Addendum
to
February 3, 2003 Facility Investigation Work Plan

El Paso Merchant Energy-Petroleum Company
Elementis Chromium, L.P. Site
Corpus Christi, Texas

February 12, 2009

Prepared for:
El Paso Merchant Energy-Petroleum Company
Houston, TX

Prepared by:
URS Corporation
9400 Amberglen Boulevard
Austin, TX 78729

EPA Comments and Conditional Approval Letter
dated April 11, 2007

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

April 11, 2007

Mr. B. Cord Harris
El Paso Corporation
1001 Louisiana Street
Houston, Texas 770021

Subject: EPA Comments and conditional approval of the El Paso Merchant Energy-Petroleum Company (formerly Coastal Refining & Marketing Inc.), Corpus Christi, Texas Facility Investigation Work Plan - Elementis Site, dated February 3, 2003

Dear Mr. Harris:

The Environmental Protection Agency (EPA) has completed a review of the above-referenced document and is providing technical comments. The comments include both general as well as key issues associated with the Facility Investigation (FI) Work Plan.

EPA approves the Facility Investigation Work Plan based on the conditions that EPA's comments are addressed and incorporated into the El Paso Facility Investigation – Elementis Site Work Plan.

Should you have any questions or need additional information, please contact me, at (214)665-8321.

Sincerely,

Sue Westbrook

Sue Westbrook
Project Manager

Enclosure

Internet Address (URL) • http://www.epa.gov
Recycled/Recyclable • Printed with Vegetable Oil Based Inks on Recycled Paper (Minimum 25% Postconsumer)

EPA TECHNICAL REVIEW AND COMMENTS

FACILITY INVESTIGATION WORKPLAN -ELEMENTIS SITE

EL PASO CGP COMPANY &
EL PASO MERCHANT ENERGY-PETROLEUM COMPANY
(Formerly Coastal Refining & Marketing, Inc.)
Corpus Christi, Texas
EPA ID No. TXD008132268
U.S. EPA Docket No. RCRA-VI-7003-01-01

April 11, 2007

GENERAL COMMENTS

EPA comments and/or changes in *italicized print*

1. The U.S. EPA's National Exposure Research Laboratory evaluated the ROST™ technology in 1995. The details of EPA's study are published in an Innovative Technology Verification Report entitled, "The Rapid Optical Screening Tool (ROST™) Laser-Induced Fluorescence (LIF) System for Screening of Petroleum Hydrocarbons in Subsurface Soils," EPA/600/R-97/020. As stated in the section, Limits of the Technology, on page 13 of the report:

   "The ROST™ LIF system often uses 290 nm as the excitation wavelength. This wavelength is short enough to excite the fluorescence of all aromatic hydrocarbons with at least two conjugated aromatic rings. Aliphatic species and single-ring aromatics do not contribute to the ROST™ LIF signal from 290 nm."

   In addition, the report section, Limitations of the Technology, states on page 51:

   "The ROST™ LIF system is applicable only to fuels and wastes containing nonchlorinated multi-ring aromatic hydrocarbon molecules. The detection capabilities for ROST™ include, but are not limited to, jet fuel, gasoline, diesel, lubricating oils, coal tar, and creosote. Other compounds such as chlorinated hydrocarbons would require separate sensors."

   Based on the above information, there appear to be serious limitations to detecting the presence of the aliphatic (straight chain) compounds, chlorinated aliphatics, and single-ring aromatic compounds, which are included on the Skinner List. According to Fugro Geosciences, Inc., the owner of the ROST™ technology, the LIF system can be tuned across a range of wavelengths from 266-310 nm in order to capture the single-ring

aromatics, such as benzene, toluene, and ethylbenzene, but does not indicate that the LIF system can now detect aliphatics. This is an important issue that must be addressed since the aliphatics and single-ring aromatics may be present, yet not detected, if the ROST™ LIF sensor is tuned to the standard frequency of 290 nm.

The Work Plan should be revised to provide the field procedure that will be used to ensure the LIF system will be adjusted appropriately during a sounding to detect the presence of single- and multi-ring aromatic compounds. Also, clarify whether the LIF sensor can be tuned to detect aliphatic (straight chain) and chlorinated hydrocarbons on the Skinner List and, if so, ensure that the LIF tuning procedure addresses these compounds as well. Alternatively, use another screening technology (e.g., direct push technology with soil gas sampling) to detect the aliphatic and chlorinated hydrocarbons on the Skinner List.

2. *The Work Plan should be revised to consider any available analytical data for the seeps along the bluff line located east of the cofferdam. If no data are available, clarify this point and indicate that the seeps will be sampled during the FI. If seep data are available, revise the site conceptual model to integrate this data. Consider available analytical data in an effort to determine the source of the contaminants discharged from the seeps. If well data are available for the eastern Facility Area, integrate the data into the site conceptual model. If wells are not presently located in the eastern Facility Area, then revise the FI Work Plan to address the delineation of any phase-separated hydrocarbon source and dissolved phase plume, including the sampling of any existing wells in the eastern portion of the Facility Area and the installation of additional monitoring wells in the Facility Area.*

3. Product thickness measurements are available for several of the wells in the Facility Area.

   The thickness of product should be mapped during the FI to identify the areas with the greatest quantities of free product and to identify any trends in contaminant migration. Revise the FI Work Plan to include a spatial evaluation of the product thickness measurements. Include maps of the product thickness measurement to illustrate the current conditions in the Facility Area. These maps would serve as a basis for responding to the requirements of AOC Section VII.2.B.(i) for determining the thickness and lateral extent of the LNAPL plume, as well as identifying areas having data gaps.

4. Section 6.1 proposes benzene and toluene as indicator compounds for siting permanent groundwater monitoring wells. Section 6.5.8 states that the most recent version of Method 8021, in EPA SW-846, *Test Methods for Evaluating Solid Waste*, is proposed as the analytical method for benzene and toluene. This analytical method can be used to detect a minimum of 12 of the 16 volatile organics, including benzene and toluene, on the "Skinner List," Constituents of Concern for Wastes from Petroleum Processes, which serves as the basis for the Facility chemicals of concern (COCs). Since so many Facility

COCs can be detected using Method 8021, clarify why only benzene and toluene are proposed as indicator compounds. Also, provide justification for the use of benzene and toluene as indicator compounds for the aliphatics, semivolatile organics, and polynuclear aromatic hydrocarbons (PAHs) on the Skinner List.

If adequate justification is not provided, the FI Work Plan should be revised to include evaluation of additional, and possibly all, Facility COCs.

5. Section 4.1.1, Groundwater, discusses the use of the BIOSCREEN Model "to predict the natural attenuation of COCs as they migrate in groundwater." Facility preliminary remediation goals (PRGs) are established for the COCs in groundwater at the upgradient edge of the Interim Measure (IM) Area. The Facility PRGs were calculated by taking the log average of two sets of PRGs, with one set based on the shortest literature value for intrinsic bioremediation half-life and the second set based on the longest literature value for intrinsic bioremediation half-life. Section 4.1.1 assumes a 350-foot travel distance for the COCs across the IM Area to the point of groundwater discharge to surface water. The BIOSCREEN model was then used to calculate Facility groundwater attenuation action levels (AALs) per the Texas Risk Reduction Program (TRRP), for the COCs. The Facility groundwater AAL values and backup BIOSCREEN printouts are presented in Appendix B. Section 4.1.1 further states that once the FI is completed, the BIOSCREEN dilution attenuation factors (DAFs) will be adjusted to reflect site-specific transmissivity, porosity, and fraction of organic carbon (f_{oc}) for saturated zone soils. BIOSCREEN will then be used during the Corrective Measures Study (CMS) to re-calculate the final AALs for the dissolved-phase COC concentrations that will be used to implement corrective measures.

AOC Section VII.2.A.(iii) requires that Facility PRGs shall be established for identified Facility COCs. The Facility PRGs must be consistent with available protective, risk-based cleanup levels applicable to current and reasonably expected future land use scenarios and environmental exposure scenarios consistent with the conceptual site model (CSM). When federal or State PRG values do not exist, they must be developed in accordance with the EPA Human Health and Ecological Risk Assessment Guidance for Superfund (RAGS) and other appropriate EPA guidance. The federal PRG values may be referenced in RAGS Part B and the State PRG values are the TRRP Tier I protective concentration limits (PCLs). Based on the requirements of the AOC for establishing PRGs, literature values were inappropriately used in the BIOSCREEN model to calculate Facility groundwater PRGs, which were developed for the purpose of establishing Facility groundwater AALs along the upgradient boundary of the IM Area. If El Paso wishes to calculate PRGs using literature values for those COCs that do not have established federal or State PRGs, they should be based on ultra-conservative literature values and not on a log average of two sets of PRGs. In particular, a very conservative value for f_{oc} and little to no biodegradation are necessary to justify a conservative approach using only literature values. That said, however, El Paso will still be required

to collect site-specific data during the FI to calculate the final remediation goals (FRGs) that will be proposed to EPA Region 6 and used to select a corrective measure for the Facility. The FI should collect site-specific data for bulk density and f_{oc} to calculate the retardation factor associated with biodegradation. Revise the FI Work Plan to establish PRGs in accordance with AOC Section VII.2.A.(iii).

In addition, the FI Work Plan does not clearly explain the assumptions for applying the BIOSCREEN model to the IM Area, rather than the AOC-defined Facility area. The model is used to back-calculate the Facility groundwater PRGs (or TRRP AALs) (Table B-1) for the natural attenuation of COCs in groundwater as it leaves the Facility and crosses the IM Area to the ship channel. The assumptions of the model are not well-described in Section 4.0, although it appears that there are at least three. First, the model appears to assume that all COCs in the Facility area will flow across the upgradient boundary of the IM Area, since the model's source area is located along this boundary. Second, the model assumes that natural attenuation of the COCs will occur during their transport along the 350-foot pathway from the IM Area upgradient edge to the groundwater discharge to surface water along the ship channel. And third, the model does not recognize the existence of the current groundwater pump-and-treat activities in the IM Area and, therefore, assumes a simple flow pathway across the IM Area. In addition, this area has free phase and residual NAPL which acts as a continued source and inhibits biodegradation, thus the model is not applicable for the area.

The conditions assumed for the BIOSCREEN model are not a realistic representation of the actual environment of the IM Area. The IM Area does not capture all of the COCs flowing in the Facility area, as witnessed by the releases of hydrocarbons from the seeps and sediments to the east of the IM Area. . The model assumes that natural attenuation will occur until the groundwater is discharged to the surface water of the ship channel, however, the downgradient water's edge of the IM Area is partially bordered by a cofferdam that prevents groundwater from reaching the ship channel. Instead, the groundwater is removed from the IM Area through a series of recovery wells for the IM pump-and-treat system, which creates numerous cones of depression in the groundwater surface of the uppermost aquifer, resulting in a complicated flow pathway across the IM Area. The second page of the EPA *BIOSCREEN Natural Attenuation Decision Support System User's Manual* (Version 1.3, EPA/600/R-96/087, August 1996) states the model "assumes simple groundwater flow conditions" and "should not be applied where pumping systems create a complicated flow field."

Clarify the assumptions that serve as the basis for the BIOSCREEN model.

6. Section 4.1.2 discusses the establishment of AALs for soil Media ("Media" is defined in AOC Section VII.2.A.(i)). Again, as discussed for groundwater, the establishment of soil Media AALs, per TRRP requirements, does not satisfy the requirements for the establishment of soil PRGs. As with the discussion above regarding the establishment of

Facility groundwater PRGs, the Facility soil PRGs must also be established in accordance with the requirements of AOC Section VII.2.A.(iii) for identified Facility COCs.

The Facility soil PRGs must be consistent with available protective, risk-based cleanup levels applicable to current and reasonably expected future land use scenarios and environmental exposure scenarios consistent with the conceptual site model (CSM). When federal or State PRG values do not exist, they must be developed in accordance with the EPA Human Health and Ecological Risk Assessment Guidance for Superfund (RAGS) and other appropriate EPA guidance. Revise the FI Work Plan to establish PRGs in accordance with AOC Section VII.2.A.(iii).

7. Section 5.0, Application of the DQO Process, discusses FI activities that are presented in detail in other portions of the FI Work Plan. Where EPA Region 6 has commented upon FI activities, responses to comments may impact the FI plan presented in the Data Quality Objectives Process. For example, the determination of AALs does not satisfy the establishment of Facility PRGs and the DQO Process should be revised accordingly.

   Revise Section 5.0 and its associated figures and tables, as necessary, to accommodate revisions to the FI Work Plan that are made in response to EPA Region 6 comments.

8. The FI Work Plan references numerous acronyms that are defined in the text, but the definitions are difficult to locate within the document.

   Provide a list of acronyms specific to the FI Work Plan, preferably after the Table of Contents.

SPECIFIC COMMENTS

1.0 INTRODUCTION

This Workplan describes the technical approach that will be used to further investigate Media at the Facility. - - - the specific objectives of the investigation to be conducted at the Facility are to:

1. *Identify the Facility chemicals of concern (COC)* and characterize the potential pathways of COC migration;

2. Identify actual or potential receptors, including human and *ecological* environmental systems that are susceptible to Facility COC exposure at or from the Facility;

3. Install adequate wells and collect sufficient samples (*analytical data)* to determine the *horizontal and vertical extent of ground water* contamination to *decreasing concentrations to below the* appropriate Facility preliminary remediation goals

(PRGs); and in soil /media ("Media shall mean ground water and contaminated soils where the soil contamination is contributing to or is attributable to the existing ground water contamination) determine the extent of contamination to below the appropriate PRGs - - - - - - .

1. **Section 1.0, Introduction, page 1:** The opening paragraph presents an incomplete reference to the definition of "Facility," as discussed in AOC Section I, Jurisdiction. The second page of the AOC states:

> "In this Order the 'Facility' is defined as the area of contamination beyond the Coastal Refinery property boundary north, northeast and east of the Coastal Refinery East Plant-North [Valero Complex 8 North], and extending onto or under the portion of the Elementis Chromium property located East of Cantwell Lane and the Inner Harbor Ship Channel. <u>The definition of Facility will be expanded to include areas west of Cantwell Lane in the IM Area (as defined below) should investigation indicate that contamination is contiguous extending west of Cantwell Lane in the IM Area.</u> The Facility does not include any portion of the Inner Harbor Ship Channel and notwithstanding anything in this Order to the contrary, this Order does not require Respondent to fully delineate or to remediate contamination in the Inner Harbor Ship Channel."

In *particular, the underlined portion of the above definition of "Facility" provides for the potential expansion of the area addressed under the FI. Revise the discussion in Section 1.0 to fully address the definition of "Facility," including its potential expansion to include appropriate portions of the IM Area.*

2. **Section 1.0, Introduction, pages 1-2:** The Introduction references the specific FI objectives prescribed under AOC Sections VII.2.A(i) and VII.2.B, but does not recognize the FI Work Plan requirements found at AOC Section VII.2.A(ii) and (iii).

Revise Section 1.0 to address all of the requirements of AOC Section VII.2.A and verify that these requirements are addressed by the FI Work Plan.

3. **Section 3.0, Characterization of Contaminant Source and Environmental Setting Based on Existing Data, pages 5-7:** The third paragraph on page 6 indicates that the vertical extent of Facility chemicals of concern (COCs) has not been defined in the Facility Area, as defined in the AOC. This paragraph then indicates that monitoring well DMW-03 is screened in the second transmissive zone and is located at Valero Complex 8 North, approximately 80 feet west of the Facility Area at Elementis. Groundwater sampled from Well DMW-03 is positive for *o*, *m*, and *p*-cresols, which is documented in Table 3-4. The presence of cresols may indicate the presence of a dense non-aqueous phase liquid (DNAPL) in the second transmissive zone.

Revise Section 3.0 to discuss the significance of the presence of the o, m, and p-cresols in the second transmissive unit, particularly to the FI at the Facility Area at Elementis and the delineation of the lateral and vertical extent of COCs in the upper transmissive zone and the second transmissive zone.

4. **Section 4.0, Facility Preliminary Remediation Goals, page 8:** The last paragraph on this page states that "the significant exposure pathways include the potential transport of LNAPL and COCs in groundwater to surface water and the potential migration of soil vapor containing volatile Facility COCs derived from LNAPL, soil, or groundwater to indoor and outdoor air at the Facility." Based upon this discussion, it appears that the direct releases of non-aqueous phase liquid (NAPL) to surface water and to sediment are considered to be incomplete pathways. As documented in a separate Administrative Order on Consent (reference US EPA Docket No. RCRA-VI-7003-01-02, Section V.7) between EPA Region 6 and Elementis Chromium, L.P., the U.S. Fish & Wildlife Service (USFWS) observed hydrocarbons, including benzene and cumene seeping from the bluff into the Inner Harbor Ship Channel on or about February 9, 2000. The USFWS also observed several seeps along the bluff, located up to 100 feet east of the cofferdam, discharging oily waste into the surface water on March 2, 2000. Also, oily liquid bubbled from below the surface of the water, which released a sheen on the water surface. The USFWS believed "the release to surface water constituted a potential endangerment to shorebirds." Based on these documented releases of NAPL to surface water and to sediment, these pathways are complete.

   Revise the conceptual site model to document these pathways as complete and evaluate them for significance.

5. **Section 4.0, Facility Preliminary Remediation Goals, page 8:** The second paragraph on page 8 states that "The CSM was developed in conjunction with the PRG Report and is presented in Figure 4-1. There have been no changes made to the CSM, as no additional data have been gathered since the submittal of the PRG report." The last paragraph on page 12 of the PRG Report stated "Non-Aqueous Phase Liquid (NAPL) is the primary source, which has migrated on to the facility in the subsurface. The NAPL in turn is the source of COCs in other environmental media, specifically surface soil, soil vapor, groundwater and surface water.

   As discussed during the November 19, 2002 meeting with El Paso and in subsequent written comments, EPA recommended that the Conceptual Site Model (CSM) identify all individual sources of contamination in order to aid in determining potential cumulative and overall risk of exposures to receptors. That is, the sources of the NAPL in environmental media should be identified, e.g., specific Solid Waste Management Units or Areas of Concern. Also, the type of NAPL,(i.e., diesel, gasoline, benzene, etc) and constituents of concern in the NAPL. The FI Report and the CSM Diagram Figure 4-1 should be revised to include these changes.

6. **Figure 4-1, Schematic Conceptual Site Model:** The Conceptual Site Model (CSM) indicates that both exposure pathway ID Numbers 3 and 9 address the ingestion of potentially contaminated surface water. Pathway No. 9 indicates that the ingestion of surface water by both human and ecological receptors is a potentially complete pathway. However, pathway ID Number 3 indicates that only ecological receptors will ingest surface water. It is not clear why human receptors are not considered for pathway No. 3.

   Revise the FI Report to address this discrepancy.

7. **Section 4.1.1, Groundwater, page 10:** The first paragraph references AOC Sections VII.A.(iv) and VII.D, however, these citations appear to be in error. Clarify the AOC citations and revise Section 4.1.1 accordingly.

8. **Section 4.1.1, Groundwater, pages 10 - 11:** The first paragraph in this section states that "Within the IM Area, the groundwater PRGs are those set in the PRG report for the groundwater/surface water interface." A review of the information presented in Table 4-1of the PRG Report revealed a number of discrepancies which required clarification and correction. The identified discrepancies are outlined in the following paragraphs.

   The footnotes to Table 4-1 of the PRG Report indicated that the source of many of the values presented in the Table is the "Texas Commission for Environmental Quality Surface Water Quality Criteria obtained from Tables 1 and 3 of the TCEQ 200a Texas Surface Water Quality Standards." However, based upon a review of the values presented and per discussions with facility representatives during the March 26, 2003 conference call, the sources of the values used included not only Texas Administrative Code (T.A.C.) Chapter 307, Tables 1 and 3 (Aquatic Life and Human Health protection criteria) dated August 17, 2000 but also, risk-based exposure limits (RBELs) from Chapter 350, the Texas Risk Reduction Rule dated August 13, 2002 .

   The table must be revised to clearly indicate the specific source of the values presented. In addition, there appears to be a 0 missing from the date of the reference (i.e., 200 versus 2000). The footnote must be revised to correct this typographical error.

   Furthermore, the footnote to Table 4-1 also indicated that the human health criteria were based on the ingestion of saltwater fish from an incidental fishery. The TCEQ standards state that the numerical criteria applicable to an incidental fishery are 10 times the human health criteria listed in columns B and C of Section 307.6, Table 3. Chapter 307.6(d)(5) indicates that all designated segments listed in Appendix A of §307.10 are considered to have sustainable fisheries. Appendix A of Chapter 307 identifies the Corpus Christi Inner Harbor Ship Channel as designated Stream Segment Number 2484 of the Nueces River Basin. Per personal communication with Mr. Jim Davenport of the TCEQ Water Quality Standards Division, the Inner Harbor Ship Channel is considered to be a sustainable

saltwater fishery rather than an incidental fishery. As such, it is not appropriate to multiply the human health criteria by a factor of 10 in the development of IM PRGs.

The IM PRGs presented in Table 4-1 and Appendix E of the PRG Report which are based on the human health pathway will need to be reviewed and corrected to reflect a value for a sustainable saltwater fishery.

The surface water PRG for benzene is listed as 1.09E-01 mg/L and the source identified for this value is the aquatic toxicity criteria from Table 1 of the TCEQ SWQS. The TCEQ SWQS do not include a saltwater chronic criteria value for the protection of aquatic life for benzene, but do include a human health value of 70.8 micrograms per liter (μg/L) for benzene. The value of 1.09E-01 mg/L appears to be taken from Chapter 350 of the Texas Risk Reduction Rule. As documented in the Administrative Order on Consent (reference US EPA Docket No. RCRA-VI-7003-01-01, Section VII.1.A.(i)) between EPA Region 6 and El Paso CPG Company, for the purposes of the Interim Measures Investigation, the Texas SWQS (30 Tex. Administrative Code Chapter 307) shall be used as IM PRGs and the IM PRG concentration for each COC shall be equal to its respective Texas SWQS value, or a comparably derived value for COCs without a standard, for aquatic life and human health protection (saltwater chronic criteria). Given the fact that benzene does have a human health criteria (70.8 μg/L) listed in Table 3 of the Texas SWQS, this value should be selected as the IM PRG for benzene. This issue also applies to the IM PRGs selected for chloroform and tetrachloroethylene.

Revise Table 4-1 and Appendix E of the PRG Report to address this issue.

In addition, Table 4-1 uses milligrams per liter (mg/L) as the unit of measure whereas the EQ surface water criteria (Chapter 307, Tables 1 and 3) and the calculations presented in Appendices C, D and E of the PRG Report are presented in μg/L. The conversion between mg/L and μg/L appears to have also resulted in some errors.

Review Table 4-1 of the PRG Report to ensure the accuracy of the information presented and to correct the listed sources and any conversion errors.

The information presented in the Facility Investigation Workplan must be reviewed in light of the above-mentioned comments and revised as applicable.

9. **Section 4.2, Chemicals of Concern, page 13:** The first paragraph in this section states that "If a chemical is not detected at concentrations greater than or equal to its risk-based level or MDL (whichever is higher) during the IM Area Investigation and the Facility Investigation, then that chemical will be dropped from further consideration and will not be considered to be a COC." If the method detection limit (MDL) is higher than the risk-based level, then it is possible that concentrations which exceed risk-based levels may be present in media. Therefore, it is inappropriate to eliminate a chemical from further

consideration based upon a comparison to an elevated MDL.

Revise the workplan to state that if the MDL for a chemical is greater than its risk-based level it will be retained for further consideration.

10. **Section 4.2, Chemicals of Concern, page 15:** The first full paragraph on page 15 states that Table 4-1 presents soil saturation limits, however, it actually presents groundwater facility attenuation action levels (AALs).

    Clarify whether the reference should be for Table 4-7, Potential COC Soil Saturation Limits.

11. **Section 5.0, Application of the DQO Process, page 17:** The third paragraph indicates that data quality objectives (DQOs) refer to the degree of accuracy and precision of a measurement. In accordance with EPA *Guidance on Quality Assurance Project Plans*, EPA QA/G-5, EPA/600/R-02/009, December 2002, accuracy and precision are performance and acceptance criteria, or data quality indicators, in this context for measurement quality objectives. Other principle data quality indicators include bias, representativeness, completeness, comparability, and sensitivity.

    Revise Section 5.0 to clarify how these seven data quality indicators support the DQO Process for the FI Work Plan. Also, an older version of EPA QA/G-5 is listed in Section 11.0, References, as entry number 35. Update Section 5.0 and Appendix A, Quality Assurance Project Plan, of the FI Work Plan as necessary to address any new requirements of the December 2002 revision of EPA QA/G-5.

12. **Section 6.1, ROST and Temporary Well Sampling, pages 22-23:** Section 6.1 indicates that LNAPL samples collected from five wells will be used to calibrate the Rapid Optical Screening Technology (ROST) to site-specific product samples to enhance the effectiveness of this technique. Section 3.0 indicates that there are three plumes of differing composition in the Facility Area at Elementis. Previous investigations indicate that a benzene plume is present in the central portion of the Facility, a gas-oil range hydrocarbon plume is present in the northern portion, and a gasoline-naphtha plume is present in the southwestern portion.

    Revise the Work Plan to clarify whether at least one LNAPL sample is collected from each of the plumes to calibrate the ROST.

13. **Section 6.1, ROST and Temporary Well Sampling, pages 23-24:** The last paragraph on page 23 continues onto page 24 and discusses the data quality objectives for definition of the LNAPL plume. The vertical thickness will be determined to less than 0.01 foot, which will be the "non-detect" value as measured by an oil/water interface probe, in accordance with AOC Section VII.2.B.(i). The lateral extent of the LNAPL plume will

be determined to "a horizontal distance of less than or equal to 200 feet" from the actual edge of the plume, however, this is an unacceptable distance. The discussion attempts to justify the degree of imprecision in establishing lateral extent of the plume by referring to three geologic cross-sections, presented as Figures 2-2 through 2-4. The degree of lateral stratigraphic variability shown in the cross-sections does not justify the imprecision in the determination of the lateral extent of the plume. Considering that direct-push technology will be used on-site, it should be relatively easy to "fine-tune" the location of the edge of the plume, which could easily be located to within 25 feet of the actual plume edge.

Revise Section 6.1 and any other portions of the FI Work Plan to reduce the "200 feet" of lateral imprecision to a distance that is appropriate to the proposed use of direct-push technology.

14. **Section 6.1, ROST and Temporary Well Sampling, page 26:** The third paragraph states: "If a well screened at the base of the uppermost transmissive zone displays COCs at concentrations in excess of applicable groundwater PRGs, then a well screened in the second transmissive zone (i.e., the transmissive zone underlying the uppermost transmissive zone) will be installed." Clarify whether this is the only condition under which a well will be installed in the second transmissive zone. For example, Table 3-4 indicates that cresols were detected in a second transmissive zone well (DMW-03) on the Valero Complex 8 North, approximately 80 feet from the Facility Area. This begs the question as to whether or not cresol is also present in the second transmissive zone in the nearby Facility Area, however, there does not appear to be a decision point that leads to further investigation.

Revise the FI Work Plan, as necessary, to expand the criteria for installing a monitoring well in the second transmissive zone.

15. **Section 6.5.8, Collection and Analysis of Groundwater Samples, page 42:** The third full paragraph on page 42 indicates that readings will be measured with a flow cell for temperature, conductivity, pH, dissolved oxygen, oxidation-reduction potential (ORP), and turbidity. This paragraph goes on to list the stabilization criteria for all of the above parameters, except temperature.

Revise the Work Plan to provide the stabilization criterion for temperature.

16. **Section 6.5.11, Decontamination, Small-Scale Equipment, pages 50-51:** The decontamination procedure for small-scale equipment does not include a hexane or isopropanol rinse following the potable water rinse. Given that the levels of contamination are expected to be quite high in many of the wells, it will be important to follow procedures that will ensure equipment is thoroughly decontaminated between sampling points.
Revise the FI Work Plan to include a hexane or isopropanol rinse after the potable water

rinse in the decontamination procedures presented on page 50.

Also, the discussion of Small-Scale Equipment does not discuss how the flow cell will be decontaminated after its use at each well.

Provide the decontamination method that will be used for the flow cell.

17. **Section 7.2, Additional QA/QC Procedures Specified in the AOC, page 57:** The first paragraph on page 57 states: "As part of their QA/QC program, STL, ETI, and SPL [i.e., Severn Trent Laboratory, Exploration Technologies, Inc., and Southern Petroleum Laboratory, respectively] will perform analysis of a reasonable number of known samples provided by EPA to demonstrate the quality of the analytical data."

    AOC Section XIII is apparently the basis for this requirement, however, it should be modified to state that this testing will be performed upon the request of EPA and will not serve as the sole criterion in determining the quality of the analytical data generated by STL, ETI, and SPL.

    The RFI QAPP provides the overall quality requirements for blanks, duplicates, and duplicate spike samples that will be analyzed to verify the ongoing quality of the data produced from samples collected during the FI.

    Revise Section 7.2 accordingly.

18. **Section 9.0, Schedule for Activities, page 71:** Section 9.0 presents a two-sentence discussion regarding the schedule for the FI Work Plan.

    The schedule must address the time frame for activities and milestones for the FI activities, not just the total time to accomplish the FI. Provide a detailed schedule for the completion of the activities proposed by the FI Work Plan.

19. **Figure 4-1, Schematic Conceptual Site Model:** The Conceptual Site Model (CSM) indicates that ingestion of fish by human receptors is a significant exposure pathway. However, it is not clear why ingestion of fish by ecological receptors such as shore birds is not considered a complete exposure pathway.

    Revise the work plan to provide information which justifies the elimination of this potentially complete pathway. Alternatively, revise the CSM to include this pathway. This comment also applies to Figure 4-2.

20. **Table 3-1, Cumulative LNAPL Thickness and Groundwater Elevation Data:** Prior to the second quarter of 2000 (00-Q2), the measurements of "depth to groundwater" appear to be measurements of "depth to LNAPL" for monitoring wells MW-U11, MW-U12, and

MW-U13. Table 3-1 presents data values for "depth to groundwater" prior to 00-Q2 that are similar to the "depth to LNAPL" data values beginning in 00-Q2. Also, the pre-00-Q2 data provide no differentiation between LNAPL and groundwater surfaces, while the data collected beginning in 00-Q2 clearly indicates over 4 feet of LNAPL thickness in these three wells.

