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**PACIFIC COAST PIPELINE SITE
FILLMORE, CALIFORNIA**

**RI/FS OVERSIGHT/RISK ASSESSMENT
COMMUNITY RELATIONS/ROD ASSISTANCE**

**FINAL
BASELINE RISK ASSESSMENT**



*Engineers
Planners
Economists
Scientists*

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BASELINE RISK ASSESSMENT**

**Prepared for
PRC Environmental Management, Inc.**

Work Assignment No.	:	PRC C09020
EPA Region	:	9
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Contract No.	:	68-W9-0009
Prepared By	:	CH2M HILL
CH2M HILL Project No.	:	LAO28420.A5
CH2M HILL Project Manager	:	Terry Foreman
Telephone No.	:	714/250-5522 x326
PRC Technical Monitor	:	Gordon Ballentine
Telephone No.	:	415/543-4880
EPA Primary Contact	:	Michael Montgomery
Telephone No.	:	415/744-2403



December 10, 1991

LAO28420.A5

Mr. Michael Montgomery (H-7-1)
U. S. Environmental Protection Agency, Region IX
Hazardous Waste Management Division
Superfund Branch/Enforcement Response Section
75 Hawthorne St.
San Francisco, California 94105

Subject: Transmittal of Baseline Risk Assessment Report
Texaco Fillmore Facility
Pacific Coast Pipeline Site

Enclosed is the revised baseline risk assessment report for the Pacific Coast Pipeline Site. I am sending copies to Gordon Ballentine of PRC Environmental Management, Inc., Glenn Anderson of Texaco Inc., and Steve Goodbred of the U.S. Fish and Wildlife Service as you requested.

If you have any questions, please give me a call.

Sincerely,

CH2M HILL

A handwritten signature in cursive script that reads 'Terry L. Foreman'.

Terry L. Foreman
Site Manager

cc: Mr. Gordon Ballentine
PRC Environmental Management, Inc.
120 Howard Street, Suite 700
San Francisco, California 94105

Mr. Glenn Anderson
Texaco Inc.
Environmental Product Safety Department
Western Regional Office 10 Universal City Plaza
Universal City, California 91608

Mr. Michael Montgomery

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December 10, 1991

Mr. Steve Goodbred

Environmental Control Specialist

U.S. Fish and Wildlife Service

2400 Avila Road

Laguna Niguel, California 92656

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

The Texaco Fillmore site is located at 67 East Telegraph Road in the City of Fillmore, Ventura County, California. The site consists of approximately 20 acres. Refinery operations began on the site between 1910 and 1920 and continued until 1950. Since 1950, the site has been operated as a crude oil pumping station. The site was acquired by Texaco in 1928.

Refinery processes at the site included distillation and thermal cracking to produce petroleum products such as gasoline, diesel fuel, and fuel oil. During the period of refinery operations, miscellaneous refinery wastes were disposed of onsite in a large main pit and in eight smaller suspected disposal areas.

Several site investigations have been conducted on the site since 1983. Site investigations have included sampling of offsite and onsite surface soils; offsite and onsite subsurface soils; onsite groundwater; surface water and sediment from Pole Creek, which is located along the western border of the site; onsite ambient air; and soil gas. Soil was removed from various waste pits in 1986.

The site was added to the National Priorities List of sites to be investigated under the Superfund program in 1989. Texaco is conducting a remedial investigation of the site. This document contains the baseline human health and environmental risk assessments for the Texaco Fillmore site. All data used in the assessment were taken from either the electronic data files provided by Texaco or the Remedial Investigation Report. Site investigations included sampling of the following media: groundwater, surface soil, subsurface soil, ambient air, surface water, and creek sediment. There were approximately 40 chemicals of potential concern detected at the site including monocyclic aromatics (e.g., BTEX), polycyclic aromatics (e.g., naphthalene, benzo(a)pyrene), phenolics, phthalate esters, halogenated aliphatics (1,2-dichloroethane), and metals. Metals in onsite surface and subsurface soils samples were detected in concentrations similar to concentrations detected in offsite background samples. The chemicals of potential concern are presented in Chapter 2, Table 2-13.

Potentially exposed populations at the site include current onsite workers who maintain the pumping operations, visitors or trespassers at the site, and nearby offsite workers and residents. As a conservative estimate, risks for the Texaco site have been calculated assuming a future onsite residential exposure scenario.

Potential exposure pathways assessed in the human health risk assessment include ingestion of groundwater, inhalation of volatile chemicals in groundwater, direct contact with site surface soil, ingestion of surface water, inhalation of volatile chemicals in surface water, ingestion of stream sediment, and inhalation of ambient air. In addition, worker exposure to soil gas while trenching onsite was also evaluated.

The potential for carcinogenic effects from chemicals detected at the site was evaluated by estimating the excess lifetime cancer risk. Excess lifetime cancer risk is the incremental increase in the probability of developing cancer (i.e., if no exposure occurs). For example, a 1×10^{-6} excess lifetime cancer risk means that for every 1 million people exposed to the carcinogen throughout their lifetimes (which is typically assumed to be 70 years), the average incidence of cancer is increased by one additional case of cancer. Because of the health protective methods followed by the U.S. Environmental Protection Agency in estimating cancer potency factors, the excess lifetime cancer risks in the assessment should be regarded as upper bounds on the potential cancer risks.

Noncarcinogenic health risks were analyzed quantitatively by evaluating whether the daily intake exceeded the reference dose; the ratio of these is called the hazard quotient. The chemical-specific noncarcinogenic risks were added together to generate a hazard index representing the chemicals detected at the site. A hazard quotient or index of one or more indicates a potential concern.

The estimated excess lifetime cancer risks, assuming residential groundwater use (ingestion and inhalation), was 6×10^{-5} . The major contributor to this risk was benzene with an estimated cancer risk of 5×10^{-5} . The total estimated hazard index, based on a child exposure scenario, was 5.0. The major contributors to the hazard index were arsenic and cadmium through groundwater ingestion.

Assuming future onsite residential surface soil ingestion, the estimated excess lifetime cancer risk was 4×10^{-5} . The major contributor to this surface soil risk was chrysene with an estimated excess lifetime cancer risk of 1×10^{-5} . Four additional chemicals, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and 2,4-dinitrotoluene had estimated excess lifetime cancer risks greater than 1×10^{-6} . The total estimated hazard index due to soil ingestion was 0.005.

Screening risk estimates were calculated for exposure to ambient air, stream sediment, surface water, and soil gas to determine where possible sources of risks might be. Calculations for ambient air, stream sediment, and surface water are based on a future onsite residential scenario. Calculations for soil gas are based on a worker excavation scenario.

The estimated excess lifetime cancer risks due to inhalation of chemicals detected in ambient air was 4×10^{-5} . The estimated hazard index for this pathway is 0.08. The estimated excess lifetime cancer risk due to ingestion and inhalation of chemicals detected in surface water was 5×10^{-6} , while the risk due to ingestion of chemicals detected in stream sediment was 1×10^{-6} . The hazard indices for both scenarios were less than one.

The estimated excess lifetime cancer risk for worker exposure to soil gas while trenching was 4×10^{-3} . The hazard index for this exposure scenario is 0.1.

In the qualitative environmental assessment, information was collected regarding the sensitive species and habitats in the area. Nine birds and seven mammals were identified as special status species potentially occurring in the vicinity of the site. Potential exposure pathways include direct contact with detected chemicals in surface soils, surface water, and creek sediment.

Both the Sespe Creek, which is located approximately one and one-quarter miles west of the site, and the Santa Clara River, which is approximately one-half mile south of the site, have designated existing beneficial water use as Warm Freshwater Habitats and as water supply and habitat for the maintenance of wildlife. In addition, the Sespe Creek is designated as an existing Cold Freshwater Habitat. Beneficial uses for the Pole Creek were not available, however, the creek flows into the Pole Creek Flood Control Channel along the western border of the site and eventually to the Santa Clara River. Chemical concentrations detected in Pole Creek were compared to regulatory standards for the protection of freshwater aquatic life. All chemicals with standards were detected at concentrations below the corresponding standard.

There are many uncertainties associated with the risk assessment process. Some of these uncertainties are that not all chemicals detected at the site have EPA-verified toxicity values available, exposure estimates assume chemical concentrations remain constant over the exposure period, and high detection limits for some chemicals may under estimate risk. Because of these uncertainties conservative assumptions are used, and carcinogenic and noncarcinogenic risks are regarded as upper-bound risks. Actual risks may be lower.

Chapter 1
INTRODUCTION

Chapter 1 INTRODUCTION

1.1 OVERVIEW AND PURPOSE

The National Contingency Plan (NCP) requires that a baseline risk assessment (RA) be conducted as part of remedial investigation activities for all Superfund sites. The purpose of the baseline RA is to characterize the potential human health and environmental risks that might exist if no further remedial actions occur. Evaluation of this "no-action" alternative also assumes that no restrictions will be placed on future use of the site.

This report presents the results of the baseline RA for the Texaco Fillmore site. In general, the approach and methodology for this baseline RA have been according to the following documents:

- Risk Assessment Guidance for Superfund Volume I--Human Health Evaluation Manual (Part A). Interim Final (EPA/540/1-89/002) December 1989a.
- Risk Assessment Guidance for Superfund Volume II--Environmental Evaluation Manual. Interim Final (EPA/540/1-89/001) March 1989b.

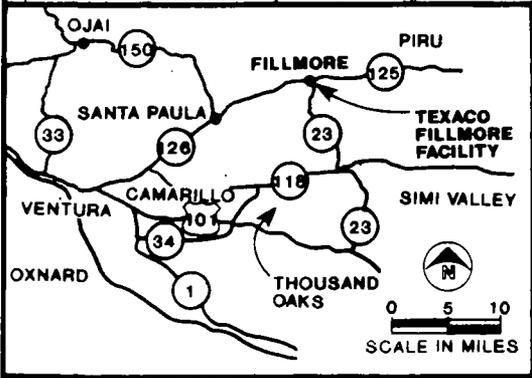
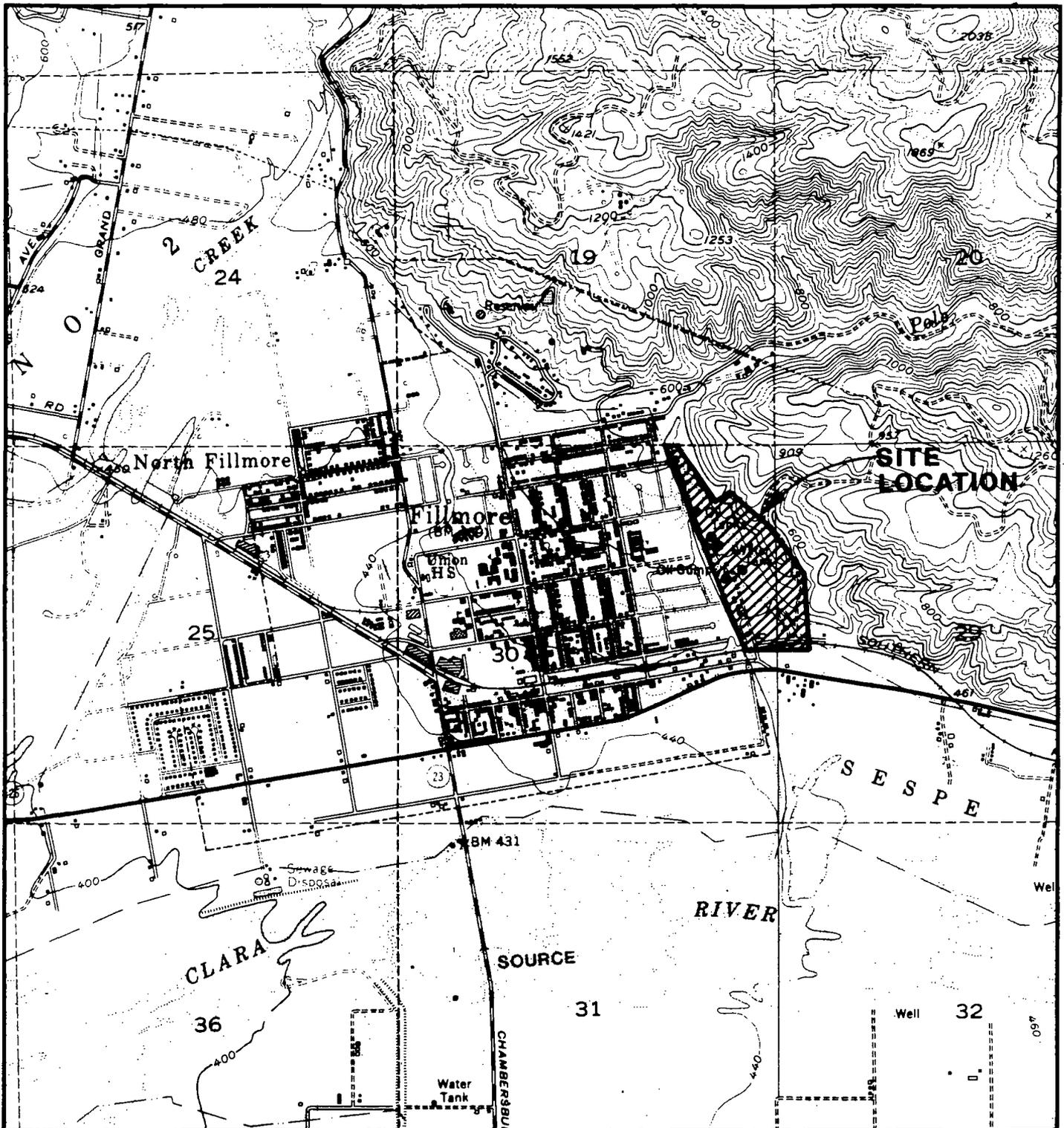
Additional direction and information on exposure assumptions have been taken from the following supplemental guidance materials:

- Risk Assessment Guidance for Superfund Human Health Risk Assessment. EPA Region IX, 1989c.
- Human Health Evaluation Manual Supplemental Guidance: Standard Default Exposure Factors. OSWER Directive 9285.6-03. EPA, March 25, 1991.

1.2 SITE BACKGROUND

The Texaco Fillmore facility, also known as the Pacific Coast Pipelines site, is located at 67 East Telegraph Road in the incorporated area of the City of Fillmore, Ventura County, California (Figure 1-1).

Refinery operations began onsite between 1910 and 1920. The refinery used processes such as distillation and thermal cracking to produce petroleum products such as gasoline, diesel fuel, and fuel oil. Refinery operations ceased in February 1950. Following the closure of the refinery in 1950, a majority of the facility was dismantled.



