

APPENDIX H

Conceptual Site Model

Conceptual Site Model
Kettleman City Community Exposure Assessment, Kettleman City, CA

Primary Sources	Potential Release Mechanism	Potential Secondary sources	Potential Secondary Release Mechanism	Pathway	Potential Exposure Route	Potential Receptor: Human	
						Area Residents	Visitors
Agricultural Pesticide Application	spill	domestic applications-pesticides	spill	air soil ground water	Ingestion Inhalation Dermal contact	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>
Oil field/ Petroleum Storage Facility	spill	Natural occurrences		soil ground water	Ingestion Inhalation Dermal contact	<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>
Drinking Water (Potables Wells-arsenic benzene)	pumping / extraction			domestic / drinking water	Ingestion Inhalation Dermal contact	<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>
Old Homes (Drinking Water-lead pipe)	leaching			air soil ground water	Ingestion Inhalation Dermal contact	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Old Homes (Structures-lead based paint, asbestos)	deterioration			air soil	Ingestion Inhalation Dermal contact	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Surface Water Aqueduct/Canals	fishing, irrigation	Illegal dumping		water Fish	Ingestion Inhalation Dermal contact	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Gas Stations Former/Current	accidental discharge			air soil ground water	Ingestion Inhalation Dermal contact	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
Truck Repair/Towing Operations	accidental discharge			air soil ground water	Ingestion Inhalation Dermal contact	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>
KHF-Chemical Waste Management Facility	accidental discharge			air soil ground water	Ingestion Inhalation Dermal contact	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Legend: Incomplete exposure pathway, no evaluation necessary
 complete exposure pathway

APPENDIX I

Data Validation Memorandum

DATA VALIDATION MEMORANDUM

TO: Javier Hinojosa
Project Manager, Department of Toxic Substances Control

FROM: Susan Lowe
ACS Associates

DATE: October 12, 2010

SUBJECT: Summary of the Level II Data Validation for Kettleman City Community Exposure Assessment (CEA) Project, Kettleman City, California

1.0 INTRODUCTION

This memorandum summarizes the findings of a Level II data validation for analytical results of all field samples and quality control (QC) samples collected in connection with the Kettleman City (KC) Community Exposure Assessment (CEA) project. The Department of Toxic Substances Control (DTSC) and the U.S. Environmental Protection Agency (USEPA) conducted a CEA to investigate the possible causes for the recent spike in birth defects and elevated cancer rates within the residential community (Site). The CEA is a joint effort by DTSC and USEPA.

As part of the CEA, a workplan titled "Sampling and Analysis Plan - Community Exposure Assessment, Kettleman City Residential Area, dated June 2010 (SAP)," (DTSC, June 2010) was prepared for investigation of the Site soil, soil gas, groundwater, and surface water. A quality assurance and quality control (QA/QC) plan was included in the SAP to provide an appropriate level of assurance regarding the reliability and usability of the data generated during the proposed CEA investigation. ACS Associates (ACS), an environmental consultant, was retained by DTSC to implement the SAP, under the Contract Agreement No. 09-T9122.

On July 14, 2010, water, soil and sediment samples were collected at the Site. Collected samples were hand delivered to USEPA Region 9 Laboratory in Richmond, California (USEPA-Richmond) on July 15, 2010 for planned analyses. On July 20 and 21, 2010, a soil gas survey was conducted onsite using a mobile laboratory, Optimal Technology (Optimal), and the remaining soil matrix samples, background metal samples and polychlorinated biphenyl (PCB) transformer samples, were collected. These soil samples were hand delivered to C&E Laboratories (C&E) on July 22, 2010 for specified analyses. Samples were maintained throughout the process under chain-of-custody (COC) protocols. A list of all sample types and quantities by analytical method is shown in Table 4-1 of the CEA report. In addition, hand held instruments were used to screen the Site for radiation in ambient air, and methane and hydrogen sulfide in soil gas. These screening readings were not included in the data validation process.

Detailed laboratory reports are included in Appendix G of the CEA report.

2.0 DATA VALIDATION

The QA objectives of this data validation are to assure that sampling, analysis, and reporting activities provide data that are accurate, precise, representative, and legally defensible. QC represents the specific steps and procedures followed during the course of the project to achieve QA. The QA/QC Plan was implemented as specified. The primary QC features included the collection and analysis of QC samples, a field audit, and the data validation.

Data validation is a process of evaluating the performance of data collection against the pre-determined method, procedural, or contractual requirements specified. It routinely evaluates how closely the requirements specified have been followed during data generation in the field and laboratory. It checks for improper practices, abuse, and warning signs shown during the investigation. It determines if the available data satisfies the project's data quality objectives (DQOs) and data use requirements by evaluating the data reports for field sampling procedures, laboratory performance, and error checks.

ACS conducted this Level II data validation for the analytical results, including review of project QC program, sampling procedures, analytical procedures, data reports, and DQOs and data quality indicators (DQIs). Each review is presented below.

3.0 REVIEW OF PROJECT QC PROGRAM

The goal is to ensure that chemical data is of the highest confidence and quality. The review of the QC program was divided into two parts: basic QC procedures and QC samples.