Verify whether the pre-00-Q2 "depth to groundwater" values should be considered as measurements to the top surface of the LNAPL on the groundwater. Also, make the calculations to determine potentiometric surface elevation based on the specific gravity of the LNAPL involved. Revise Table 3-1 as necessary..

El Paso Merchant Energy-Petroleum Company
Response to EPA Comments
February 2009

RESPONSE TO EPA'S TECHNICAL REVIEW AND COMMENTS

FACILITY INVESTIGATION WORK PLAN
ELEMENTIS SITE - CORPUS CHRISTI, TEXAS

EL PASO MERCHANT ENERGY-PETROLEUM COMPANY
EPA ID NO. TXD008132268
U.S. EPA Docket No. RCRA-VI-7003-01-01

February 12, 2009

Below are El Paso's responses to the Environmental Protection Agency's (EPA's) April 11, 2007 comments on the Facility Investigation (FI) Work Plan dated February 3, 2003.

General Comments

1. *The U.S. EPA's National Exposure Research Laboratory evaluated the ROST™ technology in 1995. The details of EPA's study are published in an Innovative Technology Verification Report entitled, "The Rapid Optical Screening Tool (ROST™) Laser-Induced Fluorescence (LIF) System for Screening of Petroleum Hydrocarbons in Subsurface Soils, "EPA/600-R-97/020. As stated in the section, Limits of the Technology, on page 13 of the report:*

   "The ROST™ LIF system often uses 290 nm as the excitation wavelength. This wavelength is short enough to excite the fluorescence of all aromatic hydrocarbons with at least two conjugated aromatic rings. Aliphatic species and single-ring aromatics do not contribute to the ROST™ LIF signal from 290 nm."

   In addition, the report section, Limitations of the Technology, states on page 51:

   "The ROST™ LIF system is applicable only to fuels and wastes containing nonchlorinated multi-ring aromatic hydrocarbon molecules. The detection capabilities for ROST™ include, but are not limited to, jet fuel, gasoline, diesel, lubricating oils, coal tar, and creosote. Other compounds such as chlorinated hydrocarbons would require separate sensors."

   Based on the above information, there appear to be serious limitations to detecting the presence of the aliphatic (straight chain) compounds, chlorinated aliphatics, and single-ring aromatic compounds, which are included on the Skinner List. According to Fugro Geosciences, Inc., the owner of the ROST™ technology, the LIF system can be tuned across a range of wavelengths from 266-310 nm in order to capture the single-ring aromatics, such as benzene, toluene, and ethylbenzene, but does not indicate that the LIF system can now detect aliphatics. This is an important issue that must be addressed since the aliphatics

and single-ring aromatics may be present, yet not detected, if the ROST™ LIF sensor is tuned to the standard frequency of 290 nm.

The Work Plan should be revised to provide the field procedure that will be used to ensure the LIF system will be adjusted appropriately during a sounding to detect the presence of single- and multi-ring aromatic compounds. Also, clarify whether the LIF sensor can be tuned to detect aliphatic (straight chain) and chlorinated hydrocarbons on the Skinner List and, if so, ensure that the LIF tuning procedure addresses these compounds as well. Alternatively, use another screening technology (e.g., direct push technology with soil gas sampling) to detect the aliphatic and chlorinated hydrocarbons on the Skinner List.

Response: El Paso addressed (October 24, 2005) this issue in response to EPA's comment on the Interim Measures (IM) Investigation Work Plan. Since then, El Paso has performed a number of ROST and cone-penetration test (CPT) borings for screening-level evaluation of the occurrence of light non-aqueous phase liquid (LNAPL) at the Facility. The fieldwork has progressed beyond the screening-level phase with the installation and sampling of permanent monitoring wells at the Facility. Groundwater samples have been analyzed for chemicals of concern (COCs) in accordance with the IM Investigation Work Plan, finalized in 2006.

With regard to the ROST technology, El Paso discussed this issue with the CPT/ROST manager of Fugro Geosciences (Dennis Stauffer). Starting in 1999 the ROST sensor can also monitor and record data for 340, 390, 440, and 490 nanometer wavelengths, resulting in the ability to detect the presence of even more compounds than when the technology was evaluated by the EPA in 1995.

Section 6.1 (page 23) of the FI Investigation Work Plan states "ROST probes will be completed as a screening process to preliminarily define the lateral extent of LNAPL at the Facility." As documented by the EPA in 1995, the application of ROST technology is limited when applied as a quantitative tool for analysis of chemical concentrations, particularly for co-mingled COCs. However the qualitative application of the CPT/ROST technology is acknowledged by the EPA in the 1995 Innovative Technology Evaluation Report for stratigraphy and as an indicator of relative percent hydrocarbon/chemical presence, based on a standard. El Paso has used CPT for stratigraphy and ROST technology as an indicator for whether or not there is a relative percent, based on a standard, of hydrocarbon/chemical present in the soil column, which can therefore offer an indication of the presence of phase separated compounds. Therefore, El Paso has used the ROST technology as a qualitative screening of the phase separated plume boundary location so that permanent piezometers and monitoring wells may be more effectively located and constructed for direct measurement of LNAPL to delineate the free phase plume. The use of the ROST technology is not intended for delineation of COCs.

2. The Work Plan should be revised to consider any available analytical data for the seeps along the bluff line located east of the cofferdam. If no data are available,

clarify this point and indicate that the seeps will be sampled during the FI. If seep data are available, revise the site conceptual model to integrate this data. Consider available analytical data in an effort to determine the source of the contaminants discharged from the seeps. If well data are available for the eastern Facility Area, integrate the data into the site conceptual model. If wells are not presently located in the eastern Facility Area, then revise the FI Work Plan to address the delineation of any phase-separated hydrocarbon source and dissolved phase plume, including the sampling of any existing wells in the eastern portion of the Facility Area and the installation of additional monitoring wells in the Facility Area.

Response: El Paso has previously addressed the seep issue in response to EPA's comments on the draft IM Investigation Work Plan and draft Preliminary Remediation Goal (PRG) Report. As stated in the Administrative Order on Consent (AOC) Section V.20, the Texas Natural Resource Conservation Commission (TNRCC) (now the Texas Commission on Environmental Quality or TCEQ) collected a sample of oily liquid seeping from Elementis Chromium, L.P. (Elementis) into the Corpus Christi Inner Harbor (CCIH) in February 2000. The laboratory report describes the sampled media as "Org. Waste." Analytical data from three samples are documented in Exhibit 15 of the AOC. Additional seepage incidents in 2002 and 2004 did not yield any samples of liquid that could be analyzed. Analytical data from a sample collected at a seepage incident observed in February 2007, west of the cofferdam area is provided as Appendix A.

El Paso has modified the Conceptual Site Model (CSM) to include potential exposure pathways related to the historical seep area. The revised CSM is provided as Appendix B.

Since the submittal of the FI Work Plan to the EPA in February 2003, El Paso has installed temporary (WG-series) and permanent monitoring wells at the eastern side of the Facility. The logs of boreholes and available gauging and analytical data have been provided to EPA in prior quarterly reports. El Paso will summarize this information and include the detailed laboratory analytical reports in the FI Report.

El Paso has also revised the Data Quality Objectives (DQOs) to more clearly describe the decision criteria to be used for the placement of new wells. The revised DQOs are provide as Appendix C.

3. Product thickness measurements are available for several of the wells in the Facility Area.

The thickness of product should be mapped during the FI to identify the areas with the greatest quantities of free product and to identify any trends in contaminant migration. Revise the FI Work Plan to include a spatial evaluation of the product thickness measurements. Include maps of the product thickness measurement to illustrate the current conditions in the Facility Area. These maps would serve as a basis for responding to the requirements of AOC Section VII.2.B

(i) for determining the thickness and lateral extent of the LNAPL plume, as well as identifying areas having data gaps.

Response: El Paso gauges selected Facility monitoring wells, as part of the semi-annual Agreed Final Judgment (AFJ) Groundwater Monitoring Program that principally includes gauging and monitoring wells west of Cantwell Lane with Valero. The latest available maps of the product thicknesses from the semiannual gauging event are provided in Appendix D. El Paso will continue to perform gauging as additional wells in the FI area are completed and will include the results of the gauging in the FI Report.

The DQOs provided in Appendix C indicate the decision rules for collecting additional data for spatial evaluation of product thickness.

4. Section 6.1 proposes benzene and toluene as indicator compounds for siting permanent groundwater monitoring wells. Section 6.5.8 states that the most recent version of Method 8021, in EPA SW-846, Test Methods for Evaluating Solid Waste, is proposed as the analytical method for benzene and toluene. This analytical method can be used to detect a minimum of 12 of the 16 volatile organics, including benzene and toluene, on the "Skinner List," Constituents of Concern for Wastes from Petroleum Processes, which serves as the basis for the Facility chemicals of concern (COCs). Since so many Facility COCs can be detected using Method 8021, clarify why only benzene and toluene are proposed as indicator compounds. Also, provide justification for the use of benzene and toluene as indicator compounds for the aliphatics, semivolatile organics, and polynuclear aromatic hydrocarbons (PAHs) on the Skinner List.

If adequate justification is not provided, the FI Work Plan should be revised to include evaluation of additional, and possibly all, Facility COCs.

Response: As described in Section 6.1 of the FI Work Plan, preliminary sampling of existing wells and temporary sampling points for only benzene and toluene does not replace delineation sampling of monitoring wells for the complete list of AOC IM COCs. A phased installation of permanent step-out monitoring wells sampled for AOC IM COCs has been used to delineate COCs to PRGs. Therefore, delineation of the free phase plume has been based on direct measurements of LNAPL in piezometers, and delineation of COCs has been based on the analysis of groundwater samples (from monitoring wells) for AOC IM COCs. The following procedure has been used in the FI study to date:

1. CPT/ROST pushes have been used, and benzene and toluene samples have been collected from temporary sampling points, to identify locations of permanent sampling points (monitoring wells).
2. Piezometers have been installed where LNAPL is not expected, and monitoring wells have been installed for groundwater sampling.
3. Piezometer measurements have been used to delineate LNAPL extent and samples from monitoring wells will be analyzed to delineate COCs.

4. Where piezometers have encountered LNAPL, additional step-out piezometer(s) have been installed.
5. Where any COC concentration is greater than the respective PRG within the FI Area, at least one additional step-out monitoring well has been installed within the FI Area for further COC analysis.

The DQOs in Appendix C provide the decision criteria for placement of new monitoring wells.

5. *Section 4.1.1, Groundwater, discusses the use of the BIOSCREEN Model "to predict the natural attenuation of COCs as they migrate in groundwater." Facility preliminary remediation goals (PRGs) are established for the COCs in groundwater at the upgradient edge of the Interim Measure (IM) Area. The Facility PRGs were calculated by taking the log average of two sets or PRGs, with one set based on the shortest literature value for intrinsic bioremediation half-life and the second set based on the longest literature value for intrinsic bioremediation half-life. Section 4.1.1 assumes a 350-foot travel distance for the COCs across the IM Area to the point of groundwater discharge to surface water. The BIOSCREEN model was the used to calculate Facility groundwater attenuation action levels (AALs) per the Texas Risk Reduction Program (TRRP), for the COCs. The Facility groundwater AAL values and backup BIOSCREEN printouts are presented in Appendix B. Section 4.1.1 further states that once the FI is completed, the BIOSCREEN dilution factors (DAFs) will be adjusted to reflect site-specific transmissivity, porosity, and fraction of organic carbon (f_{oc}) for saturated zone soils. BIOSCREEN will then be used during the Corrective Measures Study (CMS) to re-calculate the final AALs for the dissolved-phase COC concentrations that will be used to implement corrective measures.*

AOC Section VII.2.A (iii) requires that Facility PRGs shall be established for identified Facility COCs. The Facility PRGs must be consistent with available protective risk-based cleanup levels applicable to current and reasonably expected future land use scenarios and environmental exposure scenarios consistent with the conceptual site model (CSM). When federal or State PRG values do not exist, they must be developed in accordance with the EPA Human Health and Ecological Risk Assessment Guidance for Superfund (RAGS) and other appropriate EDPA guidance. The federal PRG values may be referenced in RAGS Part B and the State PRG values are the TRRP Tier 1 protective concentration limits (PCLs). Based on the requirements of the AOC for establishing PRGs, literature values were inappropriately used in the BIOSCREEN model to calculate Facility groundwater PRGs, which were developed for the purpose of establishing Facility groundwater AALs along the upgradient boundary of the IM Area. If El Paso wishes to calculate PRGs using literature values for those COCs that do not have established federal or State PRGs, they should be based on ultra-conservative literature values and not on a log average of two sets of PRGs. In particular, a very conservative value for f_{oc} and little to no biodegradation are necessary to justify a conservative approach

using only literature values. That said, however, El Paso will still be required to collect site-specific data during the FI to calculate the final remediation goals (FRGs) that will be proposed to EPA Region 6 and used to select a corrective measure for the Facility. The FI should collect site-specific data for bulk density and f_{oc} to calculate the retardation factor associated with biodegradation. Revise the FI Work Plan to establish PRGs in accordance with AOC Section VII.2A.(iii).

In addition, the FI Work Plan does not clearly explain the assumptions for applying the BIOSCREEN model to the IM Area, rather than the AOC-defined Facility area. The model issued to back-calculate the Facility groundwater PRGs (or TRRP AALs) (Table B-1) for the natural attenuation of COCs in groundwater as it leaves the Facility and crosses the IM Area to the ship channel. The assumptions of the model are not well-described in Section 4.0, although it appears that there are at least three. First, the model appears to assume that all COCs in the Facility area will flow across the upgradient boundary of the IM Area, since the model's source area is located along this boundary. Second, the model assumes that natural attenuation of the COCs will occur during their transport along the 350-foot pathway from the IM Area upgradient edge to the groundwater discharge to surface water along the ship channel. And third, the model does not recognize the existence of the current groundwater pump-and-treat activities in the IM Area and, therefore, assumes a simple flow pathway across the IM Area. In addition, this area has free phase and residual NAPL which acts as a continued source and inhibits biodegradation, thus the model is not applicable for the area.

The conditions assumed for the BIOSCREEN model are not a realistic representation of the actual environment of the IM Area. The IM Area does not capture all of the COCs flowing in the Facility area, as witnessed by the releases of hydrocarbons from the seeps and sediments of the east of the IM Area. The model assumes that natural attenuation will occur until the groundwater is discharged to the surface water of the ship channel, however, the downgradient water's edge of the IM Area is partially bordered by a cofferdam that prevents groundwater from reaching the ship channel. Instead, the groundwater is removed from the IM Area through a series of recovery wells for the IM pump-and-treat system, which creates numerous cones of depression in the groundwater surface of the uppermost aquifer, resulting in a complicated flow pathway across the IM Area. The second page of the EPA BIOSCREEN Natural Attenuation Decision Support System User's Manual (Version 1.3, EPA/600/R-96/087, August 1996) states the model "assumes simple groundwater flow conditions" and "should not be applied where pumping systems create a complicated flow field."

Clarify the assumptions that serve as the basis for the BIOSCREEN model.

Response: El Paso has reconsidered the use of the BIOSCREEN model for the development of Facility PRGs, and has decided instead to adopt the IM PRGs for

the FI. Therefore, the BIOSCREEN model is not necessary for the development of PRGs and this discussion will be deleted from the revised FI Work Plan.

The IM PRGs were only developed for groundwater. As part of this FI Work Plan Addendum, El Paso has also developed PRGs for surface soil, sediment, surface water, soil vapor and indoor air. A complete list of PRGs is provided in Appendix E.

6. *Section 4.1.2 discusses the establishment of AALs for soil Media ("Media' is defined in AOC Section VII.2.A.(i)). Again, as discussed for groundwater, the establishment of soil Media AALs per TRRP requirements does not satisfy the requirements for the establishment of soil PRGs. As with the discussion above regarding the establishment of Facility groundwater PRGs, the Facility soil PRGs must also be established in accordance with the requirements of AOC Section VII.2A.(iii) for identified Facility COCs.*

   The Facility soil PRGs must be consistent with available protective, risk-based cleanup levels applicable to current and reasonably expected future land use scenarios and environmental exposure scenarios consistent with the conceptual site model (CSM). When federal or State PRG values do not exist, they must be developed in accordance with the EPA Human Health and Ecological Risk Assessment Guidance for Superfund (RAGS) and other appropriate EPA guidance. Revise the FI Work Plan to establish PRGs in accordance with AOC Section VII.2.A.(iii).

Response: El Paso has prepared PRGs for surface soil, sediment, surface water, soil vapor and indoor air using the latest guidance from EPA Region 6. These PRGs are provided in Appendix E.

7. *Section 5.0, Application of the DQO Process, discusses FI activities that are presented in detail in other portions of the FI Work Plan. Where EPA Region 6 has commented upon FI activities, responses to comments may impact the FI plan presented in the Data Quality Objectives Process. For example, the determination of AALs does not satisfy the establishment of Facility PRGs and the DQO Process should be revised accordingly.*

   Revise Section 5.0 and its associated figures and tables, as necessary, to accommodate revisions to the FI Work Plan that are made in response to EPA Region 6 comments.

Response: El Paso has revised the Data Quality Objectives (DQO) and they are included as Appendix C to this FI Work Plan Addendum.

8. *The FI Work Plan references numerous acronyms that are defined in the text, but the definitions are difficult to locate within the document.*

Provide a list of acronyms specific to the FI Work Plan, preferably after the Table of Contents.

Response: The acronym list is provided as Appendix F to this FI Work Plan Addendum.

SPECIFIC COMMENTS

1.0 INTRODUCTION

This Workplan describes the technical approach that will be used to further investigate Media at the Facility. - - - the specific objectives of the investigation to be conducted at the Facility are to:

1. *Identify the Facility chemicals of concern (COC) and characterize the potential pathways of COC migration;*

2. *Identify actual or potential receptors, including human and ecological environmental systems that are susceptible to Facility COC exposure at or from the Facility;*

3. *Install adequate wells and collect sufficient samples (analytical data) to determine the horizontal and vertical extent of ground water contamination to decreasing concentrations to below the appropriate Facility preliminary remediation goals (PRG); and in soil/media ("Media shall mean ground water and contaminated soils where the soil contamination is contributing to or is attributable to the existing ground water contamination) determine the extent of contamination to below the appropriate PRGs - - - - -.*

1. ***Section 1.0, Introduction, page 1:*** *The opening paragraph presents an incomplete reference to the definition of "Facility," as discussed in AOC Section I, Jurisdiction. The second page of the AOC states:*

> *"In this Order the 'Facility' is defined as the area of contamination beyond the Coastal Refinery property boundary north, northeast and east of the Coastal Refinery property boundary north, northeast and east of the Coastal Refinery East Plant-North (Valero Complex 8 North), and extending onto or under the portion of the Elementis Chromium property located East of Cantwell Land and the Inner Harbor Ship Channel. <u>The definition of Facility will be expanded to include areas west of Cantwell Lane in the IM Area (as defined below) should investigation indicate that contamination is contiguous extending west of Cantwell Lane in the IM Area</u>. The Facility does not include any portion of the Inner harbor Ship Channel and notwithstanding anything in the Order to the contrary, this Order does not require Respondent to fully delineate or to remediate contamination in the Inner Harbor Ship Channel.*

In particular, the underlined portion of the above definition of "Facility" provides for the potential expansion of the area addressed under the FI. Revise the discussion in Section 1.0 to fully address the definition of "Facility," including its potential expansion to include appropriate portions of the IM Area.

Response: El Paso will provide a corrected definition of "Facility" in the FI Report as described in the AOC. This definition is included as Appendix G.

2. ***Section 1.0, Introduction, pages 1-2:*** *The introduction references the specific FI objectives prescribed under AOC Sections VII.2.A(i) and VII.2.B, but does not recognize the FI Work Plan requirements found at AOC Section VII.2.A(ii) and (iii).*

Revise Section 1.0 to address all for the requirements of AOC Section VII.2.A and verify that these requirements are addressed by the FI Work Plan.

Response: El Paso has addressed the requirements found at AOC Section VII.2.A (i), related to the development of an FI Work Plan by the submission of the original FI Work Plan in February 2003, the FI Work Plan Addendum in June 2007, and this FI Work Plan Addendum. El Paso is addressing AOC Section VII.2.A (ii) and (iii) related to establishment of Facility COCs and the development of Facility PRGs by adopting the IM COCs and PRGs for groundwater as well as developing new PRGs for additional media. The PRGs are provided in Appendix E. El Paso is preparing a Sampling and Analysis Plan that will address sampling methods and analytical requirements. The Sampling and Analysis Plan will be provided to EPA when it is completed.

3. ***Section 3.0 Characterization of Contaminant Source and Environmental Setting Based on Existing Data, pages 5-7:*** *The third paragraph on page 6 indicates that the vertical extent of Facility chemicals of concern (COCs) has not been defined in the Facility Area, as defined in the AOC. This paragraph then indicates that monitoring well DMW-03 is screened in the second transmissive zone and is located at Valero Complex 8 North, approximately 80 feet west of the Facility Area at Elementis. Groundwater sampled from Well DMW-03 is positive for o, m, and p-cresols, which is documented in Table 3-4. The presence of cresols may indicate the presence of a dense non-aqueous phase liquid (DNAPL) in the second transmissive zone.*

Revise Section 3.0 to discuss the significance of the presence of they o. m, and p-cresols in the second transmissive unit, particular to the FI at the Facility Area at Elementis and the delineation of the lateral and vertical extent of COCs in the upper transmissive zone and the second transmissive zone.

Response: El Paso has developed a more complete understanding of site hydrogeology since the original FI Work Plan was submitted in February 2003. Under the current site

hydrogeological model, Valero well DMW-03 would be screened in what El Paso would consider a third water bearing zone. (See Conceptual Site Model in Appendix B.)

El Paso is aware that the results of chemical analyses of a sample collected in 1999 from well DMW-03 at the Valero Complex 8 North show low levels of cresols. The current list of COCs for the FI include o, m, and p-cresols so if these compounds are present at any location on site, they will be identified in the FI. The DQOs (see Appendix C) define the decision rules that will be used to delineate the lateral and vertical extent of COCs in the groundwater.

4. ***Section 4.0, Facility Preliminary Remediation Goals, page 8:*** *The last paragraph on this page states that "the significant exposure pathways include the potential transport of LNAPL and COCs in groundwater to surface water and the potential migration of soil vapor containing volatile Facility COCs derived from LNAPL, soil or groundwater to indoor and outdoor air at the Facility." Based upon this discussion, it appears that the direct releases of non-aqueous phase liquid (NAPL) to surface water and to sediment are considered to be incomplete pathways. As documented in a separate Administrative Order on Consent (reference US EPA Docket No. RCRA-VI-7003-01-01, Section V.7) between EPA Region 6 and Elementis Chromium, L.P., the U.S. Fish & Wildlife Service (USFWS) observed hydrocarbons, including benzene and cumene seeping from the bluff into the Inner Harbor Ship Channel on or about February 9, 2000. The USFWS also observed several seeps along the bluff, located up to 100 feet east of the cofferdam, discharging oily waste into the surface water on March 2, 2000. Also, oily liquid bubbled from below the surface of the water, which released sheen on the water surfaces. The USFWS believed "the release to surface water constituted a potential endangerment to shorebirds." Based on these documented releases of NAPL to surface water and to sediment, these pathways are complete.*

Revise the conceptual site model to document these pathways as complete and evaluate them for significance.

Response: El Paso revised the CSM to address the seeps. The revised CSM is provided in Appendix B.

5. ***Section 4.0, Facility Preliminary Remediation Goals, page 8:*** *The second paragraph on page 8 states that "The CSM was developed in conjunction with the PRG Report and is presented in Figure 4-1. There have been no changes made to the CSM, as no additional data have been gathered since the submittal of the PRG report." The last paragraph on page 12 of the PRG Report stated "Non Aqueous Phase Liquid (NAPL) is the primary source, which has migrated on to the facility in the subsurface. The NAPL in turn is the source of COCs in other environmental media, specifically surface soil, soil vapor, groundwater, and surface water.*

As discussed during the November 19, 2002 meeting with El Paso and in subsequent written comments, EPA recommended that the Conceptual Site Model (CSM) identify all individual sources of contamination in order to aid in determining potential cumulative and overall risk of exposures to receptors. That is, the sources of the NAPL in environmental media should be identified, e.g., specific Solid Waste Management Units or Areas of Concern. Also, the type of NAPL, (i.e., diesel, gasoline, benzene, etc.) and constituents of concern in the NAPL. The FI Report and the CSM Diagram Figure 4-1 should be revised to include these changes.

Response: El Paso has revised CSM showing the composition and characteristics of the LNAPL and it is provided in Appendix B. El Paso will address the composition and characteristics of the LNAPL in the FI Report. Samples of LNAPL have been collected from monitoring wells and analyzed, ROST logs have been evaluated for the depth intervals of LNAPL occurrence, and core samples have been collected for detailed petrophysical analysis to support the CMS effort and identification and evaluation of site remedies. However, El Paso recognizes that because of the long and complex history of the site and surrounding industrial areas, the changing product refining and storage history at the site, and the time available for lateral transport of LNAPL in the subsurface makes it unlikely that the sources of non-aqueous phase liquid (NAPL) (e.g., specific Solid Waste Management Units or Areas of Concern) will be identified.

6. ***Figure 4-1, Schematic Conceptual Site Model:*** *The Conceptual Site Model (CSM) indicates that both exposure pathway ID Numbers 3 and 9 address the ingestion of potentially contaminated surface water. Pathway No. 9 indicates that the ingestion of surface water by both human and ecological receptors is a potentially complete pathway. However, pathway ID Number 3 indicates that only ecological receptors will ingest surface water. It is not clear why human receptors are not considered for pathway No. 3.*

Revise the FI Report to address this discrepancy.

Response: El Paso has revised the CSM and provided as Appendix B to this FI Work Plan Addendum.

7. ***Section 4.1.1, Groundwater, page 10:*** *The first paragraph references AOC Sections VII.A.(iv) and VII.D., however, these citations appear to be in error. Clarify the AOC citations and revise Section 4.1.1 accordingly.*

Response: El Paso will clarify that AOC section VII.1.B.(iv) requires that the IM performance goals be applied in the groundwater at the groundwater/surface water interface..

8. ***Section 4.1.1, Groundwater, pages 10 – 11:*** *The first paragraph in this section states that "Within the IM Area, the groundwater PRGs are those set in the PRG report for the groundwater/surface interface." A review of the information*

presented in Table 4-1 of the PRG Report revealed a number of discrepancies, which required clarification and correction. The identified discrepancies are outlined in the following paragraphs.

The footnotes to Table 4-1 of the PRG Report indicated that the source of many of the values presented in the Table is the "Texas Commission for Environmental Quality Surface Water Quality Criteria obtained from Tables 1 and 3 of the TCEQ 200a Texas Surface Water Quality Standards." However, based upon a review of the values presented and per discussions with facility representatives during the March 26, 2003 conference call, the sources of the values used included not only Texas Administrative Code (T.A.C.) Chapter 307, Tables 1 and e (Aquatic Life and Human Health protection criteria) dated August 17, 2000 but also, risk-based exposure limits (RBELS) from Chapter 350, the Texas Risk Reduction Rule dated August 13, 2002.

The table must be revised to clearly indicate the specific source of the values presented. In addition, there appears to be a 0 missing from the date of the reference (i.e., 200 versus 2000). The footnote must be revised to correct this typographical error.

Furthermore, the footnote to Table 4-1 also indicated that the human health criteria were based on the ingestion of saltwater fish from an incidental fishery. The TCEQ standards state that the numerical criteria applicable to an incidental fishery are 10 times the human health criteria listed in columns B and C of Section 307.6, Table 3. Chapter 307.6(d)(5) indicates that all designated segments listed in Appendix A of §307.10 are considered to have sustainable fisheries. Appendix A of Chapter 307 identifies the Corpus Christi Inner Harbor Ship Channel as designated Stream Segment Number 2484 of the Nueces River Basin. Per personal communications with Mr. Jim Davenport of the TCEQ Water Quality Standards Division, the Inner Harbor Ship Channel is considered to be a sustainable saltwater fishery rather than an incidental fishery. As such, it is not appropriate to multiply the human health criteria by a factor of 10 in the development of IM PRGs.

The IM PRGs presented in Table 4-1 and Appendix E of the PRG Report, which are based on the human health pathway, will need to be reviewed and corrected to reflect a value for a sustainable saltwater fishery.

The surface water PRG for benzene is listed as 1.09E-01 mg/L and the source identified for this value is the aquatic toxicity criteria from Table 1 of the TCEQ SWQS. The TCEQ SWQS do not include a saltwater chronic criteria value for the protection of aquatic life for benzene, but do include a human health value of 70.8 micrograms per liter (µg/L) for benzene. The value of 1.09E-01 mg/L appears to be taken from Chapter 350 of the Texas Risk Reduction Rule. As documented in the Administrative Order on Consent (reference US EPA Docket No. RCRA-VI-7003-01-01, Section VII.1.A.(i)) between EPA Region 6 and El Paso CPG

Company, for the purposes of the Interim Measures Investigation, the Texas SWOS (30 Tex. Administrative Code Chapter 307) shall be used as IM PRGs and the IM PRG concentration for each COC shall be equal to its respective Texas SWQS value, or a comparably derived value for COCs without a standard, for aquatic life and human health protection (saltwater chronic criteria). Given the fact that benzene does have a human health criteria (70.8 µg/L) listed in Table 3 of the Texas SWQS, this value should be selected as the IM PRG for benzene. This issue also applied to the IM PRGs selected for chloroform and tetrachloroethylene.

Revise Table 4-1 and Appendix E of the PRG Report to address this issue.

In addition, Table 4-1 uses milligrams per liter (mg/L) as the unit of measure whereas the EQ surface water criteria (Chapter 307, Tables 1 and 3) and the calculations presented in Appendices C, D, and E of the PRG Report are presented in µg/L. The conversion between mg/L and µg/L appears to have also resulted in some errors.

Review Table 4-1 of the PRG Report to ensure the accuracy of the information presented and to correct the listed sources and any conversion errors.