BASE MAP: USGS 7.5 MIN. FILLMORE QUADRANGLE
 PHOTOREVISED 1969



FIGURE 1-1
SITE LOCATION MAP
TEXACO FILLMORE FACILITY
VENTURA COUNTY, CALIFORNIA



KEY MAP

Since closure of the refinery, the facility has operated only as a crude oil pumping station (ENSR, March 1990). Figure 1-2 summarizes several site operations and sampling events.

During the period of operation as a refinery, miscellaneous refinery wastes, believed to have consisted primarily of tank bottoms, filter clays, and sludge were disposed of onsite in a large MWP and in eight smaller suspected disposal areas (Figure 1-3). The disposal areas consist of pits and unlined sumps (ENSR, March 1990). The types and amount of disposed waste are further discussed in Section 2.3.

Several site investigation activities have been conducted on the site since 1983. In 1986, 33,000 cubic yards of waste and contaminated soils were removed from various former waste pits on the site (ENSR, January 1991).

The Texaco Fillmore site was added to the National Priorities List (NPL) of sites to be investigated under the Superfund program in 1989. The remedial investigation is being conducted by Texaco.

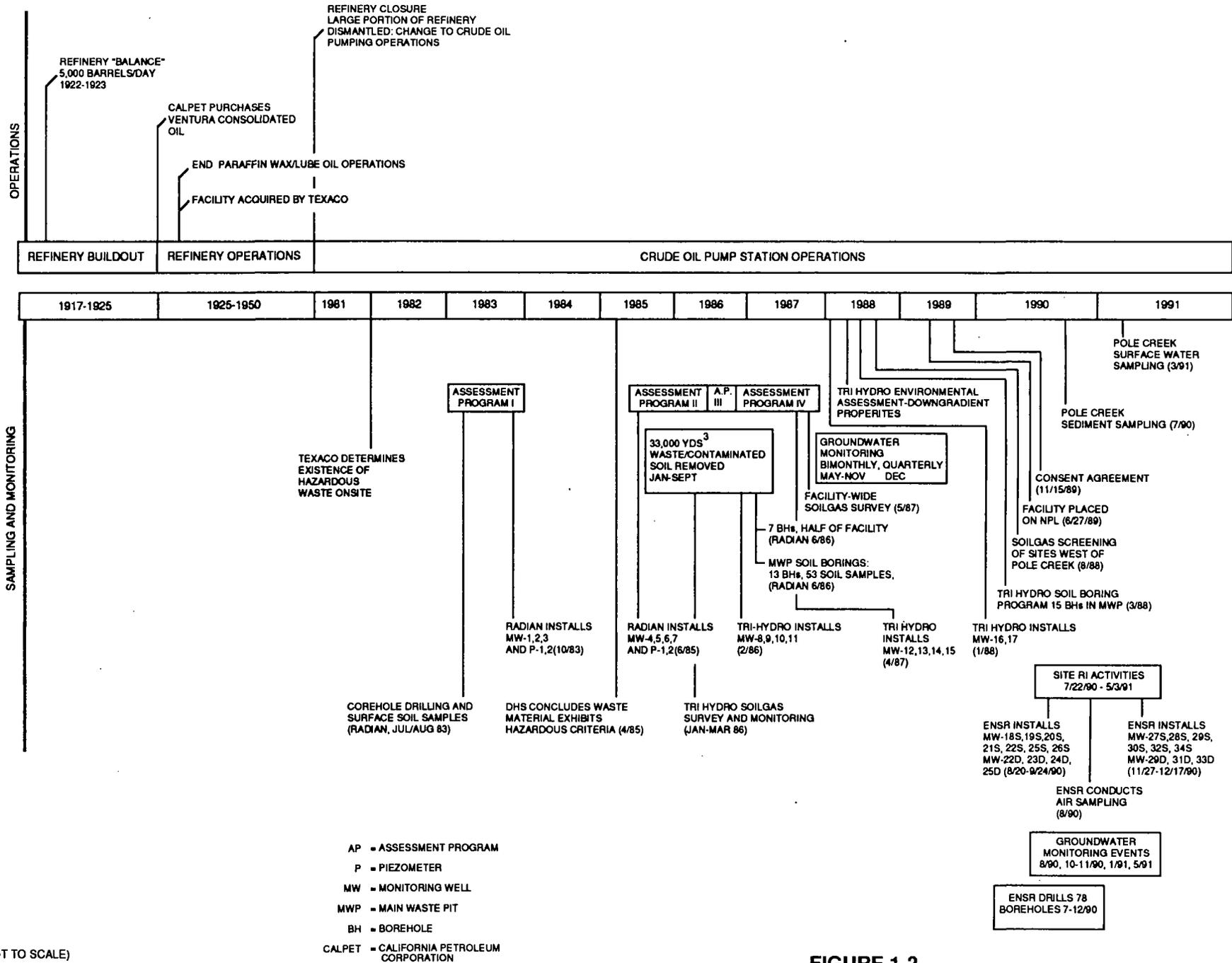
1.3 SCOPE AND ORGANIZATION OF BASELINE RISK ASSESSMENT

The baseline RA process includes four steps: identification of chemicals of potential concern; exposure assessment; toxicity assessment; and risk characterization.

Data used in this RA were taken from either the electronic data files provided by Texaco or the Final Remedial Investigation Report (ENSR, June 1991), and are subject to the limitations of these data (as discussed in Chapter 2).

This report is divided into the following additional chapters:

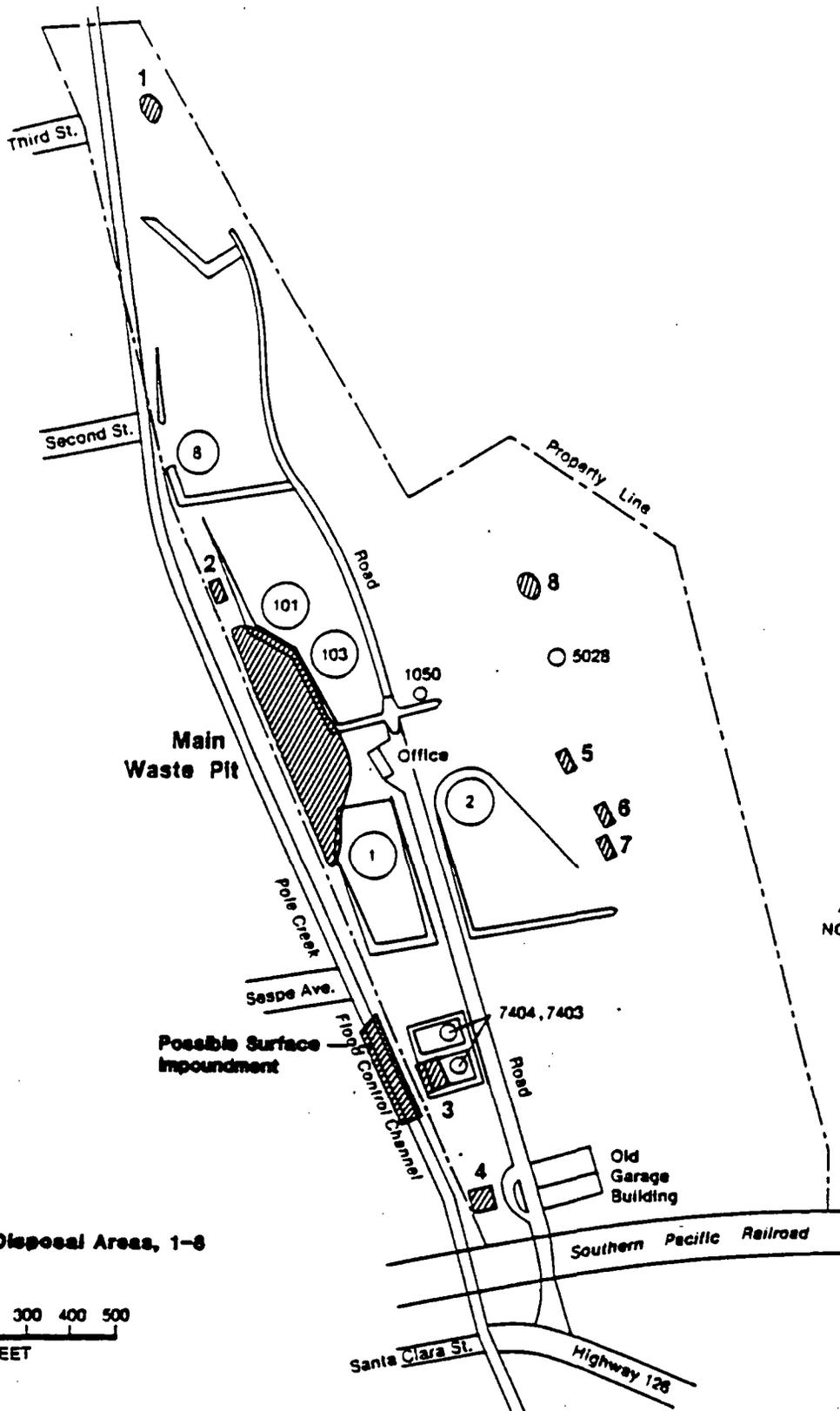
- **Identification of Chemicals of Potential Concern.** Identifies the chemicals to be evaluated in the baseline RA.
- **Exposure Assessment.** Identifies pathways by which exposures might occur. Estimates (qualitatively or quantitatively) the magnitude and frequency of potential exposures.
- **Toxicity Assessment.** Summarizes toxicity information for chemicals of concern.
- **Risk Characterization.** Integrates the toxicity and exposure assessments to estimate (qualitatively or quantitatively) the potential risks to public health from exposure to site chemicals.



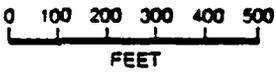
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Source: ENSR Site Background Summary 3/90

**FIGURE 1-2
TEXACO FILLMORE SITE CHRONOLOGY AND
SELECTED SAMPLING EVENTS**



 **Waste Disposal Areas, 1-8**



SOURCE: RADIAN 1984, AS PRESENTED IN
FIELD SAMPLING PLAN FOR
SURFACE SOILS, ENSR 1990.

**FIGURE 1-3
LOCATIONS OF
WASTE DISPOSAL AREAS
FILLMORE FACILITY.**



- Environmental Assessment. Identifies site-specific species and habitat information. Qualitatively discusses potential exposure pathways and environmental receptors.
- Conclusions. Summarizes the estimated excess lifetime cancer risk and estimated hazard index.
- Appendixes. Contain additional data analyses, risk assessment methodology, and risk calculations.

Chapter 2
IDENTIFICATION OF CONTAMINANTS OF CONCERN

Chapter 2

IDENTIFICATION OF CONTAMINANTS OF CONCERN

The purpose of this chapter is to develop a list of chemicals that will be the focus of the baseline RA. The types of sampling conducted at the site are briefly described; more information can be found in the Remedial Investigation (RI) Report and site-specific sampling plans prepared by ENSR. In general, the Final RI Report (ENSR, June 1991) was used during preparation of this baseline RA.

2.1 DATA COLLECTION

The following information on data collection at the Texaco Fillmore site has been taken from the draft RI report done by ENSR (January 1991). The RI report contains more detailed descriptions of sampling techniques and field Quality Assurance (QA) procedures.

Groundwater. A total of 26 monitoring wells and two piezometers have been installed at the facility since investigations began in 1983. Of these, only 16 were reported useable as of early 1991 (many have gone dry; one well and one piezometer could not be located). Monitoring well locations are shown in Figure 2-1. Well Installation and Development Data Summary are presented in Table 2-1. Seven private wells within a 1-mile radius of the site were sampled in late 1990. The wells sampled were primarily active irrigation wells and a municipal water well. Screened interval depths for the private wells (shown in Table 2-2) ranged from less than 100 feet below ground surface (bgs) to more than 300 feet bgs. The depth of one private well was unknown. Private well locations are shown in Figure 2-2.

Surface Soils. Soil samples were taken from the top 1 inch of soil at 32 locations. Each was a single sampling point within one 250-foot by 250-foot square of a sitewide sampling grid. These samples included several background locations chosen to represent areas of no known historical or current facility-related activities. Surface soil sample locations are shown in Figure 2-3, with background sampling locations highlighted with a star.

Subsurface Soils. Seventy-eight boreholes were drilled at the facility between July and December 1990. Twenty of these were converted into monitoring wells. Borehole locations are shown in Figure 2-1. Eleven boreholes were redrilled because the laboratory missed analytical holding times for a number of soil samples. Samples were collected at 5-foot intervals beginning at 5 feet below grade; 3 to 7 of these samples were sent for laboratory analysis per borehole. Background boreholes were located in areas where no past or present activity was believed to have occurred based on review of the site's historical data. The RI report states that boreholes BG-BH-2, -3, and -5

