundwater monitoring should not be performed when the potential exists for surface water to enter the well (i.e. flooding during a rainstorm).

Prior to monitoring, each well shall be opened and the well cap removed to allow water levels to stabilize and equilibrate. The condition of the well box and well cap shall be observed and recommended repairs noted. Any surface water that may have entered and flooded the well box should be evacuated prior to removing the well cap. In wells with no history of NAPL, the static water level and total well depth shall be measured to the nearest 0.01 foot with an electronic water level meter. Wells with the highest contaminant concentrations shall be measured last. In wells with a history of NAPL, the NAPL level/thickness and static water level shall be measured to the nearest 0.01 foot using an electronic interface probe. The water level meter and/or interface probe shall be thoroughly cleaned and decontaminated at the beginning of the monitoring event and between each well. Monitoring equipment shall be washed using soapy water consisting of Liqui-nox^{TM} or Alconox^{TM} followed by one rinse of clean tap water and then two rinses of distilled water.

Groundwater Purging and Sampling

Prior to groundwater purging and sampling, the historical analytical data of each monitoring well shall be reviewed to determine the order in which the wells should be purged and sampled (i.e. cleanest to dirtiest). No purging or groundwater sampling shall be performed on wells with a measurable thickness of NAPL or floating NAPL globules. If a sheen is observed, the well should be purged and a groundwater sample collected only if no NAPL is present. Wells shall be purged either by hand using a disposal or PVC bailer or by using an aboveground pump (e.g. peristaltic or Wattera^{TM}) or down-hole pump (e.g. Grundfos^{TM} or DC Purger pump).

Groundwater wells shall be purged approximately three to ten well-casing volumes (depending on the regulatory agency requirements) or until groundwater parameters of temperature, pH, and conductivity have stabilized to within 10% for three consecutive readings. Temperature, pH, and conductivity shall be measured and recorded at least once per well casing volume removed. The total volume of groundwater removed shall be recorded along with any other notable physical characteristic such as color and odor. If required, field parameters such as turbidity, dissolved oxygen (DO), and oxidation-reduction potential (ORP) shall also be measured prior to collection of each groundwater sample.

Groundwater samples shall be collected after the well has been purged. If the well is slow to recharge, a sample shall be collected after the water column is allowed to recharge to 80% of the pre-purging static water level. If the well does not recover to 80% in 2 hours, a sample shall be collected once there is enough groundwater in the well. Groundwater samples shall be collected using clean disposable bailers or pumps (if an operating remediation system exists on site and the project manager approves of its use for sampling) and shall be decanted into clean containers supplied by the analytical laboratory. New latex gloves and disposable tubing or bailers shall be used for sampling each well. If a PVC bailer or down-hole pump is used for groundwater purging, it shall be decontaminated before purging each well by using soapy water consisting of Liqui-nox™ or Alconox™ followed by one rinse of clean tap water and then two rinses of distilled water. If a submersible pump with non-dedicated discharge tubing is used for groundwater purging, both the inside and outside of pump and discharge tubing shall be decontaminated as described above.

Sample Handling

Except for samples that will be tested in the field, or that require special handling or preservation, samples shall be stored in coolers chilled to 4° C for shipment to the analytical laboratory. Samples shall be labeled, placed in protective foam sleeves or bubble wrap as needed, stored on crushed ice at or below 4° C, and submitted under chain-of-custody (COC) to the laboratory. The laboratory shall be notified of the sample shipment schedule and arrival time. Samples shall be shipped to the laboratory within a time frame to allow for extraction and analysis to be performed within the standard sample holding times.

Sample labels shall be filled out using indelible ink and must contain the site name; field identification number; the date, time, and location of sample collection; notation of the type of sample; identification of preservatives used; remarks; and the signature of the sampler. Field identification must be sufficient to allow easy cross-reference with the field datasheet.

All samples submitted to the laboratory shall be accompanied by a COC record to ensure adequate documentation. A copy of the COC shall be retained in the project file. Information on the COC shall consist of the project name and number; project location; sample numbers; sampler/recorder's signature; date and time of collection of each sample; sample type; analyses requested; name of person receiving the sample; and date of receipt of sample.

Laboratory-supplied trip blanks shall accompany the samples and be analyzed to check for cross-contamination, if requested by the project manager.

Waste Handling and Disposal

Groundwater extracted during sampling shall be stored onsite in sealed U.S. DOT H17 55-gallon drums and shall be labeled with the contents, date of generation, generator identification, and consultant contact. Extracted groundwater may be disposed offsite by a licensed waste handler or may be treated and discharged via an operating onsite groundwater extraction/treatment system.

H:\- MGT IR Group Info\SOPs\Groundwater Monitoring and Sampling SOP 07-2005.doc

ATTACHMENT D

LABORATORY REPORT

Lancaster Laboratories

Analysis Report

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

ANALYTICAL RESULTS

Prepared by:	Prepared for:
Lancaster Laboratories 2425 New Holland Pike Lancaster, PA 17605-2425	Chevron c/o CRA Suite 107 10969 Trade Center Drive Rancho Cordova CA 95670

June 02, 2010

Project: 97127

Submittal Date: 05/20/2010
Group Number: 1195341
PO Number: 97127
Release Number: MTI
State of Sample Origin: CA

Client Sample Description	Lancaster Labs (LLI) #
MW-1-W-100518 Grab Water	5985131
MW-1-W-100518 Grab Water	5985132
MW-3-W-100518 Grab Water	5985133
MW-3-W-100518 Grab Water	5985134

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO	Chevron c/o CRA	Attn: CRA EDD
ELECTRONIC COPY TO	Chevron c/o CRA	Attn: James Kiernan

Questions? Contact your Client Services Representative
Angela M Miller at (717) 656-2300 Ext. 1903

Respectfully Submitted,

Valerie L. Tomayko

Valerie L. Tomayko
Group Leader

Sample Description: **MW-1-W-100518 Grab Water**
Facility# 97127 MTI# 631656 CRAW
Grant Line Rd at I-580-Tracy T0600102298 MW-1

LLI Sample # WW 5985131
LLI Group # 1195341
Account # 11997

Project Name: 97127

Collected: 05/18/2010 11:10 by ML

Submitted: 05/20/2010 09:00
Reported: 06/02/2010 11:03
Discard: 07/03/2010

Chevron c/o CRA
Suite 107
10969 Trade Center Drive
Rancho Cordova CA 95670

GLTM1

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**	**ug/l**	**ug/l**	
10943	Benzene	71-43-2	9,000	100	200	200
10943	Ethylbenzene	100-41-4	830	10	20	20
10943	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	10	20	20
10943	Toluene	108-88-3	16,000	100	200	200
10943	Xylene (Total)	1330-20-7	5,000	10	20	20
GC Volatiles	**SW-846 8015B**		**ug/l**	**ug/l**	**ug/l**	
01728	TPH-GRO N. CA water C6-C12	n.a.	46,000	2,500	5,000	50

General Sample Comments

State of California Lab Certification No. 2501
Trip blank vials were not received by the laboratory for this sample group.