3.1 Basic QC Procedures

Basic QC evaluation criteria included field decontamination, supplies, holding times, equipment calibration and maintenance, and standards.

- **Field Decontamination:** Dedicated equipment was used for collection of most samples. Where non-dedicated equipment (i.e., glass syringes reused as soil gas sample containers, hand augers reused for drilling and collection of soil background samples, and hand shovels reused for collection of soil PCB transformer samples) was used, the equipment was decontaminated before and/or after each sample collection on July 20 and 21, 2010. See Section 3.3.3 of the CEA report for the decontamination procedures.
- **Supplies:** All supplies were certified clean by the suppliers, inspected by DTSC/ACS prior to their use, and monitored by the employed laboratories (USEPA-Richmond, C&E and Optimal) through the use of standards and blank samples.
- **Holding Times:** Compliance with the holding times specified in Tables 3-2 through 3-4 of the CEA report is critical to data quality and must be verified and confirmed. A list showing holding time verses compliance time and reported non-compliances is provided in Table 4-2 of the CEA report. More details were discussed in Section 6.0 below.
- **Equipment Calibration and Maintenance:** Each employed laboratory stated that analytical equipment calibration and maintenance were properly performed as recommended by the manufacturers and described in its QA/QC Plan and standard operating procedures (SOPs). The documentation of USEPA-Richmond, C&E and Optimal for compliance and raw data will be made available to DTSC upon request and may be subject to audit by California Department of Public Health Environmental Laboratory Accreditation Program (ELAP) inspectors or equivalent through the laboratory certification process. NOTE: ELAP currently does not offer certification for soil gas laboratories (e.g., Optimal).
- **Standards:** USEPA-Richmond, C&E and Optimal stated that standards used for calibration or to prepare samples were certified by or traceable to National Institute of Standards and Technology (NIST) or other equivalent source. The documentation of compliance will be made available to DTSC upon request and may be subject to audit by ELAP inspectors through laboratory certification process.

3.2 QC Samples

Appropriate QC samples include field QC samples, background samples, field testing confirmation samples, and laboratory QC samples.

- Field QC Samples: Field QC samples included field duplicates, equipment rinsate blanks, trip blanks and temperature blanks. A list showing the number of primary samples and field QC samples per sample type per medium is provided in Table 4-1 of the CEA report. No field blanks were required as determined by USEPA.

Field Duplicates: Field duplicates were collected, at a minimum frequency of 10 percent (%) of the primary samples per sample type per media, and analyzed to evaluate sampling and analytical precision. No field duplicates were collected if the number of primary samples was less than four (4). See Table 4-4 for duplicate pairs.

Equipment Rinsate Blanks: During the soil gas survey, no drive rods were reused and no decontamination of used drive rods was conducted onsite. According to DTSC's Advisory – Active Soil Gas Investigations (ASGI), dated January 28, 2003, used glass syringes should be disassembled and baked at 240° C for a minimum of 15 minutes, or at 120° C for a minimum of 30 minutes, prior to its reuse.

Where non-dedicated equipment was used (i.e., glass syringes used as soil gas sample containers, hand augers used for drilling and collection of soil background metal samples, and hand shovels used for collection of soil PCB transformer samples), the non-dedicated equipment was decontaminated as described in Section 3.3.3 of the CEA report. As part of the decontamination procedures, equipment rinsate blanks (for soil matrix samples) and soil gas method blanks (decontaminated glass syringes) were collected on July 20 and 21, 2010. As recommended by DTSC's ASGI, the soil gas method blanks served two purposes, to evaluate the effectiveness of decontamination procedures and to detect any possible interference from ambient air within the mobile laboratory.

Trip Blanks: When volatile organic compound (VOC) samples were shipped offsite for analyses, one (1) trip blank of the same media per shipment was prepared to evaluate if the shipping and handling procedures introduced contaminants into the samples, if any ambient VOCs were introduced during sample collection, shipping and analysis, and if cross contamination in the form of VOC migration occurred between the collected VOC samples. A total of two (2) trip blanks were included in the shipments of water VOC samples to USEPA-Richmond.

Temperature Blanks (TB): One (1) TB was included in each sample cooler shipped to USEPA-Richmond or C&E, for a total of six (6) TBs. Upon arrival at the receiving laboratory, each TB was measured and the reading recorded on the relevant COC forms. Because TB was not analyzed and did not measure introduced contamination, it was not a true QC blank. Its goal was to evaluate if samples were adequately cooled during sample shipment. If samples were not maintained at 2° C - 6° C, the problem might impact the integrity of the samples.

- Background Samples: Five (5) soil background samples, including one (1) duplicate, were collected. These soil background metal samples were all subsurface samples collected from five (5) feet BGS at four (4) boring locations onsite. Only heavy metals are considered for the background study, no man-made materials.