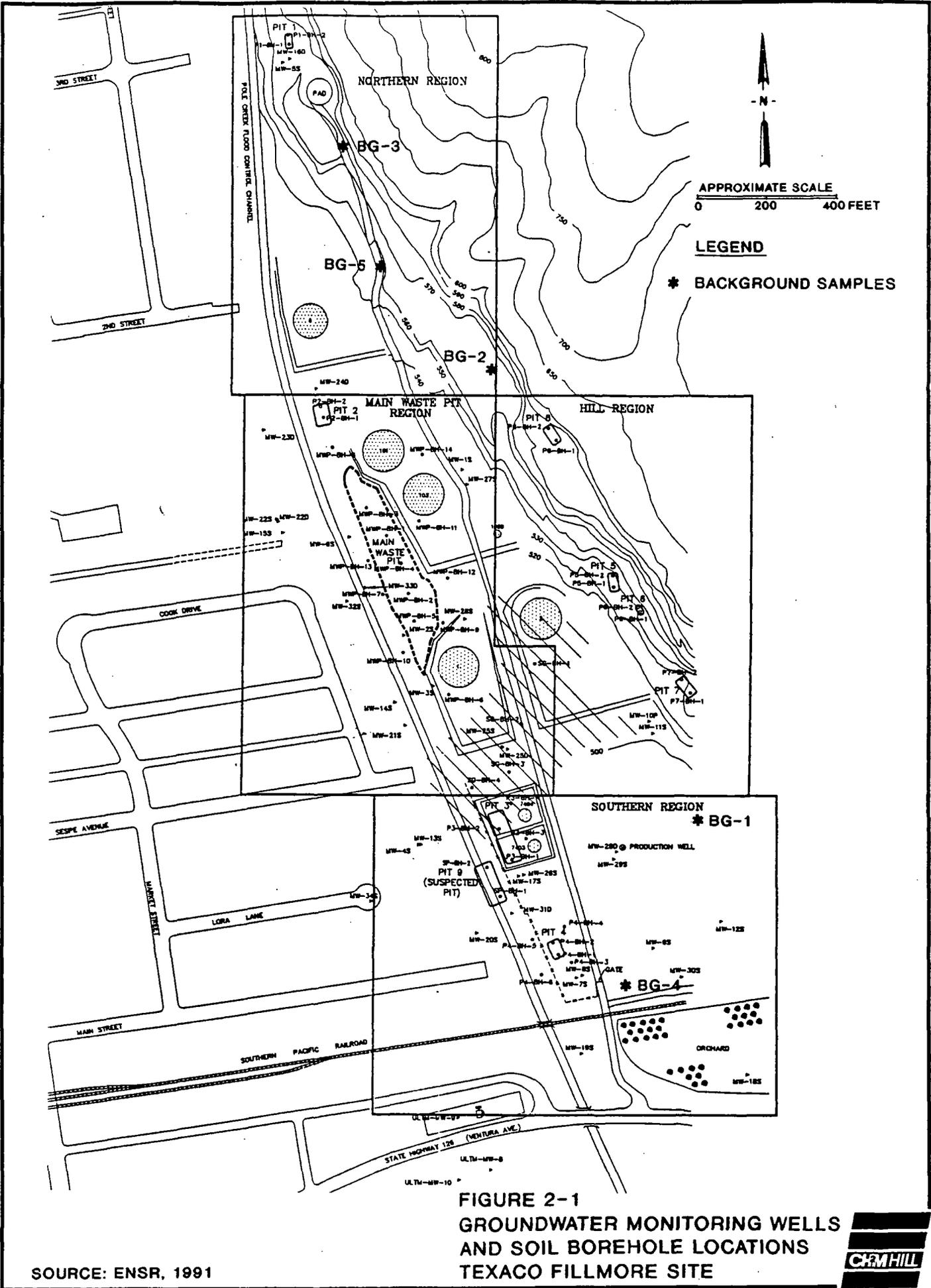


FIGURE 2-1
GROUNDWATER MONITORING WELLS
AND SOIL BOREHOLE LOCATIONS
TEXACO FILLMORE SITE

SOURCE: ENSR, 1991



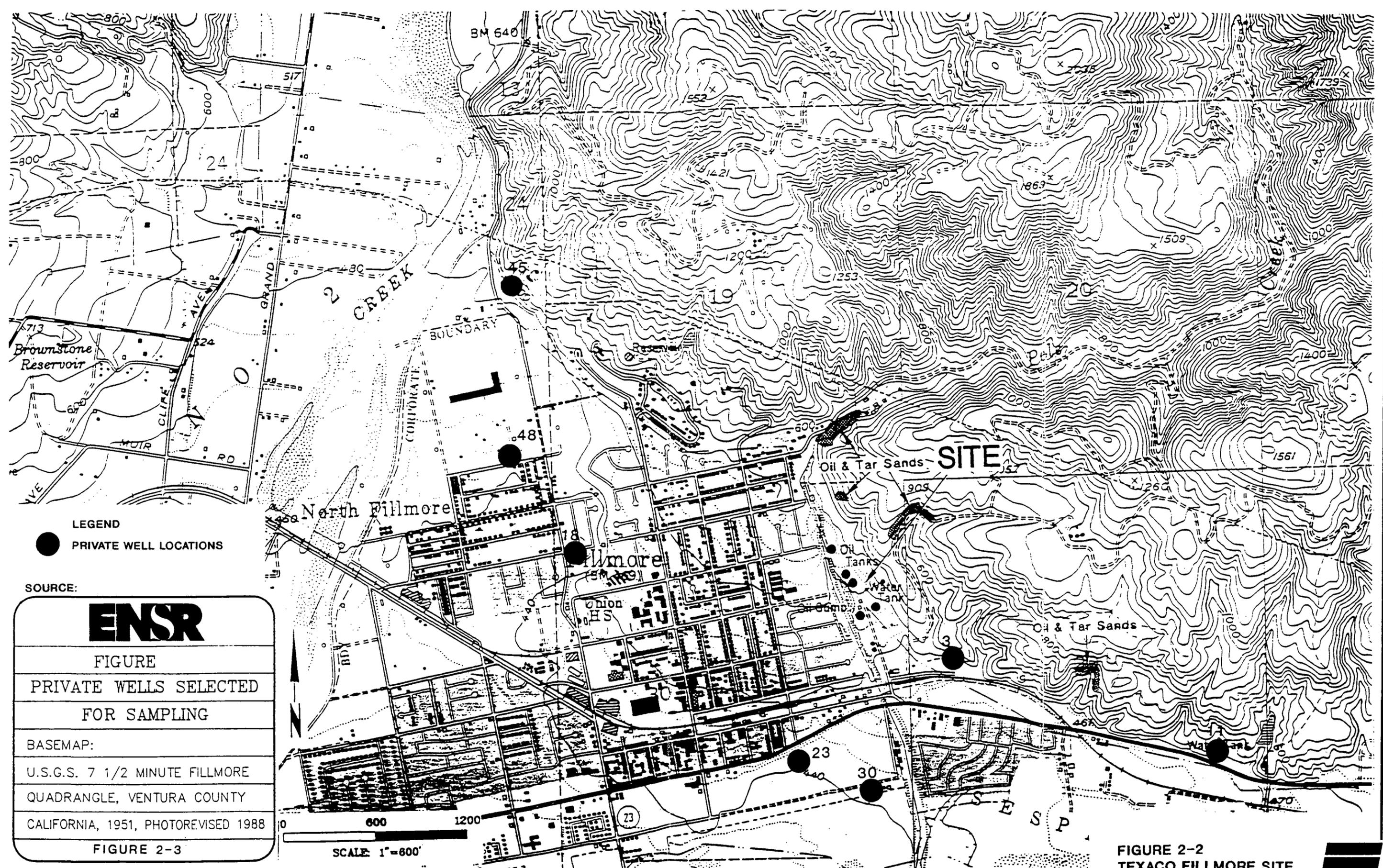
**Table 2-1
Well Installation and Development Data Summary**

Well ID Number	Date Developed	Total Well Depth (feet below grade)	Screened Interval (feet-MSL) ¹
Perched Zone			
MW-10P	2/21/86 ²	50.52	462-452
Aquifer 1			
MW-6S	7/2/86 ²	117.66	413-403
MW-8S	2/20/86 ³	72.22	439-409
MW-11S	2/21/86 ³	95.70	432-412
MW-18S	9/24/90	69.48	421-401
MW-19S	8/28/90	78.46	420-400
MW-20S	9/24/90	93.54	415-395
MW-21S	9/07/90	113.53	409-389
MW-22S	8/29/90	137.46	405-384
MW-25S	8/28/90	101.50	422-401
MW-26S	8/28/90	90.51	421-401
MW-27S	1/07/91	135.50	414-394
MW-28S	1/07/91	118.50	414-394
MW-29S	1/08/91	97.50	415-395
MW-30S	1/08/91	85.50	416-396
MW-32S	1/10/91	125.50	408-388
MW-34S	1/09/91	115.50	397-377
Aquifer 2			
MW-16D	1/13/88 ²	181.45	410-390
MW-22D	8/29/90	160.49	372-361
MW-23D	8/29/90	142.48	403-382
MW-24D	8/27/90	163.54	390-370
MW-25D	8/28/90	140.54	376-366
MW-29D	1/08/91	130.50	373-363
MW-31D	1/08/91	135.50	360-350
MW-33D	1/09/91	150.50	373-363
¹ MSL = Mean Sea Level ² Radian Corporation Well ³ TriHydro Corporation Well Source: Final Remedial Investigation Report, Texaco Fillmore Facility, ENSR, June 1991.			

**Table 2-2
Private Wells Included in Network Sampling**

Private Well Number	Screened Depths (feet below ground surface)
3	unknown
11	174-204
18	60-134 186-208 260-281 374-380
23	160-232 345-355 404-434 446-479
45	240-502 pump at 160 feet
48	well total depth = 300 feet

Source: Final Remedial Investigation Report, Texaco Fillmore Facility, ENSR, June 1991.



LEGEND
 ● PRIVATE WELL LOCATIONS

SOURCE:
ENSR
 FIGURE
 PRIVATE WELLS SELECTED
 FOR SAMPLING
 BASEMAP:
 U.S.G.S. 7 1/2 MINUTE FILLMORE
 QUADRANGLE, VENTURA COUNTY
 CALIFORNIA, 1951, PHOTOREVISED 1988
 FIGURE 2-3

0 600 1200
 SCALE: 1"=800'

FIGURE 2-2
 TEXACO FILLMORE SITE
 PRIVATE WELL LOCATIONS





* BACKGROUND SURFACE
SOIL SAMPLING
LOCATIONS

FIGURE 2-3
SURFACE SOIL
SAMPLING LOCATIONS
TEXACO FILLMORE SITE



SOURCE: ENSR, 1991

were located on the road and hillside areas on the northern portion of the facility. Boreholes BG-BH-1 and -4 were located in predominately orchard and building areas in the southern portion of the facility. Data from boreholes BG-BH-2 and -4 were excluded from calculations because information from historical photographs and field logs suggested these areas might not be truly representative of background conditions.

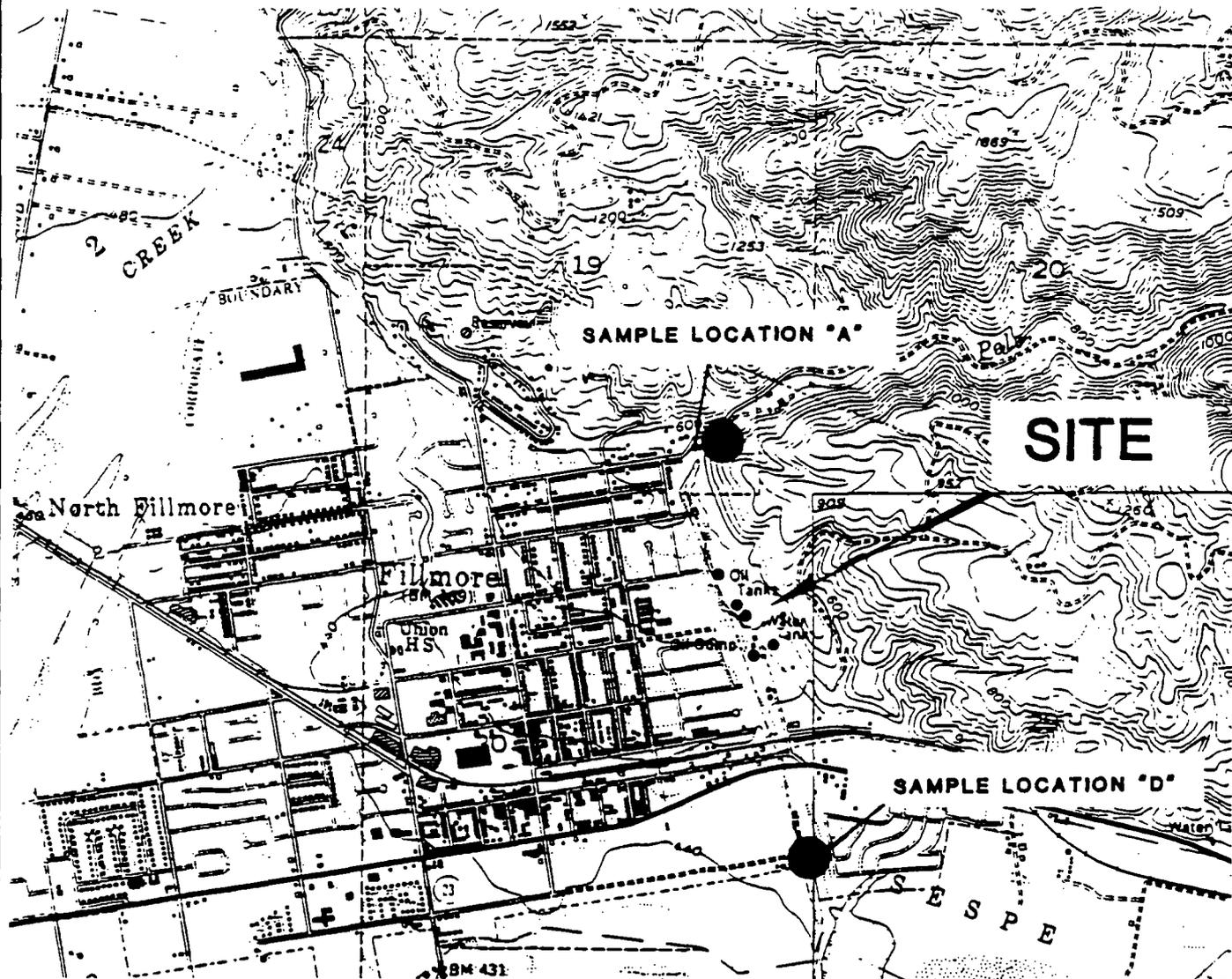
Surface Water and Stream Sediment. Two upstream and two downstream stream (Pole Creek) sediment samples were taken in July 1990 (Figure 2-4). The stream was dry at that time; surface water samples could not be taken until rain fell in March 1991. Sample locations are shown in Figure 2-5.

Ambient Air. The air investigation involved gathering information from an onsite meteorological tower, directional ambient air samplers, and an integrated surface sample. The meteorological tower was installed to provide wind direction and speed data. Although the tower was located onsite, the RI report does not provide the exact location of the tower. The two directional ambient air samplers were located immediately east (downward) and west (upwind) of the Main Waste Pit (MWP). A third sampler was located further downward of the MWP, near the area of highest soil gas concentrations detected by TriHydro Corporations' soil gas investigation. An integrated surface sample was collected in the MWP.

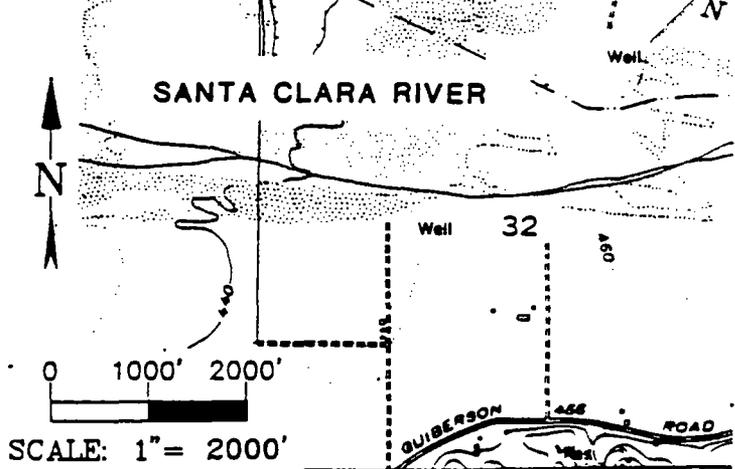
Soil Gas. Samples from five locations were collected for laboratory analysis. Four boreholes were drilled to collect soil samples in the areas of highest soil gas (ENSR, March 1990). Figure 2-6 shows the soil gas survey area and organic vapor contours.