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
01163	GC/MS VOA Water Prep	SW-846 5030B	1	Z101441AA	05/24/2010 18:58	Ginelle L Feister	20
01163	GC/MS VOA Water Prep	SW-846 5030B	2	Z101441AA	05/24/2010 19:20	Ginelle L Feister	200
10943	BTEX/MTBE 8260 Water	SW-846 8260B	1	Z101441AA	05/24/2010 18:58	Ginelle L Feister	20
10943	BTEX/MTBE 8260 Water	SW-846 8260B	1	Z101441AA	05/24/2010 19:20	Ginelle L Feister	200
01146	GC VOA Water Prep	SW-846 5030B	1	10141A20A	05/21/2010 22:07	Marie D John	50
01728	TPH-GRO N. CA water C6-C12	SW-846 8015B	1	10141A20A	05/21/2010 22:07	Marie D John	50

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*=This limit was used in the evaluation of the final result

Analysis Report

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

Sample Description: MW-1-W-100518 Grab Water
Facility# 97127 MTI# 631656 CRAW
Grant Line Rd at I-580-Tracy T0600102298 MW-1

LLI Sample # WW 5985132
LLI Group # 1195341
Account # 11997

Project Name: 97127

Collected: 05/18/2010 13:00 by ML

Submitted: 05/20/2010 09:00
Reported: 06/02/2010 11:03
Discard: 07/03/2010

Chevron c/o CRA
Suite 107
10969 Trade Center Drive
Rancho Cordova CA 95670

M1GLT

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**	**ug/l**	**ug/l**	
10943	Benzene	71-43-2	2,300	50	100	100
10943	Ethylbenzene	100-41-4	1,000	5	10	10
10943	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	5	10	10
10943	Toluene	108-88-3	6,700	50	100	100
10943	Xylene (Total)	1330-20-7	7,900	50	100	100
GC Volatiles	**SW-846 8015B**		**ug/l**	**ug/l**	**ug/l**	
01728	TPH-GRO N. CA water C6-C12	n.a.	15,000	1,000	2,000	20

General Sample Comments

State of California Lab Certification No. 2501
Trip blank vials were not received by the laboratory for this sample group.

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
01163	GC/MS VOA Water Prep	SW-846 5030B	1	Z101441AA	05/24/2010 19:42	Ginelle L Feister	10
01163	GC/MS VOA Water Prep	SW-846 5030B	2	Z101441AA	05/24/2010 20:05	Ginelle L Feister	100
10943	BTEX/MTBE 8260 Water	SW-846 8260B	1	Z101441AA	05/24/2010 19:42	Ginelle L Feister	10
10943	BTEX/MTBE 8260 Water	SW-846 8260B	1	Z101441AA	05/24/2010 20:05	Ginelle L Feister	100
01146	GC VOA Water Prep	SW-846 5030B	1	10141A20A	05/21/2010 22:29	Marie D John	20
01728	TPH-GRO N. CA water C6-C12	SW-846 8015B	1	10141A20A	05/21/2010 22:29	Marie D John	20

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*=This limit was used in the evaluation of the final result

Lancaster Laboratories

Analysis Report

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

Sample Description: MW-3-W-100518 Grab Water
Facility# 97127 MTI# 631656 CRAW
Grant Line Rd at I-580-Tracy T0600102298 MW-3

LLI Sample # WW 5985133
LLI Group # 1195341
Account # 11997

Project Name: 97127

Collected: 05/18/2010 14:50 by ML

Submitted: 05/20/2010 09:00
Reported: 06/02/2010 11:03
Discard: 07/03/2010

Chevron c/o CRA
Suite 107
10969 Trade Center Drive
Rancho Cordova CA 95670

GLTM3

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**	**ug/l**	**ug/l**	
10943	Benzene	71-43-2	1,600	13	25	25
10943	Ethylbenzene	100-41-4	240	1	3	2.5
10943	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	1	3	2.5
10943	Toluene	108-88-3	860	13	25	25
10943	Xylene (Total)	1330-20-7	1,300	1	3	2.5
GC Volatiles	**SW-846 8015B**		**ug/l**	**ug/l**	**ug/l**	
01728	TPH-GRO N. CA water C6-C12	n.a.	26,000	500	1,000	10

General Sample Comments

State of California Lab Certification No. 2501
Trip blank vials were not received by the laboratory for this sample group.

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
01163	GC/MS VOA Water Prep	SW-846 5030B	1	D101453AA	05/26/2010 00:42	Florida A Cimino	2.5
01163	GC/MS VOA Water Prep	SW-846 5030B	2	D101453AA	05/26/2010 01:05	Florida A Cimino	25
10943	BTEX/MTBE 8260 Water	SW-846 8260B	1	D101453AA	05/26/2010 00:42	Florida A Cimino	2.5
10943	BTEX/MTBE 8260 Water	SW-846 8260B	1	D101453AA	05/26/2010 01:05	Florida A Cimino	25
01146	GC VOA Water Prep	SW-846 5030B	1	10141A20A	05/21/2010 22:51	Marie D John	10
01728	TPH-GRO N. CA water C6-C12	SW-846 8015B	1	10141A20A	05/21/2010 22:51	Marie D John	10

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*=This limit was used in the evaluation of the final result

Sample Description: MW-3-W-100518 Grab Water
Facility# 97127 MTI# 631656 CRAW
Grant Line Rd at I-580-Tracy T0600102298 MW-3

LLI Sample # WW 5985134
LLI Group # 1195341
Account # 11997

Project Name: 97127

Collected: 05/18/2010 17:50 by ML

Submitted: 05/20/2010 09:00
Reported: 06/02/2010 11:03
Discard: 07/03/2010

Chevron c/o CRA
Suite 107
10969 Trade Center Drive
Rancho Cordova CA 95670

M3GLT

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
GC/MS Volatiles		**SW-846 8260B**	**ug/l**	**ug/l**	**ug/l**	
10943	Benzene	71-43-2	4,900	13	25	25
10943	Ethylbenzene	100-41-4	4,000	13	25	25
10943	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	13	25	25
10943	Toluene	108-88-3	14,000	130	250	250
10943	Xylene (Total)	1330-20-7	13,000	130	250	250
GC Volatiles		**SW-846 8015B**	**ug/l**	**ug/l**	**ug/l**	
01728	TPH-GRO N. CA water C6-C12	n.a.	120,000	2,500	5,000	50

General Sample Comments

State of California Lab Certification No. 2501
Trip blank vials were not received by the laboratory for this sample group.

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
01163	GC/MS VOA Water Prep	SW-846 5030B	1	D101473AA	05/28/2010 00:46	Florida A Cimino	25
01163	GC/MS VOA Water Prep	SW-846 5030B	2	D101473AA	05/28/2010 01:09	Florida A Cimino	250
10943	BTEX/MTBE 8260 Water	SW-846 8260B	1	D101473AA	05/28/2010 00:46	Florida A Cimino	25
10943	BTEX/MTBE 8260 Water	SW-846 8260B	1	D101473AA	05/28/2010 01:09	Florida A Cimino	250
01146	GC VOA Water Prep	SW-846 5030B	1	10141A20A	05/21/2010 23:13	Marie D John	50
01728	TPH-GRO N. CA water C6-C12	SW-846 8015B	1	10141A20A	05/21/2010 23:13	Marie D John	50

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*=This limit was used in the evaluation of the final result

Lancaster Laboratories

Analysis Report

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

Quality Control Summary

Client Name: Chevron c/o CRA
Group Number: 1195341
Reported: 06/02/10 at 11:03 AM

Matrix QC may not be reported if site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL**	Blank LOQ	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: D101453AA	Sample number(s): 5985133								
Benzene	N.D.	0.5	1	ug/l	91		79-120		
Ethylbenzene	N.D.	0.5	1	ug/l	100		79-120		
Methyl Tertiary Butyl Ether	N.D.	0.5	1	ug/l	98		76-120		
Toluene	N.D.	0.5	1	ug/l	94		79-120		
Xylene (Total)	N.D.	0.5	1	ug/l	101		80-120		
Batch number: D101473AA	Sample number(s): 5985134								
Benzene	N.D.	0.5	1	ug/l	92		79-120		
Ethylbenzene	N.D.	0.5	1	ug/l	98		79-120		
Methyl Tertiary Butyl Ether	N.D.	0.5	1	ug/l	100		76-120		
Toluene	N.D.	0.5	1	ug/l	93		79-120		
Xylene (Total)	N.D.	0.5	1	ug/l	101		80-120		
Batch number: Z101441AA	Sample number(s): 5985131-5985132								
Benzene	N.D.	0.5	1	ug/l	95		79-120		
Ethylbenzene	N.D.	0.5	1	ug/l	97		79-120		
Methyl Tertiary Butyl Ether	N.D.	0.5	1	ug/l	98		76-120		
Toluene	N.D.	0.5	1	ug/l	96		79-120		
Xylene (Total)	N.D.	0.5	1	ug/l	98		80-120		
Batch number: 10141A20A	Sample number(s): 5985131-5985134								
TPH-GRO N. CA water C6-C12	N.D.	50.	100	ug/l	109	100	75-135	9	30