- Field Test Confirmation Samples: No confirmation samples were planned because no field screening test (e.g., XRF test for metals) requiring confirmation was conducted.
- Laboratory QC Samples: Both USEPA-Richmond and C&E met the requirements for method blanks (MB), laboratory control samples (LCS), matrix spikes (MS) and matrix spike duplicates (MSD). As recommended by DTSC's ASGI, Optimal analyzed method blanks, LCS and dilution procedure duplicates as part of the soil gas survey. DTSC's ASGI recommends a minimum of one (1) method blank per 20 samples or per every 12 hours, whichever is more often. On July 20, 2010, Optimal worked approximately 12.5 hours and analyzed only one (1) method blank. After DTSC issued a field variance approval, Optimal analyzed no additional method blanks as discussed in Section 3.3.8 of the CEA report. See Table 4-1 of the CEA report for the numbers of these laboratory QC samples prepared for each batch of sample type.

3.3 Findings of Project QC Program Review

No findings were identified affecting the quality of the samples collected or the resulting data.

4.0 REVIEW OF SAMPLING PROCEDURES

Joe Hwong, a DTSC senior engineering geologist and a Professional Geologist (PG) registered in California, supervised all sampling activities on July 13, 14, 19, 20 and 21, 2010. A follow-up tap water sampling was conducted at Residences 6 and 9 on October 5, 2010. Field activities were planned, conducted, and completed pursuant to the SAP and were monitored through field audit and photo documentation by Ken Chiang, DTSC QA/QC manager.

- Field Documentation: Primary field documents including field logs, boring logs, health and safety records, photographs, COC forms and other documents, were reviewed regarding sampling procedures (e.g., sample containers, collection, preservation, packaging, transportation, receipt, handling and storage, COC, holding time, and decontamination procedures) conducted. Samples collected on July 14, 2010 were hand-delivered to USEPA-Richmond on July 15, 2010. This included the time-critical samples (i.e., water Chromium VI samples with a holding time limit of 24 hours). Samples collected on July 20 and 21, 2010 were hand-delivered to C&E on July 22, 2010. Samples were maintained throughout the process under COC protocols and adequately chilled. Conditions or problems that might impact the integrity of the samples were closely observed. For example, aqueous VOC samples were checked for head space before completion of its collection, when placing it into the sample cooler, and upon arrival at the receiving laboratory, documented as such on the COC form.
- Boring Logs: Boring logs and sample classification for four (4) soil borings deeper than five (5) feet BGS were prepared, reviewed, signed and stamped by a California registered PG. The borings included one (1) continuously cored boring to 10 feet BGS was installed at the Kings County Fire Station #9 to check the lithology, potential transport mechanisms, and possible presence of perched groundwater at subsurface horizons.
- Sample Conditions: Upon receipt, USEPA-Richmond and C&E inspected the condition of the sample containers and reported the information accordingly on the COC forms. Conditions requiring immediate notification to DTSC or ACS may include wrong sample container, container breakage, water leaks, missing or improper COC, exceeded holding times, improper preservation, missing or illegible sample labeling, or temperature excursions. Neither laboratory reported any of such sample conditions or problems.

- Observations of Significance: No observations of significance on the CEA sampling procedures were found by ACS.

No findings were identified affecting the quality of the samples collected or the resulting data.

5.0 REVIEW OF ANALYTICAL PROCEDURES

ACS only evaluated criteria of analytical methods, laboratory certifications, instrument calibration, tentatively identified compounds (TICs) for organic analyses employing the mass spectrometer, and reporting limits (RLs). A TIC is a compound that can be seen by the analytical testing method, but its identity and concentration cannot be confirmed without further analytical investigation. All analyses reported were in compliance to the requirements specified in the SOPs of the employed laboratories and proper USEPA method requirements.

- Analytical Methods: Analytical methods used were listed in Table 4-1 of the CEA report. All collected soil gas, soil matrix, sediment and water samples were analyzed for the contaminants of potential concern (COPCs) described in Section 2.6.2 of the CEA report, using appropriate analytical methods pursuant to the SAP, DTSC's ASGI, and USEPA requirements.
- Laboratory Certifications: The ELAP does not currently offer certification for soil gas or air analytical laboratories. As such, there is no certification requirement imposed for Optimal. However, Optimal's qualifications, experience, and capabilities were verified with several DTSC geologists prior to its hire by ACS. All other chemical laboratories shall be certified by ELAP, accredited by National Environmental Laboratory Accreditation Conference (NELAC), or equivalent, for analyses of environmental samples for regulatory purposes in California. C&E is an ELAP-certified laboratory while USEPA-Richmond is a NELAC-accredited laboratory (see Appendix I of the CEA report). The QA/QC manual and SOPs of each employed laboratory were maintained in project files.

Under federal regulations, there are no laboratory certification requirements except for Safe Drinking Water Act (SDWA) compliance monitoring. The tap water samples collected during the CEA were not collected for SDWA compliance monitoring. The water purveyors are responsible for meeting SDWA requirements. USEPA-Richmond is NELAP accredited, but not California ELAP certified, because it is the accrediting authority in the State of California, both under SDWA and NELAC for the State ELAP program and for the State laboratories.