2.2 DATA EVALUATION AND SUMMARY

Electronic data files were provided to CH2M HILL by Texaco. These files included sampling data from the following environmental media: groundwater (not including private well or historical well data), surface soil, subsurface soil, and stream sediment. The groundwater data were 1.33 megabyte in size, containing 37 parameters and 30 sample locations. Sample dates were from August 1990 to May 1991. The subsurface soil data were divided into two categories: metals and organics. The subsurface soil metals data were 1.54 megabyte in size, containing 8 parameters and 129 sample locations. Sample dates were from July 1990 to September 1990. The subsurface soil organics data were 4.3 megabyte in size containing 33 parameters and 832 sample locations. Sampling dates were from July 1990 to October 1990. Surface soil data were 841 kilobyte in size containing 38 parameters and 49 sample locations. Sample dates were from August 1990 to November 1990. Additional data used in this assessment, but not contained in the data base, were sampling data for surface water, ambient air, and soil gas. Data for surface water and ambient air were taken from the ENSR RI Report. The soil gas data was obtained from TriHydro, 1990.



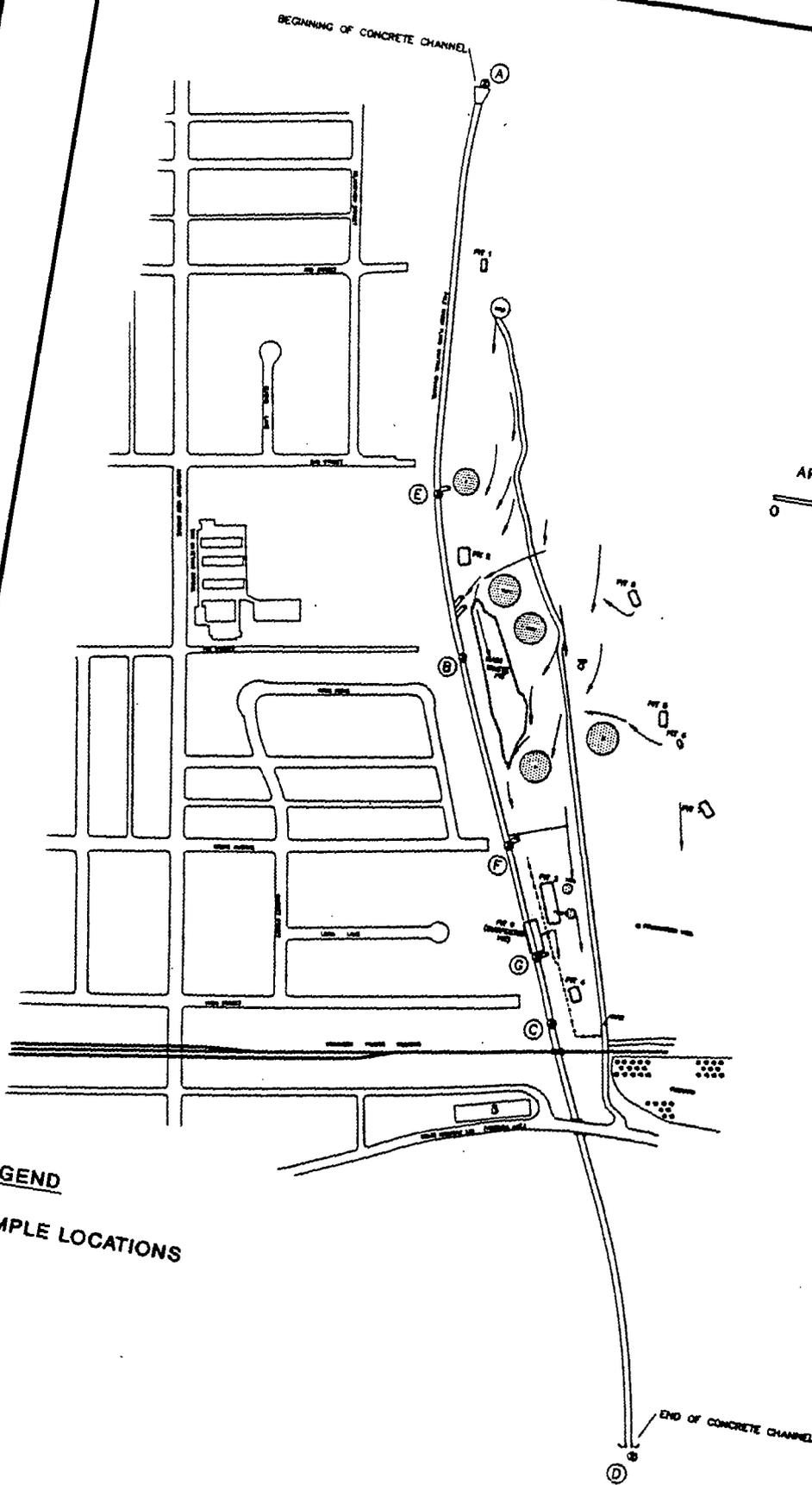
ENSR	
TEXACO INC.	
TEXACO FILLMORE DRAFT R.I. REPORT	
STREAM SEDIMENT SAMPLE LOCATION	
PROJECT # 6600-047	
DRAFTED BY: MS	APPROVED BY:
REF: U.S.G.S. 7 1/2 MINUTE FILLMORE	
TOPOGRAPHIC QUAD; 1988	



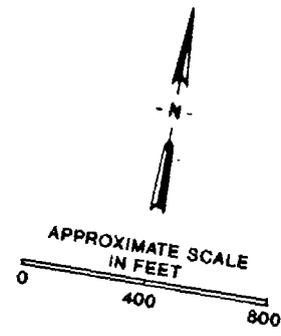
SOURCE: ENSR, 1991

FIGURE 2-4
 STREAM SEDIMENT
 SAMPLE LOCATIONS
 TEXACO FILLMORE SITE





LEGEND
 A-F
 ○ SAMPLE LOCATIONS



SOURCE: ENSR, 1991
 LAO28420.A5

FIGURE 2-5
 SURFACE WATER
 SAMPLE LOCATIONS
 TEXACO FILLMORE SITE





APPROXIMATE SCALE
 0 200 400 FEET

LEGEND

- TESTHOLE LOCATION
- AW-1 AIR WELL
- 12- TOTAL ORGANIC VAPOR CONCENTRATION CONTOUR (ppmv)

SOURCE: ENSR, 1991

FIGURE 2-6
 SOIL GAS SURVEY
 LOCATIONS AND
 ORGANIC VAPOR CONTOURS
 TEXACO FILLMORE SITE



LAO28420.A5

The following sections discuss the evaluation of the accompanying Quality Assurance/Quality Control (QA/QC) information provided along with the data base, and the methods used to produce summaries of the data. Brief data summaries are then presented by environmental medium.

2.2.1 DATA SCREENING AND QA/QC

CH2M HILL reviewed hard copies of QA/QC data for groundwater and soils. The initial QA/QC data presented by ENSR consisted of limited blank, accuracy, and precision data. This limited information was found to be inadequate and less than the level specified in the Quality Assurance Project Plan (QAPP) (ENSR, 1990), particularly for the EPA Target Compound List (TCL) parameters. Upon further evaluation of health risk assessment data needs, it was decided that, at a minimum, the QA/QC information for TCL/Target Analyte List (TAL) parameters should be upgraded to be equivalent to Contract Laboratory Program (CLP) summary QA/QC forms, as this would allow more consistent application of data qualifier flags. The QAPP indicated CLP level of effort for these parameters; therefore, EPA required that CLP QA/QC summaries would be provided for all data summaries. In addition, full CLP documentation, as defined in EPA's contract invitations for bid (IFB) WA.85.J664/J680 and WP.85.J838/J839, or later contracts, would be provided for 10 percent of the data for further review.

CH2M HILL identified the 10 percent of those data for which full CLP documentation would be provided by the laboratory in terms of laboratory batches. A batch was comprised of a group of samples analyzed at the same time, and consisted of 1 to 20 samples. At least one batch was chosen from each of the various labs employed for the analyses.

CH2M HILL has reviewed three batches of TCL and TAL analyses for CLP QA/QC summary information and one batch for full CLP QA/QC information; the packages were found to be complete with regard to the requested information. CH2M HILL has not reviewed the remaining batches, nor cross-checked hard copies with electronic deliverables.

Data QA/QC status for surface water and ambient air data has not been reviewed by CH2M HILL.

Neither split samples (collected by CH2M HILL) nor duplicate sample data (ENSR data base) have been quantitatively compared.

2.2.2 DATA SUMMARIES

Groundwater (perched aquifer and two deep aquifers), surface soil, subsurface soil, and stream sediment sampling results were available on the data base provided by Texaco. Groundwater, surface soil, and subsurface soil data summary statistics were calculated for use in the human health risk calculations. These were the arithmetic mean,

standard error of the mean, and the 95 percent upper confidence limit (UCL) on the mean. One-half the detection limit was used to include "nondetect" data points in summary statistics. This may produce mean and UCL values higher than the maximum detected value, especially for compounds with low detection frequency and/or high detection limits. The results of the data summaries, by environmental medium, are presented in Tables 2-3 through 2-5.

Because of the low numbers of samples taken from stream sediment, no summary statistics were calculated. Stream sediment data is presented in Table 2-6.

Sample quantification limits (SQL) were not available in the data base provided by Texaco (Zinni, 1991). Detection limits in the data base are contract-required detection limits (CRDL), referring to EPA's CLP requirements for analyses. These often exceed the SQL, and use of the CRDLs in data summaries may overestimate the true concentrations.

CRDLs were not entered into the data base for any sample with a positively detected value. Therefore, the concentrations in the data base for a given sample result were either a detection limit (for nondetects) or a detected concentration. This results in detected values below the "minimum" detection limit as presented in the data summary tables. Compounds detected 100 percent of the time will, therefore, not have detection limits in the summary tables.

Samples with "%," "percent," or some form of "d-xx" (where "xx" is a number) in the sample ID or results field were eliminated from the summaries, as were compounds never detected, and Tentatively Identified Compounds (TICs).

Several duplications or redundancies were noticed, such as "Acetone" and "2-Propanone" (acetone) as separate entries; these were not combined. For soil metals, however, entries such as "Chromium" and "Chromium, Total" were combined.

Data for ambient air, soil gas, private wells, and historical groundwater samples were not available in the data base provided by Texaco. Summaries for stream sediments, surface water, and ambient air were taken from the ENSR RI Report and are presented in Tables 2-6 through 2-8. The soil gas summary data were taken from TriHydro, 1990, and are presented in Table 2-9.

2.2.3 COMPARISONS WITH BACKGROUND

Metals

Each soil sample from the monitoring wells and waste pits (see Figures 2-1 and 2-2) was analyzed for total arsenic, barium, cadmium, chromium, and lead. Two samples per borehole were also analyzed for total copper, nickel, vanadium, and organic lead (ENSR, 1991).

**Table 2-3
Summary of Compounds Detected in Groundwater
Texaco Fillmore Site**

Sheet 1 of 3

Compound	Range of Detection Limits		UNITS	Range of Detected Values			OBS	DET	FREQ	Mean	SE	UCL
	Minimum	Maximum		Minimum	Maximum	Location						
Acetone	10	100	ug/l	34	46	MW-25-D	46	2	0.04	12.8	1.41	15.6
Benzene	1	50	ug/l	2	720	MW-26	66	29	0.44	41.0	15.0	71.0
2-Butanone (MEK)	10	100	ug/l	28	53	MW-25-D	44	4	0.09	14.3	1.74	17.8
Carbon Disulfide	1	50	ug/l	6	29	MW-20	66	3	0.05	1.89	0.64	3.17
Chlorobenzene	1	50	ug/l	1	1	MW-25-D	66	1	0.02	1.08	0.37	1.82
1,2-Dichloroethane	1	50	ug/l	1	9	MW-26	66	4	0.06	1.33	0.40	2.13
Ethylbenzene	1	50	ug/l	1	150	MW-27	66	18	0.27	5.66	2.38	10.4
Methylene chloride	5	50	ug/l	6.9	56	MW-26	66	3	0.05	3.68	0.82	5.32
2-Methylnaphthalene	10	10	ug/l	11	46	MW8	65	3	0.05	5.94	0.67	7.27
4-Methyl-2-pentanone	10	100	ug/l	13	13	MW-10	66	2	0.03	6.38	0.73	7.84
Naphthalene	10	10	ug/l	11	84	MW-19	61	5	0.08	7.77	1.57	10.9
2-Propanone	20	40	ug/l	39	140	MW-29-D	20	3	0.15	23.9	8.28	40.5
1,1,2,2-Tetrachloroethane	1	50	ug/l	1	1	MW-20	66	1	0.02	1.08	0.37	1.82
Toluene	2	50	ug/l	3	110	MW-26	66	20	0.30	9.59	2.69	15.0
Xylenes (TOTAL)	1	50	ug/l	1	70	MW-19	66	24	0.36	6.75	1.71	10.2
Arsenic	1.3	2	ug/l	1.3	316	MW8	68	31	0.46	8.48	4.79	18.1
Barium	5	5	ug/l	12.8	1880	MW-24	49	49	1.00	215	54.4	324

**Table 2-3
Summary of Compounds Detected in Groundwater
Texaco Fillmore Site**

Sheet 2 of 3

Compound	Range of Detection Limits		UNITS	Range of Detected Values			OBS	DET	FREQ	Mean	SE	UCL
	Minimum	Maximum		Minimum	Maximum	Location						
Boron	--	--	ug/l	260	704	MW-31	22	22	1.00	500	25.9	552
Cadmium	1.8	14.5	ug/l	1.9	48.7	MW-24	47	10	0.21	2.65	1.08	4.81
Calcium	--	--	ug/l	56400	300000	MW-29-D	22	22	1.00	175309	18035	211380
Chloride	--	--	mg/l	39.8	98.1	MW-20	22	22	1.00	60.8	3.14	67.1
Chromium	2.5	14	ug/l	2.6	179	MW-24	48	13	0.27	7.43	4.00	15.42
Chromium, Hexavalent	0.02	0.02	mg/l	0.02	0.07	MW-6	35	3	0.09	0.01	0.00	0.02
Copper	3	37	ug/l	3	254	MW-24	49	33	0.67	10.8	5.43	21.7
Lead	0.1	11	ug/l	1.2	21.8	MW-24	54	29	0.54	1.98	0.46	2.89
Magnesium	--	--	ug/l	35000	150000	MW-31	22	22	1.00	95622	8361	112346
Nickel	2.4	108	ug/l	6.4	457	MW-24	49	26	0.53	20.6	9.81	40.2
Potassium	--	--	ug/l	2420	27400	MW-25-D	22	22	1.00	5297	1094	7486
Sodium	--	--	ug/l	57800	185000	MW-19	22	22	1.00	107390	6785	120962
Sulfate	10	10	mg/l	65.6	1280	MW-31-D	22	21	0.95	605	95.2	795
Vanadium	1.9	9.5	ug/l	3	434	MW-24	48	15	0.31	12.5	9.60	31.7
Fuel Hydrocarbons	0.5	0.5	mg/l	0.66	61	MW-10	59	21	0.36	3.07	1.16	5.39
Alkalinity, Total	--	--	mg/l	277	617	MW-26	22	22	1.00	432	18.3	468
Bicarbonate As CaCO3	--	--	mg/l	277	617	MW-26	22	22	1.00	432	18.3	468