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: D101453AA	Sample number(s): 5985133 UNSPK: P986611								
Benzene	88	95	80-126	7	30				
Ethylbenzene	98	105	71-134	7	30				
Methyl Tertiary Butyl Ether	91	96	72-126	5	30				
Toluene	92	98	80-125	6	30				
Xylene (Total)	100	105	79-125	5	30				
Batch number: D101473AA	Sample number(s): 5985134 UNSPK: P989978								
Benzene	93	95	80-126	2	30				
Ethylbenzene	101	105	71-134	3	30				
Methyl Tertiary Butyl Ether	96	101	72-126	5	30				
Toluene	96	100	80-125	4	30				

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: Chevron c/o CRA Group Number: 1195341
Reported: 06/02/10 at 11:03 AM

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Xylene (Total)	103	108	79-125	5	30				
Batch number: Z101441AA	Sample number(s): 5985131-5985132 UNSPK: P985120								
Benzene	99	99	80-126	1	30				
Ethylbenzene	101	101	71-134	0	30				
Methyl Tertiary Butyl Ether	99	97	72-126	1	30				
Toluene	101	100	80-125	1	30				
Xylene (Total)	101	101	79-125	0	30				
Batch number: 10141A20A	Sample number(s): 5985131-5985134 UNSPK: P983788								
TPH-GRO N. CA water C6-C12	100		63-154						

Surrogate Quality Control

Surrogate recoveries which are outside of the QC window are confirmed
unless attributed to dilution or otherwise noted on the Analysis Report.

Analysis Name: UST VOCs by 8260B - Water
Batch number: D101453AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
5985133	104	102	103	104
Blank	103	99	102	103
LCS	103	99	101	104
MS	102	103	102	104
MSD	103	102	103	104
Limits:	80-116	77-113	80-113	78-113

Analysis Name: UST VOCs by 8260B - Water
Batch number: D101473AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
5985134	104	101	101	109
Blank	102	101	101	103
LCS	103	104	102	104
MS	101	103	103	103
MSD	104	101	103	105
Limits:	80-116	77-113	80-113	78-113

Analysis Name: UST VOCs by 8260B - Water
Batch number: Z101441AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
5985131	100	98	101	99
5985132	99	97	101	101
Blank	100	97	100	99
LCS	100	100	100	99
MS	100	99	101	100

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: Chevron c/o CRA   Group Number: 1195341
Reported: 06/02/10 at 11:03 AM

Surrogate Quality Control

MSD	100	100	100	99
Limits:	80-116	77-113	80-113	78-113

Analysis Name: TPH-GRO N. CA water C6-C12
Batch number: 10141A20A

	Trifluorotoluene-F
5985131	98
5985132	92
5985133	107
5985134	105
Blank	92
LCS	115
LCSD	115
MS	109
Limits:	63-135

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Chevron California Region Analysis Request/Chain of Custody

Lancaster Laboratories

051916-02

For Lancaster Laboratories use only

Acct. # 11997 Group # 1195341 Sample # 5985131-34

SCR#:

Facility #: 631656

Site Address: Grant Line Road at I-580, Tracy, CA

Chevron PM: **Lead Consultant:** Conestoga Rovers & Associates

Consultant Office: 5900 Hollis St, Emeryville, CA 94608

Consultant Prj. Mgr.: James Kiernan (JKiernan@CRAworld.com)

Consultant Phone #: 916-889-8917 **Fax #:** 916-889-8999

Sampler: ML

Project Code/WBS:

Analyses Requested

										Preservation Codes										
											H	H	H							
Field Point Names	Matrix	Repeat Sample	Top Depth	Year Month Day	Time Collected	New Field Pt.	Grab	Composite	Total Number of Containers	TPHg by ~~8260~~ 8015 GAL per 5/19/10 A.M. 1105	TPHd by 8015	BTEX by 8260	MTBE by 8260	Nitrate by EPA 300.0	Phosphate by EPA 365.1	Alkalinity by SM20 2320B	Methane by SW-846 8015B mod	Ferrous Iron by SM20 3500 Fe B mod		
MW-1	H2O			2010.05.18	11:10		x		5	x		x	x							
MW-1	H2O			2010.05.18	13:20		x		5	x		x	x							
MW-3	H2O			2010.05.18	14:50		x		5	x		x	x							
MW-3	H2O			2010.05.18	17:50		x		5	x		x	x							

Preservative Codes

H = HCl T = Thiosulfate

N = HNO3 B = NaOH

S = H2SO4 O = Other

☐ J value reporting needed

☒ Must meet lowest detction limits possible for 8260 compounds

8021 MTBE Confirmation

☐ Confirm highest hit by 8260

☐ Confirm all hits by 8260

☐ Run ___ oxy's on highest hit

☐ Run ___ oxy's on all hits

Comments / Remarks

6 VOAs ↓

Note: VOAs say "9-7127" under location

Please report xylenes as, "Total Xylenes."

Turnaround Time Requested (TAT) (please circle)

[✓ STD. TAT] 72 hour 48 hour

24 hour 4 day 5 day

Data Package Options (please circle if required)

[✓ QC Summary] Type 1 - Full

~~Type VI (Raw Data)~~ ☐ Coelt Deliverable not needed

WIP (RWQCB)

Disk

Relinquished by: (Signature)	Date: 5/18	Time: 20:00	Received by: (Signature)	Date: 5/18	Time: 20
Relinquished by: (Signature)	Date: 5/19	Time: 9:20	Received by: (Signature)	Date: 5/19	Time: 9:20
Relinquished by: (Signature) A. Salyer	Date: 19MAY10	Time: 1635	Received by: (Signature) FEDEX	Date:	Time:
Relinquished by Commercial Carrier: UPS [✓ FedEx] Other ______			Received by: (Signature)	Date: 5/20/10	Time: 0900
Temperature Upon Receipt 0.4-2.0 °C			Custody Seals Intact? [✓ Yes] No		

Lancaster Laboratories, Inc., 2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 (717) 656-2300

Created by ENSR 10/18/06

Lancaster Laboratories
Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

N.D.	none detected	**BMQL**	Below Minimum Quantitation Level
TNTC	Too Numerous To Count	**MPN**	Most Probable Number
IU	International Units	**CP Units**	cobalt-chloroplatinate units
umhos/cm	micromhos/cm	**NTU**	nephelometric turbidity units
C	degrees Celsius	**F**	degrees Fahrenheit
Cal	(diet) calories	**lb.**	pound(s)
meq	milliequivalents	**kg**	kilogram(s)
g	gram(s)	**mg**	milligram(s)
ug	microgram(s)	**l**	liter(s)
ml	milliliter(s)	**ul**	microliter(s)
m3	cubic meter(s)	**fib >5 um/ml**	fibers greater than 5 microns in length per ml

<	less than – The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.
>	greater than
ppm	parts per million – One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter of gas per liter of gas.
ppb	parts per billion
Dry weight basis	Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture.