- Instrument Calibrations: USEPA-Richmond, C&E, and Optimal have maintained records of standard preparation and instrument calibration, including procedures, frequency and results. The documentation and full raw data of each laboratory will be made available to DTSC upon request and may be subject to audit by ELAP or NELAC inspectors through the laboratory certification/accreditation process.
- TICs: The employed laboratories were required to report TICs or non-targeted compounds (for the soil gas survey) for organic analyses employing MS. TICs were reported by USEPA-Richmond for semi-volatile organic compound (semi-VOC) data. Since these were estimated results, DTSC determined that no additional action, (e.g., running additional standards to quantify these TICs), as well as the use of these estimated data for risk evaluation, was necessary.
- RLs: The RLs for analyses must be defensible, not less than the results of the method detection limit (MDL) study prepared by each employed laboratory, and not greater than

the CEA-specific preliminary screening levels (PSLs). Each employed laboratory used the approved RLs. Table 3-5 of the CEA report included a list of the MDL, RL and PSL for each analyte pertinent to this CEA.

No findings were identified affecting the quality of the samples collected or the analytical results.

6.0 REVIEW OF DATA REPORTS

Data review was performed to ensure that the data produced were credible, cost effective, and of known and defensive quality. The data was reviewed in accordance with the SAP, the SOPs of the employed laboratories, the principles present in USEPA's *National Functional Guidelines for Laboratory Data Review - Organics* (USEPA, 1999) and *National Functional Guidelines for Laboratory Data Review - Inorganics* (USEPA, 2002), and the professional judgment of the validation team.

All collected samples were analyzed for the specified analytes, using the specified methods. The analytical results were summarized in Tables 3-6 through 3-14 of the CEA report. A designation of "ND" means "not detected at or above the RL." The areas of data review were summarized in Table 4-3 (Data Validation Summary Checklist) of the CEA report and discussed below.

- Completeness of Laboratory Reports: Each analytical report prepared by USEPA-Richmond, C&E, or Optimal was considered complete because it contained laboratory/client/sample identification, project name, sample matrix, sample collection/preservation/preparation/extraction/analysis dates, analytical methods, analyte, reporting units, RLs, dilution factors, report page numbering system, qualifiers, designated title and signature. The related NELAC accreditation or ELAP certification documents were included in Appendix G of the CEA report. As solid samples, the sediment sample was combined with some residential soil samples as a batch by USEPA-Richmond for necessary analyses. This was allowed as long as the same sample preparation (e.g., extraction method) was followed for both sample types.
- COC: Appropriate COC forms were included in each analytical report. All COC forms were properly completed except that the VOC analysis check boxes for water Samples Muni Well 2 and Residence 4 and the PCB analysis check box for soil Sample Resident 97 were not checked off. The samples were properly collected, labeled, transported to and received by USEPA-Richmond. The unmark overlook had been resolved before the samples were analyzed and reported as labeled. Within the scope of the project, it was merely a minor exception.
- Sample Containers and Conditions: Sample conditions were marked by the receiving laboratory on the COC forms upon receipt. Since any of the problems requiring resolution were not observed during sample receiving, DTSC received no notification of such problems from any of the employed laboratories.
- Holding Times: If samples are properly preserved, analyzed within the project-specific holding time limits, and no problems with the samples are indicated in the Case Narrative and the COC form, then it is assumed that the physical integrity of the samples is acceptable. Any holding time noncompliance is a potential problem that may impact the integrity of the samples. Professional judgment is critical for evaluating holding time noncompliance. In the absence of information to the contrary, it may be conservatively assumed that holding time problems will give rise to a low bias. If there is a holding time noncompliance for low stability analytes that are known to readily volatilize or degrade in the matrix being tested (e.g., chromium VI), then qualify all NDs with the "R" flag. The

analyses may be considered unusable and rejected because the integrity of the samples may have been compromised.

A list of the holding time, compliance time, sampling date, receiving date and analytical date for each CEA sample was included in Table 4-2 of the CEA report. Most analyses were performed within the method-specified holding times. However, the water chromium VI data of Samples Residence 6 and Residence 9 and the soil organochlorine pesticide (OCP) data of Sample Resident 1-1 and associated MS/MSD were qualified with "A3" flags due to holding time violations.

Water Chromium VI Analysis: The holding time of 24 hours for Chromium VI analysis was a big challenge due to the distance between the Site and USEPA-Richmond. Although a local backup laboratory was planned, the project decision was to have Chromium VI analyses preferably performed at USEPA-Richmond. Nine (9) water Chromium VI samples, including Samples Residence 6, Residence 9, Muni Well 1, Muni Well 2, Muni Well 99, School Well, Drainage Canal, Residence 2 and CAL Aqueduct, were specifically collected between 11:00 AM and 3:00 PM on July 14, 2010 for a hand delivery on July 15, 2010. Samples Residence 6 and Residence 9 were the first two (2) tap water samples collected and were analyzed within 26 hours of sample collection (slightly exceeding the 24-hour mark). However, the Chromium VI data in question were qualified, but not rejected, for the reasons as below.