The information presented in the Facility Investigation Workplan must be reviewed in light of the above-mentioned comments and revised as applicable.

Response: El Paso revised the referenced text and tables and included the revisions in the IM Investigation Work Plan that was submitted to the EPA in August 2006. EPA approved the IM Investigation Work Plan with this revised discussion.

9. ***Section 4.2, Chemicals of Concern, page 13:*** *The first paragraph in this section states that "If a chemical is not detected at concentrations greater than or equal to its risk-based level or MDL (whichever is higher) during the IM Area Investigation and the Facility Investigation, then that chemical will be dropped from further consideration and will not be considered to be a COC." If the method detection limit (MDL) is higher than the risk-based level, then it is possible that concentrations, which exceed risk-based levels, may be present in media. Therefore, it is inappropriate to eliminate a chemical from further consideration based upon a comparison to an elevated MDL.*

Revise the work plan to state that if the MDL for a chemical is greater than its risk-based level it will be retained for further consideration.

Response: El Paso has evaluated the COC list in the AOC and discussed this in a letter to EPA dated January 8, 2007. Based on conversations with the laboratory, El Paso has confirmed that four COCs (bis(chloromethyl)ether, ethyleneimine, ethylene oxide, and methanethiol) cannot be analyzed by any commercial laboratory in groundwater using standard methods. We also noted that these compounds do not appear on the EPA

Region 5 Skinner List, presumably for this reason. In the letter, El Paso requested EPA remove these four compounds from the COC list. El Paso will continue to analyze for all other analytes on the COC list and will evaluate them in accordance with the AOC and FI Workplan (and IM Investigation Workplan) procedures.

Several PRGs are above the method detection limit (MDL) achievable by the laboratory using the current technologies. Concentrations between the MDL and reporting limits (RL) will be reported. Lower MDLs will be achieved by using selective ion monitoring (SIM) methods. Unattainable PRGs are high-lighted in red on the PRG tables. Method detection limits and reporting limits were those available in February 2009.

10. ***Section 4.2, Chemicals of Concern, page 15:*** *The first full paragraph on page 15 states that Table 4-1 presents soil saturation limits, however, it actually presents groundwater facility attenuation action levels (AALs).*

Clarify whether the reference should be for Table 4-7, Potential COC Soil Saturation Limits.

Response: El Paso has adopted the IM PRGs for the FI.

11. ***Section 5.0, Application of the DQO Process, page 17:*** *The third paragraph indicates that data quality objectives (DQOs) refer to the degree of accuracy and precision of a measurement. In accordance with EPA Guidance on Quality Assurance Project Plans, EQP QA/G-5, EPA/600/R-01/009, December 2002, accuracy and precision are performance and acceptance criteria, or data quality indicators, in this context for measurement quality objectives. Other principle data quality indicators include bias, representativeness, completeness, comparability, and sensitivity.*

Revise Section 5.0 to clarify how these seven data quality indicators support the DQO Process for the FI Work Plan. Also, an older version of EPA QA/G-5 is listed in Section 11.0, References, as entry number 35. Update Section 5.0 and Appendix A, Quality Assurance Project Plan, of the FI Work Plan as necessary to address any new requirements of the December 2002 revision of EPA QA/G-5.

Response: El Paso has revised the DQOs and included as Appendix C.

12. ***Section 6.1, ROST and Temporary Well Sampling, pages 22-23:*** *Section 6.1 indicates that LNAPL samples collected from five wells will be used to calibrate the Rapid Optical Screening Technology (ROST) to site-specific product samples to enhance the effectiveness of this technique. Section 3.0 indicates that there are three plumes of differing composition in the Facility Area at Elementis. Previous investigations indicate that a benzene plume is present in the central portion of the Facility, a gas-oil range hydrocarbon plume is present in the northern portion, and a gasoline-naptha plume is present in the southwestern portion.*

Revise the Work Plan to clarify whether at least one LNAPL sample is collected from each of the plumes to calibrate the ROST.

Response: El Paso collected and analyzed LNAPL samples from monitoring wells in different areas of the plume for the purpose of calibrating the ROST. El Paso has moved beyond the ROST study and collected additional LNAPL samples for the purpose of characterizing the composition of the LNAPL at various locations throughout the plume.

13. ***Section 6.1, ROST and Temporary Well Sampling, pages 23-24:*** *The last paragraph on page 23 continues onto page 24 and discusses the data quality objectives for definition on the LNAPL plume. The vertical thickness will be determined to less than 0.01 foot, which will be the "non-detect" value as measured by an oil/water interface probe, in accordance with AOC Section VII.2.B.(i). The lateral extent of the LNAPL plume will be determined to "a horizontal distance of less than or equal to 200 feet" from the actual edge of the plume, however, this is an unacceptable distance. The discussion attempts to justify the degree of imprecision in establishing lateral extent of the plume by referring to three geologic cross-sections, presented as Figures 2-2 through 2-4. The degree of lateral stratigraphic variability shown in the cross-sections does not justify the imprecision in the determination of the lateral extent of the plume. Considering the direct-push technology will be used on-site, it should be relatively easy to "fine-tune" the location of the edge of the plume, which could easily be located to within 25 feet of the actual plume edge.*

Revise Section 6.1 and any other portions of the FI Work Plan to reduce the "200 feet" of lateral imprecision to a distance that is appropriate to the proposed use of direct-push technology.

Response: El Paso conducted scores of ROST and CPT pushes and installed temporary piezometers and permanent monitoring wells across the IM Area and Facility. This work has resulted in the definition of the LNAPL plume limit with a much better precision than 200 feet – potentially in the range of 25 feet - in much of this investigation area. However, El Paso would need to install hundreds of ROSTs and/or monitoring wells throughout the Facility to achieve the 25-foot precision of the LNAPL plume limit requested by EPA. El Paso will continue to estimate the limit of the LNAPL plume conservatively, that is, will maximize the extent of the plume limit in areas of limited data (>50 feet between data points). El Paso will discuss the LNAPL plume limit and the relative precision of the estimated limit in the FI Report.

14. ***Section 6.1, ROST and Temporary Well Sampling, page 26:*** *The third paragraph states: "If a well screened at the base of the uppermost transmissive zone displays COCs at concentrations in excess of applicable groundwater PRGs, then a well screened in the second transmissive zone (i.e., the transmissive zone underlying the uppermost transmissive zone) will be installed." Clarify whether this is the only condition under which a well will be installed in the second*

transmissive zone. For example, Table 3-4 indicates that cresols were detected in a second transmissive zone well (DMW-03) on the Valero Complex 8 North, approximately 80 feet from the Facility Area. This begs the question as to whether or not cresol is also present in the second transmissive zone in the nearby Facility Area, however, there does not appear to be a decision point that leads to further investigation.

Revise the FI Work Plan, as necessary, to expand the criteria for installing a monitoring well in the second transmissive zone.

Response: El Paso has revised the DQOs to better define the decision criteria for installation of new monitoring wells. The DQOs are included in Appendix C of this FI Work Plan Addendum. Cresols (and other potential indicators of DNAPL) are included in the COC list that El Paso uses for the IM and FI groundwater analytical program. Therefore, the decisions that lead to the installation of deeper wells have been based on evaluation of all COCs, not just those indicative of petroleum hydrocarbon contamination.

15. ***Section 6.5.8, Collection and Analysis of Groundwater Samples, page 42:*** *The third full paragraph on page 42 indicates that a readings will be measured with a flow cell for temperature, conductivity, pH, dissolved oxygen, oxidation-reduction potential (ORP), and turbidity. This paragraph goes on to list the stabilization criteria for all of the above parameters, except temperature.*

Revise the Work Plan to provide the stabilization criterion for temperature.

Response: El Paso has provided this information to EPA in the IM Investigation Work Plan, Rev 2 and will discuss the stabilization criterion for temperature in the Sampling and Analysis Plan. The Sampling and Analysis Plan will incorporate the following information in the discussion of stabilization criterion:

> The Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures (EPA/540/S-95/504 – 1996) state, "The water quality indicator parameters monitored can include pH, redox potential, conductivity, DO, and turbidity." Temperature is not identified as a potential indicator parameter in this document, in part due to the fact that the fluctuation in temperature is often due to ambient air temperature, intensity of the sun, and the ambient temperature of the actual flow through cell. Sufficient data to determine the stabilization of water quality is provided by monitoring conductivity, pH, DO, ORP, and turbidity. Temperature will be recorded during purging activities, but is not proposed to be a determining factor in groundwater stabilization.

16. ***Section 6.5.11, Decontamination, Small-Scale Equipment, pages 50-51:*** *The decontamination procedure for small-scale equipment does not include a hexane or isopropanol rinse following the potable water rinse. Given that the levels of contamination are expected to be quite high in many of the wells, it will be*

important to follow procedures that will ensure equipment is thoroughly decontaminated between sampling points.

Revise the FI Work Plan to include a hexane or isopropanol rinse after the potable water rinse in the decontamination procedures presented on page 50.

Also, the discussion of Small-Scale Equipment does not discuss how the flow cell will be decontaminated after its use at each well.

Provide the decontamination method that will be used for the flow cell.

Response: El Paso has developed a revised decontamination plan based on experience gained in the AFJ semiannual monitoring program. The revised decontamination procedures will be discussed in the Sampling and Analysis Plan and are included in Appendix H to this FI Work Plan Addendum.

17. ***Section 7.2, Additional QA/QC Procedures Specified in the AOC, page 57:*** *The first paragraph on page 57 states: "As part of their QA/QC program, STL, ETI, and SPL (i.e., Severn Trent Laboratory, Exploration Technologies, Inc., and Southern Petroleum Laboratory, respectively] will perform analysis of a reasonable number of known samples provided by EPA to demonstrate the quality of the analytical data."*

AOC Section XIII is apparently the basis for this requirement, however, it should be modified to state that this testing will be performed upon the request of EPA and will not serve as the sole criterion in determining the quality of the analytical data generated by STL, ETI, and SPL.

Revise Section 7.2 accordingly.

Response: El Paso agrees with EPA's comment and will provide clarification of this issue in the Sampling and Analysis Plan.

18. ***Section 9.0, Schedule for Activities, page 71:*** *Section 9.0 presents a two-sentence discussion regarding the schedule for the FI Work Plan.*

The schedule must address the time frame for activities and milestones for the FI activities, not just the total time to accomplish the FI. Provide a detailed schedule for the completion of the activities proposed by the FI Work Plan.

Response: A proposed schedule for the FI is included in Appendix I to this FI Work Plan Addendum.

19. ***Figure 4-1, Schematic Conceptual Site Model:*** *The Conceptual Site Model (CSM) indicates that ingestion of fish by human receptors is a significant exposure pathway. However, it is not clear why ingestion of fish by ecological receptors such as shore birds is not considered a complete exposure pathway.*

Revise the work plan to provide information, which justifies the elimination of this potentially complete pathway. Alternatively, revise the CSM to include this pathway. This comment also applies to Figure 4-2.

Response: El Paso has revised the CSM and it is included as Appendix B to this FI Work Plan Addendum.

20 ***Table 3-1, Cumulative LNAPL Thickness and Groundwater Elevation Data:*** *Prior to the second quarter of 2000 (00-Q2), the measurements of "depth to groundwater" appear to be measurements of "depth to LNAPL" for monitoring wells MW-U11, MW-U12, and MW-U13. Table 3-1 presents data values for "depth to groundwater" prior to 00-Q2 that are similar to the "depth to LNAPL" data values beginning in 00-Q2. Also, the pre-00-Q2 data provide no differentiation between LNAPL and groundwater surfaces, while the data collected beginning in 00-Q2 clearly indicates over 4 feet of LNAPL thickness in these three wells.*

Verify whether the pre-00-Q2 "depth to groundwater" values should be considered as measurements to the top surface of the LNAPL on the groundwater. Also, make the calculations to determine potentiometric surface elevation based on the specific gravity of the LNAPL involved. Revise Table 3-1 as necessary.

Response: El Paso will clarify and correct this information in the FI Report.

Appendix A

Appendix A
Seep and LNAPL Data

Field Identification: Sample Identification: Date Sampled:	R4 Seep 07020109-001 2/8/2007	Pipeline Leak 07020109-002 2/8/2007	SUMP#1 07020247-001 2/16/2007	SUMP#2 07020247-002 2/16/2007	1 Oil 560-3445-1 2/9/2007	BLUFFWELL#1 0702174-001 2/13/2007	P-8 164924-001 12/5/2006	EPZ-3 164924-002 12/5/2006	EPZ-12 07020246-01 2/15/2007	Diesel TPHWG	Motor Oil TPHWG	SR-WG-01-010 560-3653-1 2/27/2007	SR-WG-02-010 560-3653-2 2/27/2007	SR-SO-01-010 560-3654-1 2/27/2007	SR-SO-02-010 560-3654-2 2/27/2007	SR-SO-03-010 560-3654-3 2/27/2007
Paraffin, wt%	81.702	73.29	76.435	81.702	0.55	13.739	4.67	1.847	20.208	DNA	DNA	NA	NA	NA	NA	NA
Isoparaffin, wt%	0.107	5.451	4.8	4.25	2.66	5.86	20.08	9.64	13.777	DNA	DNA	NA	NA	NA	NA	NA
Naphthenics, wt%	ND	2.378	2.255	1.912	2.9	2.636	13.35	6.76	6.169	DNA	DNA	NA	NA	NA	NA	NA
Aromatics, wt%	0.522	5.134	5.765	7.148	7.69	75.404	61.63	79.79	48.138	DNA	DNA	NA	NA	NA	NA	NA
Olefins, wt%	ND	1.41	9.623	1.031	ND	0.775	0.18	0.07	11.073	DNA	DNA	NA	NA	NA	NA	NA
Unknowns, wt%	15.695	9.951	1.12	2.417	86.21	1.586	0.09	1.9	0.636	DNA	DNA	NA	NA	NA	NA	NA
2,2,4-Trimethylpentane, wt%	ND	0.048	0.176	0.057	0.02	0.409	0.65	0.47	0.629		DNA	NA	NA	NA	NA	NA
Oxygenates, wt%	ND	ND	ND	ND	ND	ND	ND	ND	ND	DNA	DNA	NA	NA	NA	NA	NA
n-Hexane, wt%	ND	ND	0.021	ND	ND	0.216	0.44	0.21	0.337	DNA	DNA	NA	NA	NA	NA	NA
Benzene, wt%	ND	ND	0.114	0.141	ND	71.418	55.05	77.75	39.468	0.029	0.096	NA	NA	NA	NA	NA
Ethylbenzene, wt%	ND	ND	0.243	ND	0.2	0.218	0.55	0.13	0.645	0.068	DNA	NA	NA	NA	NA	NA
Toluene, wt%	ND	ND	0.066	ND	0.01	0.384	ND	0.62	0.16	0.18	0.22	NA	NA	NA	NA	NA
Xylenes, wt%	ND	0.092	0.108	0.02	0.01	0.362	1.56	0.39	0.509	0.5	0.34	NA	NA	NA	NA	NA
Specific Gravity @60F	NA	NA	0.9094	0.9055	NA	0.8605	0.8431	0.8594	0.845	DNA	DNA	NA	NA	NA	NA	NA
API Gravity@60F	NA	NA	24.08	24.75	NA	32.94	NA	NA	35.94	DNA	DNA	NA	NA	NA	NA	NA
Carbon range	C10 - C26+	C7 - C26+	C6 - C25	C6 - C26+	C9- C24+	C4 - C24	C6 - C11	C6 - C11	C1 - C24	DNA	DNA	NA	NA	NA	NA	NA
Major range	C14 - C19	C11 - C17	C7 - C19	C10 - C19	C24+	C6	C6	C6	C6 - C10	DNA	DNA	NA	NA	NA	NA	NA
Naphthalene, wt%	ND	0.107	ND	ND	0.5	0.046	ND	ND	0.139	DNA	0.059	NA	NA	NA	NA	NA
2-Methylnaphthalene, wt%	ND	0.338	0.178	0.469	0.75	0.033	ND	ND	0.119	DNA	DNA	NA	NA	NA	NA	NA
1-Methylnaphthalene, wt%	0.403	1.034	0.334	0.791	0.74	0.083	ND	ND	0.278	DNA	0.003	NA	NA	NA	NA	NA
Heptadecane, wt%	0.807	0.451	0.82	1.144	0.39	1.324	ND	ND	0.231	2.2	0.047	NA	NA	NA	NA	NA
Pristane, wt%	11.864	7.221	0.523	1.955	0.37	0.925	ND	ND	0.497	0.6	0.02	NA	NA	NA	NA	NA
Octadecane, wt%	0.692	0.49	0.154	0.811	0.41	1.047	ND	ND	0.136	1.6	0.051	NA	NA	NA	NA	NA
Phytane, wt%	3.831	2.73	0.598	0.462	0.24	0.661	ND	ND	0.139	0.5	0.027	NA	NA	NA	NA	NA
C6 - C12	NA	NA	NA	NA	< 10000	NA	NA	NA	NA	DNA	DNA	240	< 240	9700	< 5000	15000
>C12 - C28	6900	28000	770000	780000	65000	290000	NA	NA	480000	DNA	DNA	2400	1200	65000	53000	36000
>C28 - C35	NA	NA	NA	NA	< 10000	NA	NA	NA	NA	DNA	DNA	< 230	< 240	< 5000	< 5000	< 5000
C6 - C35	NA	NA	NA	NA	65000	NA	NA	NA	NA	DNA	DNA	2640	1200	74700	53000	51000
C17/Pristane	0.07	0.06	1.57	0.59	1.05	1.43	DNA	DNA	0.46	3.67	2.35	NA	NA	NA	NA	NA
C18/Phytane	0.18	0.18	0.26	1.76	1.71	1.58	DNA	DNA	0.98	3.20	1.89	NA	NA	NA	NA	NA
Pristane/Phytane	3.10	2.65	0.87	4.23	1.54	1.40	DNA	DNA	3.58	1.20	0.74	NA	NA	NA	NA	NA

DNA - Data not available.
NA - Not analyzed.
ND - Not detected.

Appendix B

Appendix B
Conceptual Site Model
El Paso Merchant Energy-Petroleum Company - Elementis Chromium, L.P. Site

INTRODUCTION

The conceptual site model (CSM) for the El Paso Merchant Energy-Petroleum Company (El Paso) - Elementis Chromium, L.P. (Elementis) Site consists of the following:

- CSM Profiles
  - Facility Profile;
  - Land Use and Exposure Profile;
  - Ecological Profile;
  - Physical Profile;
  - Release Profile, and
  - Risk Management Profile.
- CSM Flow Charts
  - Human Health CSM for Facility Investigation (FI) Area;
  - Ecological CSM for FI Area;
  - Human Health CSM for Pipeline Investigation Area, and
  - Ecological CSM for Pipeline Investigation Area.
- CSM Cross Sections

Separate CSM Flow Charts have been developed for the Facility area and the Pipeline Corridor area. The Pipeline Corridor area extends north from the northeast corner of the Valero Refinery toward the loading docks and is comprised of approximately 40 pipelines. This area has somewhat different release mechanisms and contaminant sources than the remainder of the Facility.

Contamination in the main part of the Facility originated from the Valero Refinery (formerly Coastal Refinery) and migrated in the 1st and 2nd water bearing zones (WBZs) onto the Facility. The composition of the main plume is primarily benzene. Contamination in the Pipeline Corridor originates from two sources: (1) the same lateral migration from the Valero refinery site and (2) subsurface leaks from the pipelines. Although the two plumes are comingled, the northern extent of the plume, specifically along the pipeline corridor is mostly diesel and other refined products. Therefore, these areas have been shown separately in the CSM flow charts to better depict the differences.

The CSM indicates the following:

- The primary contaminated areas/media are:
  - Light non-aqueous phase liquid (LNAPL) in the 1st WBZ;
  - Dissolved phase contamination in the 1st WBZ;
  - Dissolved phase contamination in the 2nd WBZ;
  - Seeps in the R4 Seep Area; and
  - Stained soil near the pipeline corridor.

- Groundwater contaminated above the Preliminary Remediation Goals (PRGs) is not entering the Corpus Christ Inner Harbor (CCIH) Ship Channel.
- The 2nd WBZ does not appear to be hydraulically connected to the CCIH Ship Channel.
- The 3rd WBZ does not appear to be contaminated above PRGs.
- Near surface LNAPL historically has caused seeps near R4.
- Near surface LNAPL historically has caused stained soil near the pipeline corridor.
- LNAPL is being controlled at the Facility boundaries so that no new LNAPL is migrating onto the Facility.
- Subsurface pipeline leaks have contributed to the contamination in the pipeline corridor area.
- Soil vapor is a potential migration pathway.

The CSM will be updated as new information is developed.

CONCEPTUAL SITE MODEL PROFILES

Facility Profile

- Facility structures include:
  - Numerous buildings, nine of which are occupied and are within the footprint of the light non-aqueous phase liquid (LNAPL) and groundwater plume
  - Pipelines (below ground and aboveground)
  - Underground public utility lines (storm water, electric, water, etc.)
  - Aboveground storage tanks at south end of property
  - Rail lines throughout facility property
  - Surface drains present within the chromium process areas
- Adjacent property is Valero Refinery which is located upgradient and has been operated by various companies since 1944.
- Historic operations at the site include manufacturing sodium chromate and sodium dichromate using high lime processes.
- Current operations include manufacturing chromate using no lime.

Land Use and Exposure Profile

- Facility and adjacent properties are commercial/industrial.
- Groundwater in the 1st water bearing zone (WBZ) was designated Class III based on total dissolved solids (TDS) meaning the water is not usable for drinking.
- There are no known water wells within 0.5 miles of the facility.
- Drinking water is supplied by the City of Corpus Christi. The City gets its water from surface water 40 miles upgradient.
- A wetland is present just north (downgradient) of the current known extent of the LNAPL and groundwater plume.
- There are nine occupied buildings (including facilities, break room, offices, production buildings, etc.) within the footprint of the groundwater plume.
- There are no residential structures or land uses.
- There is indication that there is no connectivity between the 2nd WBZ and the Corpus Christi Inner Harbor (CCIH) Ship Channel. Additionally, measured concentrations of constituents of potential concern (COPCs) in the 2nd WBZ directly upgradient of the CCIH Ship Channel in the Interim Measures (IM) Area are below groundwater Preliminary Remediation Goals (PRGs).
- Fishing and other recreational activities are not allowed in the CCIH Ship Channel; however, the CCIH Ship Channel does empty into the Corpus Christi Bay approximately 2.5 miles to the east.

Ecological Profile

- A wetland is present just north (downgradient) of the current extent of the groundwater plume.

- Product and groundwater seeps attributable to a diesel source have been observed in the area of the wetland.
- Animal tracks have been observed in the vicinity of the R4 seep in the wetland area.
- Potential ecological receptors (e.g., birds, fish, reptiles, mammals, and worms) are present.
- Estimated 60% of the facility is covered with asphalt and/or compacted caliche and gravel and partially occupied by buildings and chromium process structures. Rail lines are also present on the facility.
- Estimated 40% of the facility is covered with grasses and/or scrub vegetation.
- A 4-foot wide concrete channel (flume) containing 3-4 feet of cooling water year round is located between the bluff and the harbor.
- Primary COPCs are hydrocarbons; however, semivolatile organic compounds (SVOCs), cyanide, and sulfide are included in the COPC list (Skinner List, excluding methyl tertiary butyl ether (MTBE) and metals).
- Surface soil samples collected along the bluff and at the R4 seep location indicate levels of volatile organic compounds (VOCs) below Texas Benchmark soil values, but cyanide was detected at one location above the screening value and sulfide was detected above method quantitation limit (MQL) in all samples.
- Samples collected at the R4 seep and below the portion of the elevated pipeline corridor can be attributed to a diesel source.

Physical Profile

- Topography is gently sloping to the north, toward the CCIH Ship Channel.
- An east-west trending bluff is just south of the harbor.
- The bluff is generally covered with scrub vegetation and has an elevation drop of 10-15 feet.
- Natural surface drainage is toward the CCIH Ship Channel which empties into the Corpus Christi Bay 2.5 miles to the east.
- The area north of the bluff (likely including the area along the shoreline) was developed by dredging of bay sediments and deposition of construction and demolition debris.
- Surficial soil is several feet to 15 feet thick and consists mostly of clay with little silt and sand.
- The 1st WBZ is a fine to coarse grained sand aquifer that is approximately 10 to 30 feet thick.
- There is evidence of channeling within the 1st WBZ aquifer.
- The upper aquitard (between 1st and 2nd WBZ) ranges from 20 to 40 feet thick and consists of clay and silt with thin layers of fine sand.
- The 2nd WBZ is 10 to 15 feet thick and consists of very fine to medium sand with some silt and clay.
- Evidence indicates that there is no connection between the 2nd WBZ and the CCIH Ship Channel.
- Measured concentrations of COPCs in the 2nd WBZ directly upgradient of the CCIH Ship Channel in the IM Area are below groundwater PRGs.

- The groundwater plumes have been laterally delineated with the exception of the pipeline corridor area, west of R4 and the wetland.
- Hydraulic conductivities of the 1st WBZ in the IM Area (based on slug tests) range from 7.9×10^{-5} to 5.6×10^{-4} feet per second (ft/sec).
- Hydraulic conductivities of the 2nd WBZ in the IM Area (based on slug tests from 2 wells) were 3.8×10^{-5} and 1.0×10^{-4} ft/sec.
- Groundwater flow directions for both the 1st and 2nd WBZ are generally toward the CCIH Ship Channel to the north-northeast.

Release Profile

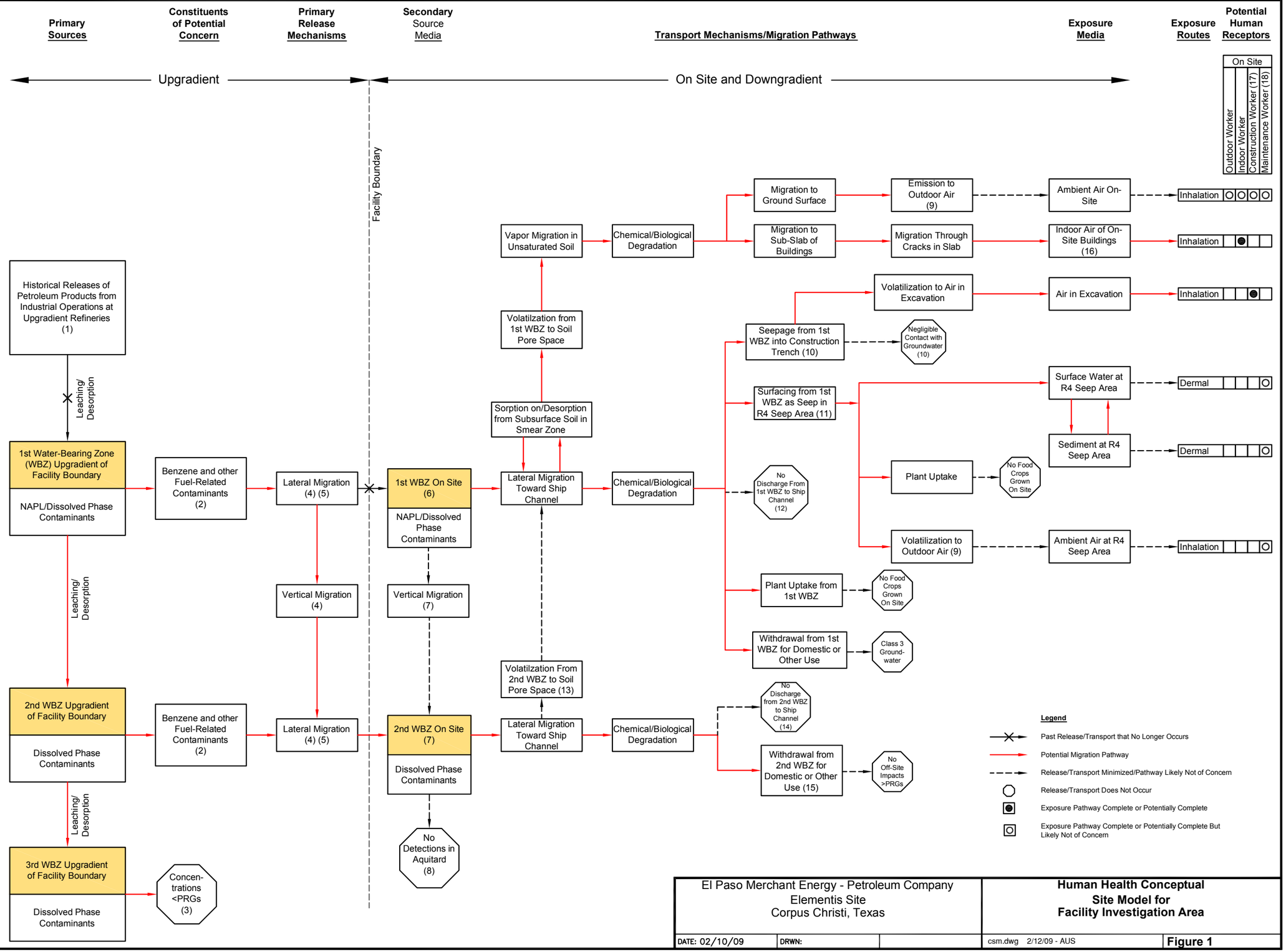
- Potential sources of contamination are historical releases from industrial operations of the upgradient refineries (Valero, Williams [formerly Amareda Hess]) and pipelines which are present on the facility property and extend from the southern end of the facility to the CCIH shipping docks north of the site.
- A release of petroleum products from the piping/distribution system and/or tanks at Valero Refinery was documented in January 1982. (Affected Property Assessment Report [APAR], 2008) Additional releases are noted in the Administrative Order on Consent (AOC).
- Primary COPCs are hydrocarbons; however, the COPC list includes SVOCs, cyanide, and sulfide (Skinner List, excluding MTBE and metals).
- Product material collected from EPZ03 and P-3 in the south-central portion of the IM Area indicates a benzene-rich source.
- Product material collected from EW1 and EPZ-12 located west-southwest of the IM Area adjacent to the pipeline corridor indicate a benzene-rich source but also has a diesel contribution.
- Product material collected at the R4 Seep, below the elevated portion of the pipeline corridor west of R4, and from sumps to the west of the corridor can be primarily attributed to a diesel source.
- Product material collected further north along the pipeline corridor appears to be highly weathered crude oil.
- Only benzene and several SVOCs exceed PRGs in the IM Area (adjacent to the harbor).
- A containment system (series of recovery wells) is in place along the boundary of the adjacent upgradient Valero property.
- The 1st and 2nd WBZ have been delineated laterally.
- The 3rd WBZ has not been sampled on the facility; however, the 3rd WBZ has been sampled on the adjacent upgradient Valero property near the boundary. Although the entire COPC list was not analyzed, results were below PRGs for all COPCs analyzed.
- The aquitard between the 2nd and 3rd WBZ was sampled and there were no detections of COPCs.