U.S. EPA data qualifiers:

Organic Qualifiers		**Inorganic Qualifiers**	
A	TIC is a possible aldol-condensation product	**B**	Value is <CRDL, but ≥IDL
B	Analyte was also detected in the blank	**E**	Estimated due to interference
C	Pesticide result confirmed by GC/MS	**M**	Duplicate injection precision not met
D	Compound quatitated on a diluted sample	**N**	Spike amount not within control limits
E	Concentration exceeds the calibration range of the instrument	**S**	Method of standard additions (MSA) used for calculation
J	Estimated value	**U**	Compound was not detected
N	Presumptive evidence of a compound (TICs only)	**W**	Post digestion spike out of control limits
P	Concentration difference between primary and confirmation columns >25%	*****	Duplicate analysis not within control limits
U	Compound was not detected	**+**	Correlation coefficient for MSA <0.995
X,Y,Z	Defined in case narrative		

Analytical test results for methods listed on the laboratories' accreditation scope meet all requirements of NELAC unless otherwise noted under the individual analysis.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

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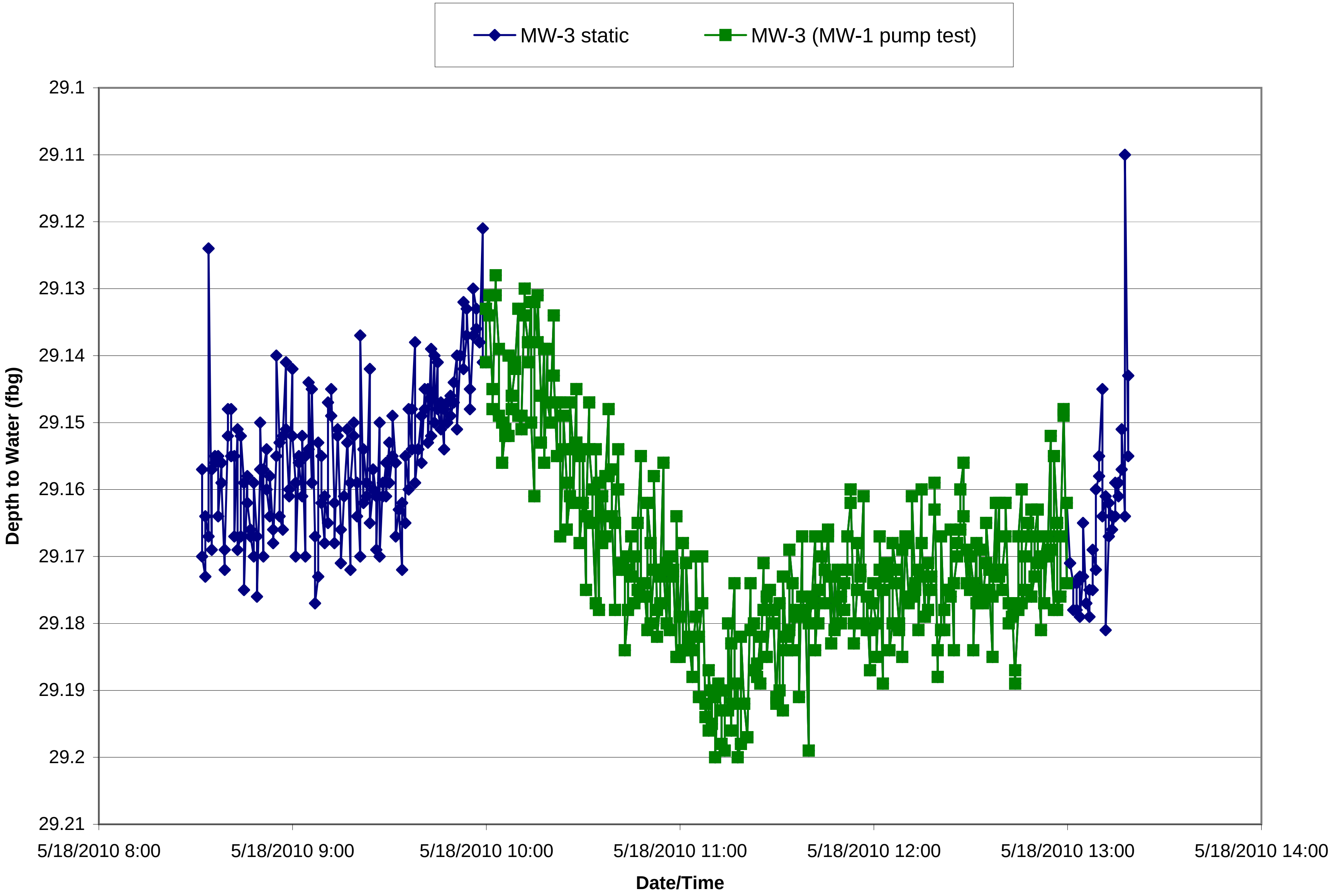
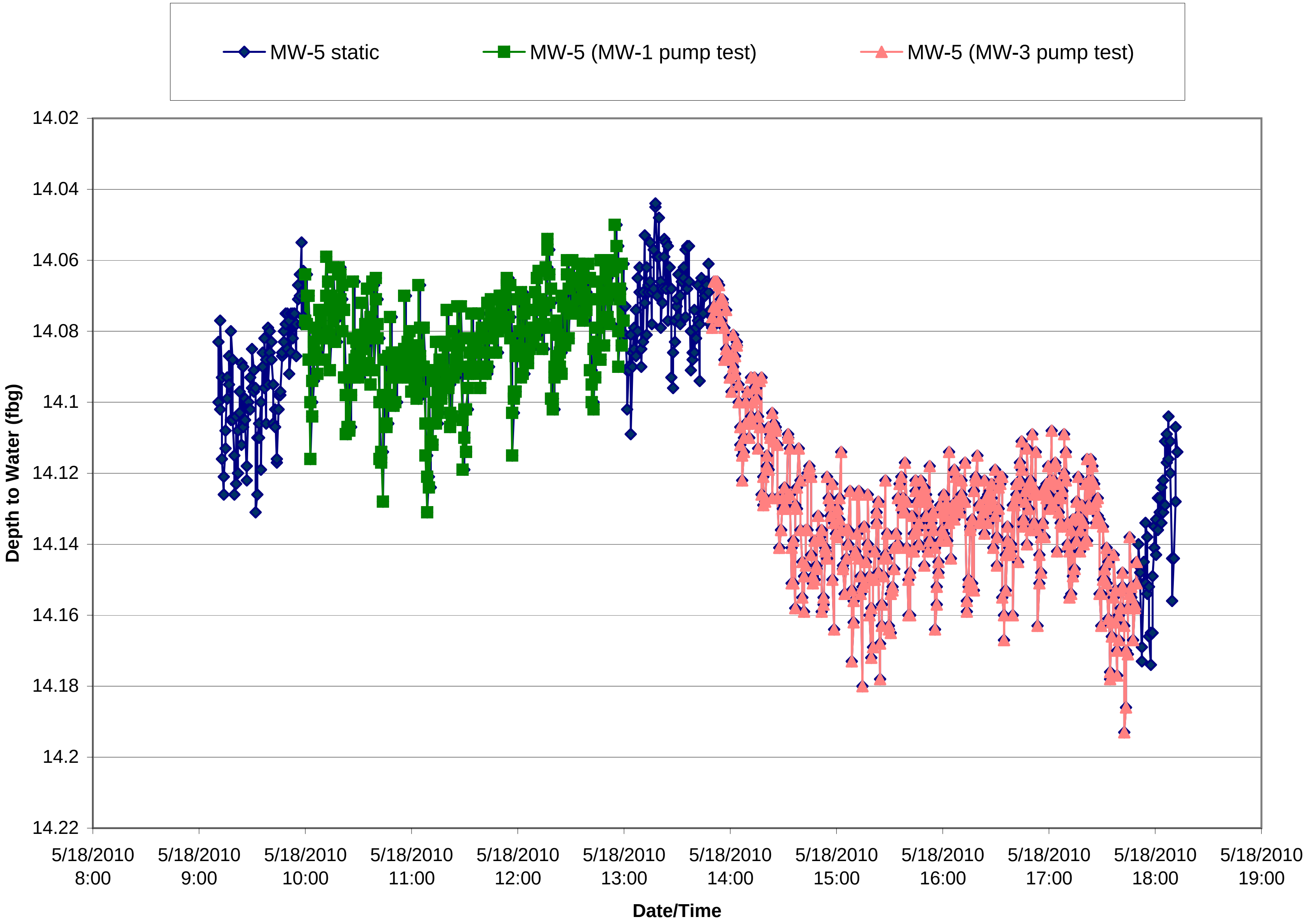
ATTACHMENT E