**Table 2-3
Summary of Compounds Detected in Groundwater
Texaco Fillmore Site**

Sheet 3 of 3

Compound	Range of Detection Limits		UNITS	Range of Detected Values			OBS	DET	FREQ	Mean	SE	UCL
	Minimum	Maximum		Minimum	Maximum	Location						
Nitrate as Nitrogen	0.05	0.05	mg/l	0.13	15.3	MW-29-D	17	8	0.47	2.42	1.00	4.42
pH	--	--	units	4.66	8.07	MW-25-D	60	60	1.00	7.28	0.06	7.39
Total Dissolved Solids	--	--	mg/l	690	2310	MW-29-D	22	22	1.00	1459	138	1735

Range of Sample Dates August 28, 1990 - April 30, 1991

Location = Location ID of maximum detected value

MW = Monitoring Well

Mean = Arithmetic mean calculated using nondetected values as 1/2 detection limit

OBS = Number of "valid" (nonrejected) observations

DET = Number of positive detects

FREQ = Frequency of detection (DET/OBS)

SE = Standard error of the mean

UCL = 95 percent upper confidence limit of the arithmetic mean

-- = For a given sample, EITHER a detection limit (for nondetects) or a concentration value (for positive detects) was found in the data base. Therefore, compounds detected 100% of the time (Freq = 1.00) will have no detection limit range. Also, the minimum detected value may be lower than the minimum DL for a given group of samples.

All samples filtered.

Table 2-4
 Summary of Compounds Detected in Surface Soils
 Texaco Fillmore Site

Compound	Range of Detection Limits		UNITS	Range of Detected Values			OBS	DET	FREQ	Mean	SE	UCL
	Minimum	Maximum		Minimum	Maximum	Location						
Acenaphthene	330	20000	ug/kg	2100	2100	TF-20-S-BG1-1	42	1	0.02	689	240	1168
Acetone	10	10	ug/kg	2.7	450	TF-39-S-SU1-1	41	32	0.78	57.0	13.0	82.9
Benzene	5	25	ug/kg	10	67	TF-42-S-BG1-1	42	4	0.10	6.80	2.04	10.9
Benzo(a)anthracene	330	20000	ug/kg	61	61	TF-49-S-KN901-1	41	1	0.02	652	243	1139
Benzo(a)pyrene	330	20000	ug/kg	100	250	TF-49-S-KN901-1	41	2	0.05	651	243	1138
Benzo(b)fluoranthene	330	20000	ug/kg	93	93	TF-24-S-KN901-1	41	1	0.02	652	243	1140
bis(2-Ethylhexyl)phthalate	330	20000	ug/kg	49	890	TF-6-S-KN1-1-D	41	6	0.15	669	243	1156
2-Butanone	10	50	ug/kg	12	82	TF-6-S-KN1-1	41	12	0.29	14.3	2.66	19.6
Chlorobenzene	5	25	ug/kg	61	61	TF-20-S-BG1-1	42	1	0.02	4.75	1.43	7.61
4-chloro-3-methyl phenol	330	20000	ug/kg	4700	4700	TF-20-S-BG1-1	42	1	0.02	751	256	1263
2-Chlorophenol	330	20000	ug/kg	4700	4700	TF-20-S-BG1-1	42	1	0.02	751	256	1263
Chrysene	330	20000	ug/kg	38	800	TF-26-S-SU1-1	41	5	0.12	667	243	1153
1,2-Dibromoethane	5	5	ug/kg	7.2	8	TF-42-S-BG1-1	34	2	0.06	2.80	0.21	3.22
1,4-Dichlorobenzene	330	20000	ug/kg	1900	1900	TF-20-S-BG1-1	42	1	0.02	684	239	1163
1,1-Dichloroethylene	5	25	ug/kg	44	44	TF-20-S-BG1-1	42	1	0.02	4.35	1.05	6.45
2,4-Dinitrotoluene	330	20000	ug/kg	2500	2500	TF-20-S-BG1-1	42	1	0.02	698	241	1181
Ethylbenzene	5	25	ug/kg	5.2	10	TF-49-S-KN1-1	41	3	0.07	3.75	0.46	4.67

**Table 2-4
Summary of Compounds Detected in Surface Soils
Texaco Fillmore Site**

Compound	Range of Detection Limits		UNITS	Range of Detected Values			OBS	DET	FREQ	Mean	SE	UCL
	Minimum	Maximum		Minimum	Maximum	Location						
4-Nitrophenol	1600	97000	ug/kg	6600	6600	TF-20-S-BG1-1	42	1	0.02	3281	1155	5591
Methylene chloride	5	5	ug/kg	1.7	230	TF-11-S-SU1-1-D	41	37	0.90	36.9	8.25	53.4
N-Nitrosodi-n-propylamine	330	20000	ug/kg	2400	2400	TF-20-S-BG1-1	42	1	0.02	696	241	1178
Pentachlorophenol	1600	97000	ug/kg	4900	4900	TF-20-S-BG1-1	42	1	0.02	3240	1153	5546
Phenanthrene	330	20000	ug/kg	110	110	TF-24-S-KN901-1	41	1	0.02	653	243	1140
Phenol	330	20000	ug/kg	3600	3600	TF-20-S-BG1-1	42	1	0.02	725	248	1220
Pyrene	330	20000	ug/kg	88	2800	TF-20-S-BG1-1	42	3	0.07	690	243	1177
Toluene	5	5	ug/kg	1	900	TF-11-S-SU1-1-D	42	38	0.90	120	26.7	173
1,2,4-Trichlorobenzene	330	20000	ug/kg	2400	2400	TF-20-S-BG1-1	42	1	0.02	696	241	1178
1,1,1-Trichloroethane	5	25	ug/kg	1.5	14	TF-36-S-BG1-1	41	3	0.07	3.71	0.50	4.70
Trichloroethylene	5	25	ug/kg	52	52	TF-20-S-BG1-1	42	1	0.02	4.54	1.23	6.99
Vinyl Acetate	10	50	ug/kg	33	110	TF-39-S-SU1-1-D	41	2	0.05	9.89	2.72	15.3
Xylenes (TOTAL)	5	25	ug/kg	1.1	41	TF-49-S-KN1-1	41	13	0.32	7.09	1.30	9.69
Arsenic	--	--	mg/kg	1.1	17.6	TF-33-S-SU1-1	34	34	1.00	6.02	0.63	7.27
Barium	0.2	0.2	mg/kg	88.6	525	TF-23-S-SU1-1	34	33	0.97	198	18.4	235
Cadmium	0.58	0.58	mg/kg	1.5	8.1	TF-39-S-SU1-1-D	34	32	0.94	4.09	0.33	4.75
Chromium	--	--	mg/kg	9.7	61.2	TF-42-S-BG1-1	34	34	1.00	25.9	1.89	29.7

**Table 2-4
Summary of Compounds Detected in Surface Soils
Texaco Fillmore Site**

Compound	Range of Detection Limits		UNITS	Range of Detected Values			OBS	DET	FREQ	Mean	SE	UCL
	Minimum	Maximum		Minimum	Maximum	Location						
Copper	--	--	mg/kg	9.6	301	TF-33-S-SU1-1	34	34	1.00	37.4	8.59	54.5
Lead	0.44	44	mg/kg	6	6120	TF-42-S-BG1-1	34	20	0.59	243	179	601
Nickel	--	--	mg/kg	11.6	151	TF-42-S-BG1-1	34	34	1.00	48.3	4.06	56.4
Vanadium	--	--	mg/kg	19.4	126	TF-21-S-SU1-1	34	34	1.00	71.2	4.93	81.1

Range of Sample Dates August 10, 1990 to November 7, 1990.

Location = Location ID of maximum detected value.

Mean = Arithmetic mean calculated using nondetected values as 1/2 detection limit.

OBS = Number of "valid" (nonrejected) observations.

DET = Number of positive detects.

FREQ = Frequency of detection (DET/OBS)

SE = Standard error of the mean.

UCL = 95 percent upper confidence limit of the arithmetic mean.

-- = For a given sample, EITHER a detection limit (for nondetects) or a concentration value (for positive detects) was found in the data base. Therefore, compounds detected 100% of the time (FREQ = 1.00) will have no detection limit range. Also, the minimum detected value may be lower than the minimum DL for a given group of samples.

Table 2-5
Summary of Compounds Detected in Subsurface Soils
Texaco Fillmore Site

Compound	Range of Detection Limits		UNITS	Range of Detected Values			OBS	DET	FREQ	MEAN	SE	UCL
	Minimum	Maximum		Minimum	Maximum	Location						
Acenaphthene	50	10000	ug/kg	2300	2300	MW19-60	21	1	0.05	4226	1084	6394
Acetone	0.25	70000	ug/kg	2.2	6300	SG-BH3-50	85	48	0.56	1849	840	3529
Benzene	0.125	36000	ug/kg	1.3	4900	SG-BH3-45	103	18	0.17	916	369	1654
bis(2-Ethylhexyl)phthalate	165	10000	ug/kg	38	140	MWP-BH13-65	19	2	0.11	4438	1121	6680
2-Butanone	0.25	70000	ug/kg	3	21	SG-BH1-25	95	4	0.04	1778	752	3282
Chlorobenzene	0.125	36000	ug/kg	52	5600	SG-BH3-45	103	4	0.04	922	370	1662
4-chloro-3-methyl phenol	50	10000	ug/kg	6000	6000	MW19-60	21	1	0.05	4476	1074	6624
2-Chlorophenol	50	10000	ug/kg	4800	4900	MW19-60	22	2	0.09	4416	1071	6558
1,4-Dichlorobenzene	50	10000	ug/kg	2000	2100	MW19-60	22	2	0.09	4276	1078	6431
1,1-Dichloroethylene	0.125	36000	ug/kg	39	4700	SG-BH3-45	103	4	0.04	913	369	1651
1,2-Dichloroethylene	0.125	36000	ug/kg	2.2	2.2	SG-BH1-35	99	1	0.01	875	371	1616
2,4-Dinitrotoluene	50	10000	ug/kg	2800	2800	MW19-60	21	1	0.05	4226	1084	6394
Di-n-octyl phthalate	165	10000	ug/kg	83	83	MWP-BH13-65	19	1	0.05	4441	1120	6682
Ethylbenzene	0.25	36000	ug/kg	1.2	6800	SG-BH3-35-D	99	34	0.34	989	376	1740
Methylene chloride	0.125	250	ug/kg	4.9	69000	SG-BH4-5	99	81	0.82	1744	710	3165
2-Methylnaphthalene	165	10000	ug/kg	360	13000	P4-BH3-35	19	6	0.32	4083	1080	6242
Naphthalene	165	10000	ug/kg	100	13000	P4-BH3-35	19	7	0.37	4424	1098	6620

**Table 2-5
Summary of Compounds Detected in Subsurface Soils
Texaco Fillmore Site**

Compound	Range of Detection Limits		UNITS	Range of Detected Values			OBS	DET	FREQ	MEAN	SE	UCL
	Minimum	Maximum		Minimum	Maximum	Location						
4-Nitrophenol	800	48500	ug/kg	3800	4400	MW19-60	21	2	0.10	21447	5412	32271
N-Nitrosodi-n-propylamine	165	10000	ug/kg	2900	3000	MW19-60	21	2	0.10	4546	1106	6759
Phenol	165	10000	ug/kg	4400	4500	MW19-60	21	2	0.10	4446	1119	6684
Pyrene	165	10000	ug/kg	2900	3000	MW19-60	21	2	0.10	4546	1106	6759
Tetrachloroethylene	0.12	36000	ug/kg	110	110	SG-BH1-75	99	1	0.01	873	371	1615
Toluene	0.25	36000	ug/kg	0.7	5700	SG-BH3-45	103	47	0.46	892	369	1631
1,2,4-Trichlorobenzene	165	10000	ug/kg	2400	2400	MW19-60	20	1	0.05	4446	1119	6684
Trichloroethylene	0.12	36000	ug/kg	45	5300	SG-BH3-45	103	5	0.05	916	369	1655
Vinyl Acetate	0.25	70000	ug/kg	420	940	P4-BH4-45	99	2	0.02	1733	722	3177
Xylenes (TOTAL)	0.25	36000	ug/kg	2	5000	SG-BH3-35-D	99	43	0.43	1037	373	1783
Arsenic	--	--	mg/kg	0.80	15.9	P3-BH1-20	442	442	1.00	3.62	0.08	3.78
Barium	--	--	mg/kg	25.6	1410	MWP-BH3-5	442	442	1.00	121	4.26	130
Cadmium	0.10	2.50	mg/kg	0.25	31.6	MWP-BH8-20	442	433	.98	4.38	0.11	4.60
Chromium	--	--	mg/kg	1.90	41.6	BG-BH2-10	442	442	1.00	14.6	0.30	15.2
Copper	--	--	mg/kg	7.70	107	BG-BH2-10	76	76	1.00	25.2	1.78	28.8
Lead	2.5	50	mg/kg	1.25	4900	P7-BH2-5	442	35	0.08	229	147	523

Table 2-5
Summary of Compounds Detected in Subsurface Soils
Texaco Fillmore Site

Compound	Range of Detection Limits		UNITS	Range of Detected Values			OBS	DET	FREQ	MEAN	SE	UCL
	Minimum	Maximum		Minimum	Maximum	Location						
Nickel	--	--	mg/kg	4.40	63.3	BG-BH4-20	76	76	1.00	32.3	1.17	34.6
Vanadium	--	--	mg/kg	9.50	111	BG-BH3-15	76	76	1.00	56.2	2.73	61.7
TPH, Extractable	5	10	mg/kg	12	12000	SP-BH2-30	599	332	0.55	772	63.7	899
TPH as Diesel Fuel No.2	5	5	mg/kg	11	13000	MWP-BH2-5	126	46	0.37	467	142	750
Diesel Fuel	5	600	mg/kg	60	70	P3-BH902-15	37	2	0.05	91.4	23.1	138
pH	--	--	none	6.5	9.7	P4-BH5-5	322	322	1.00	8.04	0.03	8.09
Percent Solids	--	--	%	81.1	91.9	SG-BH3-5	8	8	1.00	89.5	1.25	92.0
Water	--	--	%	9.9	14.8	MW19-60	4	4	1.00	13.2	1.44	16.0

Range of Sample Dates July 23, 1990 to October 1, 1990.