Risk Management Profile

- Risks include human and ecological exposure.
- A cofferdam barrier and LNAPL recovery trench was installed in 1971 along the shoreline to stop periodic releases of LNAPL into the CCIH Ship Channel.
- The containment system has been upgraded over the years to include a series of LNAPL and groundwater recovery wells and trenches along the shoreline upgradient of the Cofferdam are operating to control migration of product and COPCs into the harbor.
- U.S. Environmental Protection Agency (EPA) recently approved an enhanced containment system as part of the IM Implementation Work Plan. This new containment system will be installed by Summer 2009.
- A series of extraction wells along Valero's property boundary are operating to control migration of contamination from the source property.

Notes:

1. Historical releases of petroleum products from industrial operations at upgradient refineries have occurred. For example, a release of petroleum products from the piping/distribution system and/or tanks at the Valero Refinery was documented in January 1982. This and other historical upgradient releases are not on-going; they no longer occur.
2. Primary Constituents of Potential Concern (COPCs) are benzene and other fuel-related hydrocarbons; however, the COPC list also includes semi-volatile organic compounds (SVOCs), cyanide, and sulfide. Only benzene and several SVOCs exceed PRGs in the Interim Measures (IM) Area (adjacent to the ship channel) in the 1st Water Bearing Zone (WBZ) .
3. The 3rd WBZ has been sampled on the adjacent upgradient Valero property at the fence line. Benzene results were less than PRGs. However, the entire COPC list was not analyzed at this well.
4. Transport and fate mechanisms from upgradient locations include contaminant loss through attenuation, volatilization to soil pore space and vapor migration, and potential chemical or biological degradation.
5. A series of extraction wells along Valero's property boundary is operating to control migration of contamination from the source property in the 1st WBZ. Groundwater flow for both the 1st and 2nd WBZs is generally toward the ship channel to the north-northeast.
6. Surficial soil is several feet to 15 feet thick and consists mostly of clay with little silt and sand. The 1st WBZ is a fine to coarse grained sand aquifer that is approximately 10-30 feet thick. There is evidence of channeling within the aquifer.
7. There is no evidence of vertical migration between the 1st and 2nd WBZs on site. The upper aquitard between the 1st and 2nd WBZs ranges from approximately 20-40 feet thick on the facility and consists of clay and silt with thin layers of fine sand. The 2nd WBZ is 10-15 feet thick and consists of very fine to medium sand with some silt and clay.
8. The aquitard between the 2nd and 3rd WBZs was sampled and there were no detections of COPCs.
9. Any emissions to outdoor air from the subsurface are typically quickly diluted and dispersed. Therefore, in comparison to vapor intrusion to indoor air, vapor migration from the subsurface to outdoor air is not an exposure pathway of significant concern.
10. Seepage into a construction trench can occur if the excavation encounters shallow groundwater. This is typically not a pathway of concern at locations where the shallow groundwater is greater than 10 feet below the ground surface. Common construction practices prevent direct contact with water in an excavation; however, inhalation of vapor phase COPCs is a potentially complete pathway of exposure.
11. The R4 Seep Area is located north of where the benzene-rich plume comingles with the weathered diesel plume associated with the pipelines. The source of the R4 seep is not clearly defined.
12. A cofferdam barrier was installed in 1971 along the shoreline to stop periodic releases of contaminated groundwater. A series of light non-aqueous phase liquid (LNAPL) and groundwater recovery wells and trenches along the shoreline upgradient of the cofferdam are operating to control migration of product and dissolved phase contaminants into the ship channel. In addition, an upgraded groundwater/LNAPL containment system will be installed by August 2009.
13. Volatilization to soil pore space from 2nd WBZ is limited by the upper aquitard, which ranges from approximately 20 to 40 feet thick on the facility.
14. Evidence indicates no connection between the 2nd WBZ and the ship channel. Moreover, measured concentrations in the 2nd WBZ close to the ship channel do not exceed approved groundwater PRGs.
15. There are no known wells within 0.5 mile of the facility. Drinking water is supplied by the City of Corpus Christi. The City obtains its water from surface water 40 miles upgradient of the facility.
16. There are 9 occupied buildings within the footprint of the identified plume.
17. Construction worker is assumed to be involved in trenching or excavation to depths down to 10 ft bgs.
18. Maintenance worker is assumed to be involved in activities that require contact with seep water and sediment.



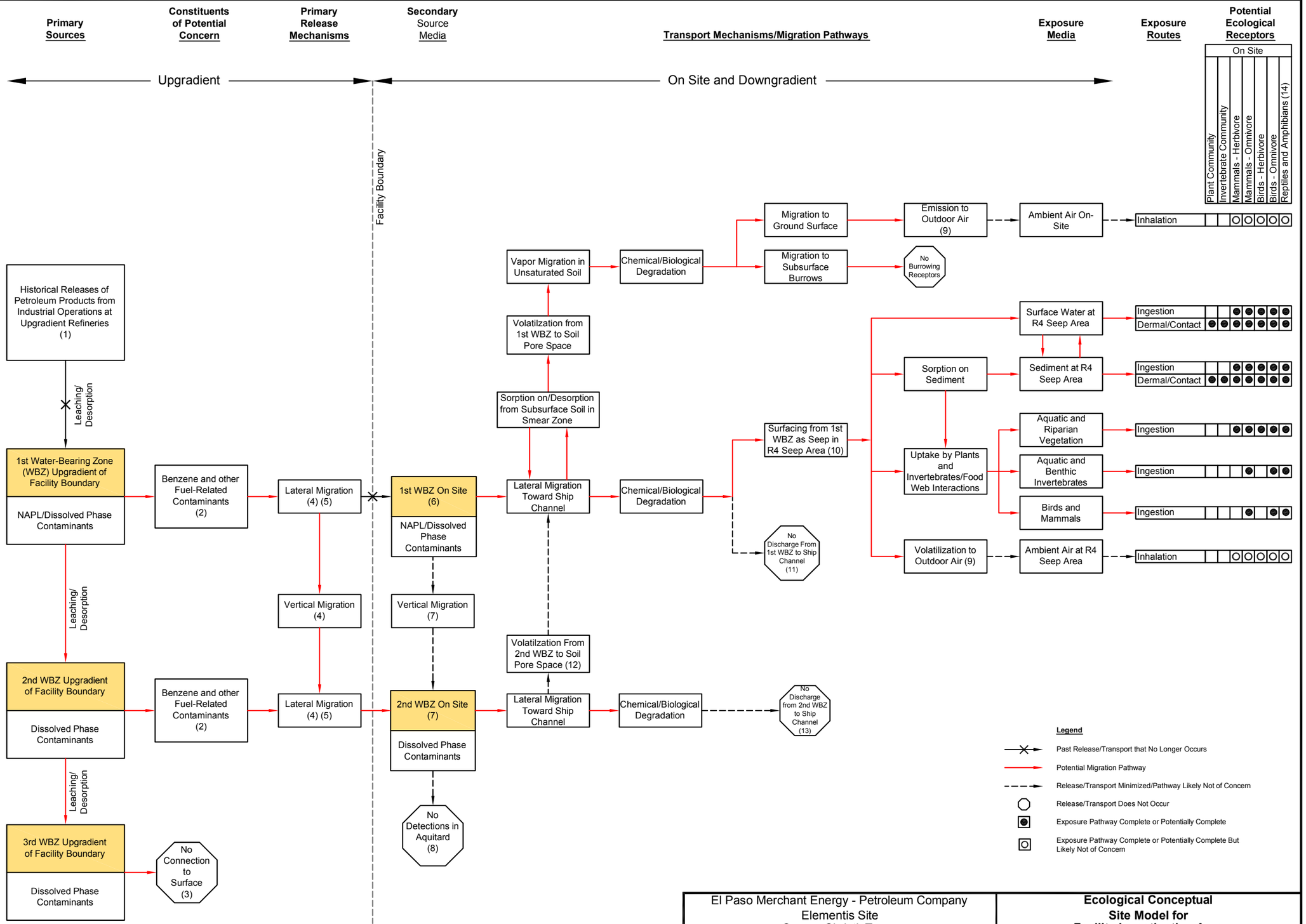
URS Corporation
9400 Amberglen Blvd.
Austin, Texas 78729

El Paso Merchant Energy - Petroleum Company Elementis Site Corpus Christi, Texas			**Human Health Conceptual Site Model for Facility Investigation Area**	
DATE: 02/10/09	DRWN:		csm.dwg 2/12/09 - AUS	**Figure 1**

File: Q:\El Paso Elementis\Drawings-GIS\Facility_Investigation\Addendum\csm.dwg Layout: Fig 1 User: Gary_Callahan Plotted: Feb 12, 2009 - 2:15pm Xref's:

Notes:

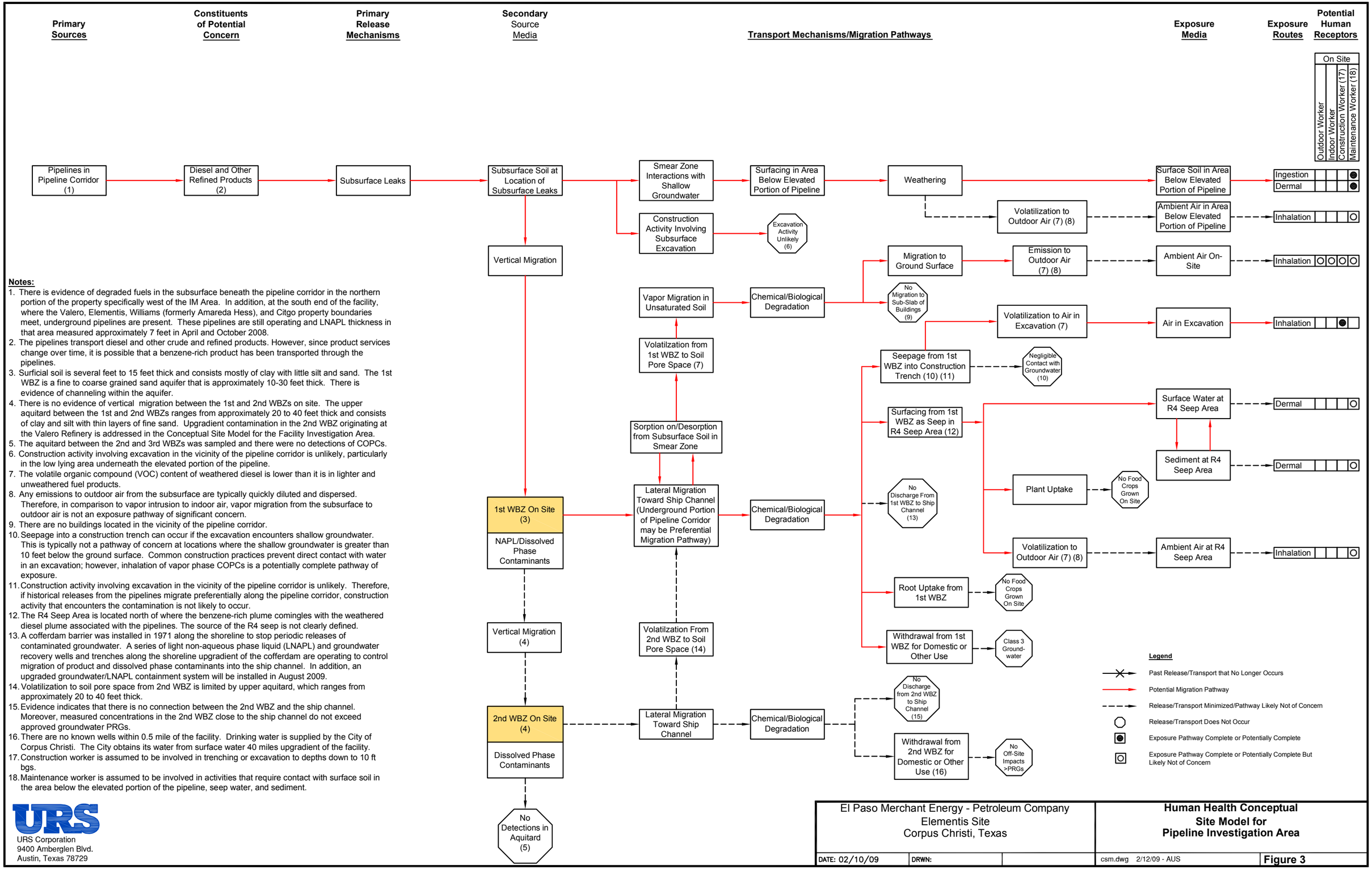
1. Historical releases of petroleum products from industrial operations at upgradient refineries have occurred. For example, a release of petroleum products from the piping/distribution system and/or tanks at the Valero Refinery was documented in January 1982. This and other historical upgradient releases are not on-going; they no longer occur.
2. Primary Constituents of Potential Concern (COPCs) are benzene and other fuel-related hydrocarbons; however, the COPC list also includes semi-volatile organic compounds (SVOCs), cyanide, and sulfide. Only benzene and several SVOCs exceed approved groundwater human health (preliminary remediation goals) PRGs in the Interim Measures (IM) Area (adjacent to the ship channel) in the 1st Water Bearing Zone (WBZ).
3. The 3rd WBZ has been sampled on the adjacent upgradient Valero property at the fence line. Benzene results were less than PRGs. However, the entire COPC list was not analyzed for at this well. Additionally, there is no connection to the surface.
4. Transport and fate mechanisms from upgradient locations include contaminant loss through attenuation, volatilization to soil pore space and vapor migration, and potential chemical or biological degradation.
5. A series of extraction wells along Valero's property boundary is operating to control migration of contamination from the source property in the 1st WBZ. Groundwater flow for both the 1st and 2nd WBZs is generally toward the ship channel to the north-northeast.
6. Surficial soil is several feet to 15 feet thick and consists mostly of clay with little silt and sand. The 1st WBZ is a fine to coarse grained sand aquifer that is approximately 10-30 feet thick. There is evidence of channeling within the aquifer.
7. There is no evidence of vertical migration between the 1st and 2nd WBZs on site. The upper aquitard between the 1st and 2nd WBZs ranges from approximately 20-40 feet thick on the facility and consists of clay and silt with thin layers of fine sand. The 2nd WBZ is 10-15 feet thick and consists of very fine to medium sand with some silt and clay.
8. The aquitard between the 2nd and 3rd WBZs was sampled and there were no detections of COPCs.
9. Any emissions to outdoor air from the subsurface are typically quickly diluted and dispersed.Therefore, vapor migration from the subsurface to outdoor air is not an exposure pathway of significant concern.
10. The R4 Seep Area is located north of where the benzene-rich plume comingles with the weathered diesel plume associated with the pipelines. The source of the R4 seep is not clearly defined.
11. A cofferdam barrier was installed in 1971 along the shoreline to stop periodic releases of contaminated groundwater. A series of light non-aqueous phase liquid (LNAPL) and groundwater recovery wells and trenches along the shoreline upgradient of the cofferdam are operating to control migration of product and dissolved phase contaminants into the ship channel. In addition, an upgraded groundwater/LNAPL containment system will be installed by August 2009.
12. Volatilization to soil pore space from 2nd WBZ is limited by the upper aquitard, which ranges from approximately 20 to 40 feet thick on the facility.
13. Evidence indicates no connection between the 2nd WBZ and the ship channel. Moreover, measured concentrations in the 2nd WBZ close to the ship channel do not exceed approved groundwater PRGs.
14. Reptiles and amphibians are represented; however, there is a lack of available toxicity data.



URS Corporation
9400 Amberglen Blvd.
Austin, Texas 78729

El Paso Merchant Energy - Petroleum Company Elementis Site Corpus Christi, Texas			Ecological Conceptual Site Model for Facility Investigation Area	
DATE: 02/10/09	DRWN:		csm.dwg 2/12/09 - AUS	Figure 2

File: Q:\El Paso Elementis\Drawings-GIS\Facility_Investigation\Addendum\csm.dwg Layout: Fig 2 User: Gary_Callahan Plotted: Feb 12, 2009 - 2:15pm Xref's:



Notes:

1. There is evidence of degraded fuels in the subsurface beneath the pipeline corridor in the northern portion of the property specifically west of the IM Area. In addition, at the south end of the facility, where the Valero, Elementis, Williams (formerly Amareda Hess), and Citgo property boundaries meet, underground pipelines are present. These pipelines are still operating and LNAPL thickness in that area measured approximately 7 feet in April and October 2008.
2. The pipelines transport diesel and other crude and refined products. However, since product services change over time, it is possible that a benzene-rich product has been transported through the pipelines.
3. Surficial soil is several feet to 15 feet thick and consists mostly of clay with little silt and sand. The 1st WBZ is a fine to coarse grained sand aquifer that is approximately 10-30 feet thick. There is evidence of channeling within the aquifer.
4. There is no evidence of vertical migration between the 1st and 2nd WBZs on site. The upper aquitard between the 1st and 2nd WBZs ranges from approximately 20 to 40 feet thick and consists of clay and silt with thin layers of fine sand. Upgradient contamination in the 2nd WBZ originating at the Valero Refinery is addressed in the Conceptual Site Model for the Facility Investigation Area.
5. The aquitard between the 2nd and 3rd WBZs was sampled and there were no detections of COPCs.
6. Construction activity involving excavation in the vicinity of the pipeline corridor is unlikely, particularly in the low lying area underneath the elevated portion of the pipeline.
7. The volatile organic compound (VOC) content of weathered diesel is lower than it is in lighter and unweathered fuel products.
8. Any emissions to outdoor air from the subsurface are typically quickly diluted and dispersed. Therefore, in comparison to vapor intrusion to indoor air, vapor migration from the subsurface to outdoor air is not an exposure pathway of significant concern.
9. There are no buildings located in the vicinity of the pipeline corridor.
10. Seepage into a construction trench can occur if the excavation encounters shallow groundwater. This is typically not a pathway of concern at locations where the shallow groundwater is greater than 10 feet below the ground surface. Common construction practices prevent direct contact with water in an excavation; however, inhalation of vapor phase COPCs is a potentially complete pathway of exposure.
11. Construction activity involving excavation in the vicinity of the pipeline corridor is unlikely. Therefore, if historical releases from the pipelines migrate preferentially along the pipeline corridor, construction activity that encounters the contamination is not likely to occur.
12. The R4 Seep Area is located north of where the benzene-rich plume comingles with the weathered diesel plume associated with the pipelines. The source of the R4 seep is not clearly defined.
13. A cofferdam barrier was installed in 1971 along the shoreline to stop periodic releases of contaminated groundwater. A series of light non-aqueous phase liquid (LNAPL) and groundwater recovery wells and trenches along the shoreline upgradient of the cofferdam are operating to control migration of product and dissolved phase contaminants into the ship channel. In addition, an upgraded groundwater/LNAPL containment system will be installed in August 2009.
14. Volatilization to soil pore space from 2nd WBZ is limited by upper aquitard, which ranges from approximately 20 to 40 feet thick.
15. Evidence indicates that there is no connection between the 2nd WBZ and the ship channel. Moreover, measured concentrations in the 2nd WBZ close to the ship channel do not exceed approved groundwater PRGs.
16. There are no known wells within 0.5 mile of the facility. Drinking water is supplied by the City of Corpus Christi. The City obtains its water from surface water 40 miles upgradient of the facility.
17. Construction worker is assumed to be involved in trenching or excavation to depths down to 10 ft bgs.
18. Maintenance worker is assumed to be involved in activities that require contact with surface soil in the area below the elevated portion of the pipeline, seep water, and sediment.

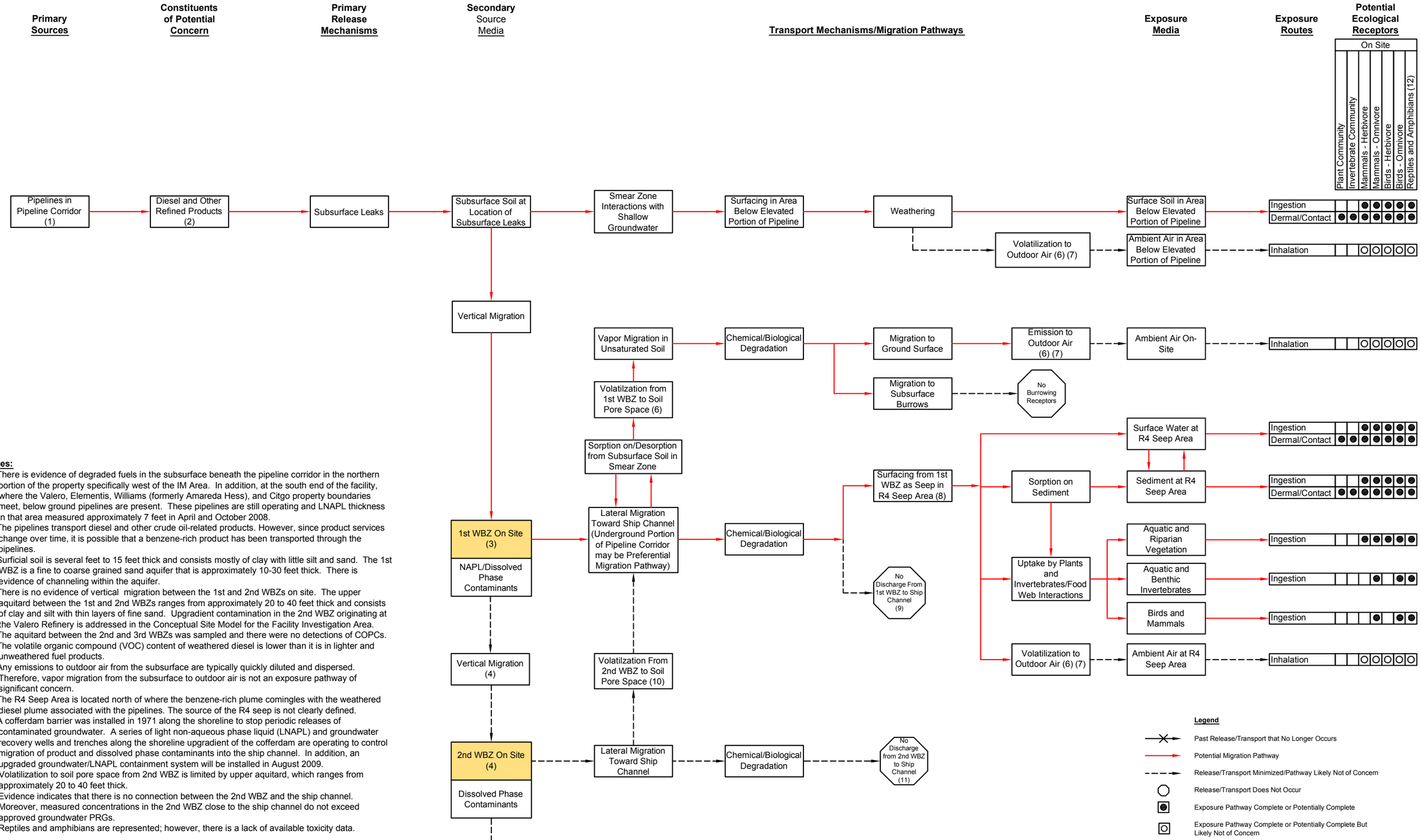
URS Corporation
9400 Amberglen Blvd.
Austin, Texas 78729

El Paso Merchant Energy - Petroleum Company
Elementis Site
Corpus Christi, Texas

Human Health Conceptual Site Model for Pipeline Investigation Area

DATE: 02/10/09 | DRWN: | csm.dwg 2/12/09 - AUS | **Figure 3**

File: Q:\El Paso Elementis\Drawings-GIS\Facility_Investigation\Addendum\csm.dwg Layout: Fig 3 User: Gary_Callahan Plotted: Feb 12, 2009 - 2:15pm Xref's:



Notes:

1. There is evidence of degraded fuels in the subsurface beneath the pipeline corridor in the northern portion of the property specifically west of the IM Area. In addition, at the south end of the facility, where the Valero, Elementis, Williams (formerly Amareda Hess), and Citgo property boundaries meet, below ground pipelines are present. These pipelines are still operating and LNAPL thickness in that area measured approximately 7 feet in April and October 2008.
2. The pipelines transport diesel and other crude oil-related products. However, since product services change over time, it is possible that a benzene-rich product has been transported through the pipelines.
3. Surficial soil is several feet to 15 feet thick and consists mostly of clay with little silt and sand. The 1st WBZ is a fine to coarse grained sand aquifer that is approximately 10-30 feet thick. There is evidence of channeling within the aquifer.
4. There is no evidence of vertical migration between the 1st and 2nd WBZs on site. The upper aquitard between the 1st and 2nd WBZs ranges from approximately 20 to 40 feet thick and consists of clay and silt with thin layers of fine sand. Upgradient contamination in the 2nd WBZ originating at the Valero Refinery is addressed in the Conceptual Site Model for the Facility Investigation Area.
5. The aquitard between the 2nd and 3rd WBZs was sampled and there were no detections of COPCs.
6. The volatile organic compound (VOC) content of weathered diesel is lower than it is in lighter and unweathered fuel products.
7. Any emissions to outdoor air from the subsurface are typically quickly diluted and dispersed. Therefore, vapor migration from the subsurface to outdoor air is not an exposure pathway of significant concern.
8. The R4 Seep Area is located north of where the benzene-rich plume comingles with the weathered diesel plume associated with the pipelines. The source of the R4 seep is not clearly defined.
9. A cofferdam barrier was installed in 1971 along the shoreline to stop periodic releases of contaminated groundwater. A series of light non-aqueous phase liquid (LNAPL) and groundwater recovery wells and trenches along the shoreline upgradient of the cofferdam are operating to control migration of product and dissolved phase contaminants into the ship channel. In addition, an upgraded groundwater/LNAPL containment system will be installed in August 2009.
10. Volatilization to soil pore space from 2nd WBZ is limited by upper aquitard, which ranges from approximately 20 to 40 feet thick.
11. Evidence indicates that there is no connection between the 2nd WBZ and the ship channel. Moreover, measured concentrations in the 2nd WBZ close to the ship channel do not exceed approved groundwater PRGs.
12. Reptiles and amphibians are represented; however, there is a lack of available toxicity data.