TRANSDUCER DATA


MW-3 static
MW-3 (MW-1 pump test)
Depth to Water (fbg)
29.1
29.11
29.12
29.13
29.14
29.15
29.16
29.17
29.18
29.19
29.2
29.21
5/18/2010 8:00
5/18/2010 9:00
5/18/2010 10:00
5/18/2010 11:00
5/18/2010 12:00
5/18/2010 13:00
5/18/2010 14:00
Date/Time



MW-5 static
MW-5 (MW-1 pump test)
MW-5 (MW-3 pump test)
Depth to Water (fbg)
14.02
14.04
14.06
14.08
14.1
14.12
14.14
14.16
14.18
14.2
14.22
5/18/2010 8:00
5/18/2010 9:00
5/18/2010 10:00
5/18/2010 11:00
5/18/2010 12:00
5/18/2010 13:00
5/18/2010 14:00
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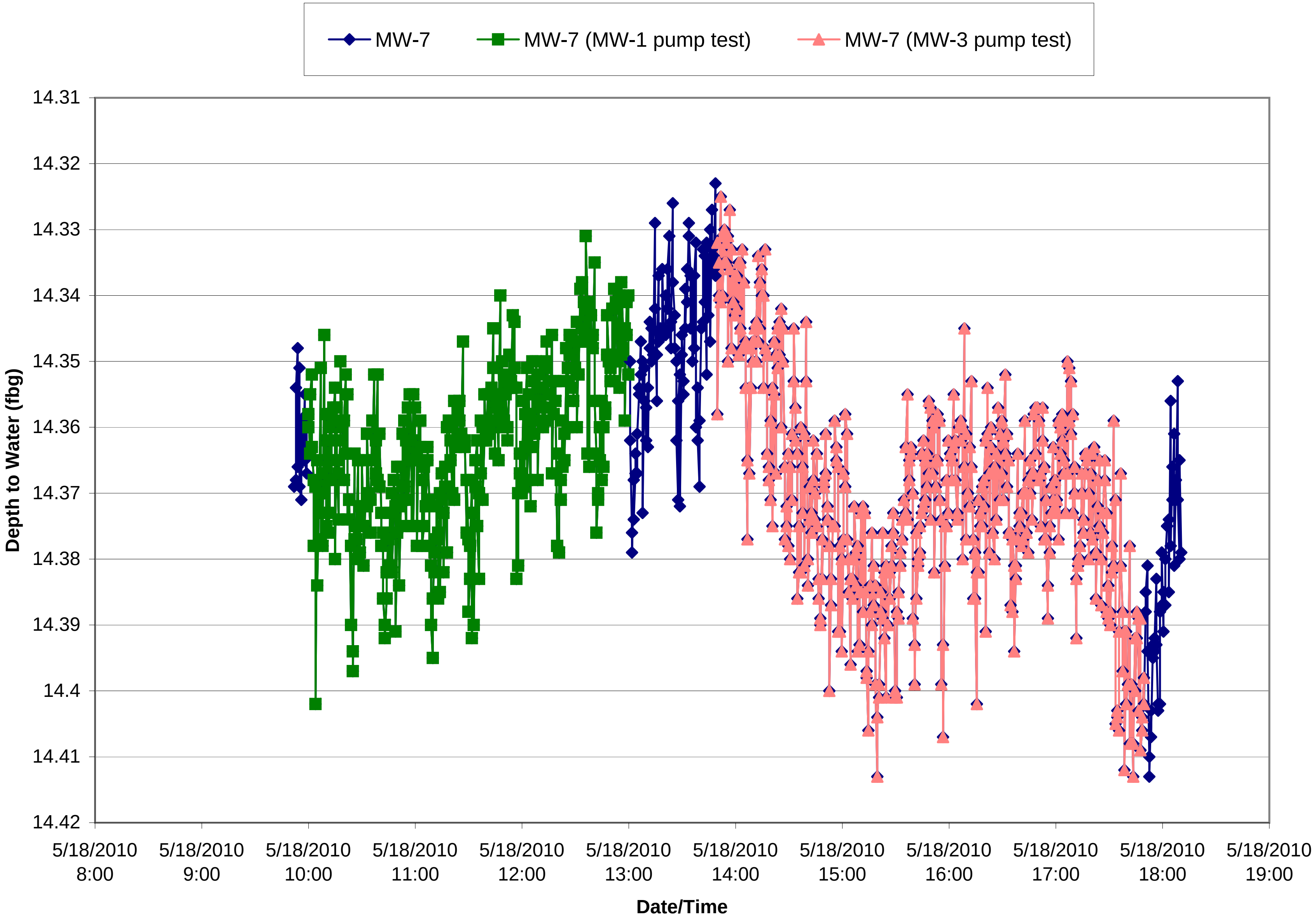
5/18/2010 16:00
5/18/2010 17:00
5/18/2010 18:00
5/18/2010 19:00
Date/Time