1. Three (3) tap water samples and four (4) groundwater samples were all originated from the groundwater onsite
2. All total chromium and Chromium VI data were NDs for those seven (7) water samples originated from the onsite groundwater
3. No concerns were noted on conditions of these samples and other QA/QC requirements

Soil OCP Analysis: The project holding time for OCP analysis is 14 days until extraction and 40 days after extraction. This batch included Samples Dr. Canal Sed, Resident 2-1, Resident 2-2, Resident 2-3, Resident 2-4, Resident 97, Resident 1-2, Resident 1-3, Resident 1-4, Resident 1-1, Resident 8-1, Resident 8-2, Resident 8-3, Resident 8-4, Resident 11-1, Resident 11-2, Resident 11-3, Resident 11-4, Resident 100, Resident 7-1, Resident 7-2, Resident 7-3, Resident 7-4, Resident 98, Resident 10-1, Resident 10-2, Resident 10-3, Resident 10-4, Resident 9-1, Resident 9-2, Resident 9-3, Resident 9-4, and Resident 99. All were collected on July 14, 2010 and delivered to USEPA-Richmond on July 15, 2010. For unknown reasons, Sample Resident 1-1 and associated MS/MSD were not prepared until July 29, 2010, in violation of the 14-day-to-extraction requirement. These holding time noncompliances were marginal. In addition, OCPs typically have longer half-lives and when degradation occurs, they convert to other OCP analytes. The total risks present by the sample may not change much. As such, the OCP data in question were not rejected, but qualified.

- Sample Preservation: As shown in Table 4-2 of the CEA report, water samples for analyses of VOCs, total petroleum hydrocarbon reported in gasoline range (TPHg) and Title 22 metals required acid preservation by addition of HCl, HCl and HNO₃, respectively to pH < 2. Bacteria samples were chilled to 4° C (± 2° C) during transport and storage and addition of 0.008% Na₂S₂O₃ was required for chlorinated water samples (see Case Narrative note 3 below). No specific chemical preservations were required for other

samples shipping offsite. However, all samples were chilled to 4° C (± 2° C) during transport and storage as specified in the SAP to maintain sample quality and integrity.

- Field QC Samples (Equipment Rinsate Blanks): As shown in Table 4-1 of the CEA report, two (2) equipment rinsate blanks were shipped to C&E for analyses, one (1) for Title 22 metals and one (1) for PCBs. In addition, two (2) soil gas method blanks (also served as equipment rinsate blanks) were analyzed for targeted VOCs by Optimal. All target chemicals were not detected in the equipment blanks and the method blanks. The ND results met the analytical goal of no detectable analyte and the equipment rinsate blank results were acceptable.
- Field QC Samples (Trip Blanks): Two (2) trip blanks were included in the shipments of water VOCs and water TPHg samples to USEPA-Richmond. All VOC analytes were not detected in the trip blanks. The ND results met the analytical goal of no detectable analyte and the trip blank results were acceptable.
- Field QC Samples (Temperature Blanks): A total of 10 temperature blanks, including nine (9) to USEPA-Richmond and one (1) to C&E, were prepared, at a rate of one (1) per sample cooler shipped offsite. USEPA-Richmond and C&E marked down a temperature ranging from 3° to 5° C on the COC forms upon receipt of samples. The temperature range was considered normal and acceptable.
- Field QC Samples (Field Duplicates): Thirteen (13) field duplicates, including soil Samples AG98, AG99, Resident 97, Resident 98, Resident 99, Resident 100, B3X and PCB 1X, water Samples Muni Well 99 and Residence 99, and soil gas Samples SG01-7V, SG10 and SG25, were submitted blind to USEPA-Richmond, C&E and Optimal. A list of primary and duplicate sample pairs (per sample matrix/type) was included in Table 4-4 of the CEA report.
- Surrogate Spike Recoveries: Prior to its analysis, appropriate surrogates were spiked into each organic sample (i.e., VOC, semi-VOC, OCP, PCB and TPH). Each surrogate's name and its recovery % rate and recovery limit were included in the laboratory reports.
- Laboratory QC Samples (Method Blanks): No target analytes were detected in the associated method blanks. The method blank results were acceptable.
- Laboratory QC Samples (LCS): The % recoveries of all spiked analytes for USEPA-Richmond and C&E were within the respective laboratory's acceptance criteria. These LCS results were acceptable. Optimal's LCS data were not required to be included in its laboratory report for soil gas survey, but available upon request. Optimal stated its LCS data were within its acceptance criteria.
- Laboratory QC Samples (MS/MSD): The MS/MSD % recoveries and relative percent differences (RPDs) for USEPA-Richmond and C&E were within the respective laboratory's acceptance criteria. These MS/MSD results were acceptable. No MS/MSD samples are required for soil gas or air VOC analyses.
- Laboratory QC Samples (Duplicates): No other laboratory duplicates beyond MS/MSD were prepared.
- Compound Identification and Quantitation: The analytical reports (see Appendix G of the CEA report) contained data for the target analytes. Qualitatively, the analytes were

documented to be correctly identified and reported. Raw data were not reviewed, but available for review upon request, as part of this Level II data validation. When there is any concern or question on data quality, a specific raw data review will be conducted as appropriate. Result recalculation or transcription error checking from the raw data was conducted separately by each employed laboratory. Therefore, analytical results were checked, verified, and confirmed by each employed laboratory.