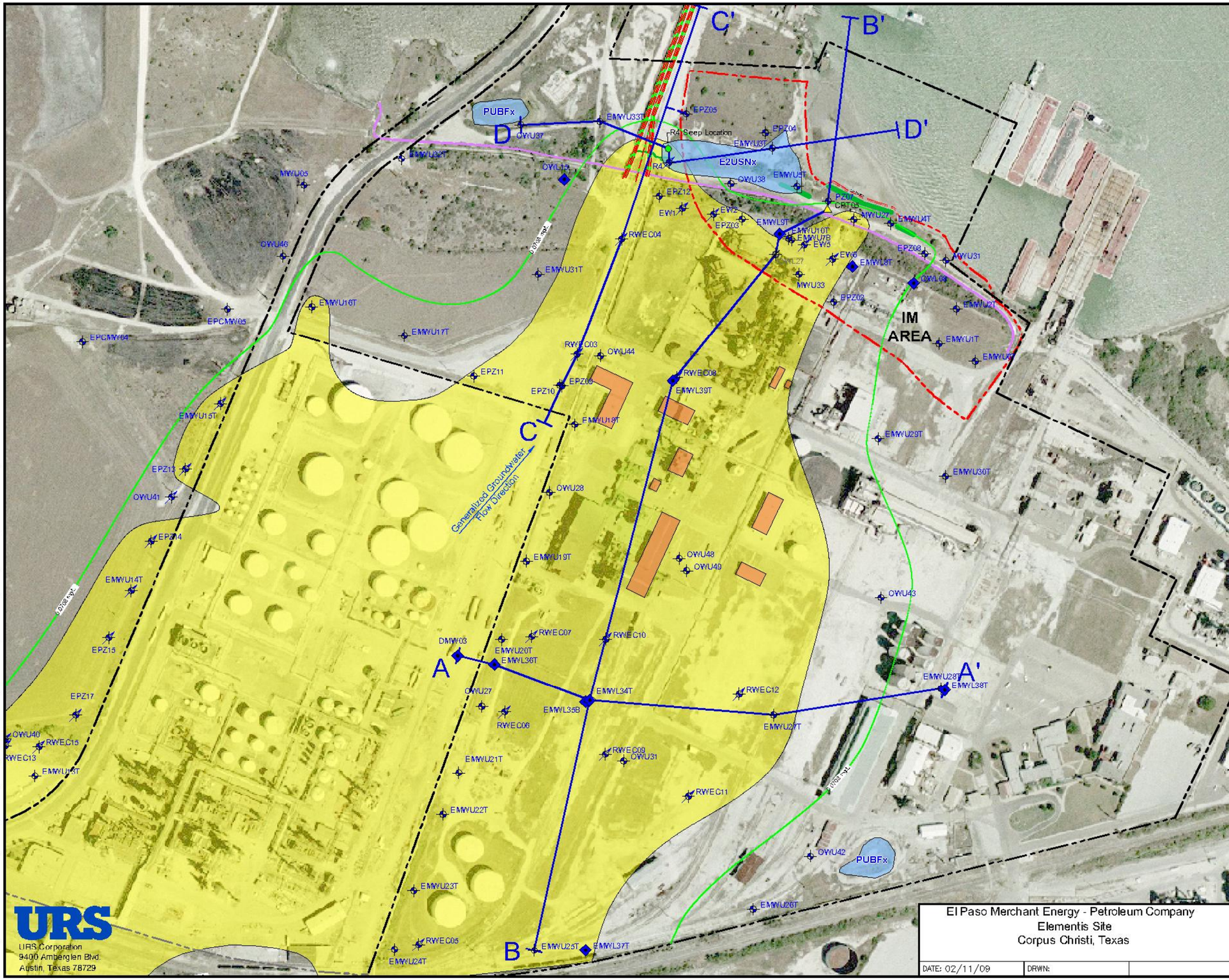
URS Corporation
9400 Amberglen Blvd.
Austin, Texas 78729

El Paso Merchant Energy - Petroleum Company
Elementis Site
Corpus Christi, Texas

Ecological Conceptual Site Model for Pipeline Investigation Area

DATE: 02/10/09 | DRWN: | csm.dwg 2/12/09 - AUS | **Figure 4**

File: Q:\El Paso Elementis\Drawings-GIS\Facility_Investigation\Addendum\csm.dwg Layout: Fig 4 User: Gary_Callahan Plotted: Feb 12, 2009 - 2:15pm Xref's:



Legend

- Elementis Property Boundary
- IM Area
- Recovery Trench
- Flume
- Monitoring Well Location (1st WBZ)
- Plugged and Abandoned Monitoring Well Location
- Monitoring Well Location (Deeper WBZ)
- Recovery Well Location
- R4 Seep Location
- Benzene Contour
- LNAPL
- Wetland
- Occupied Building

Notes:

1. *Contours inferred between well locations.*
2. *Dissolved phase extent includes 1st WBZ and 2nd WBZ.*
3. *Wetland locations and boundaries obtained from USFWS (www.nwi.fws.gov).*
4. *Benzene PRG = 0.0708 mg/L*

El Paso Merchant Energy - Petroleum Company
Elementis Site
Corpus Christi, Texas

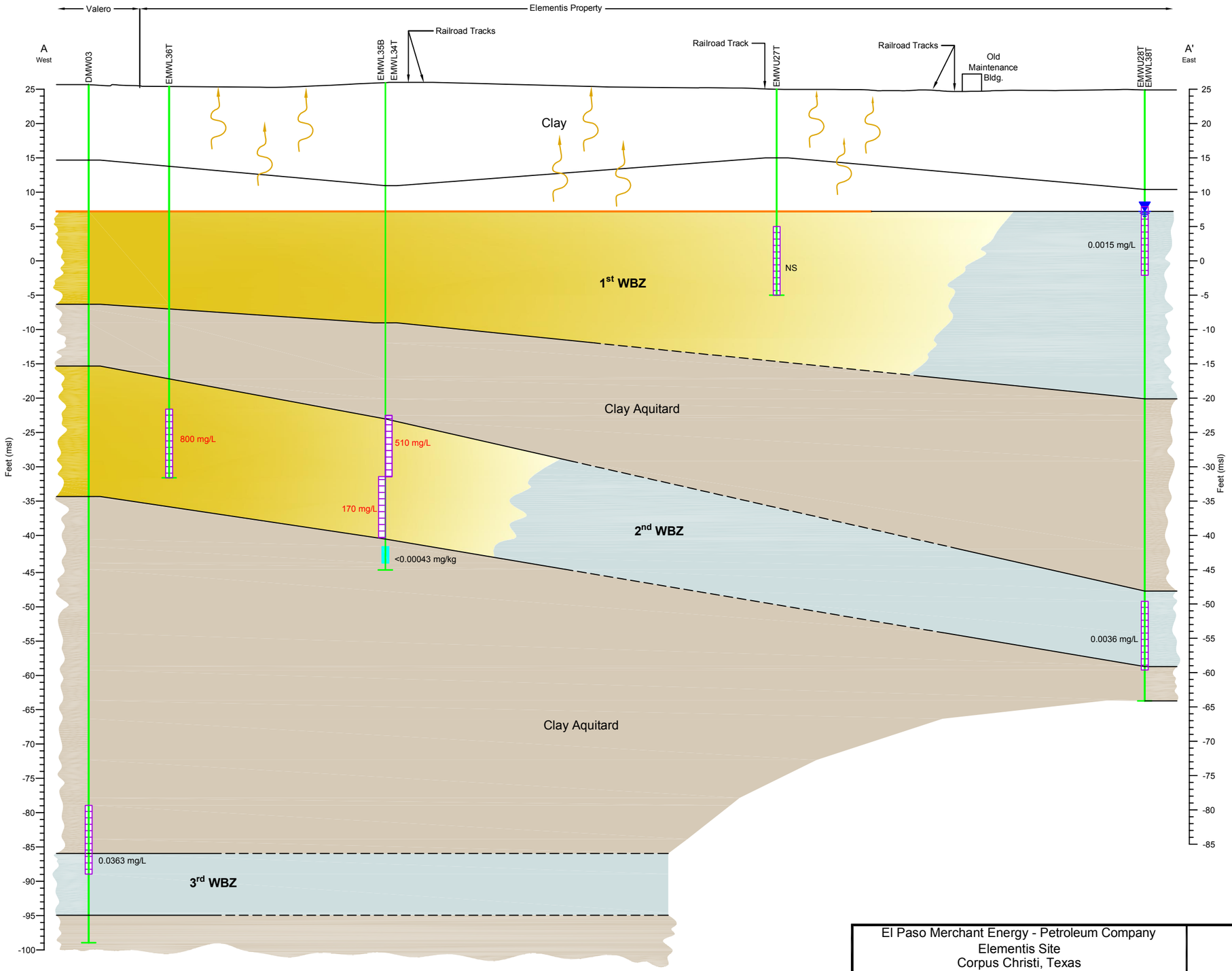
DATE: 02/11/09 | DRWN:

Elementis Facility Overview

Xsects.dwg 2/12/09 - AUS

Figure 5

File: Q:\El Paso Elementis\Drawings-GIS\Facility_Investigation\Addendum\Xsects.dwg Layout: Fig 5 User: Gary_Callahan Plotted: Feb 12, 2009 - 12:21pm Xref's:



Legend

- Water Bearing Zone (Estimated From Geologic Logs)
- Groundwater with COCs Above PRGs
- Clay Aquitard
- Estimated Hydrostratigraphic contact lines (dashed where inferred)
- LNAPL
- 0.0044 mg/L <0.00043 mg/kg — Benzene Concentration (Most Recent Result)
- Soil Vapor
- Screened Interval
- Soil Sample Interval

Notes:

1. *Locations of cross-sections are shown on Figure 5.*
2. *Subsurface conditions are known only at borings; hydrostratigraphic contacts are extrapolated between borings.*
3. *Only those contacts having hydrogeologic significance are shown. Generalized descriptions are based on the predominant lithology encountered in each stratigraphic unit.*
4. *Benzene PRG = 0.0708 mg/L.*
5. *Groundwater flow direction in the 1st and 2nd WBZs is to the north-northeast.*
4. *WBZ = water bearing zone.*
5. *NS = not sampled because LNAPL was present.*

Conceptual Site Model:

1. *Source of contamination in 1st and 2nd WBZs migrated from the Valero property.*
2. *No evidence of vertical migration between 2nd and 3rd WBZs on the Elementis property.*
3. *No COPC concentrations > PRGs in 3rd WBZ.*
4. *Soil vapor is a potential migration pathway.*

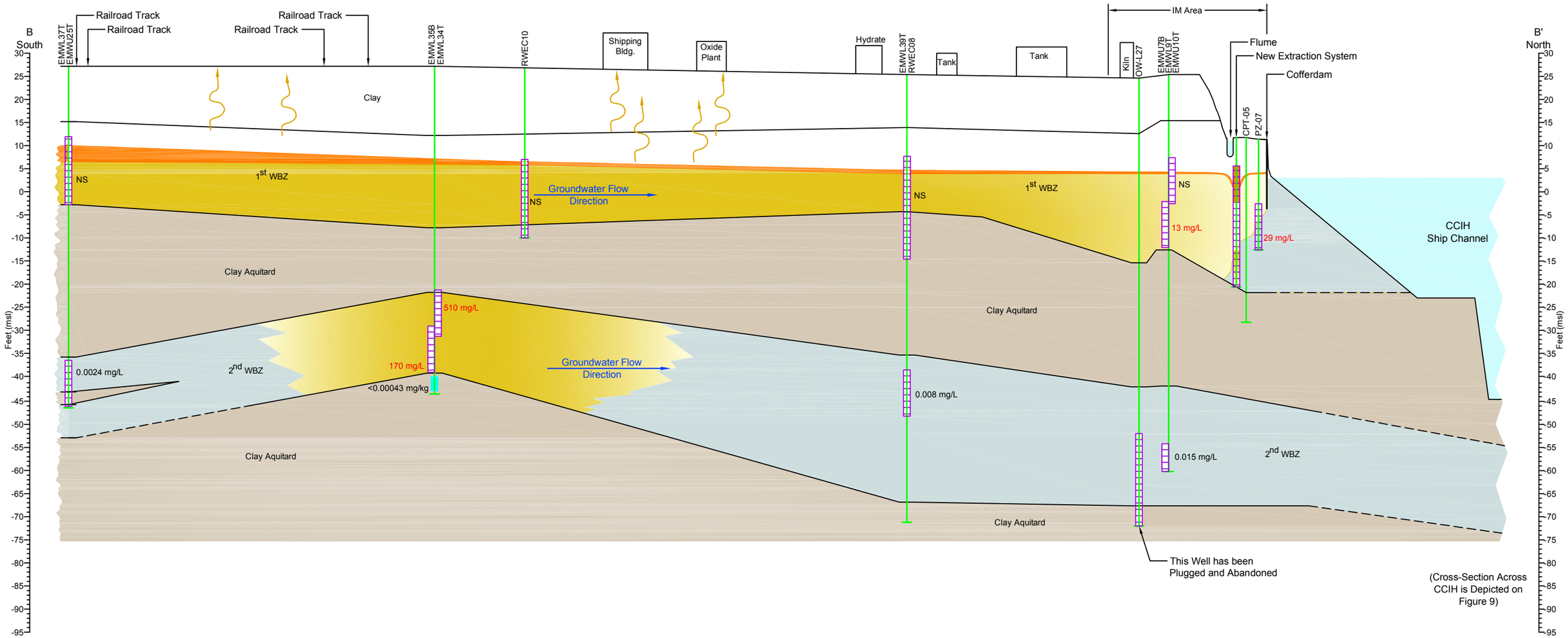
75 0 150

Horizontal Scale in Feet
Vertical Exaggeration = X10

URS Corporation
9400 Amberglen Blvd.
Austin, Texas 78729

El Paso Merchant Energy - Petroleum Company Elementis Site Corpus Christi, Texas			**Hydrogeologic Cross-Section A-A'**	
DATE:	DRWN:		Xsects.dwg 2/12/09 - AUS	**Figure 6**

File: Q:\El Paso Elementis\Drawings-GIS\Facility_Investigation\Addendum\Xsects.dwg Layout: Fig 6 User: Gary_Callahan Plotted: Feb 12, 2009 - 12:11pm Xref's:



Legend

- Water Bearing Zone (Estimated From Geologic Logs)
- Groundwater with COCs Above PRGs
- Clay Aquitard
- Estimated Hydrostratigraphic contact lines (dashed where inferred)
- LNAPL
- 0.0044 mg/L <0.00043 mg/kg — Benzene Concentration (Most Recent Result)
- Soil Vapor
- Screened Interval
- Soil Sample Interval

Notes:

1. *Locations of cross-sections are shown on Figure 5.*
2. *Subsurface conditions are known only at borings; hydrostratigraphic contacts are extrapolated between borings.*
3. *Only those contacts having hydrogeologic significance are shown. Generalized descriptions are based on the predominant lithology encountered in each stratigraphic unit.*
4. *Benzene PRG = 0.0708 mg/L.*
5. *No well was installed at CPT-05.*
6. *WBZ = water bearing zone.*
7. *NS = not sampled because LNAPL was present.*
8. *CCIH = Corpus Christi Inner Harbor (Avery Point)*

Conceptual Site Model:

1. *There is no migration pathway between the 1st WBZ and the CCIH.*
2. *There is limited contamination in the 2nd WBZ.*
3. *There is no connection between the 2nd WBZ and the CCIH.*
4. *2nd WBZ wells nearest the CCIH harbor have concentrations below PRGs.*
5. *Soil vapor is a potential migration pathway.*
6. *New extraction system will consist of a series of fully penetrating dual-phase extraction wells.*

110 0 220

Horizontal Scale in Feet
Vertcal Exaggeration = X10

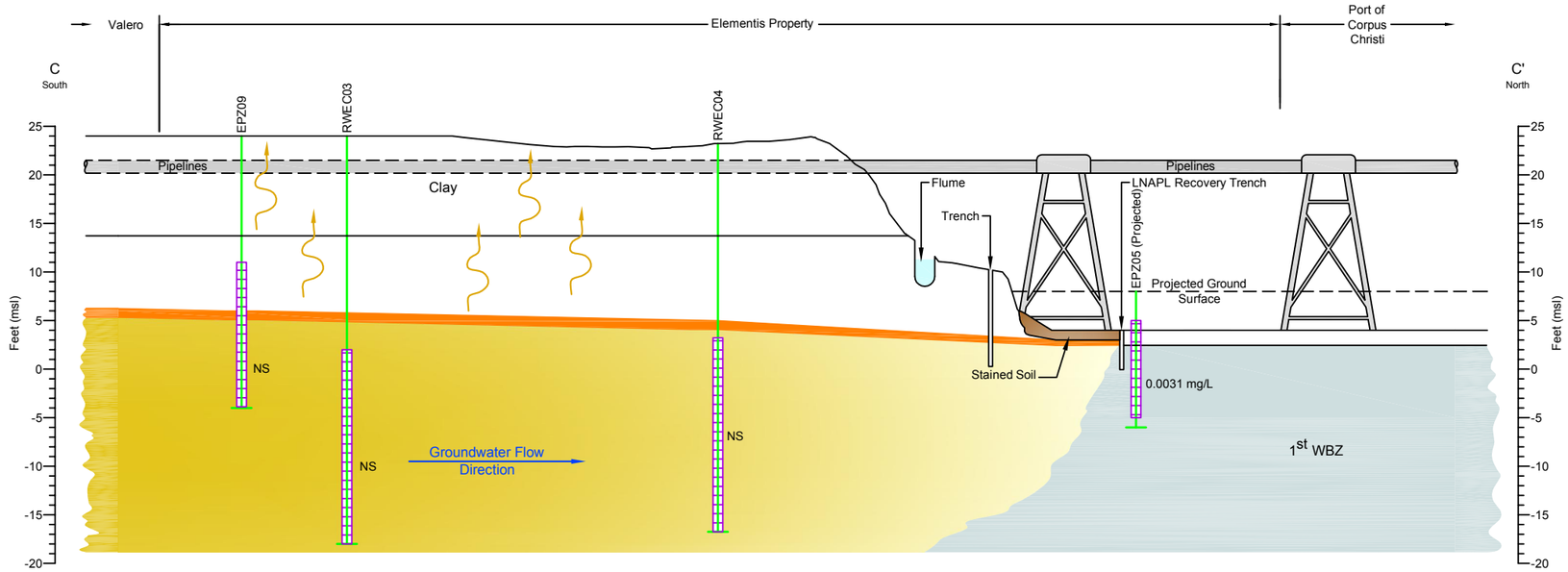
URS Corporation
9400 Amberglen Blvd.
Austin, Texas 78729

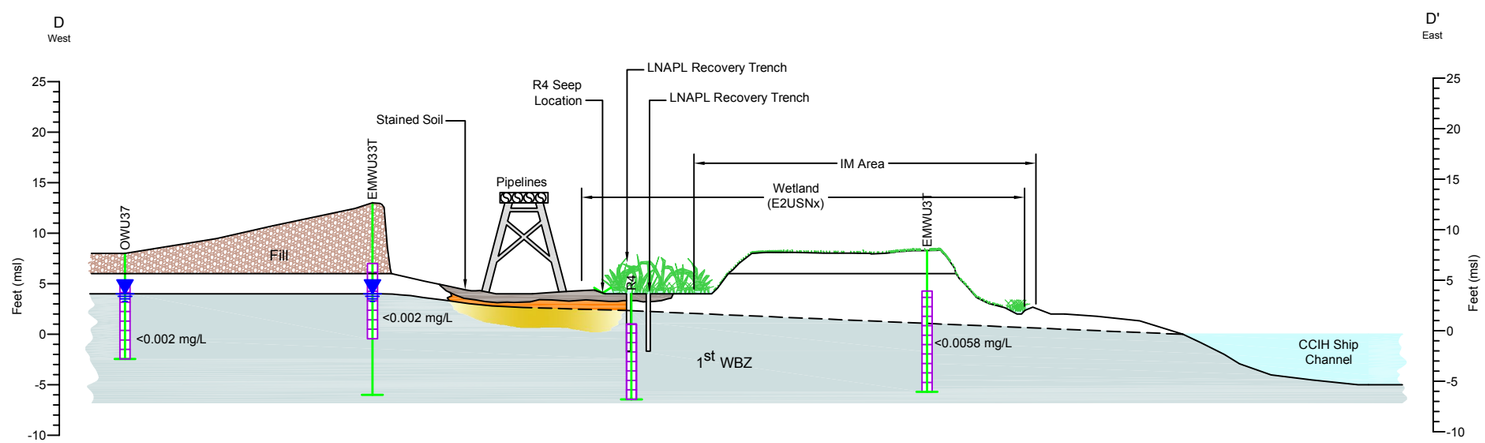
El Paso Merchant Energy - Petroleum Company
Elementis Site
Corpus Christi, Texas

Hydrogeologic Cross-Section B-B'

DATE: 02/11/09 | DRWN: | Xsects.dwg 2/12/09 - AUS | **Figure 7**

File: Q:\El Paso Elementis\Drawings-GIS\Facility_Investigation\Addendum\Xsects.dwg Layout: Fig 7 User: Gary_Callahan Plotted: Feb 12, 2009 - 1:14pm Xref's:





Legend

- Water Bearing Zone (Estimated From Geologic Logs)
- Groundwater with COCs Above PRGs
- Clay Aquitard
- Estimated Hydrostratigraphic contact lines (dashed where inferred)
- LNAPL
- 0.0044 mg/L — Benzene Concentration (Most Recent Result)
- Soil Vapor
- Screened Interval

Notes:

1. *Locations of cross-sections are shown on Figure 5.*
2. *Subsurface conditions are known only at borings; hydrostratigraphic contacts are extrapolated between borings.*
3. *Only those contacts having hydrogeologic significance are shown. Generalized descriptions are based on the predominant lithology encountered in each stratigraphic unit.*
5. *Height of elevated pipelines is estimated.*
6. *WBZ = water bearing zone.*
7. *CCIH = Corpus Christi Inner Harbor (Avery Point).*
8. *NS = not sampled because LNAPL was present.*

Conceptual Site Model

1. *Underground portion of the pipeline is a preferential migration pathway.*
2. *Soil vapor is a potential migration pathway.*
3. *Stained soil is the result of contact with LNAPL and contaminated groundwater.*
4. *Historic seeps have occurred in R4 Seep Area.*
5. *No release of contaminated groundwater to the CCIH.*

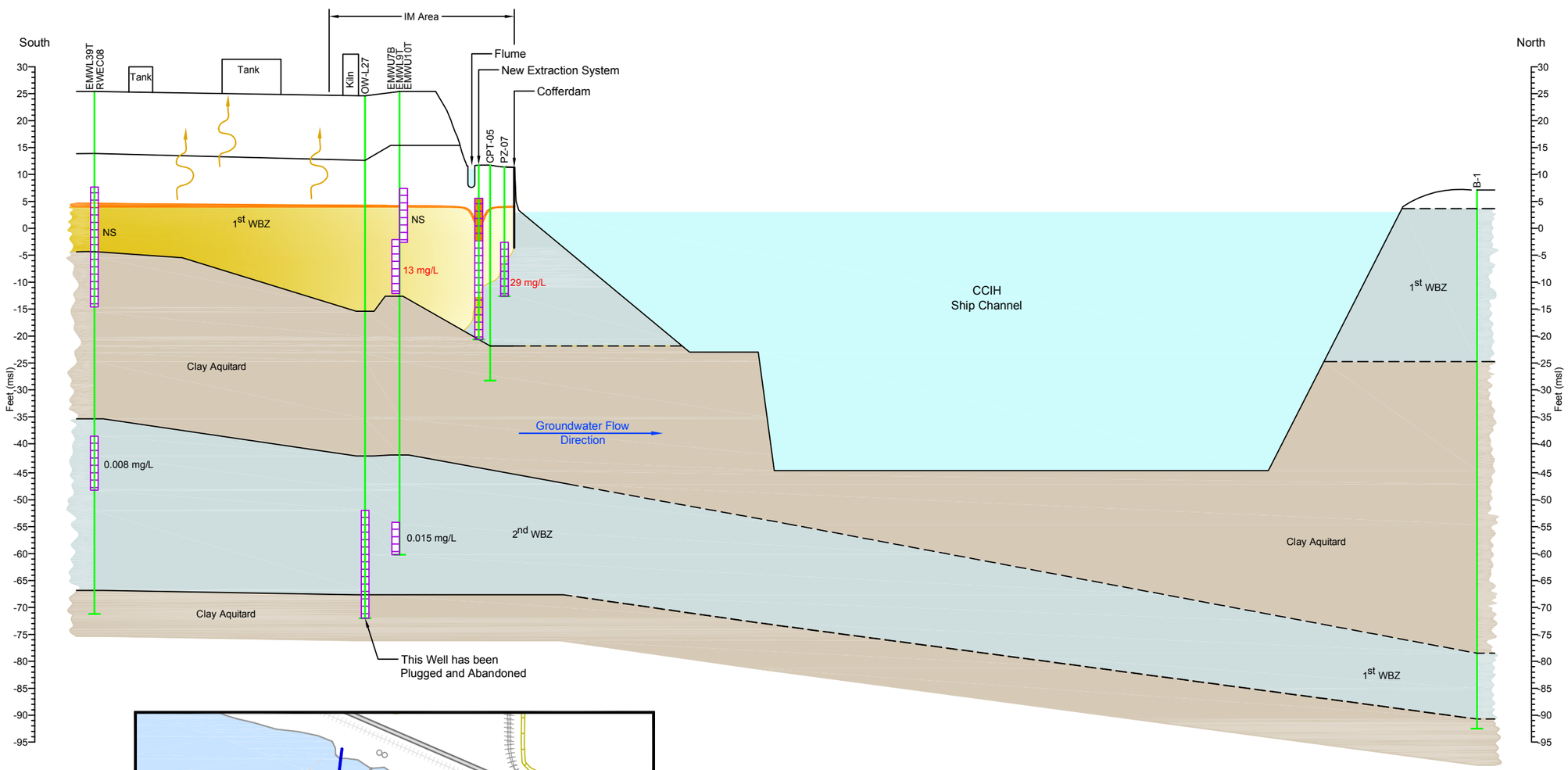
75 0 150

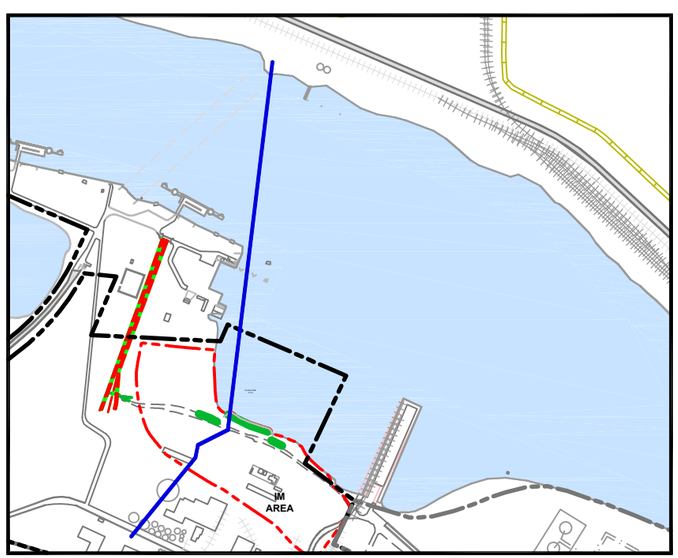
Horizontal Scale in Feet
Vertical Exaggeration = X10

URS Corporation
9400 Amberglen Blvd.
Austin, Texas 78729

El Paso Merchant Energy - Petroleum Company Elementis Site Corpus Christi, Texas			**Hydrogeologic Cross-Section C-C' and D-D'**	
DATE: 02/11/09	DRWN:		Xsects.dwg 2/12/09 - AUS	**Figure 8**

File: Q:\El Paso Elementis\Drawings-GIS\Facility_Investigation\Addendum\Xsects.dwg Layout: Fig 8 User: Gary_Callahan Plotted: Feb 12, 2009 - 1:15pm Xref's:





Legend

- Water Bearing Zone (Estimated From Geologic Logs)
- Groundwater with COCs Above PRGs
- Clay Aquitard
- Estimated Hydrostratigraphic contact lines (dashed where inferred)
- LNAPL
- 0.0044 mg/L — Benzene Concentration (Most Recent Result)
- Soil Vapor
- Screened Interval

Notes:

1. *Subsurface conditions are known only at borings; hydrostratigraphic contacts are extrapolated between borings.*
2. *Only those contacts having hydrogeologic significance are shown. Generalized descriptions are based on the predominant lithology encountered in each stratigraphic unit.*
3. *Benzene PRG = 0.0708 mg/L.*
4. *No well was installed at CPT-05.*
5. *WBZ = water bearing zone.*
6. *NS = not sampled because LNAPL was present.*
7. *CCIH = Corpus Christi Inner Harbor (Avery Point)*

Conceptual Site Model:

1. *There is no migration pathway between the 1st WBZ and the CCIH.*
2. *There is limited contamination in the 2nd WBZ.*
3. *There is no connection between the 2nd WBZ and the CCIH.*
4. *2nd WBZ wells nearest the CCIH harbor have concentrations below PRGs.*
5. *Soil vapor is a potential migration pathway.*
6. *New extraction system will consist of a series of fully penetrating dual-phase extraction wells.*

110 0 220

Horizontal Scale in Feet
Vertical Exaggeration = X10

URS Corporation
9400 Amberglen Blvd.
Austin, Texas 78729

El Paso Merchant Energy - Petroleum Company Elementis Site Corpus Christi, Texas			**Hydrogeologic Cross-Section of CCIH**
DATE: 02/11/09	DRWN:		Xsects.dwg 2/12/09 - AUS **Figure 9**

File: Q:\El Paso Elementis\Drawings-GIS\Facility_Investigation\Addendum\Xsects.dwg Layout: Fig 9 User: Gary_Callahan Plotted: Feb 12, 2009 - 2:06pm Xref's:

Appendix C

Appendix C

Data Quality Objectives (DQOs)

Table C-1. DQO Development for the Facility Investigation

Step 1 - State the Problem		
Identify members of the planning team	***El Paso Environmental Manager:***	David Zuvanich, El Paso Energy
	Regulatory Authorities:	Sue Westbrook, U.S. Environmental Protection Agency (EPA) Region 6
	Technical Staff:	URS Corporation
	Stakeholders:	El Paso Energy, Elementis, Valero, EPA
Develop/refine the conceptual site model (CSM)	See attached CSM diagrams and profiles.	
Define potential exposure scenarios	Exposure of ecological receptors due to migration of constituents of potential concern (COPCs) from groundwater to sediment/surface water limited to the R4 Seep Area with no migration to the Corpus Christ Inner Harbor (CCIH) Ship Channel. Exposure of onsite indoor workers due to migration of volatile organic compounds (VOCs) to indoor air. Exposure of construction workers to air in excavations impacted by vapor migration.	
Write brief summary of the contamination problem	A primary source of light non-aqueous phase liquid (LNAPL) contamination is believed to originate from the Coastal Refining & Marketing facility, now the Valero Refinery. The former Coastal East Plant North is hydrogeologically upgradient and directly adjacent to the Elementis Chromium, L.P. (Elementis) facility. LNAPL and dissolved phase constituents currently extend across the Elementis facility between the refinery and the CCIH Ship Channel. LNAPL thickness measured in wells across the facility ranges from 0 to nearly 7 feet within the 1st water bearing zone (WBZ). Dissolved phase contamination is also present within the 2nd WBZ. The Pipeline Corridor comprised of an estimated 40 pipelines traverses generally north-south through the facility and is known to have transported various types of crude and refined products. Numerous leaks have been observed over the years. There is evidence of degraded fuels in the subsurface beneath the above-ground stretch of the pipeline corridor in the northern portion of the property, specifically west of the Interim Measures (IM) Area.	

Specify available resources and constraints	The goal is to complete the majority of the investigation in the initial phases. As per the Administrative Order on Consent (AOC), the Facility Investigation (FI) Report and Corrective Measures Study (CMS) Report must be submitted to the EPA within 360 days of the approval of the FI Work Plan. To ensure compliance and cost efficiency, existing and available site data will be reviewed to identify data gaps for both the FI and the CMS and to develop sampling strategies. El Paso will conduct working meetings with the EPA to ensure concurrence for each media sampling strategy prior to the implementation of the field activities. Additional samples will be collected as necessary based on comparison of initial phase results with Preliminary Remediation Goals (PRGs). Constraints may include the operating nature of the facility, accessibility of sampling locations, and availability of information regarding pipeline products and possible leaks.
Step 2 - Identify the Decision	
Identify the principal study question	1. What is the lateral distribution and thickness of LNAPL? 2. What is the lateral and vertical distribution of dissolved phase COPCs in the 1st and 2nd WBZs? 2a. Has the 3rd WBZ been impacted? 3. Is vapor intrusion in occupied buildings a pathway of concern? 4. Are COPC concentrations in sediment and surface water in the R4 Seep Area of concern to human or ecological receptors? 5. Are COPC concentrations in surface soil below the elevated portion of the pipeline of concern to human and ecological receptors?
Define decision statement	Determine the variations in LNAPL thickness across the site and where contaminant concentrations exceed PRGs. Determine whether site contamination poses an unacceptable risk to human health and the environment and requires further investigation and/or corrective action. Determine what areas require further consideration and response action.
Step 3 - Identify Inputs to the Decision	
Develop CSM	See attached human health and ecological CSM diagrams.
Define COPCs	Known site contaminants include petroleum products. The analyte list includes organic analytes on the Skinner List (excluding methyl tertiary butyl ether [MTBE]). The list is presented in the AOC and was modified in the letter to Sue Westbrook, EPA, on January 8, 2007.