Location = Location ID of maximum detected value.

Mean = Arithmetic mean calculated using nondetected values as 1/2 detection limit. OBS Number of "valid" (non-rejected) observations

DET Number of positive detects

FREQ Frequency of detection (DET/OBS)

SE Standard error of the mean

UCL 95% upper confidence limit of the mean

-- = For a given sample, EITHER a detection limit (for nondetects) or a concentration value (for positive detects) was found in the data base. Therefore, compounds detected 100% of the time (FREQ = 1.00) will have no detection limit range. Also, the minimum detected value may be lower than the minimum DL for a given group of samples.

Table 2-6
Summary of Compounds Detected in Stream Sediments
Texaco Fillmore Site
(All Values in ug/kg)

Compound	Range of Detected Values		Location	OBS	DET
	Minimum	Maximum			
Acetone	11J	150J	D1-S-B2	4	4
Benzoic acid	300J	420J	D1-S-B2	4	4
BEHP	95J	130J	D1-S-B1	4	2
Chrysene	100J	110J	D1-S-B1	4	2
Dimethyl phthalate	2300	2500	D1-S-B1	4	2
Pyrene	68J	68J	D1-S-B1	4	1
Styrene	5.6	8.8	D1-S-B2	4	2
Trichloroethylene	22	27	A1-S-B2	4	4
Arsenic	4.1	5.8	A1-S-B2	4	4
Barium	148	181	A1-S-B1	4	4
Cadmium	3.7	5.6	A1-S-B1	4	4
Chromium (Total) ^a	21.5	22.6	D1-S-B1	4	4
Copper	32.7	41.4	A1-S-B2	4	4
Lead ^b	4.2	25	D1-S-B2	4	4
Nickel	27.9	35.8	A1-S-B2	4	4
Vanadium	41.2	54.1	A1-S-B2	4	4

OBS = Number of "valid" (nonrejected) observations

DET = Number of positive detects

J = The numerical value is an estimated quantity

Source: ENSR RI Report, June 1991.

^aChromium VI also analyzed for; not detected at DL = 1000 ug/kg.

^bOrganic lead also analyzed for; not detected at DL = 1000 ug/kg.

TABLE 2-7
 Texaco Fillmore RI/FS
 Surface Water Analytical Results
 Pole Creek - March 2 and 5, 1991

Location		A			B				C	D	E		F				G		Tnp Blank
Sample ID No.		TF-C- A1-W-B1	TF-C-A1- W-B1	TF-C- K1-W-B1	TF-C-B1- W-B1	TF-C-I1- W-B1	TF-C-J1- W-B1	TF-C-I1- W-B1	TF-C- C1-W-B1	TF-C- D1-W-B1	TF-C-E1- W-B1	TF-C- E1-W-B1	TF-C-F1- W-B1	TF-C-H1- W-B1	TF-C-F1- W-B1	TF-C- H1-W-B1	TF-C-G1- W-B1	TF-C- G1-W- B1	
Sampling Date		3/2/91	3/5/91	3/5/91	3/2/91	3/2/91	3/5/91	3/5/91	3/2/91	3/2/91	3/2/91	3/5/91	3/2/91	3/2/91	3/5/91	3/5/91	3/2/91	3/5/91	3/2/91
Analytical Method	Compound																		
Metal Analysis																			
EPA 7060	Arsenic	2.4	NA	NA	2.0	2.2	NA	NA	2.2	2.2	2.6	NA	2.1	2.1	NA	NA	1.7	NA	NA
EPA 6010	Barium	229	NA	NA	242	215	NA	NA	227	248	234	NA	234	220	NA	NA	234	NA	NA
EPA 6010	Cadmium	<2.0	NA	NA	<2.0	<2.0	NA	NA	<2.0	<2.0	<2.0	NA	<2.0	<2.0	NA	NA	<2.0	NA	NA
EPA 6010	Chromium (tot.)	<3.0	NA	NA	3.9	6.0	NA	NA	5.0	<3.0	4.3	NA	5.0	3.9	NA	NA	5.0	NA	NA
EPA 7196	Chromium (VI)	NA	<20	<20	NA	NA	<20	<20	NA	NA	NA	<20	NA	NA	<20	<20	NA	<20	NA
EPA 6010	Copper	<3.0	NA	NA	4.8	<3.0	NA	NA	<3.0	6.8	<3.0	NA	<3.0	<3.0	NA	NA	<3.0	NA	NA
EPA 7421	Lead	<5.0	NA	NA	<5.0	<5.0	NA	NA	<5.0	<5.0	<5.0	NA	<5.0	<5.0	NA	NA	<5.0	NA	NA
EPA 6010	Nickel	13.6	NA	NA	15.1	15.1	NA	NA	17.5	18.6	17.0	NA	17.5	16.0	NA	NA	14.6	NA	NA
EPA 6010	Vanadium	6.8	NA	NA	7.7	7.7	NA	NA	8.1	9.6	9.5	NA	9.0	6.3	NA	NA	7.7	NA	NA
Organic Analysis																			
EPA 504	EDB	<0.017	NA	NA	<0.017	<0.017	NA	NA	<0.017	<0.017	<0.017	NA	<.0017	<.0017	NA	NA	<.0017	NA	NA
EPA 8240	Styrene	<1	NA	NA	11	11	NA	NA	11	6	9	NA	12	11	NA	NA	<1	NA	NA
EPA 8240	Other VOAs	<1-<20	NA	NA	<1-<20	<10-<20	NA	NA	<1-<20	<1-<10	<1-<10	NA	<1-<20	<1-<20	NA	NA	<1-<20	NA	<1-<20
EPA 8270	Diethylphthalate	<10	NA	<10	<10	<10	<10	NA	<10	<10	<10	NA	<10	<10	NA	NA	TR	NA	NA
EPA 8270	Other SVOAs	<10-<50	NA	<10-<50	<10-<50	<10-<50	<10-<50	NA	<10-<50	<10-<50	<10-<50	NA	<10-<50	<10-<50	NA	NA	<10-<50	NA	NA
General Chemistry																			
EPA 9040	pH	8.23	NA	8.21	8.26	8.22	8.26	8.21	8.21	8.24	8.28	NA	8.23	8.20	NA	NA	8.21	NA	NA
NA = Indicates method not run. TR = Indicates trace.																			

SOURCE TEXACO FILLMORE RI/FS, APRIL 1991 MONTHLY STATUS REPORT (ENSR, MAY 1991)

NOTE: UNITS ASSUMED FROM TEXT DISCUSSION TO BE ug/L

**Table 2-8
Summary of Compounds Detected in Ambient Air
Texaco Fillmore Site**

Compound	Range of Detected Values				Units	DET/OBS (includes collocated)
	"Upwind"		"Downwind"			
	Minimum	Maximum	Minimum	Maximum		
Barium	0.021	0.045	0.023	0.043	ug/m3	15/15
Chromium	0.009	0.025	0.010	0.021	ug/m3	15/15
Copper	0.037	0.059	0.043	0.133	ug/m3	15/15
Lead	0.009	0.012	0.005	0.127	ug/m3	15/15
Nickel	<0.010	0.024	0.013	0.020	ug/m3	11/15
Vanadium ¹	0.003	0.003	0.003	0.003	ug/m3	3/15
Naphthalene	0.322	0.615	0.350	0.631	ug/m3	15/15
2-Methylnaphthalene	0.020	0.049	0.017	0.068	ug/m3	15/15
Benzene	<0.20	1.00	<0.20	1.40	PPB	11/15
Toluene	2.80	9.10	5.00	18.00	PPB	15/15
Ethylbenzene	<0.20	0.59	<0.20	1.20	PPB	13/15
Xylenes, total	0.75	3.90	1.60	4.10	PPB	15/15
Acetone	<10.00	10.00	<10.00	10.00	PPB	5/15
N,N-Dimethyl Acetamide	100.00	300.00	70.00	200.00	PPB	15/15
Phenol	30.00	100.00	30.00	70.00	PPB	15/15
Trichlorotrifluoroethane	<10.00	50.00	<10.00	<10.00	PPB	1/15
C10 branched Alkane ¹	<10.00	10.00	<10.00	<10.00	PPB	1/15

¹Nonflagged values equal "<" values; may not be true detects

**Table 2-9
Summary of Compounds Detected in Soil Gas**

Constituents	Concentration (ppmv)					
	AW-1	AW-2	AW-3		AW-4	AW-5
			Dup. 1	Dup. 2		
Benzene	0.004	140	1.5	1.9	5.3	19.0
Ethylbenzene	0.003	5.2	0.52	0.68	1.2	87.0
4-Ethyltoluene	BDL(0.004)	BDL(2.0)	BDL(0.16)	0.18	0.64	BDL(0.80)
Toluene	0.005	3.4	0.42	0.43	0.94	BDL(0.60)
1,1,1-Trichloroethane	0.004	BDL(1.0)	0.18	BDL(0.08)	BDL(0.20)	BDL(0.40)
1,2,4-Trimethylbenzene	0.008	BDL(1.5)	BDL(0.12)	BDL(0.12)	0.41	4.0
1,3,5-Trimethylbenzene	0.003	1.5	BDL(0.10)	BDL(0.10)	BDL(0.25)	BDL(0.50)
Xylenes	0.008	4.6	0.75	0.97	2.4	BDL(1.0)
All others (41 VOCs)	BDL(Various)	BDL(Various)	BDL(Various)	BDL(Various)	BDL(Various)	BDL(Various)

Note: BDL = Below Detection Limit. All analyses conducted by EPA TO-14 Modified.
Source: TriHydro Corporation, 1990.

Concentrations of metals for background surface and subsurface soils (see Tables 2-10 and 2-11) were compared with onsite samples, using statistical box plots to identify general features of data distribution for each sample group. The box plots and a description of the background comparison analysis are presented in Appendix A.

Surface Soils. For the surface soil comparisons, parameters with similar IDs such as "Arsenic" and "Arsenic, Total" were not originally combined. After reviewing the resulting plots, it was concluded that combining the samples would probably not affect the overall conclusion; that there were no significant differences in data distribution between onsite and background surface soil metals (See Appendix A).

Organic lead was not included in this analysis, however, it was detected in 1 out of 3 onsite samples at a concentration of 73.1 mg/kg but not detected in 2 onsite samples and 5 background samples at a detection limit of 0.5 mg/kg.

Subsurface Soils. During the review of data for these comparisons, it was noted that the sample results by compound appeared to have been entered separately in the data base where sample methods differed. For example, the method description field (Field 15 in the data base) lists the following methods separately for "Arsenic" or "Arsenic, Total":

OEPA 7061	(58 entries)
7061	(16 entries)
AS-GFAA-BZ-CLPR-S	(8 entries)
AS-HAA-S	(185 entries)
METALS	(1 entry)
Method 7061	(12 entries)
EPA 7060	(4 entries)
EPA 7061	(426 entries)

It was decided that all parameter IDs for Arsenic would be combined, as long as the Field 15 ID was common to both background and onsite samples. If a particular analysis type (e.g., AS-HAA-S) was not used in both onsite and background samples for the same parameter, those entries were not included in the comparison. This way, any tendency for a particular analytical method to generate relatively low or high results should be equally reflected in both onsite and background statistical comparisons.

Since the maximum depth of the background boreholes was 20 feet, only onsite samples taken at 20 feet or less bgs were initially used for comparisons. Samples from 20 feet below the bottom of the Main Waste Pit (MWP) area, however, were not strictly comparable to the other 20-foot samples because the MWP is excavated below the ground surface. To check variability by area, background samples were also compared with onsite samples by group, such as MWP, and Waste Pits 1-8 plus the Suspected Pit. Neither of these comparisons showed significant differences between onsite and background samples. There were no overall trends by depth to 20 feet in metals concentrations. Trends by depth beyond 20 feet were not examined. The box

Table 2-10

Surface Soil Sample Laboratory Results - Areas Of No Past Activity - Background
(concentrations in mg/kg)

Parameter	Method	2-BG1	8-BG1	9-BG1	13-BF1	20-BG1	36-BG1	41-BG1	42-BG1	43-BG1	47-BG1
Arsenic	7061	2.0	4.4	1.1	3.1	3.2	3.9	5.3	12.9	6.8	6.0
Barium	6010	112	132	101	109	155	222 (256)	206 (170)	334	251	108
Cadmium	6010	<.58	5.1	2.9	2.8	3.5	2.5 (1.5)	6.7 (4.7)	4.7	5.0	3.4
Chromium	6010	10.4J	18.7	16.7J	20.3	27.5J	40.9 (19.6)	40.0 (15.1)	44.3	22.9J	25.3J
Lead	6010	5.4	54.5	17.8	56.0	33.3	761 (1330)	13.2 (8.5)	4290	3.2	5.4
Copper	6010	26.5	40.1	15.9	19.4	20.7	32.0 (15.5)	37.5 (22.0)	114	18.4	11.0
Nickel	6010	11.7	29.4	27.9	30.2	39.6	44.4 (32.3)	68.6 (40.9)	64.3	60.2	40.0
Vanadium	6010	19.4	45.6	36.1	41.3	65.5	103 (65.4)	93.5 (39.0)	126	76.8	53.7
Organic Lead	(not given)	<1.0	<1	<1	<1	<1	3.3	<1	108	<1	<1
Hex. Chrome	7196	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5

() = Duplicate values. J = Estimated. < = Not detected at method reporting limit.
Source: ENSR, June 1991, Final Remedial Investigation Report, Texco Fillmore Facility

Table 2-11
Background Samples Results - Subsurface Soil
(concentrations in mg/kg)

Parameter	Method	Borehole 1 (BG-BH-1)				Borehole 3 (BG-BH-3)				Borehole 5 (BG-BH-5)				
		5'	10'	15'	20'	5'	10'	15'	20'	5'	10'	15'	15'D	20'
Arsenic	Hydride,AA	3.6	3.5	3.0	4.0	4.6	4.6	4.7	4.8	4.4	4.1	4.1	3.7	5.3
Barium	EPA 6010	115.0	128.0	127.0	176.0	128.0	100.0	111.0	122.0	185	165	177	173	259
Cadmium	EPA 6010	5.8	4.5	4.8	7.1	7.0	4.4	6.3	4.8	4.2	3.6	3.2	3.8	4.5
Chromium (total)	(not given)	24.3	25.6	16.4	33.8	28.4	19.8	41.2	36.7	17.4	14.7	21.2	20.4	22.7
Copper	EPA 1060	23.7	48.1	13.9	24.6	35.5	29.3	49.1	22.1	17	16.3	18.9	18.1	20.8
Lead*	EPA 1060	5.0 (ND)	5.0 (ND)	5.0 (ND)	5.0 (ND)	5.0 (ND)	5.0 (ND)	5.0 (ND)	5.0 (ND)	5.0 (ND)	5.0 (ND)	5.0 (ND)	5.0 (ND)	5.0 (ND)
Nickel	EPA 6010	29.1	30.3	21.4	35.3	39.4	36.2	37.0	39.7	37	37.3	43.3	41.9	46.7
Vanadium	EPA 6010	76.7	66.1	53.0	103.0	89.8	66.7	111.0	107.0	70.4	62.6	77.7	73.4	94.3

* ND concentrations reported by lab assumed to be at detection limit.