- Dilution Factors (DF): DF information was included in the laboratory reports prepared by Optimal and C&E both. C&E used a DF of 1 (i.e., without any dilution) for all soil background metal samples and PCB transformer samples. Optimal used a DF of 2 for Samples SG26 and SG28 collected from the JD Towing and a DF of 1 for the remaining soil gas samples. When no DF is shown in a laboratory report, the DF is assumed to be 1. USEPA-Richmond did not report DFs in its laboratory reports, but reported the DFs in the Excel spreadsheets for raw data (attached to the appropriate USEPA-Richmond's laboratory reports) instead. A dilution factor of 2 was reported for Samples Ag East1 and Dr Canal Sed. As such, modified RLs (MRLs) were reported as the final RLs that applied to the samples when a DF of 2 or more was used. These MRLs were slightly elevated relative to the RLs for other samples of the same type. See Section 7.2 below for additional information on RLs.
- Data Qualifiers: Data validation flags, as defined in the National Functional Guidelines, indicate if results are considered anomalous, qualitative, estimated or rejected. All qualifiers should be discussed prior to utilizing the data for the screening risk evaluation. Only rejected data are unusable for decision-making purposes; however, other qualified data may require further verification. All employed laboratories were instructed to report any "J" flagged values if there was any. Both Optimal and C&E did not report any data qualifiers or validation flags while USEPA-Richmond included several data qualifiers and comments in its laboratory reports. A list of data qualifiers with definitions used by USEPA-Richmond is provided in Table 4-5 of the CEA report. These included: A3 flag for holding time noncompliance, C-series flags (C1 – C4) for calibration related noncompliances, and others.

For example, TPH data were normally reported in three (3) ranges as gasoline (TPHg), diesel (TPHd) and motor oil (TPHo) unless specific carbon chain distribution reporting is specified. USEPA-Richmond flagged the TPHg data of 190 micrograms per liter (ug/L) with "F1" and "J" for Sample Muni Well 1. The "J" flag means that the reported result for this analyte should be considered an estimated value. The "F1" flag means that the sample chromatographic pattern does not resemble the fuel standard used for quantitation. As a result, a case narrative was also included in the laboratory report for the water TPHg data.

- Confirmation of Positive Samples: Certain positive analytical detections may require confirmation by a mass spectrometer (MS), a second column of detector, or a different method. For example, USEPA Method 8260C is a gas chromatography/mass spectrometer (GC/MS) method while USEPA Method 8081B commonly requires confirmation by second column analysis. USEPA-Richmond runs a dual column analysis for every sample. For samples where there is a hit for a particular analyte on both columns, the identification of the analyte is considered to be confirmed and the lower of the two values is reported. For samples where there is a hit on only one column and no peak on the other column the identification of the analyte is not confirmed and the analyte is reported as non-detect (in accordance with the method).

No specific confirmation of any positive samples was required during the CEA unless otherwise required by the analytical method or for reporting TICs.

- Observations of Significance: No significant observations or occurrences which might adversely affect sample integrity or data quality were noted in the analytical report.
- Case Narrative: Case narratives are included as needed to highlight sampling, matrix or analytical issues. All variances, deviations or deficiencies encountered during analyses, possible reasons (with verifications), potential impacts, and corrective actions taken, if any, should be included in the case narrative section of each analytical report. Most of the laboratory reports contained no specific case narrative. Exceptions are noted below.
 1. Matrix interference on organic analyses (i.e., PCBs, OCPs and TPH) of Sample Dr Canal Sed (or 1007022-01) was evident. It was a sediment sample collected from an irrigation canal. Case narratives on these organic analyses were included in the laboratory reports as below.

PCB Analysis: “Surrogate recoveries for samples 1007022-01, and associated MS/MSD were below QC limits. Also, the matrix spike for MS1/MSD1 (1007022-01) was not recovered. A review of the pesticide and diesel data and showed that sample 1007022-01 and associated MS/MSD also had low surrogate and spike recoveries. Other PCB's soil samples in the group had acceptable recoveries further confirming a matrix effect for sample 1007022-01. Sample matrix for all samples in this work order contained components that interfered with the identification and quantitation of Aroclors. Comparison of the PCB and organochlorine pesticide results showed that this was mainly due to the chlordane content of the samples. Accordingly, the reporting limit for aroclors in these samples was adjusted for the level of interference by taking the highest reportable amount of an aroclor tabulated on the quantitation report for a sample and setting the reporting limit for all aroclors in that sample to that value.”