MW-7
MW-7 (MW-1 pump test)
MW-7 (MW-3 pump test)
Depth to Water (fbg)
14.31
14.32
14.33
14.34
14.35
14.36
14.37
14.38
14.39
14.4
14.41
14.42
5/18/2010 8:00
5/18/2010 9:00
5/18/2010 10:00
5/18/2010 11:00
5/18/2010 12:00
5/18/2010 13:00
5/18/2010 14:00
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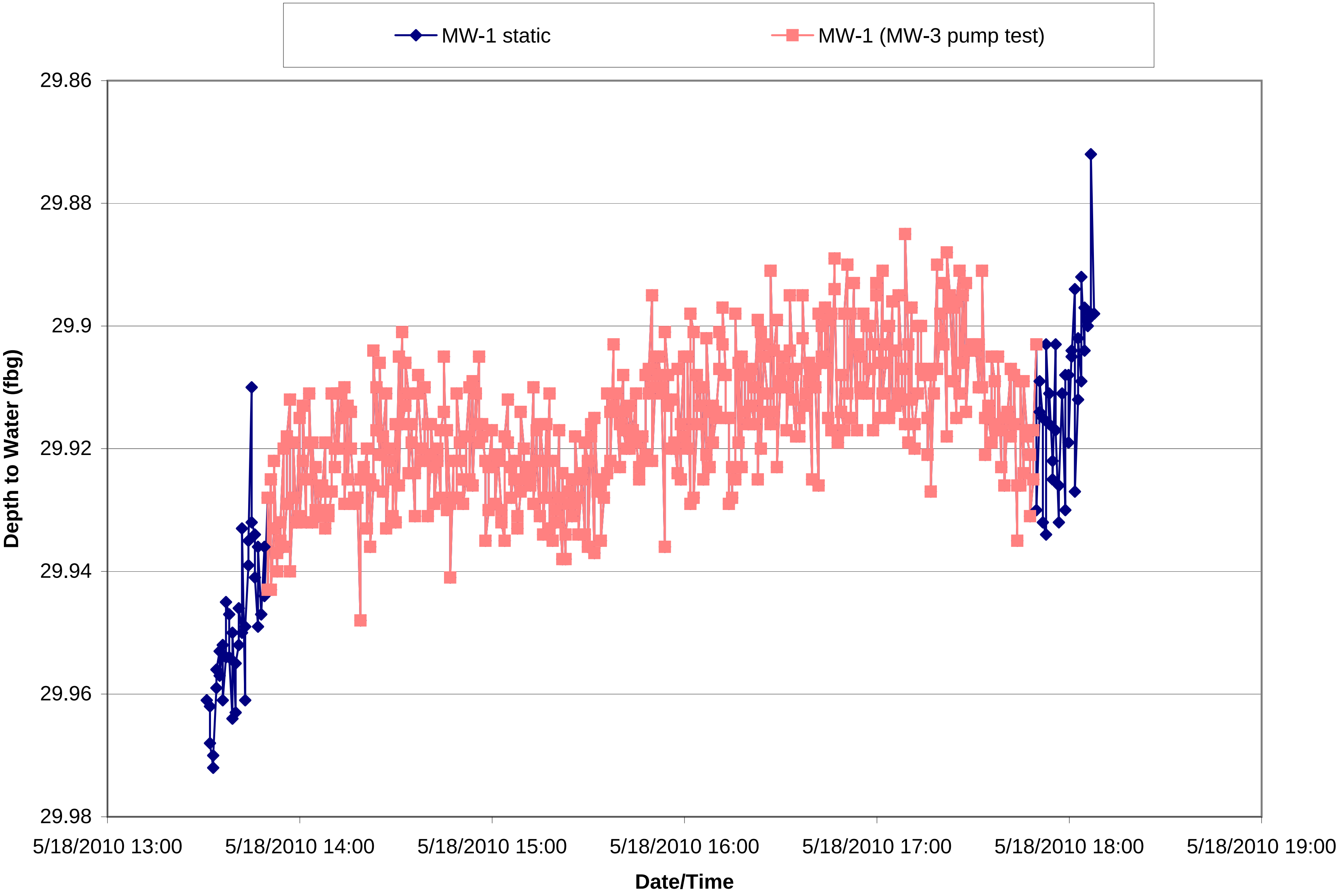
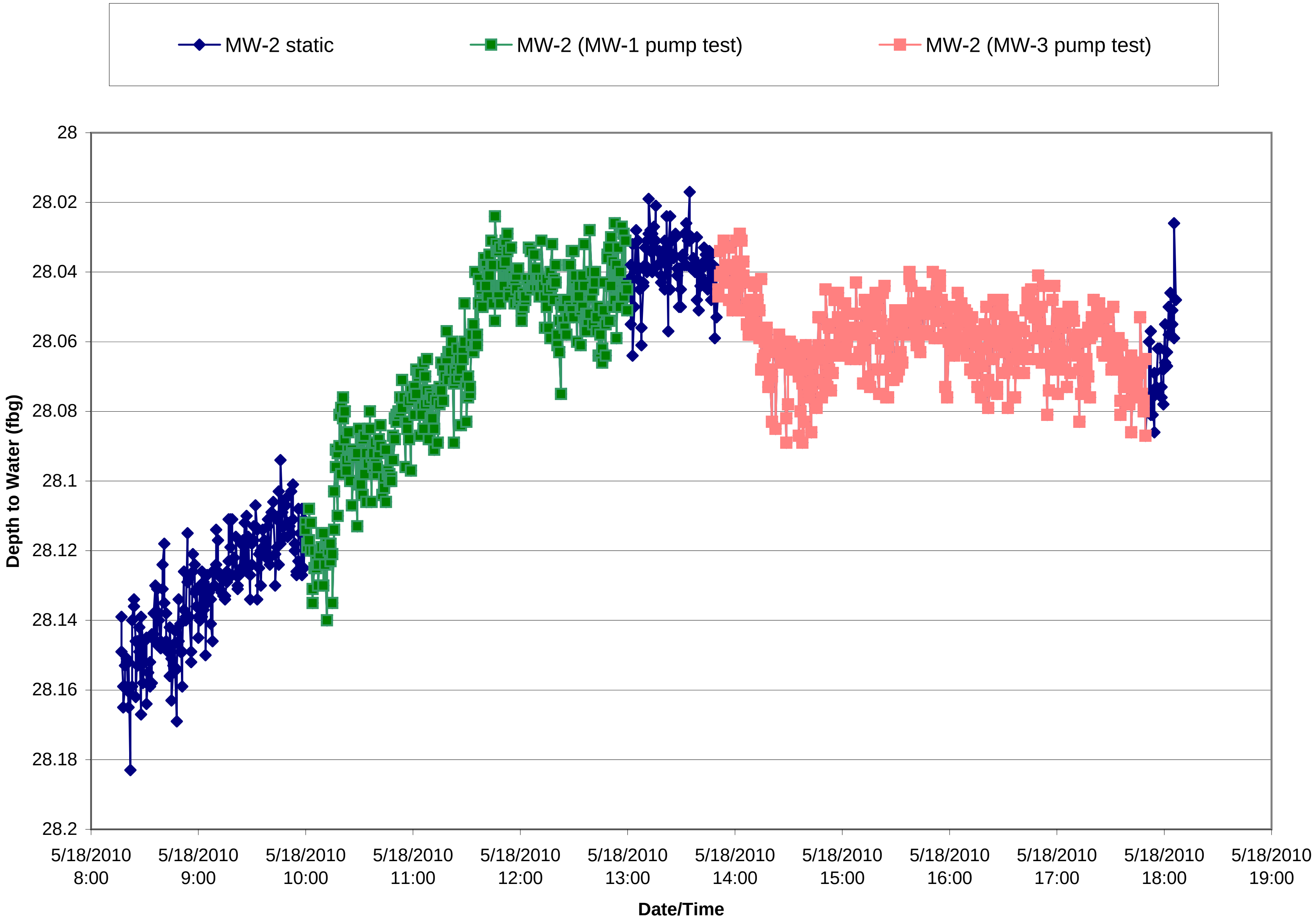
5/18/2010 17:00
5/18/2010 18:00
5/18/2010 19:00
Date/Time


MW-1 static
MW-1 (MW-3 pump test)
29.86
29.88
29.9
29.92
29.94
29.96
29.98
Depth to Water (fbg)
5/18/2010 13:00
5/18/2010 14:00
5/18/2010 15:00
5/18/2010 16:00
5/18/2010 17:00
5/18/2010 18:00
5/18/2010 19:00
Date/Time


MW-2 static
MW-2 (MW-1 pump test)
MW-2 (MW-3 pump test)
Depth to Water (fbg)
28
28.02
28.04
28.06
28.08
28.1
28.12
28.14
28.16
28.18
28.2
5/18/2010 8:00
5/18/2010 9:00
5/18/2010 10:00
5/18/2010 11:00
5/18/2010 12:00
5/18/2010 13:00
5/18/2010 14:00
5/18/2010 15:00
5/18/2010 16:00
5/18/2010 17:00
5/18/2010 18:00
5/18/2010 19:00
Date/Time

ATTACHMENT F

SURFACTANT INFORMATION

Ivey-sol® Non-ionic Surfactant Biodegradability

The following discussion on Ivey-sol® biodegradability has been produced by Dr. Steven Nearhos, a Senior Microbiologist with Baseline (Australia) Pty. Ltd. This briefing was prepared to verify the product was biodegradable and safe for the proposed site application.

The product, Ivey-sol® based around MSDS 080123-01, has been validated using OECD Procedures 301 E and 301 B. Australian procedures for biodegradability are defined collectively under Australian Standard AS 4351.1-7. The Australia Standards have been individually internationalized to an ISO equivalent but these are based on OECD, Guidelines for Testing of Chemicals, Section 3 "Degradation and Accumulation". Test 301E is technically equivalent to ISO 7827: 1984 while AS 4351.2 (1996) is equivalent to ISO 7827:1994.