Source: ENSR, June 1991, Final Remedial Investigation Report, Texco Fillmore Facility

plots are included in Appendix A. Organic lead was not included in this analysis since offsite subsurface soils were not analyzed for this chemical. Organic lead was detected in onsite subsurface soils in 3 out of 91 samples at concentrations ranging from 2.6 to 23 mg/kg.

Groundwater

Seven private wells and an onsite production well were sampled in late 1990. The private wells were primarily active irrigation and municipal water wells, within a 1-mile radius of the site, and ranging in depth from less than 100 to over 500 feet. Ethylene dibromide, volatile and semivolatile organics, and fuel hydrocarbons were generally reported to be below detection limits. The only exception was for aliphatic hydrocarbons (240 ug/l) in well PW-11. This well is noted in the RI Report to be about 3/4-mile upgradient of the site (ENSR, January 1991).

Historical groundwater and private well data were not available on the data base. No quantitative background comparisons have been done for onsite wells versus private wells. For metals, however, it appears that onsite wells show higher concentrations than those found in the private wells. For example, in four of the private wells (PW-3, -23, -18, -48), the only metals detected were barium, copper, and vanadium. Vanadium was only detected in PW-3, at 3.2 ug/L. Copper was detected in 3 of 4 wells at 5.2, 10.5, and 20.1 ug/L. Barium was detected in all four wells at concentrations from 14.3 to 20.1 ug/L. Although these results were only from one sampling event at each well, the overall levels of metals detected were much lower than those detected in onsite wells. During this same sampling event, the following chemicals were analyzed for, but not detected at the indicated detection limits in the private wells: arsenic (<1.7 ug/l), cadmium (<1.8 ug/l), chromium (<2.5 ug/l), chromium VI (<20 ug/l), nickel (<2.4 ug/l), and lead (<1.3 ug/l).

Groundwater samples taken from MW-18S, the most upgradient well at the Texaco site, detected barium at a maximum concentration of 353 ug/l and lead at 1.3 ug/l. Arsenic, cadmium, chromium, hexavalent chromium, nickel, and vanadium were not detected in this well at detection limits similar to the private wells.

Additional statistical box plots (included in Appendix A) were also done for groundwater to compare actual detection limits with detected values. From these comparisons, it appears that several compounds have occasional high detection limits, which may or may not tend to obscure the presence of the compound. No quantitative comparisons of risk levels to detection limits have been done for these compounds.

2.2.4 DATA LIMITATIONS AND UNCERTAINTIES

Some of the "background" boreholes were also the location of the highest detected values for volatiles in surface soils. No statistical comparisons of background versus onsite soil volatile organic compounds (VOC) were done. It appears as though eliminating the background surface soil boreholes that show high concentrations of VOCs

from consideration would not change the overall interpretation of the background comparisons, but this is not certain. No VOC analyses were done for the background subsurface soils, so these cannot be similarly compared.

In general, many of the soil analyses showed high detection limit ranges. These have not been quantitatively assessed to determine whether the high detection limits might obscure contaminants, which might be present at concentrations potentially associated with exposure risk.

As mentioned previously, use of one-half the detection limit to generate summary statistics may tend to overestimate actual concentrations.

2.2.5 SUMMARY OF CHEMICALS OF POTENTIAL CONCERN

The following screening procedures were used to provide a working list of contaminants of concern:

1. Eliminate any chemicals not detected in a given medium.
2. Eliminate essential human nutrients (calcium, cobalt, iron, magnesium, manganese, potassium, sodium) if present at low concentrations (i.e., only slightly elevated above naturally occurring concentrations) (EPA, December 1989).
3. Eliminate acetone and methylene chloride because they are common laboratory contaminants.

It is not implied that chemicals excluded from this RA are without risk. Rather, either sufficient information is lacking to characterize risk, or it has been determined that the concentrations do not appear to add significantly to the total risk.

In addition, the list of detected contaminants was reviewed to see if compounds detected less than 5 percent of the time (Foreman, 1991) were eliminated from consideration in the RA. EPA guidance suggests that chemicals may be considered for elimination from a quantitative RA if 1) detected infrequently in one or perhaps two media, 2) not detected in any other sampled media or at high concentrations, and 3) there is no reason to believe that the chemical may be present (EPA, December 1989).

Several compounds in various media were detected less than 5 percent of the time. These were eliminated from the list of compounds of concern if they were not detected more than 5 percent of the time in any other media, and if they were not expected to be present at the site, based on site history. The following compounds were therefore eliminated:

- 4-Methyl-2-pentanone
- 4-Chloro-3-methyl phenol
- Pentachlorophenol

- 1,2,4-Trichlorobenzene
- Tetrachloroethylene

A few compounds, which were detected less than 5 percent of the time, were retained. Chlorobenzene was detected in groundwater, subsurface soil, and surface soil, although at low frequencies in each. Chlorobenzene and phenanthrene are also included on a list of compounds regarded by EPA to be of potential health concern in petroleum refining wastes (Table 2-12). Both 1,1- and 1,2-dichloroethylene were retained. These are both common degradation products of trichloroethylene which were detected.

Because the single detected value for 1,1,2,2-tetrachloroethane is equal to the current maximum contaminant level (MCL) for groundwater (1 ug/L), and because the detection limits ranged from 1-50 ug/L, this compound was also retained as a contaminant of concern.

Several metals were retained as contaminants of concern. Although metals did not appear to be of site-specific concern in the soils, (i.e., there were no significant differences in onsite and background soil metals concentrations) EPA guidance states that "...a chemical that is infrequently detected in soil (a potential groundwater contamination source) probably should not be eliminated as a site contaminant if the same chemical is frequently detected in groundwater" (EPA, December 1989a). Concentrations of metals detected in onsite wells appear to exceed those detected in the private wells, although this comparison has not been quantitatively assessed.

The resulting list of compounds of concern, with criteria for selection, is given in Table 2-13.

2.3 NATURE AND EXTENT OF CONTAMINATION

2.3.1 HISTORICAL BASIS FOR CHEMICAL PRESENCE

Refinery operations at the Texaco Fillmore facility began between 1910 and 1920. Aerial photographs indicate that refinery buildout occurred until 1924, and operations continued from 1925 to 1950. In 1922, the refinery complex had a throughput of approximately 5,000 barrels of crude oil and blending stock per day. It is unclear whether the capacity of the refinery increased over the next 25 years during changes in ownership and expansions. Texaco acquired the facility in 1928 (ENSR, March 1990).

Distillation was the primary method used to produce petroleum products including gasoline, diesel, and fuel oil at the site. The refinery operated as a single topping plant where the more highly volatile constituents were removed leaving reduced crude (or heavier hydrocarbon fractions) as a residue. Thermal cracking processes were added to the system sometime after Texaco's acquisition. The use of thermal cracking suggests that the plant produced a majority of light distillate products (e.g., automobile gasoline)

Table 2-12
Constituents Of Petroleum Refining Wastes

Sheet 1 of 2

MONOCYCLIC AROMATICS

Benzene
Toluene
Xylenes
Ethylbenzene
Styrene

POLYCYCLIC AROMATICS

Naphthalene
1-Methyl naphthalene
Anthracene
Phenanthrene
Benzo(a)anthracene
7,12-Dimethylbenzo(a)anthracene
Chrysene
Methyl chrysenes
Pyrene
Flouranthene
Dibenz(a,h)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Dibenz(a,h)acridine
Indene

PHENOLICS

Phenol
Cresols
2,4-Dimethylphenol
4-Nitrophenol
2,4-Dinitrophenol

PHTHALATE ESTERS

Dimethyl phthalate
Diethyl phthalate
Di(n)butyl phthalate
Di(n)octyl phthalate
Bis(2-ethylhexyl) phthalate
Butyl benzyl phthalate

Table 2-12
Constituents Of Petroleum Refining Wastes

Sheet 2 of 2

HALOGENATED ALIPHATICS

Chloroform
1,2-Dichloroethane
Ethylene dibromide

METALS

Antimony
Arsenic
Cadmium
Chromium
Barium
Lead
Mercury
Nickel
Selenium
Vanadium
Beryllium
Cobalt

MISCELLANEOUS

Benzenethiol
Carbon disulfide
1,4-Dioxane
Methyl ethyl ketone
pyridine
quinolines

HALOGENATED CYCLICS

Chlorobenzene
Dichlorobenzenes

Compounds considered to be of potential environmental health concern in petroleum refining wastes (The Cadmus Group, 1985).

Table 2-13
Potential Compounds of Concern and Criteria for Selection
Texaco Fillmore Site

Sheet 1 of 2

Compound	Toxicity Values	Toxicity Concerns	Other Factors
Acenaphthene	a		
Benzene	b		
Benzo(a)anthracene		c	
Benzo(a)pyrene		c	
Benzo(b)fluoranthene		c	
Benzoic Acid	a		
Bis(2-ethylhexyl)phthalate	a,b		
2-Butanone (MEK)	a		
Carbon disulfide			d
Chlorobenzene	a		
2-Chlorophenol	a		
Chrysene		c	
1,2-Dibromoethane	b		
1,4-Dichlorobenzene	b		
1,2-Dichloroethane	b		
1,1-Dichloroethylene	a,b		
1,2-Dichloroethylene	a		
Dimethyl phthalate	a		
2,4-Dinitrotoluene	b		
Ethylbenzene	a		
2-Methylnaphthalene			d
Naphthalene	a		
4-Nitrophenol			d
N-nitroso-di-n-propylamine	b		
N,N-Dimethyl acetamide	--		--
Phenanthrene			d
Phenol	a		

**Table 2-13
Potential Compounds of Concern and Criteria for Selection
Texaco Fillmore Site**

Sheet 2 of 2

Compound	Toxicity Values	Toxicity Concerns	Other Factors
Pyrene	a		
Styrene	a,b		
Toluene	a		
1,2,4-Trichlorobenzene	a		
1,1,1-Trichloroethane	a		
1,1,2,2-Tetrachloroethane	b		
Trichloroethylene	b		
Trichlorotrifluoroethane	--	--	d
Vinyl acetate	a		
Xylenes, total	a		
Arsenic	b		
Barium	a		
Cadmium	a,b		
Chromium	b		
Copper	a		
Lead		c	
Nickel	a		
Vanadium	a		

^aHas a Reference Dose (RfD) (oral or inhalation) (as defined in Chapter 4, Toxicity Assessment)

^bHas a Cancer Slope Factor (CSF) (oral or inhalation)

^cPotential carcinogenicity

^dFrequency of occurrence or site history

rather than heavier diesel and fuel oil. At the time of Texaco's purchase of the plant, the refinery was equipped for the manufacture of lubricating oils and paraffin wax. At some time after Texaco's purchase, paraffin wax/lube oil operations ceased. It is unclear whether solvent processes were used in the wax operations. In 1950, the refinery was closed and a large portion of the refinery dismantled. Since closure of the refinery, the facility has operated only as a crude oil pumping station.

A summary of refinery process units, their capacities and potential waste streams generated from each of the process units was presented in ENSR (March 1990).

During the period of refinery operation, miscellaneous refinery wastes, believed to have consisted primarily of tank bottoms, filter clays, and sludge were disposed of onsite in a large main pit and in eight smaller suspected disposal areas. Waste pit filling occurred between 1917 and 1950. Two waste/water percolation areas may have also existed west of pit 4, within the Pole Creek bed (ENSR, March 1990). It is believed that the waste disposal areas onsite have not been active since 1950.

Texaco determined the existence of hazardous waste onsite in 1981. The chemical constituents comprising the wastes in the waste pits were assessed in the early 1980s (after significant weathering of the waste had occurred). Chemical constituents of the weathered waste included, but were not limited to lead, benzene, ethylbenzene, xylene, naphthalene, chrysene, and benzo(a)anthracene. Table 2-14 presents a summary of maximum chemical concentrations detected in the waste found in the main waste pit.

The chemicals present in the samples collected from the waste pits are indicative of the past operations at the site and weathering or degradation of some of the organic compounds. Although the actual waste was found primarily in the upper 5 feet of the southern portion of the MWP, visual inspection and chemical data indicate that the soil below the MWP has also been impacted. This is likely due to the leaching of the more water-soluble constituents of the waste down into the vadose zone and the migration of free product (i.e., undissolved or nonemulsified product) within the air-filled pore space in the vadose zone. The hydrocarbons detected in the vadose zone at the time of the excavation included benzene, toluene, ethylbenzene, naphthalene, and phenanthrene (ENSR, March 1990). Benzene, toluene, and ethylbenzene exhibit some of the highest solubilities of all major motor gasoline hydrocarbons and may be transported by infiltrating water leaching through the waste prior to its removal. Naphthalene and phenanthrene are less soluble and may be transported as free product within the vadose zone. No subsurface investigation of the eight small waste disposal areas had been conducted prior to the RI to determine vadose zone impacts.

Visible waste and contaminated soil was removed from the waste pits in 1986. The main pit, located on the site's western border, occupied an area of approximately 600 by 100 feet. The smaller pits are located throughout the facility (Figure 1-3). Texaco excavated and removed approximately 33,000 cubic yards of waste and contaminated soil from the MWP and from eight smaller waste disposal areas.

Wastes were confirmed by Radian to exist in six of the eight suspected waste disposal areas (ENSR, March 1990); the remaining two areas, No. 4 and No. 6, could not be drilled due to surface obstructions. Wastes in the suspected waste disposal areas were found to be highly organic, similar to those found in the main pit (Radian, February 1984). Excavation was performed at each of the smaller suspected waste disposal areas except No. 4. No records exist for any excavation at site No. 4 (ENSR, March 1990). It should also be noted that two wastewater percolation areas may have been active west of pit 4 in the past.