Define action criteria	For groundwater, the EPA-approved IM PRGs will be used as investigative endpoints for groundwater during the FI. Those values are presented in Table 4-1 of Attachment A to the PRG report approved by the EPA on October 31, 2006. PRGs for surface water, soil, sediment, and soil vapor were developed consistent with available protective, risk-based screening levels applicable to current and reasonably expected future land use scenarios and environmental exposure scenarios consistent with the CSMs. EPA Region 6 resources were utilized for available and appropriate PRG values for site COPCs. When pertinent EPA information was not available, PRGs were developed based on other available resources (e.g., Texas Commission on Environmental Quality [TCEQ] risk-based values).
Confirm appropriate analytical methods exist	The Skinner List presented in the AOC was reviewed with respect to appropriate analytical methods. Several compounds cannot be analyzed by <u>any</u> commercial laboratory in soil or groundwater using standard methods. Additionally, these compounds do not appear on the EPA Region 5 Skinner List. These compounds are: • Bis(chloromethyl)ether (hydrolyzes rapidly in water) • Ethyleneimine (hydrolyzes in water) • Ethylene Oxide (gas under standard temperature and pressure) • Methanethiol (gas under standard temperature and pressure) The lack of standard methods for these compounds was documented in a letter to Sue Westbrook, EPA in January 2007. In addition, current analytical technology will not achieve detection limits as low as the groundwater PRGs for several compounds (primarily polycyclic aromatic hydrocarbons [PAHs]). Therefore, the best available technology has been selected to achieve the lowest detection limits possible using 8270 SIM. Analytical method detection limits (MDLs) were also considered during the development of the soil, sediment, surface water, and soil vapor PRGs.

Step 4 - Define the Boundaries of the Study	
Define strata	• 1st WBZ Groundwater; • 2nd WBZ Groundwater; • 3rd WBZ Groundwater; • Sediment/surface water (limited to the R4 Seep Area, not the CCIH Ship Channel); • Soil (to the water table, estimated to be within 1-foot of the ground surface) where evidence of hydrocarbon surfacing is present in the area below the elevated portion of the pipeline corridor; • Soil vapor underneath occupied on-site buildings located within the footprint of the LNAPL and dissolved phase plumes; and • Indoor air in occupied on-site buildings located within the footprint of the LNAPL and dissolved phase plumes.
Define spatial boundaries (vertical and lateral)	The facility defined by the AOC encompasses the portion of Elementis property east of Cantwell Lane. Specifically, the AOC area is defined as "the area of contamination beyond the Coastal Refinery East Plant-North and extending onto or under the portion of American Chrome and Chemical, LP, (Elementis) property located East of Cantwell Lane and to the CCIH Ship Channel" (AOC, Section I). The definition of the Facility will be expanded to include areas west of Cantwell Lane in the IM Area should investigation indicate that contamination is contiguous extending west of Cantwell Lane in the IM Area. The Facility does not include any portion of the CCIH Ship Channel and the Order does not require El Paso to fully delineate or remediate contamination in the CCIH Ship Channel. (AOC Section I) The spatial boundaries consist of the property line boundaries of the Elementis facility and the surface water boundary of the south shore of the CCIH Ship Channel.

Define spatial boundaries (vertical and lateral) (continued)	Specific boundaries for each media are defined below: *Soil Vapor* – The lateral boundaries will be beneath occupied buildings within the footprint of the LNAPL and dissolved phase plume(s). *Indoor Air* – Occupied buildings within the footprint of the defined LNAPL and groundwater plume extent. *Sediment/Surface Water* – The lateral boundary is an approximately 300-foot by 150-foot area, defined as the R4 Seep Area. Sediment and surface water in the CCIH Ship Channel is not included in this study. *Surface soil* – The lateral boundary is defined as an approximately 200-foot by 200-foot area below the elevated portion of the pipeline corridor west of R4. The vertical boundary is to the water table, estimated at 1 foot below ground surface (bgs). *1st WBZ Groundwater* – The lateral boundary is the Elementis property boundary, Cantwell Lane, and the south shore of the CCIH Ship Channel. The vertical boundary is the lower boundary of the 1st WBZ at the contact of the underlying clay aquitard. *2nd WBZ Groundwater* – The lateral boundary is the Elementis property boundary, Cantwell Lane, and the south shore of the CCIH Ship Channel. The vertical boundary is the lower boundary of the 2nd WBZ at the contact of the underlying clay aquitard. *3rd WBZ Groundwater* - The lateral boundary is the Elementis property boundary, Cantwell Lane, and the south shore of the CCIH Ship Channel. The vertical boundary is the lower boundary of the 3rd WBZ at the contact of the underlying clay aquitard.
Define temporal boundaries	The FI must be completed within a reasonable timeframe to allow sufficient time for evaluation of the data to support preparation and submittal of the LNAPL Upgrade Work Plan to the EPA within 300 days of EPA approval of the FI Work Plan and preparation and submittal of the CMS and FI Reports to EPA within 360 days of approval of the FI Work Plan.
Identify practical constraints	**General Site Constraints** The site is an operating industrial facility, therefore production areas with process equipment and other obstacles may limit sample location options. Underground utilities (e.g., high pressure pipelines, water, sewer, etc.) and aboveground pipelines are present in the study area and will be avoided. Samples will be collected in locations where personnel and field equipment can safely access.

Identify practical constraints (continued)	**<u>Groundwater Wells</u>** <u>*1st WBZ*</u> There is an LNAPL plume and dissolved phase plume in the 1st WBZ across much of the facility. Placement of wells within the 1st WBZ does not represent a significant cross contamination issue. However, these plumes represent a potential cross contamination issue for drilling wells into lower WBZs beneath these plumes even when all reasonable care is taken to prevent the spread of contamination. This cross contamination can occur during the drilling process by unintentionally dragging contamination down from the 1st WBZ into the 2nd WBZ. It can also create a conduit for contaminant migration along the well casing itself if the casing is not properly isolated. Even when taking reasonable care, it is impossible to ensure that the 1st WBZ is completely isolated during the drilling process. The CCIH Ship Channel also represents a practical constraint. Per the AOC, the boundary of this investigation is the surface water boundary of the CCIH Ship Channel. Additionally, there are a number of structures and rubble near the shore that limit how close wells can be drilled to the CCIH Ship Channel. Another potential constraint is the wetland area around recovery well R4. Due to the potential damage to the wetland, El Paso will not install monitoring wells in the wetland area. <u>*2nd WBZ*</u> There have been several wells screened within the 2nd WBZ beneath the LNAPL plume, and a dissolved phase plume has been identified. The existing 2nd WBZ wells identify significant levels of contamination (e.g., 510 milligrams per Liter [mg/L] benzene) in the center of the plume and declining levels to the edge of the plume. However, it is suspected that two of these wells may have introduced contamination into the 2nd WBZ during the drilling process. These wells are at the edge of the plume in the 2nd WBZ and initial samples identified contamination near the PRGs. However, after further development and re-sampling, the contamination levels declined to below the PRGs. Placement of additional 2nd WBZ wells beneath the LNAPL or dissolved phase plume in the 1st WBZ is not recommended due to the cross contamination potential and the potential to provide a conduit for contaminant migration. The CCIH Ship Channel also represents a practical constraint. Per the AOC, the boundary of this investigation is the surface water

Identify practical constraints (continued)	boundary of the CCIH Ship Channel. Additionally, there are a number of structures and rubble near the shore that limit how close wells can be drilled to the CCIH Ship Channel. Another potential constraint is the wetland area around recovery well R4. El Paso will not install monitoring wells in the wetland area. *3rd WBZ* The presence of contamination in the 2nd WBZ would raise the question about whether contamination had migrated vertically into the 3rd WBZ. Drilling through plumes in both the 1st WBZ and 2nd WBZ into a potentially uncontaminated aquifer raises significant opportunities for cross contamination, regardless of the degree of care taken during the drilling process. Current evidence indicates that the 3rd WBZ has not been contaminated. Contamination in the 1st WBZ and 2nd WBZ is believed to have originated on the Valero Refinery site and migrated laterally onto the Elementis site. Valero has a deep well (DMW03) near the Elementis property line that is screened in what El Paso has identified as the 3rd WBZ. The latest sample that Valero collected from this well indicates that concentrations of constituents on Valero's COPC list are below El Paso's respective PRGs. However, Valero's COPC list is not identical to El Paso's COPC list so it is recommended that a sample be collected from this well during the FI and analyzed for El Paso's COPC list to confirm there are no COPC concentrations above the PRGs. In addition, there is no evidence of vertical migration of contamination from either the 1st WBZ to the 2nd WBZ or from the 2nd WBZ to the 3rd WBZ on the Elementis site. During the investigation of the 2nd WBZ, El Paso placed two wells in the center of the plume, one screened at the top of the 2nd WBZ and another screened at the bottom of the 2nd WBZ. The sample from the well at the top of the 2nd WBZ demonstrated benzene concentrations of 510 mg/L while the well screened at the bottom of the 2nd WBZ demonstrated benzene concentrations of 170 mg/L. When the lower well was installed, a soil sample was collected 1-3 feet into the aquitard between the 2nd WBZ and 3rd WBZ. This soil sample was non-detect for all COPCs. Furthermore, at the Valero deep well location, the aquitard between the 2nd and 3rd WBZs is 50 feet thick. El Paso believes that this weight of evidence indicates that the 3rd WBZ has not been impacted and that the risk of cross contamination by placement of wells through two contaminated WBZs into the 3rd WBZ is not warranted.

Step 5 - Develop a Decision Rule	
Specify statistical parameters to be used in decision	Individual groundwater, surface water, and soil sample results will be compared to the appropriate PRGs. Individual sample results for sediment will also be compared to PRGs; however, if an individual sample exceeds a given PRG, a representative concentration (95% upper confidence level [UCL]) will be calculated and compared to PRGs. Soil vapor sample results will be evaluated per building by calculating a weighted average concentration. In addition, if concentrations exceed PRGs , indoor air and ambient air concentrations from each of the buildings will be considered along with any other relevant lines of evidence to evaluate whether the vapor intrusion pathway is complete.
Specify action level for the decision	See attached PRG tables (Appendix E). PRGs for groundwater are those presented in the PRG Report (August, 2006) approved by the EPA (October, 2006). PRGs for sediment, surface water, soil vapor, and indoor air were developed consistent with available protective, risk-based screening levels applicable to current and reasonably expected future land use scenarios and environmental exposure scenarios consistent with the CSM. Available EPA regional screening values obtained from the EPA Region 6 website were used. When pertinent EPA information was not available, PRGs were developed based on other resources (e.g., TCEQ risk-based values).
Develop decision rule	*Rule #1: LNAPL* – The goal is to define the thickness and lateral extent of LNAPL. Initially, piezometers and/or monitoring wells will be installed to determine the presence and thickness of LNAPL based on the existing rapid optical screening technology (ROST) and direct push technology (DPT) screening data. If LNAPL is detected, a step-out piezometer or monitoring well will be installed. The lateral extent will be defined when LNAPL is determined to be “non-detect” as measured by an oil/water interface probe.

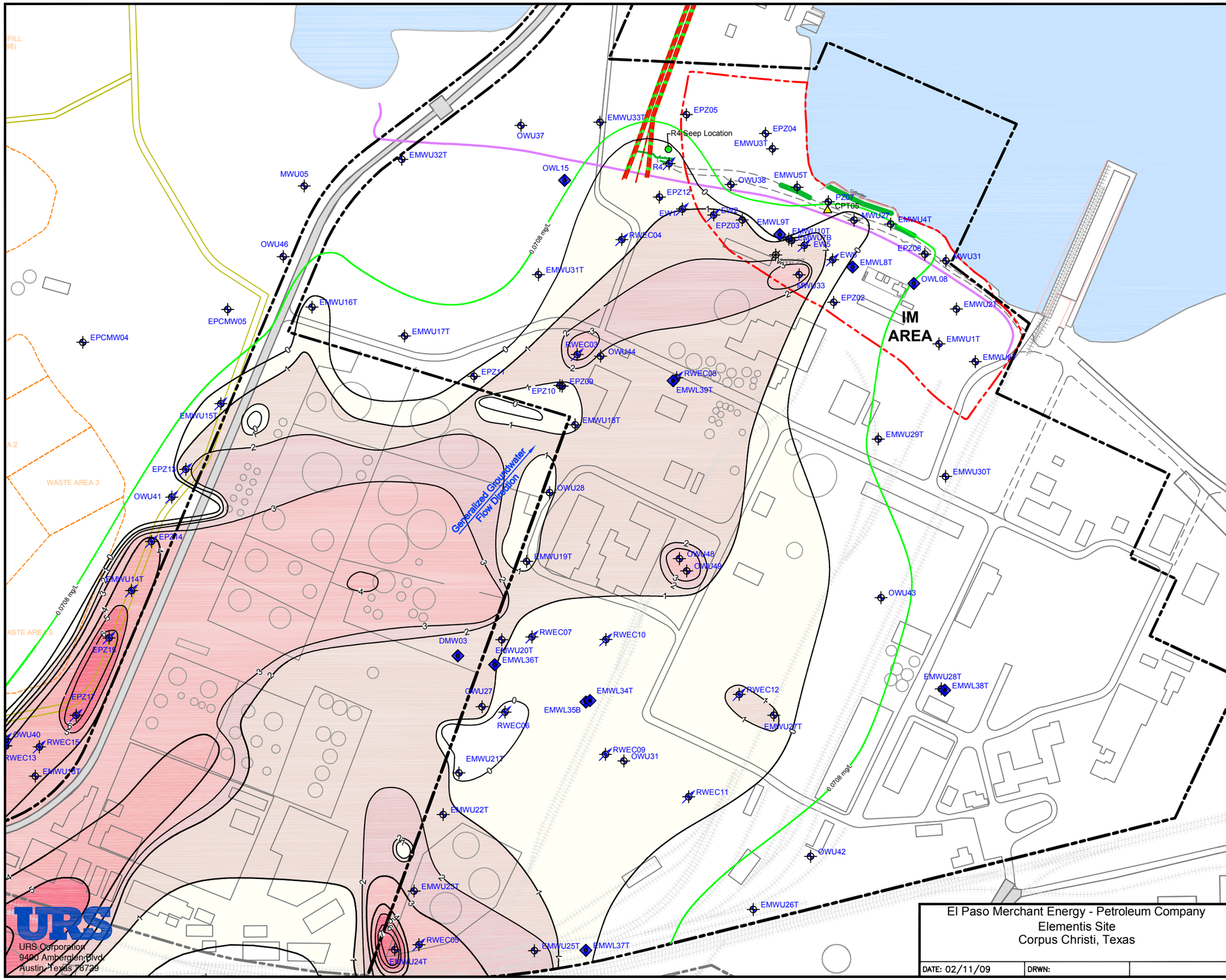
Develop decision rule (continued)	*Rule #2: Groundwater* - 1st WBZ Lateral Extent – The goals are to define the lateral extent of contamination above the PRGs and illustrate decreasing trends to the extent practicable. Groundwater samples will be collected and analyzed from select 1st WBZ monitoring wells that do not contain LNAPL. The extent of contamination will be determined when the plume can be defined by monitoring wells with all COPCs below their respective PRGs. If a monitoring well at the edge of the plume exceeds the PRG for any of the COPCs, a step-out monitoring well will be installed. There may be practical limitations on the installation of these wells as discussed in Step 4. *Rule #3: Groundwater* - 2nd WBZ Lateral Extent – The goals are to define the lateral extent of contamination above the PRGs and illustrate decreasing trends to the extent practicable. Groundwater samples will be collected and analyzed from all 2nd WBZ monitoring wells. The extent of contamination will be determined when the plume can be defined by monitoring wells with all COPCs below their respective PRGs. If a monitoring well at the edge of the plume exceeds the PRG for any of the COPCs, a step-out monitoring well will be installed. There may be practical limitations on the installation of these wells as discussed in Step 4. *Rule #4: Groundwater* - 3rd WBZ – The goal is to determine if the 3rd WBZ has contamination above the PRGs. A groundwater sample will be collected from Valero's deep well DMW03 and compared to the PRGs. If all COPCs are less than the PRGs, this along with the other evidence discussed in Step 4, will lead to the conclusion that the 3rd WBZ has not been contaminated. If the result from the 3rd WBZ groundwater (Valero's deep well DMW03) exceeds the PRGs, a 3rd WBZ strategy will be discussed with EPA. *Rule #5: Groundwater* - Vertical Extent – The goal is to determine the vertical extent of groundwater contamination on the Facility. The vertical extent will be defined by the extent of plume maps for the 1st WBZ and 2nd WBZ. The vertical extent of contamination will be considered confined to the 1st WBZ when the underlying area of the 2nd WBZ is determined to be less than the PRGs. The vertical extent of contamination will be considered confined to the 2nd WBZ within the area of the 2nd WBZ plume if the sample from Valero deep well DMW03 is less than PRGs. If the Valero deep well DMW03 has COPCs at concentrations greater than the PRGs, a 3rd WBZ strategy will be discussed with EPA.

Develop decision rule (continued)	*Rule #6: Sediment in the R4 Seep Area* – The goals are to determine the extent of COPCs in the R4 Seep Area and whether the sediment presents an unacceptable risk to potential ecological receptors. Sediment samples will be collected from across the wetland area in the R4 Seep Area. If the individual sample results exceed ecological PRGs, then collect an additional sample(s) (where possible) to determine extent. If no PRGs are exceeded, conclude no ecological impacts are present. Under no circumstances will additional sediment samples be collected from the CCIH Ship Channel *Rule #7: Surface Water in the R4 Seep Area* – The goal is to determine if surface water in the R4 Seep Area presents an unacceptable risk to potential ecological receptors. If no PRGs are exceeded, conclude no ecological impacts are present. Under no circumstances will additional surface water samples be collected from the CCIH Ship Channel. *Rule #8: R4 Seep* – If a seep is observed near R4, a sample will be collected if possible. *Rule #9: Surface Soil in the Elevated Pipeline Corridor Area* – If an individual sample result exceeds the human health or ecological PRGs and the constituent is not bounded by results less than the PRG, then consider additional investigation (e.g., collect step-out sample(s)). Otherwise, conclude lateral extent is delineated at this location. *Rule #10: Soil Vapor* – The goal is to determine if vapor intrusion from the LNAPL and dissolved phase plumes represent an unacceptable risk to potential human receptors. Soil gas samples will be collected from beneath occupied buildings over the LNAPL and dissolved phase plumes. If the weighted average of sample results from a given building exceeds the PRGs, then consider the indoor and ambient air sample results at that building along with any other relevant lines of evidence. If the indoor air concentrations are above both appropriate PRGs and background levels in ambient air, recommend collecting confirmatory air samples or proceeding directly to managing risk (e.g., vapor controls). Otherwise, conclude vapor intrusion is not a pathway of concern.

Step 6 - Specify Tolerable Limits on Decision Errors	
Design Approach	*Groundwater: Judgmental.* Due to the mobility of contaminants in groundwater, a probabilistic sampling grid for groundwater is not recommended (EPA, January 2000. Data Quality Objective Process for Hazardous Waste Site Investigations, EPA QA/G-4HQ, Final EPA/600/R-00/007, Washington, DC). The number and placement of wells at this site is based on professional judgment with the objective to adequately characterize groundwater flow patterns and detect/delineate LNAPL and dissolved phase constituents associated with past operations without introducing unnecessary risk of carry down or cross contamination between WBZs. *Sediment and Surface Water: Judgmental.* The selection of initial sampling locations will be determined based on historical information (e.g., past evidence of a seep in the vicinity of R4), field knowledge, and potential exposure scenarios. *Soil Strata: Judgmental* – The selection of initial soil sampling locations will be based on existing data and the history of the pipeline area. Selection of sample locations will be biased by potential source information and contaminant release history. *Soil Vapor and Air Sampling: Judgmental* – Sampling locations will be biased towards worst-case locations at occupied building within the footprint of the known extent of the LNAPL and dissolved phase groundwater plumes.
Minimum sample size	1st WBZ Groundwater – 19 samples (existing wells) 2nd WBZ Groundwater – 12 samples (10 existing wells and 2 new wells) 3rd WBZ Groundwater – 1 sample (existing well) Sediment – 8 samples (R4 Seep Area only) Surface water – 1 sample (R4 Seep Area only) Soil – 6 samples Soil vapor – 2-6 samples per building (dependant on size of building footprint) Indoor air – 2-3 samples per building (dependent on soil vapor results and size of building footprint) Ambient air – 1-2 samples per building
Sample types (simple or composite)	Simple

Step 7 - Optimize the Design for Data Collection	
Optimized sample size	The sample design has been optimized by allowing for the collection of step-out samples based upon comparison of results to the applicable PRGs. This will enable the project team to complete the sampling and evaluation of the data within the AOC specified timeframe.
Sample locations	To be finalized during sampling strategy discussions with the EPA and documented in the Sampling and Analysis Plan.

Appendix D



Legend

- Elementis Property Boundary
- IM Area
- Recovery Trench
- Flume
- Monitoring Well Location (1st WBZ)
- Plugged and Abandoned Monitoring Well Location
- Monitoring Well Location (Deeper WBZ)
- Recovery Well Location
- R4 Seep Location
- 0.0708 mg/L — Benzene Contour
- WBZ — Water Bearing Zone
- 6 — LNAPL Thickness Contour (ft)

LNAPL Thickness

- 0-1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- >5 ft

Notes:

1. *Contours inferred between well locations.*
2. *Dissolved phase extent includes 1st WBZ and 2nd WBZ.*

Reference:

Groundwater Monitoring Program Semiannual Report, September 2008.

N

165 0 330

Feet

URS Corporation
9400 Amberglen Blvd
Austin, Texas 78729

El Paso Merchant Energy - Petroleum Company
Elementis Site
Corpus Christi, Texas

LNAPL Thickness Map (2008)

DATE: 02/11/09 | DRWN: | Xsects.dwg 2/12/09 - AUS | **Appendix D**

File: Q:\El Paso Elementis\Drawings-GIS\Facility_Investigation\Addendum\Xsects.dwg Layout: App D User: Gary_Callahan Plotted: Feb 12, 2009 - 12:13pm Xref's:

Appendix E

Table E-1. IM Groundwater PRGs

Parameter	Critical Pathway	Source	PRG (µg/L)	MDL (µg/L)	RL (µg/L)	Method
Hydrogen Sulfide	Aquatic	RBEL	0.002	0.0000130	0.00005	EPA 376.2
Cyanide	Aquatic	TSWQS	0.0056	0.0000080	0.00002	EPA 9012
1,1,1,2-Tetrachloroethane	Human Health	Calculation	55	0.209	1.0	EPA 8260B
1,1,1-Trichloroethane	Aquatic	RBEL	1560	0.200	1.0	EPA 8260B
1,1,2,2-Tetrachloroethane	Human Health	RBEL	40	0.200	1.0	EPA 8260B
1,1,2-Trichloroethane	Human Health	RBEL	160	0.200	1.0	EPA 8260B
1,1-Dichloroethylene	Human Health	TSWQS	3.9	0.200	1.0	EPA 8260B
1,2,3-Trichlorobenzene	Human Health	Calculation	59.4	0.200	5.0	EPA 8260B
1,2,4-Trichlorobenzene	Aquatic	RBEL	22	0.200	5.0	EPA 8260B
1,2-Dibromoethane (EDB)	Human Health	TSWQS	0.223	0.200	1.0	EPA 8260B
1,2-Dichloroethane	Human Health	TSWQS	49.3	0.200	1.0	EPA 8260B
1,2-Dichloropropane	Human Health	RBEL	150	0.200	1.0	EPA 8260B
1,3,5-Trichlorobenzene	Human Health	Calculation	43.6	0.203	5.0	EPA 8260B
1,3-Dichloropropane	Human Health	Calculation	51.2	0.200	1.0	EPA 8260B
Acetonitrile	Aquatic	Calculation	20000	2.16	10	EPA 8260B
Acrolein	Aquatic	RBEL	50	5.000	10	EPA 8260B
Acrylonitrile	Human Health	TSWQS	7.3	1.927	10	EPA 8260B
Benzene	Human Health	TSWQS	70.8	0.200	1.0	EPA 8260B
Benzyl chloride	Human Health	Calculation	10.9	0.278	5.0	EPA 8260B
Carbon disulfide	Aquatic	Calculation	3250	0.200	1.0	EPA 8260B
Chlorobenzene	Aquatic	RBEL	105	0.200	1.0	EPA 8260B
Chloroform	Human Health	TSWQS	861	0.200	1.0	EPA 8260B
Chloromethane	Human Health	Calculation	3150	0.390	1.0	EPA 8260B
Dichloromethane	Aquatic	RBEL	5420	2.000	25.0	EPA 8260B
Methyl ethyl ketone (2-butanone)	Aquatic	Calculation	97500	0.474	1.0	EPA 8260B
Tetrachloroethylene	Human Health	TSWQS	215	0.200	1.0	EPA 8260B
Toluene	Aquatic	RBEL	480	2.00	5.0	EPA 8260B
trans-1,2-Dichloroethane	Human Health	RBEL	10000	0.200	1.0	EPA 8260B
Trichloroethene	Human Health	TSWQS	408	0.317	1.0	EPA 8260B
1,2-Dichlorobenzene	Aquatic	RBEL	99	2.00	10.0	EPA 8270C
1,2-Diphenylhydrazine	Human Health	RBEL	2	0.561	10.0	EPA 8270C
1,3-Dichlorobenzene	Aquatic	RBEL	142	2.000	10.0	EPA 8270C
1,4-Dichlorobenzene	Aquatic	RBEL	99	2.000	10.0	EPA 8270C
1,4-Dioxane	Human Health	Calculation	48318	20.0	100	EPA 8270C
2,4,5-Trichlorophenol	Aquatic	TSWQS	12	2.000	10.0	EPA 8270C
2,4,6-Trichlorophenol	Human Health	RBEL	24	2.000	10.0	EPA 8270C
2,4-Dimethylphenol	Aquatic	Calculation	66	2.000	10.0	EPA 8270C
2,4-Dinitrophenol	Aquatic	RBEL	670	10.000	50.0	EPA 8270C
2,4-Dinitrotoluene	Human Health	RBEL	34	2.000	10.0	EPA 8270C
2-Chloronaphthalene	Aquatic	Calculation	116	0.500	10.0	EPA 8270C
2-Chlorophenol	Human Health	RBEL	150	2.000	10.0	EPA 8270C
3-Methylcholanthrene	Human Health	Calculation	0.0000343	**2.000**	**10.0**	EPA 8270C
4,6-Dinitro-o-cresol	Human Health	RBEL	280	10.000	50.0	EPA 8270C
4-Nitrophenol	Aquatic	RBEL	359	10.000	50.0	EPA 8270C
7,12-Dimethyl-benz(a)anthracene	Human Health	Calculation	0.00000272	**0.500**	**10.0**	EPA 8270C
7H-Dibenzo(c,g)carbazole	Human Health	TSWQS	0.54	**10.000**	**10.0**	EPA 8270C
Aniline	Aquatic	Calculation	1470	2.000	10.0	EPA 8270C
Benz(a)anthracene	Human Health	TSWQS	0.54	0.500	10.0	EPA 8270C
Benz(c)acridine	Human Health	Calculation	0.00222	**10.000**	**10.0**	EPA 8270C
Benzenethiol	Human Health	Calculation	2.23	**10.0**	**10.0**	EPA 8270C
Benzidine	Human Health	TSWQS	0.00232	**10.000**	**50.0**	EPA 8270C
Benzo(a)pyrene	Human Health	TSWQS	0.54	0.500	**10.0**	EPA 8270C
Benzo(b)fluoranthene	Human Health	RBEL	0.18	**0.500**	**10.0**	EPA 8270C
Benzo(j)fluoranthene	Human Health	TSWQS	0.54	**10.000**	**10.0**	EPA 8270C
Bis(2-chloroethyl)ether	Human Health	RBEL	5.3	0.705	10.0	EPA 8270C
Bis(2-chloroisopropyl)ether	Human Health	RBEL	65000	0.572	10.0	EPA 8270C
Adipic Acid Bis(2-ethylhexyl)ester	Human Health	Calculation	0.0929	**10.0**	**10.0**	EPA 8270C

Table E-1. IM Groundwater PRGs (Continued)

Parameter	Critical Pathway	Source	PRG (µg/L)	MDL (µg/L)	RL (µg/L)	Method
Bis(2-ethylhexyl)phthalate	Human Health	RBEL	22	1.890	10.0	EPA 8270C
Butyl benzyl phthalate	Aquatic	RBEL	147	2.000	10.0	EPA 8270C
Chrysene	Human Health	TSWQS	5.4	0.500	10.0	EPA 8270C
Cresols (o,m & p cresol)	Aquatic	Calculation	1080	0.500	10.0	EPA 8270C
2-Methylphenol	Aquatic	Calculation	1080	0.500	10.0	EPA 8270C
3&4 Methylphenol	Aquatic	Calculation	1080	0.881	10.0	EPA 8270C
Dibenz(a,h)acridine	Human Health	Calculation	0.00222	**2.000**	**10.0**	EPA 8270C
Dibenz(a,h)anthracene	Human Health	RBEL	0.18	**0.500**	**10.0**	EPA 8270C
Dibenz(a,j)acridine	Human Health	Calculation	0.00385	**1.530**	**10.0**	EPA 8270C
Dibenzo(a,e)pyrene	Human Health	TSWQS	0.54	**10.000**	**10.0**	EPA 8270C
Dibenzo(a,h)pyrene	Human Health	TSWQS	0.54	**10.000**	**10.0**	EPA 8270C
Dibenzo(a,i)pyrene	Human Health	TSWQS	0.54	**TBD**	**10.0**	EPA 8270C
Dichloropropanol	Human Health	Calculation	21402	TBD	TBD	EPA 8270C
Diethyl phthalate	Aquatic	RBEL	442	0.524	10.0	EPA 8270C
Dimethyl phthalate	Aquatic	RBEL	580	0.549	10.0	EPA 8270C
Di-n-butyl phthalate	Aquatic	RBEL	5	0.500	**10.0**	EPA 8270C
Di-n-octyl phthalate	Human Health	Calculation	0.106	**5.000**	**10.0**	EPA 8270C
Fluoranthene	Aquatic	RBEL	2.96	0.500	10.0	EPA 8270C
Indeno (1,2,3-cd)pyrene	Human Health	RBEL	0.18	**0.500**	**10.0**	EPA 8270C
Naphthalene	Aquatic	RBEL	125	0.500	10.0	EPA 8270C
Nitrobenzene	Aquatic	RBEL	66.8	2.000	10.0	EPA 8270C
p-Chloro-m-cresol	Human Health	Calculation	645	2.000	10.0	EPA 8270C
Pentachlorophenol	Aquatic	TSWQS	9.56	5.000	50.0	EPA 8270C
Phenol	Aquatic	RBEL	2750	2.000	10.0	EPA 8270C
p-Nitroaniline	Human Health	Calculation	1120	1.460	10.0	EPA 8270C
Pyridine	Human Health	TSWQS	8889	5.000	10.0	EPA 8270C
Crotonaldehyde	Human Health	Calculation	52.4	0.0060	0.1000	EPA 8315
Formaldehyde	Aquatic	Calculation	380	0.0030	0.0500	EPA 8315

Note:
(1) Method detection limits (MDLs) and reporting limits (RLs) were provided by TestAmerica.
(2) Preliminary Remediation Goals (PRGs) for groundwater were developed in accordance with Texas Surface Water Quality Standards (TSWQS) as documented in the PRG Report, August, 2006. PRGs were set equal to the lower of Texas Commission on Environmental Quality (TCEQ) Numerical Standards for acute and chromic aquatic toxicity and for human consumption of saltwater fish. When a human health or aquatic life standard was not found for a constituent of concern (COC) in TCEQ standards or U.S. Environmental Protection Agency (EPA) guidance, the applicable PRG was calculated.