There are a variety of different parallel and suitable methodologies in the Australian Standard for assessing biodegradability and these are based around different methods for detection e.g. measurement of respiratory gases or reductions in dissolved organic carbon. What these methods show though is a reduction of the total quantity of surfactant by 90% within 28days.

It is further noted in regard to risk assessment at an in-situ pump and treatment site with hydraulic control, that most of the material introduced will ultimately be drawn off during the operation and pumping at an extraction well on-site. Introduction of surfactant at injection points will stop when the TPH level falls away so that the final concentration of surfactant will be quite low, even before biodegradation commences. The other part of reporting in the Ivey-sol® MSDS refers to the product having a CO_2 evolution after 28days of 70%. This reflects the apparent extent of complete mineralization without measuring new biomass or surfactant residues. On this test and there is no apparent Australian equivalent, there is a mechanism under the UK Offshore Chemical Notification Scheme to cause the reformulation of chemical products which have a lesser rate of decomposition under Test 301E i.e. when between 20 and 70% carbon dioxide is evolved. In this case 70 % compliance is shown so the product would be expected to be highly degradable under said conditions as encountered project sites.

References:

Ivey international Inc (2008) Material Safety Data Sheet Ivey-sol® Surfactant Technology pp1-4.

Australia Standard 4351.1 –1996 Biodegradability Organic Compounds in Aqueous solution Part 1: Method for determining & reporting biodegradability Standards Australia pp1-10

Australia Standard 4351.1 –1996 Biodegradability Organic Compounds in Aqueous solution Part 2: Determination by Analysis of Dissolved Organic Carbon (DOC) pp1-11.

Australia Standard 4351.1 –1996 Biodegradability Organic Compounds in Aqueous solution Part 3: Determination by Oxygen demand in a closed respirometer. pp1-16.

Australia Standard 4351.1 –1996 Biodegradability Organic Compounds in Aqueous solution Part 4: Determination by Analysis of Released Carbon Dioxide pp1-13.

Australia Standard 4351.1 –1996 Biodegradability Organic Compounds in Aqueous solution Part 5: Determination by Analysis of Biochemical Oxygen Demand (closed Bottle Test) pp1-13.

Australia Standard 4351.1 –1996 Biodegradability Organic Compounds in Aqueous solution Part 6:Guidance for the determination of biodegradability of poorly soluble organic compounds pp1-7.

Australia Standard 4351.1 –1996 Biodegradability Organic Compounds in Aqueous solution Part 7: Determination by semi-continuous activated sludge method (SCAS) pp1-12.

OECD (2003) Introduction to the OECD Guidelines for the testing of Chemicals Section 3: Part 1 Principles & Strategies Related to the Testing of Degradation of Organic Chemicals

Centre for Environment, Fisheries & Aquaculture Science (Cefas) (2007) Offshore Chemical Notification Scheme –Warning Notices.http:// www.cefas.co.uk/offshore chemical notification scheme-(ocns)/frequently asked Questions (FAQs)/warning notices.

Dr. Steven Nearhos, B.App, Sc., Ph.D. MASM
Senior Microbiologist, Baseline (Australia) Pty. Ltd.
Tel: + 61 (07) 3863 1111 Fax: + 61 (07) 3863 1333 E-mail: basel@baseline.com.au

Ivey International Inc. **MSDS NUMBER: 080123-01**

MATERIAL SAFETY DATA SHEET
Ivey-sol ® Surfactant Technology

SECTION 1: CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name:	Ivey-sol
Chemical Name:	Not Applicable (mixture)
Chemical Family:	Non-ionic Surfactants
Formula:	Not Applicable (mixture)
Synonym(s):	Ivey-sol 103, Ivey-sol 106, and Ivey-sol 108

COMPANY IDENTIFICATION

Ivey International (USA) Inc.	26 Berkeley Place, Newington, CT USA 06111
Ivey International (CAN) Inc	PO Box 706 Campbell River BC Canada V9W 6J3
Prepared By:	Technical Products Department
Telephone Number:	(250)923-6326 or Toll Free 1-800-246-2744
Prepared (Last Updated):	January 23, 2008

Ivey International Inc. (III) urges each customer or receipt of this MSDS to study it carefully to become aware of and understand the proper use and handling of the subject product. The reader should consider consulting reference materials, and/or III technical support personal, and/or other recognized experts, as necessary or appropriate to the use and understanding of the data contained in this MSDS. To promote the safe handling, storage and use of this product, each customer or recipient should (1) notify his employees, agents, contractors, and others whom he knows or believes will use this product, of the information in this MSDS and any other information regarding product use, storage and handling, (2) furnish this same information to each of his customers for the product, and (3) request his customers to notify their employees, customers, and other users of the product, and of this information.

SECTION 2: COMPOSITION INFORMATION

Components:	Ivey-sol 103 - 3 Molar Concentration In Water
Generic Description:	Water based biodegradable wetting agents and surfactants.

Ivey-sol® / SPT® Technology - Stock Mixtures. Patented and or proprietary blends. Information in this MSDS is applicable for all component products listed.

SECTION 3: HAZARDS IDENTIFICATION

Effects of A Single Exposure:

Swallowing:	Non to slightly toxic. May cause abdominal discomfort and nausea for some individuals.
Skin Absorption:	No evidence of harmful effects.
Inhalation:	No evidence of harmful effects.
Skin Contact:	Brief contact should not result in any significant effects. Prolong exposure may cause mild irritation with local itching and redness for individuals with sensitive skin.
Eye Contact:	May cause mild to moderate irritation.
Effects Of Repeated Exposure:	Repeated skin contact may cause mild dermatitis (dryness of skin).
Medical Conditions:	Existing dermatitis may be aggravated through repeated skin contact.
Other Effects:	None currently known.

Section 4: FIRST AID MEASURES

Swallowing:	If patient if fully conscious, give two glasses of water
Skin Absorption:	Wash with soap and water. Obtain medical attention if irritation or dermatitis persists. Wash any exposed clothing before reuse.
Inhalation:	Not applicable.
Eye Contact:	Immediately flush eyes with water and continue to flush as required. Remove any contact lenses, if worn. Obtain medical attention if deemed necessary.
Note To Physician:	There is no required antidote. Treatment should be directed tat the control of symptoms and the clinical condition of the patient.

Section 5: FIRE FIGHTER MEASURES

Flammability:	Not Flammable
Auto Ignition Temp.	Not Available
Upper Flammable Limit	Not Established
Lower Flammable Limit	Not Established
Explosive Date:	Explosive Power - Not Available Rate of Burning - Not Available
Hazardous Combustion Products:	Not applicable.
Special Protective Equipment:	Not Applicable.
Extinguishing Media:	Not Applicable.
Extinguishing Media To Be Avoided:	Not Applicable.
Special Fire Fighting Procedures:	Not Applicable.

Section 6: ACCIDENTAL RELEASE MEASURES

Step To Be Taken If Material Is Released or Spilled: Eliminate and/or contain source with inert material (sand, earth, absorbent pads, etc.). Wear basic eye and skin protection. Floor may be slightly slippery; so use care to avoid falling. Avoid discharge to natural waters, and/or dilute with water. Transfer liquids to suitable containers for recovery, re-use or disposal. Contact III for technical assistance if required.

Section 7: HANDLING AND STORAGE

Handling Procedures:	Avoid contact with eyes, skin, and clothing. Do not swallow. Keep containers closed or sealed when not in use. Wash thoroughly after handling.
Storage:	Keep closed or sealed when not in use. Do not allow to freeze, keep > 0°C (32°F).
Ventilation:	General (mechanical) room ventilation is expected to be satisfactory.

Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Gloves / Type Gloves / Type:	Latex, or similar would be sufficient.
Respiratory / Type:	None expected to be needed. However, if an engineered / industrial application where vapors and/or misting may occur, wear MSHA/NIOSH approved half mask air purifying respirator.
Eye / Type:	Mono Goggles or similar.
Footwear / Type:	No special requirements.
Clothing / Type:	Wear an apron and /or coveralls.
Other / Type:	Eye bath.
Engineering Controls:	General (mechanical) room ventilation is expected to be satisfactory.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Water Based Liquid
Appearance:	Clear to slightly Cloudy White Color
Odor:	Mild
Molecular Weight:	Mixture (Not Applicable)
Boiling Point:	Not Applicable
Freezing Point:	Around 0°C (32 °F)
Pour Point:	Not Applicable
Melting Point:	Not Applicable
Specific Gravity:	0.99-1.04 (Water = 1.0)
Vapor Pressure:	<0.01 mm Hg
Vapor Density:	> 1 (Air = 1.00)
pH:	Not Available (Typically 6.5-7.5 Range)
Solubility In Water:	100%
Evaporation Rate:	<0.01
Coefficient of Oil/Water Distribution	Not Determined

Section 10: STABILITY AND REACTIVITY

Stability:	Stable
Conditions To Avoid:	Prolonged excessive heat may cause product decomposition. Freezing should also be avoided as it may cause product decomposition. In some cases it may cause irreversible changes.
Incompatible Materials:	Normally un-reactive; however avoid strong bases at high temperatures, strong acids, strong oxidizing agents, and materials with reactive hydroxyl compounds. These compounds would damage the mixture and reduce its effectiveness during application.
Hazardous Decomposition Products:	Not applicable.
Hazardous Polymerization:	Will not occur.

Section 11: TOXICOLOGICAL INFORMATION

Exposure Limit of Material:	Not Established
LD/50:	Not Available
LC/50:	Not Available
EL:	Not Established
Carcinogenicity of Material:	None Known
Reproductive Effects:	Not Available.
Irritancy of Material:	See Section 3
Sensitizing Capability:	Not Available
Synergistic Materials:	Not Available

LD: Lethal Dose LC: Lethal Concentration EL: Exposure Limit

Section 12: ECOLOGICAL CONSIDERATIONS

Environmental Toxicity:	Low Potential to affect aquatic organisms*	
Biodegradability:	>90% in 28 days**	
LC/50:	48 Hour: 0.11 %,Species: Daphnia magna	
LC/50:	96 Hour: 0.07695%	Species: Rainbow Trout

* When used in accordance with Ivey International Inc. In-situ and Ex-situ Remediation Application Guidelines.

** Based on actual testing or on data for similar material(s). Degradation Biodegradation reached in Modified OECD Screening Test (OECD Test No.301 E) after 28 days: 90 %. Biodegradation reached in CO2 Evolution Test (Modified Sturm Test, OECD Test No. 301 B) after 28 days: 70 %.

All available ecological data have been taken into account for the development of the hazard and precautionary information contained in this Material safety data Sheet.

Section 13: DISPOSAL CONSIDERATIONS

Waste Disposal Method:	For aqueous Ivey-sol mixture solutions; aerobic biological wastewater treatment systems are effective in treating said mixtures. Ivey-sol does not have any known negative affect on coagulant or flocculent water treatment processes.

Section 14: TRANSPORTATION INFORMATION

UN Number:	Not Applicable
TDG Classification:	Not Required
Shipping Name:	Ivey-sol (a.k.a. Selective Phase Transfer Mixtures)
Packing Group:	Not Applicable
Special Shipping Instructions:	Do not allow to freeze

Section 15: REGULATORY INFORMATION

WHMIS Classification:	Not Controlled as per WHMIS Regulation.
CPR Compliance:	This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
CEPA Compliance:	All ingredients of this product are listed on a DSL.

Section 16: OTHER INFORMATION

Available Literature and Brochures:	Additional information on this product may be obtained by calling our customer service representatives at (800) 246-2744 or (250) 923-6326.
Recommended Uses and restrictions:	For the application of air, soil, groundwater, shoreline, and off-shore spill petroleum reclamations purposes. Secondary recoveries of petroleum products form crude-oil, oil-shale, and oil-sands. Additional information on uses can be made available by contacting out technical sales director in your area by visiting www.ivey-sol.com, or by calling toll free (800) 246-2744 or (250) 923-6326.

Legend:

TS	- Trade Secret
D2B	- Toxic Material causing Other Effects.
mm	- Millimeters
LD	- Lethal Dose
LC	- Lethal Concentration
EL	- Exposure Limit
Hg	- Mercury (760 mm Hg = 1 Atmosphere, Sea Level)

Ref:Ivey-sol/MSDS/080123-01(Revised January 23, 2008)

Ivey-sol® Surfactant Technology
"TODAY'S ENVIRONMENTAL SOLUTIONS FOR A BETTER TOMORROW" ®
1-800-246-2744 • www.iveyinternational.com

Specification Sheet
Ivey-sol® Surfactant Products

Product Information:

Product Name:	Ivey-sol®
Chemical Name:	Not Applicable (mixture)
Chemical Family:	Non-Ionic Surfactants
Formula:	Not Applicable (mixture)
Synonym(s):	Ivey-sol® 103, Ivey-sol® 106, and Ivey-sol® 108
MSDS NUMBER:	080123-01 (See MSDS for additional information)

Product Description:

Water based biodegradable wetting agents and surfactants.
Non hazardous
Non TDG Regulated
Phosphate Free
Salt Free

Physical and Chemical Properties:

Physical state:	Water Based Liquid
Appearance:	Clear to slightly Cloudy White Color
Odor:	Mild
Molecular Weight:	Mixture (Not Applicable)
Boiling Point:	Not Applicable
Freezing Point:	Approximately 0°C (32 °F)
Pour Point:	Not Applicable
Melting Point:	Not Applicable
Specific Gravity:	0.99-1.04 (Water = 1.0)
Vapor Pressure:	<0.01 mm Hg
Vapor Density:	>1 (Air = 1.00)
pH:	Typically 6.5-7.5 Range
Solubility in Water:	100%
Evaporation Rate:	<0.01
Coefficient of Oil/Water Distribution:	Not Determined

Handling and Storage:

Handling Procedures: Avoid contact with eyes, skin, and clothing. Do not swallow. Keep containers closed or sealed when not in use. Wash thoroughly after handling.

Storage: Keep closed or sealed when not in use. Do not allow to freeze. Keep above 0°C (32°F). Ventilation general mechanical room ventilation is expected to be satisfactory.

Transport / Regulatory Information:

UN Number:	Not Applicable
TDG Classification:	Not Required
Shipping Name:	Ivey-sol® (a.k.a. Selective Phase Transfer Mixtures)
Packing Group:	Not Applicable
Shipping Instructions:	Do not allow to freeze.
Shipping Containers:	5 Gallon Plastic Pails, 55 Gallon Drums (Plastic or Steel), Totes (Plastic 264 Gallon)
WHMIS Classification:	Not controlled as per WHMIS regulation.
CPR Compliance:	This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
CEPA Compliance:	All ingredients of this product are listed on a DSL.

First Aid:

Swallowing:	If patient if fully conscious, give two glasses of water.
Skin Absorption:	Wash with soap and water. Obtain medical attention if irritation or dermatitis persists. Wash exposed clothing before reuse.
Inhalation:	Not applicable.
Eye Contact:	Immediately flush eyes with water and continue to flush as required. Remove any contact lenses, if worn. Obtain medical attention if deemed necessary.
Note to Physician:	There is no required antidote. Treatment should be directed at the control of symptoms and the clinical condition of the patient.

Applications/Use:

For the application of air, soil, sediment, groundwater, shoreline, off-shore spill petroleum hydrocarbon remediation. Additional applications: Secondary recoveries of petroleum products form crude-oil, oil-shale, and oil-sands. Additional information on this product may be obtained by calling our customer service representatives at 1-800-246-2744 or 250-923-6326.

Ref: Ivey-sol/Spec. Sheet/100526-02