OCP Analysis: “Sample 1007022-01 was very wet. The sample had to be mixed with clean sand and sodium sulfate after spiking with surrogate and matrix spike solutions in order to prepare a loose, dry material suitable for extraction. Surrogate recoveries for samples 1007022-01, and associated MS/MSD were well below QC limits. The matrix spike for B0G0086-MS1/MSD1 (sample 1007022-01) was not recovered. A review of the PCB and diesel data showed that sample 1007022-01 and associated MS/MSD had low surrogate and spike recoveries for these analyses also. Other pesticide soil samples in the group had acceptable recoveries further confirming a matrix effect for sample 1007022-01. Toxaphene was quantitated by using five characteristic peaks instead of total area because of interferences from sample components such as 4,4'-DDT. The sample chromatographic patterns, although characteristic of toxaphene and technical chlordane, did not precisely match that of the standards used for instrument calibration (possibly due to different product manufacture or weathering). Results for these analytes should therefore be considered to be estimates.”

TPH Analysis: “Sample 1007022-01 was very wet. The sample had to be mixed with clean sand and sodium sulfate after spiking with surrogate and matrix spike solutions in order to prepare a loose, dry material suitable for extraction. Surrogate recoveries for samples 1007022-01, and associated MS/MSD were well below QC limits. The matrix spike for B0G0100-MS1/MSD1 (sample 1007022-01) was barely recovered. A

review of the PCB and pesticides data showed that sample 1007022-01 and associated MS/MSD had low surrogate and spike recoveries for these analyses also.”

2. The TPHg data report for Sample Muni Well 1 (a groundwater sample) included the following case narrative: “The hydrocarbon pattern of the sample 1007015-09 (Muni Well 1) does not resemble a typical fuel or mixed solvent pattern. It is primarily a single component. Results from the EPA method 524.2 GC/MS volatile organics analysis indicate a significant benzene concentration in this sample. It is likely that the TPH concentration reported here is due primarily to benzene only. The result is flagged with F1 to indicate that the pattern does not resemble gasoline.”
3. The total coliforms and E. coli data for the “repeat” tap water samples collected at Residences 6 and 9 on October 5, 2010 were J qualified because the chlorine residual was not checked. Chlorine residual data was needed to ensure that there was not too much chlorine in the water to overwhelm the sodium thiosulfate (which was added to the coliform sample bottles to neutralize chlorine). The coliform sample bottles contained enough sodium thiosulfate to neutralize up to 15 milligrams per liter (mg/L) chlorine. It was highly unlikely that tap water had more than 15 mg/L chlorine, but chlorine residual testing was part of the protocol and should have been performed. However, the results are not intended for compliance with the Safe Drinking Water Act. As such, the coliform data are still usable for the purposes of the CEA. In any case, the laboratory report included the following case narrative: “Results are flagged as estimates because sample chlorine residual was not checked. The lot of sample bottles used (DE007) was previously QC checked and found to contain sufficient sodium thiosulfate to neutralize 15 mg/L total residual chlorine.”

7.0 REVIEW OF DATA QUALITY OBJECTIVES AND DATA QUALITY INDICATORS

The project DQOs were evaluated to determine whether the quantitative and qualitative needs of the sampling and analysis program had been met. Based on the conceptual site model (CSM) for the Site (see Appendix J of the CEA report) and USEPA’s seven-step DQO process (USEPA, 2000), the project DQOs were established to evaluate whether hazardous materials are present at the Site, that may pose an unacceptable health risk to community residents, and to determine if any such contaminants may have contributed to the recent spike in birth defects or elevated cancer rates at the Site. All gathered data were then compared with risk based PSLs specified in Table 3-5 of the CEA report to draw such determinations.

DQOs were specified in terms of specific data quality indicators (DQIs), i.e., precision, accuracy, representativeness, completeness, comparability, and RLs. These DQIs, also known as measurement quality objectives (MQOs), are discussed in terms of quality and quantitative DQIs below. The data generated from the investigation may not be considered invalid if the MQOs or criteria are not fully achieved, but variances will trigger the appropriate QA/QC measures needed to evaluate and correct these activities, if necessary.

7.1 Qualitative DQIs

Qualitative DQIs are comparability and representativeness.

- **Comparability:** Comparability expresses the confidence with which one data set can be compared to another. The laboratories used the methods listed in the SAP, consistent with the current standards of practice as approved by DTSC and USEPA. The methods allowed the data to be evaluated for trends or changes (in space or time) at the Site, if necessary. All data were calculated and reported in units (mg/kg, ug/kg, mg/l, or ug/l)

consistent with standard procedures so that the analytical results could be compared with those of other laboratories, if necessary. The MQO for comparability has been met.

- **Representativeness:** Representativeness is the degree to which data accurately and precisely represent the actual Site conditions (in terms of a population, parameter variations at a sampling point, process condition, or environmental condition). To address representativeness, sufficient and proper number and locations of samples were specified, sample collection and preservation techniques incorporated, required decontamination procedures performed, appropriate methods selected to prepare and analyze all primary and QC samples, and proper field and laboratory QA/QC procedures established for the parameters of interest. Samples were collected and analyzed in accordance with the SAP. The MQO for representativeness has been met.

7.2 Quantitative DQIs

Quantitative DQIs are precision, accuracy, completeness and RLs. Precision and accuracy objectives, based on statistically generated limits established annually by each laboratory, were viewed as goals, not as criteria. If matrix bias was suspected, the associated data would have been qualified and the direction of the bias indicated in the data validation report.