Bolded values are greater than the PRG.
The MDL and RL for crotonaldehyde need to be confirmed.
MDLs and RLs are based upon February 2009 data.
µg/L - Micrograms per liter.
RBEL - Risk-based exposure limit.
TBD - MDL study must be rerun.
Surrogates:
Dibenz(a,h)acridine used for benz(c)acridine.
Benzo(a)pyrene used for dibenzo(a,e)pyrene, dibenzo(a,h)pyrene, dibenzo(a,i)pyrene, and 7H-dibenzo(c,g)carbazole.

Table E-2. PRGs for Soil Vapor and Indoor Air

Parameter	Soil Gas PRG ($\mu g/m^3$)	Indoor Air PRG ($\mu g/m^3$)	MDL ($\mu g/m^3$)	RL ($\mu g/m^3$)	Method
Hydrogen Sulfide (mg/L)	NS	NS	NS	NS	NS
Cyanide (mg/L)	NS	NS	NS	NS	NS
1,1,1,2-Tetrachloroethane	850	1.7000	1.370	2.74	TO-15
1,1,1-Trichloroethane	11000000	22000.0000	0.820	1.63	TO-15
1,1,2,2-Tetrachloroethane	105	**0.2100**	1.030	2.06	TO-15
1,1,2-Trichloroethane	385	**0.7700**	0.820	1.63	TO-15
1,1-Dichloroethylene	440000	880.0000	0.400	0.79	TO-15
1,2,3-Trichlorobenzene	9000	18.0000	1.850	3.7	TO-15
1,2,4-Trichlorobenzene	9000	18.0000	1.480	5.92	TO-15
1,2-Dibromoethane (EDB)	10	**0.0200**	1.530	3.07	TO-15
1,2-Dichloroethane	235	0.4700	0.400	0.81	TO-15
1,2-Dichloropropane	600	1.2000	0.370	0.92	TO-15
1,3,5-Trichlorobenzene	9000	18.0000	1.480	5.92	TO-15
1,3-Dichloropropane	600	1.2000	0.920	1.84	TO-15
1,4-Dioxane	8000000	16000.0000	0.900	1.8	TO-15
Acetonitrile	130000	260.0000	0.670	1.68	TO-15
Acrolein	44	**0.0880**	4.580	9.15	TO-15
Acrylonitrile	90	**0.1800**	0.430	4.33	TO-15
Benzene	800	1.6000	0.480	0.96	TO-15
Benzyl chloride	2200	4.4000	1.290	2.58	TO-15
Carbon disulfide	1550000	3100.0000	0.780	3.11	TO-15
Chlorobenzene	110000	220.0000	0.690	1.38	TO-15
Chloroform	265	**0.5300**	0.730	1.46	TO-15
Chloromethane	3400	6.8000	0.820	1.65	TO-15
Dichloromethane	13000	26.0000	0.520	1.04	TO-15
Methyl ethyl ketone	11000000	22000.0000	1.180	2.94	TO-15
Tetrachloroethylene	1050	2.1000	1.380	2.71	TO-15
Toluene	11000000	22000.0000	0.560	1.13	TO-15
trans-1,2-Dichloroethene	130000	260.0000	0.400	0.79	TO-15
Trichloroethene	3050	6.1000	1.070	2.15	TO-15
1,2-Dichlorobenzene	440000	880.0000	1.200	2.4	TO-15
1,3-Dichlorobenzene	550	**1.1000**	1.200	2.4	TO-15
1,4-Dichlorobenzene	550	**1.1000**	1.200	2.4	TO-15
Naphthalene	180	**0.3600**	1.310	2.62	TO-15
1,2-Diphenylhydrazine	NS	NS	NS	NS	NS
2,4,5-Trichlorophenol	NS	NS	NS	NS	NS
2,4,6-Trichlorophenol	NS	NS	NS	NS	NS
2,4-Dimethylphenol	NS	NS	NS	NS	NS
2,4-Dinitrophenol	NS	NS	NS	NS	NS
2,4-Dinitrotoluene	NS	NS	NS	NS	NS
2-Chloronaphthalene	NS	NS	NS	NS	NS
2-Chlorophenol	NS	NS	NS	NS	NS
3-Methylcholanthrene	NS	NS	NS	NS	NS
4,6-Dinitro-o-cresol	NS	NS	NS	NS	NS
4-Nitrophenol	NS	NS	NS	NS	NS
7,12-Dimethyl-benz(a)anthracene	NS	NS	NS	NS	NS
7H-Dibenzo(c,g)carbazole	NS	NS	NS	NS	NS
Aniline	NS	NS	NS	NS	NS
Benz(a)anthracene	NS	NS	NS	NS	NS
Benz(c)acridine	NS	NS	NS	NS	NS
Benzenethiol	NS	NS	NS	NS	NS
Benzidine	NS	NS	NS	NS	NS
Benzo(a)pyrene	NS	NS	NS	NS	NS
Benzo(b)fluoranthene	NS	NS	NS	NS	NS
Benzo(j)fluoranthene	NS	NS	NS	NS	NS
Bis(2-chloroethyl)ether	NS	NS	NS	NS	NS
Bis(2-chloroisopropyl)ether	NS	NS	NS	NS	NS

Table E-2. PRGs for Soil Vapor and Indoor Air (Continued)

Parameter	Soil Gas PRG ($\mu g/m^3$)	Indoor Air PRG ($\mu g/m^3$)	MDL ($\mu g/m^3$)	RL ($\mu g/m^3$)	Method
Adipic Acid bis(2-ethylhexyl)ester	NS	NS	NS	NS	NS
Bis(2-ethylhexyl)phthalate	NS	NS	NS	NS	NS
Butyl benzyl phthalate	NS	NS	NS	NS	NS
Chrysene	NS	NS	NS	NS	NS
Cresols (o,m & p cresol)	NS	NS	NS	NS	NS
Dibenz(a,h)acridine	NS	NS	NS	NS	NS
Dibenz(a,h)anthracene	NS	NS	NS	NS	NS
Dibenz(a,j)acridine	NS	NS	NS	NS	NS
Dibenzo(a,e)pyrene	NS	NS	NS	NS	NS
Dibenzo(a,h)pyrene	NS	NS	NS	NS	NS
Dibenzo(a,i)pyrene	NS	NS	NS	NS	NS
Dichloropropanol	NS	NS	NS	NS	NS
Diethyl phthalate	NS	NS	NS	NS	NS
Dimethyl phthalate	NS	NS	NS	NS	NS
Di-n-butyl phthalate	NS	NS	NS	NS	NS
Di-n-octyl phthalate	NS	NS	NS	NS	NS
Fluoranthene	NS	NS	NS	NS	NS
Indeno (1,2,3-cd)pyrene	NS	NS	NS	NS	NS
Nitrobenzene	NS	NS	NS	NS	NS
p-Chloro-m-cresol	NS	NS	NS	NS	NS
Pentachlorophenol	NS	NS	NS	NS	NS
Phenol	NS	NS	NS	NS	NS
p-Nitroaniline	NS	NS	NS	NS	NS
Pyridine	NS	NS	NS	NS	NS
Crotonaldehyde	NS	NS	NS	NS	NS
Formaldehyde	NS	NS	NS	NS	NS

Note:
(1) Method detection limits (MDLs) and reporting limits (RLs) were provided by TestAmerica.
(2) Indoor air Preliminary Remediation Goals (PRGs) taken from U.S. Environmental Protection Agency (EPA) Medium-Specific Screening Levels for Industrial Air, accessed from the Region 6 website unless otherwise noted.
(3) An attenuation factor of 500x (i.e., alpha = 0.002) in an industrial setting is a conservative value used to derive screening criteria for soil vapor beneath industrial buildings from the industrial air PRGs.
Vapor intrusion is a pathway of concern for volatile organic compounds (VOCs) only.
Bolded values are greater than the PRG.
MDLs and RLs are based upon February 2009 data.
$\mu g/m^3$ - Micrograms per cubic meter.
mg/L - Milligrams per liter.
NS - Not sampled.
Surrogates:
1,2,4-Trichlorobenzene PRG used for 1,2,3-trichlorobenzene and 1,3,5-trichlorobenzene PRG.
1,2-Dichloropropane PRG used for 1,3-dichloropropane.
1,4-Dichlorobenzene PRG used for 1,3-dichlorobenzene.

Table E-3. Ecological Receptor PRGs for Surface Water

Analyte	TCEQ Benchmarks (mg/L) Freshwater PRGs	EPA Region 5 Ecological Screening Levels (mg/L) Freshwater PRGs	PRGs (mg/L)	MDL (mg/L)	RL (mg/L)	Method
Hydrogen sulfide	0.002	--	0.002	0.013	0.05mg/l	EPA 9034
Cyanide	0.0107	0.0052	0.0107	0.008	0.02mg/L	EPA 9012
1,1,1,2-Tetrachloroethane	--	--	--	0.00021	0.00100	EPA 8260B
1,1,1-Trichloroethane	2.45	0.076	2.45	0.00020	0.00100	EPA 8260B
1,1,2,2-Tetrachloroethane	0.465	0.38	0.465	0.00020	0.00100	EPA 8260B
1,1,2-Trichloroethane	0.90	0.5	0.90	0.00020	0.00100	EPA 8260B
1,1-Dichloroethene	1.5	0.065	1.5	0.00020	0.00100	EPA 8260B
1,2,3-Trichlorobenzene	0.051	0.03	0.051	0.00020	0.00500	EPA 8260B
1,2,4-Trichlorobenzene	0.051	0.03	0.051	0.00020	0.00500	EPA 8260B
1,2-Dibromoethane (EDB)	--	--	--	0.00020	0.00100	EPA 8260B
1,2-Dichloroethane	6.3	0.91	6.3	0.00020	0.00100	EPA 8260B
1,2-Dichloropropane	1.87	0.36	1.87	0.00020	0.00100	EPA 8260B
1,3,5-Trichlorobenzene	0.051	0.03	0.051	0.00020	0.00500	EPA 8260B
1,3-Dichloropropane	1.87	0.36	1.87	0.00020	0.00100	EPA 8260B
Acetonitrile	--	12	12	0.00216	0.01000	EPA 8260B
Acrolein	--	0.00019	0.00019	**0.00500**	**0.01000**	EPA 8260B
Acrylonitrile	0.076	0.066	0.076	0.00193	0.01000	EPA 8260B
Benzene	0.130	0.114	0.130	0.00020	0.00100	EPA 8260B
Benzyl chloride	--	--	--	0.00028	0.00500	EPA 8260B
Carbon disulfide	0.105	0.015	0.105	0.00020	0.00100	EPA 8260B
Chlorobenzene	0.064	0.047	0.064	0.00020	0.00100	EPA 8260B
Chloroform	0.89	0.14	0.89	0.00020	0.00100	EPA 8260B
Chloromethane	28	--	28	0.00039	0.00100	EPA 8260B
Dichloromethane	11	0.94	11	0.00200	0.02500	EPA 8260B
Methyl ethyl ketone (2-Butanone)	42.4	2.2	42.4	0.00047	0.00100	EPA 8260B
Tetrachloroethene	0.79	0.045	0.79	0.00020	0.00100	EPA 8260B
Toluene	1.45	0.253	1.45	0.00200	0.00500	EPA 8260B
trans-1,2-Dichloroethene	22	0.97	22	0.00020	0.00100	EPA 8260B
Trichloroethene	0.55	0.047	0.55	0.00032	0.00100	EPA 8260B
1,2-Dichlorobenzene	0.11	0.014	0.11	0.00200	0.01000	EPA 8270C
1,2-Diphenylhydrazine	0.012	0.545	0.012	0.00056	0.01000	EPA 8270C
1,3-Dichlorobenzene	0.085	0.038	0.085	0.00200	0.01000	EPA 8270C
1,4-Dichlorobenzene	0.11	0.0094	0.11	**0.00200**	**0.01000**	EPA 8270C
1,4-Dioxane	--	22	22	0.02000	0.10000	EPA 8270C
2,4,5-Trichlorophenol	0.064	--	0.064	**0.00200**	**0.01000**	EPA 8270C
2,4,6-Trichlorophenol	0.0135	0.0049	0.0135	0.00200	0.01000	EPA 8270C
2,4-Dimethylphenol	0.105	0.1	0.105	0.00200	0.01000	EPA 8270C
2,4-Dinitrophenol	0.031	0.019	0.031	**0.01000**	**0.05000**	EPA 8270C
2,4-Dinitrotoluene	1.22	0.044	1.22	0.00200	0.01000	EPA 8270C
2-Chloronaphthalene	0.054	0.000396	0.054	**0.00050**	**0.01000**	EPA 8270C
2-Chlorophenol	0.13	0.024	0.13	0.00200	0.01000	EPA 8270C
3-Methylchlolanthrene	--	0.0000891	0.0000891	**0.00200**	**0.01000**	EPA 8270C
4,6-Dinitro-o-cresol	--	0.023	0.023	**0.01000**	**0.05000**	EPA 8270C
4-Nitrophenol	0.532	0.06	0.532	0.01000	0.05000	EPA 8270C
7,12-Dimethyl-benz(a)anthracene	--	0.000548	0.000548	0.00050	**0.01000**	EPA 8270C
7H-Dibenzo(c,g)carbazole	0.007	--	0.007	0.01000	**0.01000**	EPA 8270C
Aniline	--	0.0041	0.0041	0.00200	**0.01000**	EPA 8270C
Benz(a)anthracene	0.0346	0.000025	0.0346	0.00050	0.01000	EPA 8270C
Benz(c)acridine	0.007	--	0.007	**0.01000**	**0.01000**	EPA 8270C
Benzenethiol	--	--	--	0.00000	0.01000	EPA 8270C
Benzidine	1.92	0.545	1.92	0.01000	0.05000	EPA 8270C
Benzo(a)pyrene	0.000014	0.000014	0.000014	**0.00050**	**0.01000**	EPA 8270C
Benzo(b)fluoranthene	0.00616	0.00907	0.00616	0.00050	**0.01000**	EPA 8270C

Table E-3. Ecological Receptor PRGs for Surface Water (Continued)

Analyte	TCEQ Benchmarks (mg/L) Freshwater PRGs	EPA Region 5 Ecological Screening Levels (mg/L) Freshwater PRGs	PRGs (mg/L)	MDL (mg/L)	RL (mg/L)	Method
Benzo(j)fluoranthene	0.00616	0.0019	0.00616	**0.01000**	**0.01000**	EPA 8270C
Bis(2-chloroethyl)ether	12	19	12	0.00071	0.01000	EPA 8270C
Bis(2-chloroisopropyl) ether	6.3	--	6.3	0.00057	0.01000	EPA 8270C
Adipic Acid bis(2-ethylhexyl)ester	--	--	--	0.01000	0.01000	EPA 8270C
Bis(2-Ethylhexyl)phthalate	0.3	0.0003	0.3	0.00189	0.01000	EPA 8270C
Butyl benzyl phthalate	0.093	0.023	0.093	0.00200	0.01000	EPA 8270C
Chrysene	0.007	--	0.007	0.00050	**0.01000**	EPA 8270C
Cresols (methyl phenols)	0.272	0.0348	0.272	0.00050	0.01000	EPA 8270C
Dibenz(a,h)acridine	0.007	--	0.007	0.00200	**0.01000**	EPA 8270C
Dibenz(a,h)anthracene	0.005	--	0.005	0.00050	**0.01000**	EPA 8270C
Dibenz(a,j)acridine	0.007	--	0.007	0.00153	**0.01000**	EPA 8270C
Dibenzo(a,e)pyrene	0.007	0.0003	0.007	**0.01000**	**0.01000**	EPA 8270C
Dibenzo(a,h)pyrene	0.007	0.0003	0.007	**0.01000**	**0.01000**	EPA 8270C
Dibenzo(a,i)pyrene	0.007	0.0003	0.007	0.00000	**0.01000**	EPA 8270C
Dichloropropanol	--	--	--	TBD	0.01000	EPA 8270C
Diethyl phthalate	1.04	0.11	1.04	0.00052	0.01000	EPA 8270C
Dimethyl phthalate	0.33	--	0.33	0.00055	0.01000	EPA 8270C
Di-n-butyl phthalate	0.007	0.0097	0.007	0.00050	**0.01000**	EPA 8270C
Di-n-octyl phthalate	0.007	0.03	0.007	0.00500	**0.01000**	EPA 8270C
Fluoranthene	0.00616	0.0019	0.00616	0.00050	**0.01000**	EPA 8270C
Indeno(1,2,3-c,d)pyrene	0.007	0.00431	0.007	0.00050	**0.01000**	EPA 8270C
Naphthalene	0.25	0.013	0.25	**0.00050**	**0.01000**	EPA 8270C
Nitrobenzene	0.27	0.22	0.27	0.00200	0.01000	EPA 8270C
p-Chloro-m-cresol	0.0003	0.0348	0.0003	**0.00200**	**0.01000**	EPA 8270C
Pentachlorophenol	0.0021	0.004	0.0021	**0.00500**	**0.05000**	EPA 8270C
Phenol	0.11	0.18	0.11	0.00200	0.01000	EPA 8270C
P-Nitroaniline	--	--	--	0.00146	0.01000	EPA 8270C
Pyridine	--	2.38	2.38	0.00500	0.01000	EPA 8270C
Crotonaldehyde	--	--	--	0.00600	0.10000	EPA 8315
Formaldehyde	--	--	--	0.00300	0.05000	EPA 8315

Note:
(1) Method detection limits (MDLs) and reporting limits (RLs) were provided by TestAmerica.
Sources:
Texas Commission on Environmental Quality (TCEQ). 2006. Update to Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas RG-263 (Revised) Remediation Division. January.
U.S. Environmental Protection Agency (EPA), August 2003. Resource Conservation and Recovery Act (RCRA) Corrective Action, Ecological Screening Levels. http://www.epa.gov/reg5rcra/ca/edql.htm -- Screening Criteria not available.
Screening criteria used TCEQ values as primary and then EPA Region 5 values if no TCEQ value was available.
-- Screening Criteria not available.
Bolded values are greater than the Preliminary Remediation Goal (PRG).
MDLs and RLs are based upon February 2009 data.
The MDL and RL for crotonaldehyde need to be confirmed.
mg/L - Milligrams per liter.
TBD - MDL limit study must be rerun.
Surrogates:
Fluoranthene used for benzo(b)fluoranthene (TCEQ only) and for benzo(j)fluoranthene.
4-Methylphenol used for cresols for TCEQ benchmark; p-chloro-m-cresol used for cresols for EPA Region 5.
Anthracene used for dibenz(a,h)anthracene.
Pyrene used for dibenzo(a,e)pyrene, dibenzo(a,h)pyrene and dibenzo(a,i)pyrene.
di-n-Butyl phthalate used for di-n-octyl phthalate for TCEQ benchmark.
Pyrene used for indeno(1,2,3-cd)pyrene for the TCEQ benchmark.
1,2-Dichloropropane used for 1,3-dichloropropane.
Chrysene used for 7H-dibenzo(c,g)carbazole, benz(c)acridine, benzo(j)fluoranthene, dibenz(a,h)acridine, dibenz(a,j)acridine, dibenzo(a,e)pyrene, dibenzo(a,h)pyrene, and dibenzo(a,i)pyrene.
1,2,4-Trichlorobenzene used for 1,2,3-trichlorobenzene and 1,3,5-trichlorobenzene.
n-Nitrosodiphenylamine used for 1,2-diphenylhydrazine, and benzidine. The EPA Region 5 ecological soil screening level is 0.545 milligrams per kilogram (mg/kg) in the masked shrew.

Table E-4. Ecological Receptor PRGs for Surface Soil

Analyte	TCEQ Benchmark (mg/kg)		EPA Region 5 (mg/kg)			PRGs (mg/kg)	MDL (mg/kg)	RL (mg/kg)	Method
	Earthworms	Plants	Masked Shrew	Meadow Vole	Plants				
Hydrogen sulfide	--	--	0.0358	--	--	0.0358	**5**	**50**	EPA 9034
Cyanide				1.33		1.33	**0.46**	**1**	EPA 9012
1,1,1,2-Tetrachloroethane	--	--	225	--	--	225	0.0004	0.005	EPA 8260B
1,1,1-Trichloroethane	--	--	29.8	--	--	29.8	0.0007	0.005	EPA 8260B
1,1,2,2-Tetrachloroethane	--	--	0.127	--	--	0.127	0.0004	0.005	EPA 8260B
1,1,2-Trichloroethane	--	--	28.6	--	--	28.6	0.0004	0.005	EPA 8260B
1,1-Dichloroethene	--	--	8.28	--	--	8.28	0.0004	0.005	EPA 8260B
1,2,3-Trichlorobenzene	20	--	11.1	--	--	11.1	0.0004	0.005	EPA 8260B
1,2,4-Trichlorobenzene	20	--	11.1	--	--	11.1	0.00097	0.005	EPA 8260B
1,2-Dibromoethane (EDB)	--	--	1.23	--	--	1.23	0.0008	0.005	EPA 8260B
1,2-Dichloroethane	--	--	21.2	--	--	21.2	0.00052	0.005	EPA 8260B
1,2-Dichloropropane	700	--	32.7	--	--	32.7	0.0004	0.005	EPA 8260B
1,3,5-Trichlorobenzene	20	--	11.1	--	--	11.1	0.0004	0.005	EPA 8260B
1,3-Dichloropropane	--	--	32.7	--	--	32.7	0.0004	0.005	EPA 8260B
Acetonitrile	--	--	--	1.37	--	1.37	0.037	0.05	EPA 8260B
Acrolein	--	--	--	5.27	--	5.27	0.0086	0.05	EPA 8260B
Acrylonitrile	--	--	--	0.0239	--	0.0239	0.0079	0.05	EPA 8260B
Benzene	--	--	0.255	--	--	0.255	0.0004	0.005	EPA 8260B
Benzyl chloride	40	--	--	--	--	40	0.001	0.005	EPA 8260B
Carbon disulfide	--	--	0.0941	--	--	0.0941	0.00073	0.005	EPA 8260B
Chlorobenzene	40	--	13.1	--	--	13.1	0.0004	0.005	EPA 8260B
Chloroform	--	--	1.19	--	--	1.19	0.00087	0.005	EPA 8260B
Chloromethane	--	--	--	10.4	--	10.4	0.0012	0.005	EPA 8260B
Dichloroemethane	--	--	--	4.05	--	4.05	0.005	0.025	EPA 8260B
Methyl ethyl ketone (2-Butanone)	--	--	--	89.6	--	89.6	0.001	0.005	EPA 8260B
Tetrachloroethene	--	--	9.92	--	--	9.92	0.00074	0.005	EPA 8260B
Toluene	--	200	5.45	--	--	5.45	0.00056	0.005	EPA 8260B
trans-1,2-Dichloroethene	--	--	0.784	--	--	0.784	0.0004	0.005	EPA 8260B
Trichloroethene	--	--	12.4	--	--	12.4	0.0004	0.005	EPA 8260B
1,2-Dichlorobenzene	--	--	2.96	--	--	2.96	0.0521	0.33	EPA 8270C
1,2-Diphenylhydrazine	--	--	0.545	--	--	0.545	0.0167	0.33	EPA 8270C
1,3-Dichlorobenzene	--	--	37.7	--	--	37.7	0.0438	0.33	EPA 8270C
1,4-Dichlorobenzene	20	--	0.546	--	--	0.546	0.0458	0.33	EPA 8270C
1,4-Dioxane	--	--	--	2.05	--	2.05	0.088	0.1	EPA 8270C
2,4,5-Trichlorophenol	9	4	14.1	--	--	14.1	0.0167	0.33	EPA 8270C
2,4,6-Trichlorophenol	10	--	9.94	--	--	9.94	0.0167	0.33	EPA 8270C
2,4-Dimethylphenol	--	--	--	--	0.01	0.01	**0.0204**	**0.33**	EPA 8270C
2,4-Dinitrophenol	--	20	0.0609	--	--	0.0609	**0.167**	**1.67**	EPA 8270C
2,4-Dinitrotoluene	--	--	1.28	--	--	1.28	0.167	1.67	EPA 8270C
2-Chloronaphthalene	--	--	0.0122	--	--	0.0122	**0.0167**	**0.33**	EPA 8270C
2-Chlorophenol	10	7	0.243	--	--	0.243	0.0278	0.33	EPA 8270C
3-Methylchlolanthrene	--	--	0.0779	--	--	0.0779	0.0167	0.33	EPA 8270C
4,6-Dinitro-o-cresol	--	--	0.144	--	--	0.144	**0.167**	**1.67**	EPA 8270C
4-Nitrophenol	7	--	5.12	--	--	5.12	0.167	0.67	EPA 8270C
7,12-Dimethyl-benz(a)anthracene	--	--	16.3	--	--	16.3	0.0167	0.33	EPA 8270C
7H-Dibenzo(c,g)carbazole	--	--	4.73	--	--	4.73	TBD	0.330	EPA 8270C
Aniline	--	--	--	0.0568	--	0.0568	**0.333**	**1.67**	EPA 8270C
Benz(a)anthracene	--	--	5.21	--	--	5.21	0.0167	0.33	EPA 8270C
Benz(c)acridine	--	--	4.73	--	--	4.73	TBD	0.33	EPA 8270C
Benzenethiol	--	--	--	--	--	--	0.33	0.33	EPA 8270C
Benzidine	--	--	0.545	--	--	0.545	1.67	1.67	EPA 8270C
Benzo(a)pyrene	--	--	1.52	--	--	1.52	0.0167	0.33	EPA 8270C
Benzo(b)fluoranthene	--	--	59.8	--	--	59.8	0.0167	0.33	EPA 8270C
Benzo(j)fluoranthene	--	--	4.73	--	--	4.73	TBD	0.33	EPA 8270C
Bis(2-chloroethyl)ether	--	--	--	23.7	--	23.7	0.0374	0.33	EPA 8270C
Bis(2-chloroisopropyl) ether	--	--	19.9	--	--	19.9	0.041	0.33	EPA 8270C
Adipic Acid bis (2-ethylhexyl)ester	--	--	--	--	--	--	0.33	0.33	EPA 8270C
Bis(2-Ethylhexyl)phthalate	--	--	0.925	--	--	0.925	0.0167	0.33	EPA 8270C
Butyl benzyl phthalate	--	--	0.239	--	--	0.239	0.0167	0.33	EPA 8270C

Table E-4. Ecological Receptor PRGs for Surface Soil (Continued)

Analyte	TCEQ Benchmark (mg/kg)		EPA Region 5 (mg/kg)			PRGs (mg/kg)	MDL (mg/kg)	RL (mg/kg)	Method
	Earthworms	Plants	Masked Shrew	Meadow Vole	Plants				
Chrysene	--	--	4.73	--	--	4.73	0.0167	0.33	EPA 8270C
Cresols (methyl phenols)	30	70	3.49	--	--	3.49	TBD	0.33	EPA 8270C
2-methylphenol						3.49	0.033	0.33	EPA 8270C
3&4 Methylphenol						3.49	0.05	0.67	EPA 8270C
Dibenz(a,h)acridine	--	--	4.73	--	--	4.73	0.0167	0.33	EPA 8270C
Dibenz(a,h)anthracene	--	--	18.4	--	--	18.4	0.0167	0.33	EPA 8270C
Dibenz(a,j)acridine	--	--	4.73	--	--	4.73	0.022	0.33	EPA 8270C
Dibenzo(a,e)pyrene	--	--	4.73	--	--	4.73	TBD	0.33	EPA 8270C
Dibenzo(a,h)pyrene	--	--	4.73	--	--	4.73	TBD	0.33	EPA 8270C
Dibenzo(a,i)pyrene	--	--	4.73	--	--	4.73	TBD	0.33	EPA 8270C
Dichloropropanol	--	--	--	--	--	--	TBD	TBD	EPA 8270C
Diethyl phthalate	--	100	24.8	--	--	24.8	0.0167	0.33	EPA 8270C
Dimethyl phthalate	200	--	734	--	--	734	0.0167	0.33	EPA 8270C
Di-n-butyl phthalate	--	200	0.15	--	--	0.15	0.0167	0.33	EPA 8270C
Di-n-octyl phthalate	--	--	709	--	--	709	0.0167	0.33	EPA 8270C
Fluoranthene	--	--	122	--	--	122	0.0167	0.33	EPA 8270C
Indeno(1,2,3-c,d)pyrene	--	--	109	--	--	109	0.0167	0.33	EPA 8270C
Naphthalene	--	--	0.0994	--	--	0.0994	0.0417	0.33	EPA 8270C
Nitrobenzene	40	--	1.31	--	--	1.31	0.0364	0.33	EPA 8270C
p-Chloro-m-cresol	--	--	7.95	--	--	7.95	0.0167	0.33	EPA 8270C
Pentachlorophenol	31	5	0.119	--	--	0.119	**0.167**	**1.67**	EPA 8270C
Phenol	30	70	120	--	--	120	0.0167	0.33	EPA 8270C
P-Nitroaniline	--	--	21.9	--	--	21.9	0.067	0.67	EPA 8270C
Pyridine	--	--	--	1.03	--	1.03	0.333	1.67	EPA 8270C
Crotonaldehyde	--	--	--	--	--	--	0.16	0.2	EPA 8315
Formaldehyde	--	--	--	--	--	--	0.078	0.1	EPA 8315

Note:
(1) Method detection limits (MDLs) and reporting limits (RLs) were provided by TestAmerica.
Sources:
Texas Commission on Environmental Quality (TCEQ). 2006. Update to Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas RG-263 (Revised). Remediation Division. January.
U.S. Environmental Protection Agence (EPA), August 2003. Resource Conservation and Recovery Act (RCRA) Corrective Action, Ecological Screening Levels. http://www.epa.gov/reg5rcra/ca/edql.htm.
Screening criteria used EPA Region 5 values as primary and then TCEQ values if no EPA Region 5 value was available.
-- Screening Criteria not available.
Bolded values are greater than the Preliminary Remediation Goal (PRG).
MDLs and RLs are based upon February 2009 data.
The MDL and RL for crotonaldehyde need to be confirmed.
TBD - MDL study must be rerun.
Surrogates:
Chrysene used for 7H-dibenzo(c,g)carbazole, benz(c)acridine, benzo(j)fluoranthene, dibenz(a,h)acridine, dibenz(a,j)acridine, dibenzo(a,e)pyrene, dibenzo(a,h)pyrene, and dibenzo(a,i)pyrene.
Chlorobenzene used for Benzyl chloride.
n-Nitrosodiphenylamine used for 1,2-diphenylhydrazine, and benzidine. The Region 5 Ecological soil screening level is 0.545 milligrams per kilogram (mg/kg) in the masked shrew.
1,2-Dichloropropane used for 1,3-dichloropropane.
1,2,4-trichlorobenzene used for 1,2,3-trichlorobenzene and 1,3,5-trichlorobenzene.
m-cresol used for cresols for EPA Region 5.
3-chlorophenol used for 2-chlorophenol for TCEQ.

Table E-5. Human Health PRGs for Soil

Parameter	PRG (mg/kg)	MDL (mg/kg)	RL (mg/kg)	Method
Hydrogen Sulfide	12000000	5.000	50.0	EPA 376.2
Cyanide	20000	0.460	1.0	EPA 9010/9013/9014
1,1,1,2-Tetrachloroethane	9.80	0.000400	0.0050000	EPA 8260B
1,1,1-Trichloroethane	39000	0.000700	0.0050000	EPA 8260B
1,1,2,2-Tetrachloroethane	2.90	0.000400	0.0050000	EPA 8260B
1,1,2-Trichloroethane	5.50	0.000400	0.0050000	EPA 8260B
1,1-Dichloroethylene	9200	0.000400	0.0050000	EPA 8260B
1,2,3-Trichlorobenzene	3900	0.000400	0.0050000	EPA 8260B
1,2,4-Trichlorobenzene	400	0.000970	0.0050000	EPA 8260B
1,2-Dibromoethane (EDB)	0.17	0.000800	0.0050000	EPA 8260B
1,2-Dichloroethane	2.20	0.000520	0.0050000	EPA 8260B
1,2-Dichloropropane	4.70	0.000400	0.0050000	EPA 8260B
1,3,5-Trichlorobenzene	81.00	0.000400	0.0050000	EPA 8260B
1,3-Dichloropropane	20000	0.000400	0.0050000	EPA 8260B
1,4-Dioxane	160	0.088000	0.1000000	EPA 8260B
Acetonitrile	3700	0.037000	0.0500000	EPA 8260B
Acrolein	0.68	0.008600	0.0500000	EPA 8260B
Acrylonitrile	1.20	0.007900	0.0500000	EPA 8260B
Benzene	5.60	0.000400	0.0050000	EPA 8260B
Benzyl chloride	17	0.001000	0.0050000	EPA 8260B
Carbon disulfide	3000	0.000730	0.0050000	EPA 8260B
Chlorobenzene	1500	0.000400	0.0050000	EPA 8260B
Chloroform	1.50	0.000870	0.0050000	EPA 8260B
Chloromethane	8.40	0.001200	0.0050000	EPA 8260B
Dichloromethane	54	0.005000	0.0250000	EPA 8260B
Methyl ethyl ketone	190000	0.001000	0.0050000	EPA 8260B
Tetrachloroethylene	2.70	0.000740	0.0050000	EPA 8260B
Toluene	46000	0.000560	0.0050000	EPA 8260B
trans-1,2-Dichloroethene	500	0.000400	0.0050000	EPA 8260B
Trichloroethene	14	0.000400	0.0050000	EPA 8260B
1,2-Dichlorobenzene	10000	0.052100	0.3300000	EPA 8270C
1,2-Diphenylhydrazine	2.20	0.016700	0.3300000	EPA 8270C
1,3-Dichlorobenzene	1000	0.043800	0.3300000	EPA 8270C
1,4-Dichlorobenzene	13	0.045800	0.3300000	EPA 8270C
1,4-Dioxane	160	0.088000	0.1000000	EPA 8270C
2,4,5-Trichlorophenol	62000	0.016700	0.3300000	EPA 8270C
2,4,6-Trichlorophenol	160	0.016700	0.3300000	EPA 8270C
2,4-Dimethylphenol	12000	0.020400	0.3300000	EPA 8270C
2,4-Dinitrophenol	1200	0.167000	1.6700000	EPA 8270C
2,4-Dinitrotoluene	1200	0.167000	1.6700000	EPA 8270C
2-Chloronaphthalene	82000	0.016700	0.3300000	EPA 8270C
2-Chlorophenol	5100	0.027800	0.3300000	EPA 8270C
3-Methylcholanthrene	1700	0.016700	0.3300000	EPA 8270C
4,6-Dinitro-o-cresol	62	0.167000	1.6700000	EPA 8270C
4-Nitrophenol	15	0.167000	0.6700000	EPA 8270C
7,12-Dimethyl-benz(a)anthracene	140	0.016700	0.3300000	EPA 8270C
7H-Dibenzo(c,g)carbazole	210	0.000000	0.0000000	EPA 8270C
Aniline	300	0.333000	1.6700000	EPA 8270C
Benz(a)anthracene	2	0.016700	0.3300000	EPA 8270C
Benz(c)acridine	210	TBD	0.3300000	EPA 8270C
Benzenethiol	10	TBD	0.3300000	EPA 8270C
Benzidine	0.0073	**1.670000**	**1.6700000**	EPA 8270C
Benzo(a)pyrene	0.21	0.016700	0.3300000	EPA 8270C

Table E-5. Human Health PRGs for Soil (Continued)

Parameter	PRG (mg/kg)	MDL (mg/kg)	RL (mg/kg)	Method
Benzo(b)fluoranthene	2.10	0.016700	0.3300000	EPA 8270C
Benzo(j)fluoranthene	2900	TBD	0.3300000	EPA 8270C
Bis(2-chloroethyl)ether	0.90	0.037400	0.3300000	EPA 8270C
Bis(2-chloroisopropyl)ether	21	0.041000	0.3300000	EPA 8270C
Adipic Acid bis(2-ethylhexyl)ester	1200000	0.330000	0.3300000	EPA 8270C
Bis(2-ethylhexyl)phthalate	120	0.016700	0.3300000	EPA 8270C
Butyl benzyl phthalate	910	0.016700	0.3300000	EPA 8270C
Chrysene	210	0.016700	0.3300000	EPA 8270C
Cresols (o,m & p cresol)	3100	0.000000	0.3300000	EPA 8270C
2-methylphenol	3100	0.033000	0.3300000	EPA 8270C
3&4 Methylphenol	3100	0.050000	0.6700000	EPA 8270C
Dibenz(a,h)acridine	6500	0.016700	0.3300000	EPA 8270C
Dibenz(a,h)anthracene	0.21	0.016700	0.3300000	EPA 8270C
Dibenz(a,j)acridine	13000	0.022000	0.3300000	EPA 8270C
Dibenzo(a,e)pyrene	15000	TBD	0.3300000	EPA 8270C
Dibenzo(a,h)pyrene	1300	TBD	0.3300000	EPA 8270C
Dibenzo(a,i)pyrene	1300	TBD	0.3300000	EPA 8270C
Dichloropropanol	1800	TBD	TBD	EPA 8270C
Diethyl phthalate	490000	0.016700	0.3300000	EPA 8270C
Dimethyl phthalate	9300	0.016700	0.3300000	EPA 8270C
Di-n-butyl phthalate	62000	0.016700	0.3300000	EPA 8270C
Di-n-octyl phthalate	1000000	0.016700	0.3300000	EPA 8270C
Fluoranthene	22000	0.016700	0.3300000	EPA 8270C
Indeno (1,2,3-cd)pyrene	2.10	0.016700	0.3300000	EPA 8270C
Naphthalene	20	0.041700	0.3300000	EPA 8270C
Nitrobenzene	280	0.036400	0.3300000	EPA 8270C
p-Chloro-m-cresol	680	0.016700	0.3300000	EPA 8270C
Pentachlorophenol	9	0.167000	1.6700000	EPA 8270C
Phenol	180000	0.016700	0.3300000	EPA 8270C
p-Nitroaniline	82	0.067000	0.6700000	EPA 8270C
Pyridine	1000	0.333000	1.6700000	EPA 8270C
Crotonaldehyde	0.11	0.160000	0.2000000	EPA 8315
Formaldehyde	NS	0.078000	0.1000000	EPA 8315

Note:
(1) Method detection limits (MDLs) and reporting limits (RLs) were provided by TestAmerica.
(2) Soil Preliminary Remediation Goals (PRGs) taken from U.S. Environmental Protection Agency (EPA) Medium-Specific Screening Levels for Industrial Soil, accessed from the Region 6 website unless otherwise noted.

Bolded values are greater than the PRG.
MDLs and RLs are based upon February 2009 data.
The MDL and RL for crotonaldehyde need to be confirmed.
mg/kg - Milligrams per kilogram.
TBD - MDL study needs to be rerun.
Surrogates:
2,3-Dichloropropanol used for Dichloropropanol.
Chrysene used for 7H-Dibenzo(c,g)carbazole and benz(c)acridine.
3-Methylcholanthrene was taken from from Texas Commission on Environmental Quality (TCEQ) Tier 1 Commercial Industrial Soil Protective Contamination Limits (PCLs) for Class 3.

Table E-6. Ecological PRGs for Sediment Receptors

Analyte	TCEQ Benchmark (mg/Kg) Freshwater	EPA Region 5 (mg/kg) EqP	PRG (mg/kg)	MDL (mg/kg)	RL (mg/kg)	Method
Hydrogen sulfide	--	--	--	5.000	50.0	EPA 9030/9034
Cyanide	--	0.0001	0.0001	**0.460**	**1.0**	EPA 9012
1,1,1,2-Tetrachloroethane	--	--	--	0.00040	0.00500	EPA 8260B
1,1,1-Trichloroethane	4.13	0.213	4.13	0.00070	0.00500	EPA 8260B
1,1,2,2-Tetrachloroethane	0.63	0.85	0.63	0.00040	0.00500	EPA 8260B
1,1,2-Trichloroethane	0.98	0.518	0.98	0.00040	0.00500	EPA 8260B
1,1-Dichloroethene	1.87	0.0194	1.87	0.00040	0.00500	EPA 8260B
1,2,3-Trichlorobenzene	0.88	5.062	0.88	0.00040	0.00500	EPA 8260B
1,2,4-Trichlorobenzene	0.88	5.062	0.88	0.00097	0.00500	EPA 8260B
1,2-Dibromoethane (EDB)	--	--	--	0.00080	0.00500	EPA 8260B
1,2-Dichloroethane	4.79	0.26	4.79	0.00052	0.00500	EPA 8260B
1,2-Dichloropropane	2.2	0.333	2.2	0.00040	0.00500	EPA 8260B
1,3,5-Trichlorobenzene	0.88	5.062	0.88	0.00040	0.00500	EPA 8260B
1,3-Dichloropropane	2.2	0.333	2.2	0.00040	0.00500	EPA 8260B
Acetonitrile	--	0.056	0.056	0.03700	0.05000	EPA 8260B
Acrolein	--	1.52E-06	0.00000152	**0.00860**	**0.05000**	EPA 8260B
Acrylonitrile	0.05	0.0012	0.05	0.00790	0.05000	EPA 8260B
Benzene	0.16	0.142	0.16	0.00040	0.00500	EPA 8260B
Benzyl chloride	--	--	--	0.00100	0.00500	EPA 8260B
Carbon disulfide	0.12	0.0239	0.12	0.00073	0.00500	EPA 8260B
Chlorobenzene	0.17	0.291	0.17	0.00040	0.00500	EPA 8260B
Chloroform	0.94	0.121	0.94	0.00087	0.00500	EPA 8260B
Chloromethane	17.8	--	17.8	0.00120	0.00500	EPA 8260B
Dichloromethane	7.75	0.159	7.75	0.00500	0.02500	EPA 8260B
Methyl ethyl ketone (2-Butanone)	25.71	0.0424	25.71	0.00100	0.00500	EPA 8260B
Tetrachloroethene	1.69	0.99	1.69	0.00074	0.00500	EPA 8260B
Toluene	2.88	1.22	2.88	0.00056	0.00500	EPA 8260B
trans-1,2-Dichloroethene	23.95	0.654	23.95	0.00040	0.00500	EPA 8260B
Trichloroethene	0.84	0.112	0.84	0.00040	0.00500	EPA 8260B
1,2-Dichlorobenzene	0.83	0.294	0.83	0.05210	0.33000	EPA 8270C
1,2-Diphenylhydrazine	--	0.545	0.545	0.01670	0.33000	EPA 8270C
1,3-Dichlorobenzene	0.19	1.315	0.19	0.04380	0.33000	EPA 8270C
1,4-Dichlorobenzene	0.77	0.318	0.77	0.04580	0.33000	EPA 8270C
1,4-Dioxane	--	0.119	0.119	0.08800	0.10000	EPA 8270C
2,4,5-Trichlorophenol	--		--	0.01670	0.33000	EPA 8270C
2,4,6-Trichlorophenol	--	0.208	0.208	0.01670	0.33000	EPA 8270C
2,4-Dimethylphenol	--	0.304	0.304	0.02040	0.33000	EPA 8270C
2,4-Dinitrophenol	--	0.00621	0.00621	0.16700	1.67000	EPA 8270C
2,4-Dinitrotoluene	--	0.0144	0.0144	0.16700	1.67000	EPA 8270C
2-Chloronaphthalene	--	0.417	0.417	0.01670	0.33000	EPA 8270C
2-Chlorophenol	--	0.0319	0.0319	0.02780	0.33000	EPA 8270C
3-Methylchlolanthrene	--		--	0.01670	0.33000	EPA 8270C
4,6-Dinitro-o-cresol	--	0.104	0.104	**0.16700**	**1.67000**	EPA 8270C
4-Nitrophenol	--	0.0133	0.0133	**0.16700**	**0.67000**	EPA 8270C
7,12-Dimethyl-benz(a)anthracene	--	66.4	66.4	0.01670	0.33000	EPA 8270C
7H-Dibenzo(c,g)carbazole	--	0.166	0.166	TBD	**0.33000**	EPA 8270C
Aniline	--	0.31	0.31	**0.33300**	**1.67000**	EPA 8270C
Benz(a)anthracene	0.108	0.108	0.108	0.01670	**0.33000**	EPA 8270C
Benz(c)acridine	--	0.166	0.166	TBD	**0.33000**	EPA 8270C
Benzenethiol	--		--	TBD	0.33000	EPA 8270C
Benzidine	--	0.545	0.545	**1.67000**	**1.67000**	EPA 8270C
Benzo(a)pyrene	0.15	0.15	0.15	0.01670	**0.33000**	EPA 8270C
Benzo(b)fluoranthene	0.423	10.4	0.423	0.01670	0.33000	EPA 8270C
Benzo(j)fluoranthene	0.423		0.423	0.00000	0.33000	EPA 8270C
Bis(2-chloroethyl)ether	--	3.52	3.52	0.03740	0.33000	EPA 8270C
Bis(2-chloroisopropyl) ether	--	--	--	0.04100	0.33000	EPA 8270C
Adipic Acid bis(2-ethylhexyl)ester	--		--	0.33000	0.33000	EPA 8270C
Bis(2-Ethylhexyl)phthalate	0.182	0.182	0.182	0.01670	**0.33000**	EPA 8270C

Table E-6. Ecological PRGs for Sediment Receptors (Continued)

Analyte	TCEQ Benchmark (mg/Kg) Freshwater	EPA Region 5 (mg/kg) EqP	PRG (mg/kg)	MDL (mg/kg)	RL (mg/kg)	Method
Butyl benzyl phthalate	0.182	1.97	0.182	0.01670	**0.33000**	EPA 8270C
Chrysene	0.166	0.166	0.166	**0.01670**	**0.33000**	EPA 8270C
2-methylphenol			0.0524	0.03300	0.33000	EPA 8270C
3&4 Methylphenol			0.0524	**0.05000**	**0.67000**	EPA 8270C
Dibenz(a,h)acridine	--		--	0.01670	0.33000	EPA 8270C
Dibenz(a,h)anthracene	0.033	0.033	0.033	0.01670	**0.33000**	EPA 8270C
Dibenz(a,j)acridine	--		--	0.02200	0.33000	EPA 8270C
Dibenzo(a,e)pyrene	0.195	0.195	0.195	TBD	**0.33000**	EPA 8270C
Dibenzo(a,h)pyrene	0.195	0.195	0.195	TBD	**0.33000**	EPA 8270C
Dibenzo(a,i)pyrene	0.195	0.195	0.195	TBD	**0.33000**	EPA 8270C
Dichloropropanol	--		--	TBD	TBD	EPA 8270C
Diethyl phthalate	0.63	0.295	0.63	0.01670	0.33000	EPA 8270C
Dimethyl phthalate	0.63	--	0.63	0.01670	0.33000	EPA 8270C
Di-n-butyl phthalate	0.63	1.114	0.63	0.01670	0.33000	EPA 8270C
Di-n-octyl phthalate	0.63	40.6	0.63	0.01670	0.33000	EPA 8270C
Fluoranthene	0.423	0.423	0.423	0.01670	0.33000	EPA 8270C
Indeno(1,2,3-c,d)pyrene	0.195	0.2	0.195	0.01670	**0.33000**	EPA 8270C
Naphthalene	0.176	0.176	0.176	0.04170	**0.33000**	EPA 8270C
Nitrobenzene	0.51	0.145	0.51	0.03640	0.33000	EPA 8270C
p-Chloro-m-cresol	--	0.388	0.388	0.01670	0.33000	EPA 8270C
Pentachlorophenol	--	23	23	0.16700	1.67000	EPA 8270C
Phenol	--	0.0491	0.0491	0.01670	**0.33000**	EPA 8270C
P-Nitroaniline	--	--	--	0.06700	0.33000	EPA 8270C
Pyridine	--	0.106	0.106	**0.33300**	**1.67000**	EPA 8270C
Crotonaldehyde	--		--	0.16000	0.20000	EPA 8315
Formaldehyde	--		--	0.07800	0.10000	EPA 8315

Note:
(1) Method detection limits (MDLs) and reporting limits (RLs) were provided by TestAmerica.
Sources:
Texas Commission on Environmental Quality (TCEQ). 2006. Update to Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas RG-263 (Revised). Remediation Division. January.
U.S. Environmental Protection Agency (EPA), August 2003. Resource Conservation and Recovery Act (RCRA) Corrective Action, Ecological Screening Levels. http://www.epa.gov/reg5rcra/ca/edql.htm.
Screening criteria used TCEQ values as primary and then EPA Region 5 values if no TCEQ value was available.
-- Screening Criteria not available.
Bolded values are greater than the Preliminary Remediation Goal (PRG).
MDLs and RLs are based upon February 2009 data.
The MDL and RL for crotonaldehyde need to be confirmed.
EqP - Equilibrium partitioning.
TBD - MDL study must be rerun.
Surrogates:
Fluoranthene used for benzo(b)fluoranthene and benzo(j)fluoranthene for TCEQ value.
Bis(2-ethylhexyl)phthalate used for butyl benzyl phthalate for TCEQ value.
Diethyl phthalate used for dimethyl phthalate, di-n-butyl phthalate and di-n-octyl phthalate for TCEQ value.
Pyrene used for indeno(1,2,3-cd)pyrene for TCEQ value.
Pyrene used for dibenzo(a,e)pyrene, dibenzo(a,h)pyrene and dibenzo(a,i)pyrene.
1,2,4-Trichlorobenzene used for 1,2,3-trichlorobenzene and 1,3,5-trichlorobenzene.
m-Cresol used for cresols for EPA Region 5.
1,2-Dichloropropane used for 1,3-dichloropropane.
Chrysene used for 7H-dibenzo(c,g)carbazole, benz(c)acridine, benzo(j)fluoranthene, dibenz(a,h)acridine, dibenz(a,j)acridine, dibenzo(a,e)pyrene, dibenzo(a,h)pyrene, and dibenzo(a,i)pyrene.
n-Nitrosodiphenylamine used for 1,2-diphenylhydrazine, and benzidine. The Region 5 Ecological soil screening level is 0.545 milligrams per kilogram (mg/kg) in the masked shrew.

Appendix F

Appendix F
Acronym List (from PRG Report)

List of Acronyms

AFJ	Agreed Final Judgment
AOC	Administrative Order on Consent
APAR	Affected Property Assessment Report
COCs	Chemicals of Concern
CSM	Conceptual Site Model
EPA	Environmental Protection Agency
FRGs	Final Remediation Goals
HASP	Health and Safety Plan
IM	Interim Measures
LC50	Lethal Concentration to 50% of the Population
LNAPL	Light Non-Aqueous Phase Liquid
MDL	Method Detection Limit
MTBE	Methyl Tertiary-butyl Ether
NAPL	Non-Aqueous Phase Liquid
PAHs	Polycyclic Aromatic Hydrocarbons
PR/VSI	Preliminary Review/Visual Site Inspection
PRG	Preliminary Remediation Goals
PRGs	Preliminary Remediation Goals
RAGs	Risk Assessment Guidance for Superfund
TBCDS	Texas Biological and Conservation Data System
TCEQ	Texas Commission on Environmental Quality
TDS	Total Dissolved Solids
TPWD	Texas Parks and Wildlife Department
UCL	Upper Confidence Limit
USFWS	United States Fish and Wildlife Service
VOC	Volatile Organic Compound
WWTS	Waste Water Treatment System

Appendix G

Appendix G: Definition of "Facility" (from PRG Report)

The AOC defines the "Facility" as "...the area of contamination beyond the Coastal Refinery property boundary north, northeast and east of the Coastal Refinery East Plant-North and extending onto or under the portion of Elementis Chrome and Chemical, Inc., (Elementis) [adjacent] property located East of Cantwell Lane and to the Inner Harbor Ship Channel"(AOC, Section I.) The "Facility" may also be expanded to include areas west of Cantwell Lane in the IM Area as defined in Section 2.1 of this PRG report, should contamination contiguously extend into that area. Figure 1-1 is a site map depicting the area covered under the AOC, including the IM area, all other areas that make up the Facility, and adjacent properties.

Appendix H

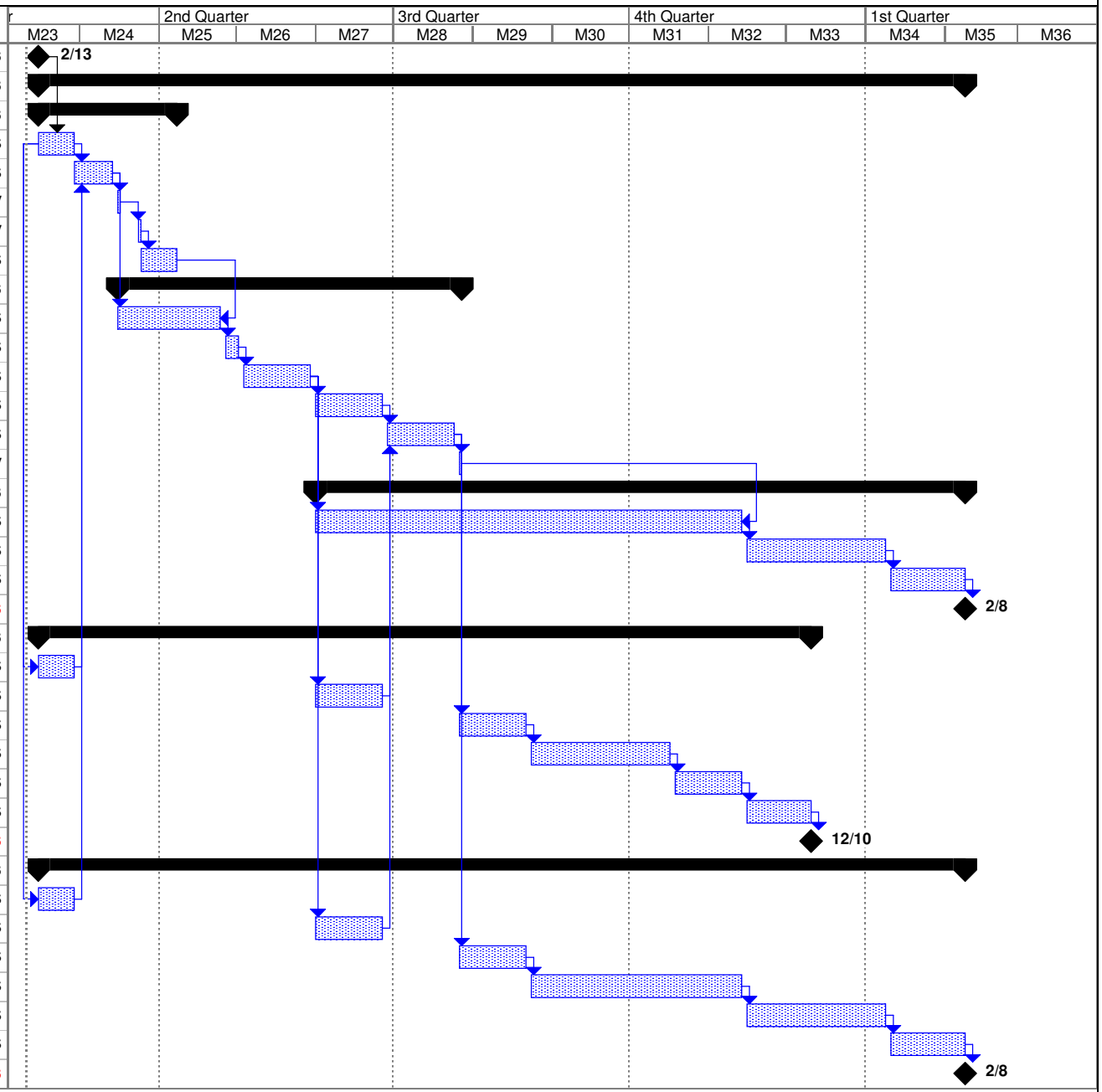
Appendix H
Equipment Decontamination Procedures

All non-dedicated groundwater monitoring and sampling equipment (e.g., interface probe, submersible pumps, etc.) will be thoroughly decontaminated prior to use at each well. The decontamination procedure can be modified if justified by supplemental information obtained as the field program evolves. The decontamination procedure is a seven-step process that consists of water rinses and a final air rinse. Each step should be performed for a minimum of 30 seconds. The decontamination process is as follows:

1) 15-20 gallons potable water rinse;
2) Distilled water and Alconox® or Liquinox® (or other phosphate-free detergent) rinse;
3) 10-15 gallons potable water rinse;
4) Isopropanol alcohol (IPA) rinse;
5) Potable water rinse;
6) American Society for Testing and Materials (ASTM) Type II reagent grade (laboratory) water rinse; and
7) Allow equipment to air dry or circulate air through the pump for 30 seconds to allow remnant IPA to volatilize.

Care will be taken to prevent the clean sampling equipment from coming into contact with potentially contaminating substances such as oil, engine exhaust, corroded surfaces, and dirt. Decontamination rinses may be replaced with fresh water or new solutions multiple times a day (between boreholes or sample locations) if it is determined that the decontamination process may be affecting the integrity of samples collected.

Appendix I

El Paso Elementis Site
Field Investigation, LNAPL Work Plan and Corrective Measures Study Schedule

ID	Task Name	Duration
1	**EPA Approval of FI Work Plan**	**0 days**
2	**Facility Investigation**	**257 days**
3	**Sampling and Analysis Plan**	**38 days**
4	Identify Data Gaps	10 days
5	Develop Draft SAP	11 days
6	Submit Draft SAP to EPA	1 day
7	Working Meeting with EPA	1 day
8	Finalize SAP	10 days
9	**Field Investigation**	**96 days**
10	Planning	30 days
11	Mobilization	5 days
12	Field Work - Phase 1	20 days
13	Phase 1 Data Evaluation	20 days
14	Field Work - Phase 2	20 days
15	Demob	1 day
16	**FI Report**	**181 days**
17	Evaluate Data	120 days
18	Develop Draft FI Report	40 days
19	Develop Final FI Report	21 days
20	**Submit FI Report to EPA**	**0 days**
21	**LNAPL Upgrade Work Plan**	**215 days**
22	Identify Field Data Needs	10 days
23	Phase 1 Data Evaluation	20 days
24	Phase 2 Data Evaluation	20 days
25	Develop and Evaluate Alternatives	40 days
26	Develop Draft LNAPL Work Plan	20 days
27	Develop Final LNAPL Work Plan	19 days
28	**Submit LNAPL Work Plan to EPA**	**0 days**
29	**Corrective Measures Study**	**257 days**
30	Identify Field Data Needs	10 days
31	Phase 1 Data Evaluation	20 days
32	Phase 2 Data Evaluation	20 days
33	Develop and Evaluate Alternatives	60 days
34	Develop Draft CMS	40 days
35	Develop Final CMS	21 days
36	**Submit CMS to EPA**	**0 days**