- **Precision:** Precision measures the reproducibility of repetitive measurements by assessing the RPD between each pair of field sample and field duplicate analyses, MS/MSD analyses, and/or field sample and laboratory duplicate analyses. If the RPD for laboratory QC samples exceeds 30 percent (%), data may be qualified. If the RPD between primary and duplicate field samples exceeds 50%, data may be qualified. Some pairs of primary and duplicate samples were reported ND. Since ND samples yield no usable numbers to perform statistical evaluation, they are not generally used to evaluate the precision of analyses. When field duplicates yield no usable numbers, the MS/MSD results are used to evaluate the precision of the analysis. RPDs were calculated and the results tabulated in Table 4-6 of the CEA report. Most of the RPDs for field samples were below the 50% limit. All of those RPD non-compliances were listed and bold on Table 4-6. Since the MQO for precision was met on the laboratory QC (MS/MSD) samples and the LCS and method blank results were acceptable, the effect of the out-of-control high % RPD (due to potential matrix interference) may be negligible. As a result, the effect does not impact the data and the associated sample results will not be qualified as estimates.
- **Accuracy:** Accuracy is a statistical measurement (the degree of agreement of a measurement with a known or true value) of correctness and includes components of random error (variability due to imprecision) and systematic error.

Laboratory accuracy is expressed as % recovery by assessing LCS, MS/MSD, and initial and continuing calibrations of instruments. The acceptance limits were provided in the SOPs of the selected laboratories as well as in the QC section of the laboratory reports. If the % recovery is determined to be outside of acceptance criteria, associated data will be qualified. Most recoveries of LCS, MS, and MSD were reported within the corresponding control limits. Some were qualified with Q series flags (Q2 through Q10). Since the MQO for laboratory accuracy was met on most laboratory QC (MS/MSD) samples, the LCS, and method blank results were acceptable, the effect of the low surrogate and spike recoveries (due to potential matrix interference) may be negligible. As a result, the effect does not impact the data and the associated sample results will not be qualified as estimates. A list of % recovery non-compliances is provided in Table 4-7 of the CEA report.

Field accuracy is assessed through the analysis of equipment rinseate blanks, soil gas method blanks, and trip blanks to monitor errors associated with the sampling process including equipment decontamination procedures, field contamination, sample preservation, and sample handling. The MQO for field accuracy is that all values are less than the RL for each target constituent. If contamination is reported in the field equipment blanks, soil gas method blanks or trip blanks, data will be qualified. All reported values were less than the corresponding RLs for the target compounds.

Therefore, the MQO for accuracy has been met.

- **Completeness:** Completeness is the amount of valid data obtained compared to the amount expected under ideal conditions. The MQO for completeness was to obtain valid results for at least 90% of the planned data results. Completeness could have been affected by such factors as sample bottle breakage and acceptance/non-acceptance of analytical results. The analytical data for the samples were approximately 98% complete as shown in Table 4-8 of the CEA report. There were a few logistical reasons that resulted in less sampling as documented in Section 3.3.8 of the CEA report as field variances. For example, only one sample was collected for soil gas sampling at Spirit Gas Station. The MQO for completeness has been met.
- **RLs:** RL refers to the initial “RL” or the lowest quantifiable RL that can be achieved when an analysis is performed under ordinary conditions. For the purposes of the CEA, the RLs for soil, sediment and water samples should be no less than the results of each employed laboratory’s MDL study and no more than the corresponding PSLs. Otherwise, there is no way to know whether ND results are above or below the corresponding PSLs. The RLs for soil gas samples should comply with DTSC’s ASGI. The RL shown on laboratory reports for each sample was the final modified RLs that applied to the sample once all sample preparation factors (e.g., sample size, final volume, dry-weight correction factor) and dilution factors have been applied. In addition, each employed laboratory was required to report TICs whose concentrations were above the MDLs but below the RLs. For example, USEPA-Richmond reported that the soil DDE data for Sample Ag East 1 was 3.2 micrograms per kilogram (ug/kg) while its MDL was 1.7 ug/kg and RL 3.3 ug/kg. The PSL for DDE in residential soil is 1000 ug/kg. Therefore, the relevant RLs listed in Table 3-5 of the CEA report met these requirements as well as the objective of having sufficient quality data to perform a screening risk evaluation.

8.0 CONCLUSIONS

Based on this Level II validation, all data collected through implementation of the SAP satisfied data and measurement quality requirements specified for the CEA investigation. The analyses followed the approved methods and included acceptable QC procedures. Some matrix effects were noted, which are typical of real environmental samples.

The relevant QA/QC results were satisfactory and acceptable. No significant issues were identified during the course of the data validation review. Overall, the presented data are reliable and useable for the CEA project and for project decision making.

9.0 RECOMMENDATION

It is recommended that the data be used to characterize the nature and extent of any contamination, support screening risk evaluation, evaluate the response action need and assist in determination of additional actions.

APPENDIX J

Fact Sheet