Generally, contamination at the site in groundwater and subsurface soils is indicative of the petroleum production process. Initial processing involves distillation of crude oil into a series of fractions. The contaminants detected in soil indicate the presence of lighter fractions or lighter end hydrocarbon compounds characteristic of gasoline production. Although higher end hydrocarbons may be present in samples classified by chemical analysis as Total Petroleum Hydrocarbons (TPH), Diesel Fuel No. 2, Extractable TPH, and Unknown Hydrocarbons. These classifications include C6 to C22 hydrocarbons.

2.3.2 TRANSPORT OF CHEMICALS IN THE SUBSURFACE

When applied or spilled on soil, the behavior of a petroleum product is controlled by several processes. The product can migrate through soil as a separate immiscible phase until it is redistributed in the vadose zone or reaches the underlying water table. During and following redistribution, water percolating through the soil can dissolve soluble components from the immiscible phase and subsequently leach these components to groundwater. The more volatile components of the petroleum product can also evaporate into the air-filled voids in the soil and subsequently migrate through vapor diffusion. Dissolution, degradation, and evaporation of components from the petroleum product cause the material to weather, resulting in a change in chemical composition over time.

2.3.3 CHEMICAL FATE CHARACTERISTICS BY COMPOUND GROUP

Many of the compounds typically found at refinery sites (Table 2-12) have been detected in various media at Texaco Fillmore. Some compounds detected in subsurface soils and groundwater during the RI were not found in the list of typical refinery waste compounds. Compounds not typical of refinery waste found in the subsurface soils were 2,4- dinitrotoluene, acenaphene, 2-chlorophenol, 4-chloro-3-methyl phenol, and N-nitrosodi-n-propylamine. Compounds not typical of refinery waste found in the groundwater were 2-methyl-1-naphthalene, benzoic acid and 1,1,2,2-tetrachloroethane.

Some of the most prevalent organic contaminants detected in groundwater and subsurface soils at the site are monoaromatic compounds including benzene, ethylbenzene, toluene, and xylenes (BETX compounds). These lighter end hydrocarbons are typically of high solubility and toxicity, and are relatively mobile. Given their relative mobility and the coarse-grained character of the vadose zone, it is not surprising to find that

**Table 2-14
Maximum Recorded Concentrations of Compounds in
Excavated Main Waste Pit Material**

Compounds	Maximum Concentration (ppm)
Benzene	9.3
Toluene	16.0
Ethylbenzene	10.0
Alcohols ¹	200.0
Ketones ¹	100.0
Aliphatic and Alicyclic Hydrocarbons ¹	450.0
Aromatic Hydrocarbons ¹	140.0
Alkene and Alkyne Hydrocarbons ¹	120.0
Arsenic	19.0
Barium	140.0
Cadmium	11.0
Chromium	120.0
Lead	3,700.0
Mercury	None Detected
Selenium	1.2
Silver	None Detected

¹Individual compounds combined and reported in their major hydrocarbon groups.

Source: ENSR 1990.

benzene and other BETX compounds have migrated 80 to 100 feet in soil to groundwater at the site. However, these compounds are also easily volatilized from soil compared to other gasoline components and are considered to be relatively easy for microbes to degrade. Therefore, the natural processes of volatilization and biodegradation in soil will help to remove these lighter end monocyclic aromatic hydrocarbons from the environment over time. It is also possible for these compounds to move downward as free product and dissolve in groundwater or subsurface pore water at greater depths where volatilization is not a major process.

Several polycyclic aromatic hydrocarbons (PAHs) were also detected in subsurface soils and groundwater at the site. Naphthalene and 2-methyl-1-naphthalene were detected in both subsurface soil and groundwater at the site and acenaphthene, pyrene, and phenanthrene were detected in subsurface soils only. These PAHs are generally of medium-to-low solubility and volatility and exhibit medium-to-very slow rates of degradation. They are also more highly sorbed than the BETX compounds and are, hence, less mobile and more persistent in soil. Detection of naphthalene and 2-methylnaphthalene in groundwater at depth indicate potential vertical migration as free product and subsequent dissolution in groundwater.

Several phenolic compounds were detected in subsurface soil, including phenol, 4-nitrophenol, 2-chlorophenol, and 4-chloro-3-methylphenol. These constituents are of high solubility, medium volatility, high degradability, and are relatively mobile. None of these compounds have been detected in groundwater suggesting that weathering processes may have degraded them prior to the time they would have been transported to groundwater.

Two phthalate esters, di-n-octyl phthalate and bis(2-ethylhexyl)phthalate, were detected in soil at depths of 50 and 60 feet. These compounds are relatively immobile in soil and in the mid-range of solubility and volatility as compared with the other compounds in Table 2-9. Considering their relative immobility, it is likely that these compounds reached these depths moving as free product.

Several halogenated aliphatic compounds (1,2-DCA and 1,1,2,2-TCA, 1,2-DCE), halogenated cyclic compounds (chlorobenzene), and miscellaneous compounds including methyl ethyl ketone (MEK), propanone, and 4-methyl-2-pentanone (MIBK) were also detected in groundwater and/or subsurface soils at the site. A summary of detected VOC's by medium is given in Table 2-15.

TPHs were also detected in subsurface soil and groundwater samples collected at the facility. Analysis for lumped petroleum constituents included TPH, Diesel Fuel No. 2, Extractable TPH, and Unknown Hydrocarbons for soil samples and Fuel Hydrocarbons, Unknown Hydrocarbons, Aliphatic Hydrocarbons (C1 to C28), Aromatic and Cyclic Hydrocarbons, and Total Extractable Hydrocarbons (C6 to C22) for samples collected

Table 2-15
Summary of Detected Volatile Organic Compounds by Medium
Texaco Fillmore Site

Sheet 1 of 3

Compound	Subsurface Soil	Surface Soil	Groundwater	Surface Water	Stream Sediment	Air
Acenaphthene	X	X				
Acetone	X	X	X		X	X
Benzene	X	X	X			X
Benzo(a)anthracene		X				
Benzo(a)pyrene		X				
Benzo(b)fluoranthene		X				
Benzoic Acid					X	
Bis(2-ethylhexyl)phthalate	X	X				
2-Butanone (MEK)	X	X	X			
Carbon disulfide			X			
Chlorobenzene	X	X	X			
4-Chloro-3-methyl phenol	X	X				
2-Chlorophenol	X	X				
Chrysene		X			X	
1,2-Dibromoethane		X				

Table 2-15
Summary of Detected Volatile Organic Compounds by Medium
Texaco Fillmore Site

Sheet 2 of 3

Compound	Subsurface Soil	Surface Soil	Groundwater	Surface Water	Stream Sediment	Air
1,4-Dichlorobenzene	X	X				
1,2-Dichloroethane			X			
1,1-Dichloroethylene	X	X				
1,2-Dichloroethylene	X					
Dimethyl phthalate					X	
2,4-Dinitrotoluene	X	X				
Ethylbenzene	X	X	X			X
Methylene chloride	X	X	X			
2-Methylnaphthalene	X		X			X
4-Methyl-2-pentanone			X			
Naphthalene	X		X			X
4-Nitrophenol	X	X				
N-nitroso-di-n-propylamine	X	X				
N,N-Dimethyl acetamide						X
Pentachlorophenol		X				

Table 2-15
Summary of Detected Volatile Organic Compounds by Medium
Texaco Fillmore Site

Sheet 3 of 3

Compound	Subsurface Soil	Surface Soil	Groundwater	Surface Water	Stream Sediment	Air
Phenanthrene		X				
Phenol	X	X				X
Pyrene	X	X			X	
Styrene				X	X	
Tetrachloroethylene	X					
Toluene	X	X	X			X
1,2,4-Trichlorobenzene	X	X				
1,1,1-Trichloroethane		X				
1,1,2,2-Tetrachloroethane						
Trichloroethylene	X	X			X	
Trichlorotrifluoroethane						X
Vinyl acetate	X	X				
Xylenes, total	X	X	X			X

from groundwater. Detections of TPH are indicators of petroleum presence in the respective medium, but are difficult to apply in a RA framework for several reasons:

- Although measurement of the total hydrocarbon content is intended, a significant portion of the more volatile compounds in gasolines and light fuel oils may be lost in the solvent concentration step in the laboratory (Paschke, December 1991).
- Standardization during instrument calibration is a problem because hydrocarbon mixtures used for calibration have constant composition, whereas, the relative composition of petroleum products and their residues are highly variable (Paschke, December 1991).

2.3.4 NATURE AND EXTENT OF CHEMICAL PRESENCE

SUBSURFACE SOILS

The site has been divided into four regions for the purpose of discussion of the extent of contamination. The four regions include the MWP region (MWP region), the southern region, the eastern hill region, and the northern region. Figure 2-1 presents the boundaries of each of these regions and the boreholes and monitoring wells that are included in each one.

The discussion of the nature and extent of chemical contaminants in subsurface soils in the Draft RI Report (Chapter 4.1), states that TPH concentrations vary with depth, and that higher TPH levels were detected in shallow soil samples. It also states that concentrations of TPH decrease with depth and are only present at high levels at shallow depths. This decreasing concentration of TPH with depth appears to be a general trend; however, in both the MWP region and the southern region in the vicinity of pit 3, higher concentrations of TPH also occur deeper in the vadose zone, approximately 50 to 60 feet bgs. In the hill region and the northern region, TPH does decrease with depth in the vadose zone.

The presence of high concentrations of TPH at depth, especially in the southern region in the vicinity of pit 3, MW-19 and the possible surface impoundment and in the MWP region in the vicinity of BH-2, BH-4 and BH-7 indicate that individual components of the TPH can continue to be a source of contamination to groundwater as they dissolve at depth. The petroleum constituents with the highest solubilities (e.g., BETX compounds, phenols, and to a lesser degree naphthalenes) will be most likely to appear in groundwater in a miscible phase, if those components have not totally degraded during vertical transport.

Significant vertical migration of TPH and associated wastes is further justified by the presence of dichlorobenzene, dinitrotoluene, chlorophenol, trichlorobenzene, 4-nitrophenol, 4-chloromethyl phenol, acenaphene, N-nitrosodi-n-propylamine, phenol, and pyrene in a soil sample collected at 60 feet in MW-19.

In addition, 2-methylnaphthalene, naphthalene, and toluene were found at depth in MW-20 in the southern region. Naphthalene, toluene, and xylene were found in the MWP region at depth and in the southern region near pits 3 and 4. Toluene and xylene were also found often in shallower boreholes in the soil gas area.

Benzene and ethylbenzene were detected in subsurface soils at depth in the southern region near pits 3 and 4. Benzene, ethylbenzene, and chlorobenzene were found in the soil gas area in relatively high concentrations. Interestingly, benzene was not observed in subsurface soils (listed in the current data base which, only includes data between July 1990 and October 1990) anywhere in the MWP region with the exception of a qualified detect in BH13 at 65 feet. Ethylbenzene was found at depth (60 to 70 feet) in the MWP region. This may be an indication that, after excavation of the main wastes, volatilization of benzene and other lighter end hydrocarbons occurred in the shallow soils beneath the waste pit. Degradation and relatively rapid transport to groundwater may also account for the lack of benzene in subsurface soils and the presence of ethylbenzene only at depth. The possible contributions of data uncertainties, such as elevated detection limits for the soil matrix, have not been reviewed.

Phthalates were found at depth in the MWP region (65 feet) and in the southern region in the vicinity of pit 3.

In summary, chemical data for subsurface soils, presented in the ENSR data base, indicate:

- TPHs are present in all four regions in subsurface soil. The concentration of TPH generally decreases with depth with exceptions noted in the MWP region and the southern regions in the vicinity of pit 3 and the surface impoundment area. These are also the areas of highest TPH concentration.

SOUTHERN REGION

- Benzene, ethylbenzene, toluene, xylene, (BETX compounds), naphthalene, 2-methylnaphthalene, and phthalates were detected at depth in subsurface soils in the southern region in the vicinity of pits 3 and 4. Some of these constituents were also detected in soil in MW-20.
- Deep (60 feet) subsurface soil contamination in this region in the vicinity of MW-19 has been detected, and includes halogenated benzenes and phenols, and PAHs.
- BETX compounds and chlorobenzene were detected in soil samples taken from the soil gas area in shallower boreholes.

MWP REGION

- No unqualified detects of benzene are reported in ENSR's data base for subsurface soil samples collected below the MWP or in the MWP region. However, earlier reports (ENSR, March 1990) state that benzene was detected in soil samples taken below the MWP at the time of its excavation. This discrepancy may be due to volatilization of benzene and other related compounds since the excavation.
- Ethylbenzene, toluene, xylene, naphthalene, 2-methylnaphthalene, and phthalates were detected in soil samples taken at depth (50 to 65 feet) in the MWP region.

NORTHERN AND EASTERN HILL REGIONS

- TPH was the only constituent detected in subsurface soil samples collected in these regions.

A summary provided in the background summary report (ENSR, March 1990) that is based on chemical data collected previous to that presented in the data base states that:

- Below the MWP, benzene, toluene, ethylbenzene, naphthalene, and phenanthrene were detected in soils immediately after excavation.
- A refined liquid hydrocarbon source appears responsible for a broad area of degraded soils in the southwestern portion of the facility, between the southwest corner of the facility and the MWP.
- The chemical composition of the soil contaminants beneath the MWP is somewhat different from that of soils beneath the southwestern portion of the facility. In contrast to the soils beneath the MWP, which contain little or no benzene, ethylbenzene, and toluene, almost all of the soil samples collected south of the MWP contain significant concentrations of these aromatics.
- The near absence of benzene in soil samples from beneath the MWP, in contrast to the consistent presence of benzene in groundwater samples, indicates that the MWP is probably not the source of the area of groundwater quality degradation identified in the vicinity of the MWP.

The data base supports each of these summary statements based on historical data, with the following exceptions:

1. Benzene and phenanthrene are not detected in subsurface soils beneath the waste pit.

2. The absence of benzene in soil samples beneath the MWP does not necessarily indicate that the MWP is not the source of the area groundwater quality degradation. It is possible that benzene (having high solubility, volatility, mobility, and degradation potential) is no longer detected in soil because it has weathered, but that benzene from the MWP, which reached groundwater previously (as free product or soluble in pore water), continues to be detected in groundwater.

GROUNDWATER

Groundwater contamination has been detected in the general area of the MWP and the southwestern corner of the site in the principal water bearing zone, which ranges in depth from 50 to 150 feet bgs across the facility. Contamination has also been detected in perched groundwater, ranging in depth from 44 to 56 feet bgs. Contamination in perched water has been observed in the Eastern Hill Region in MW-10.

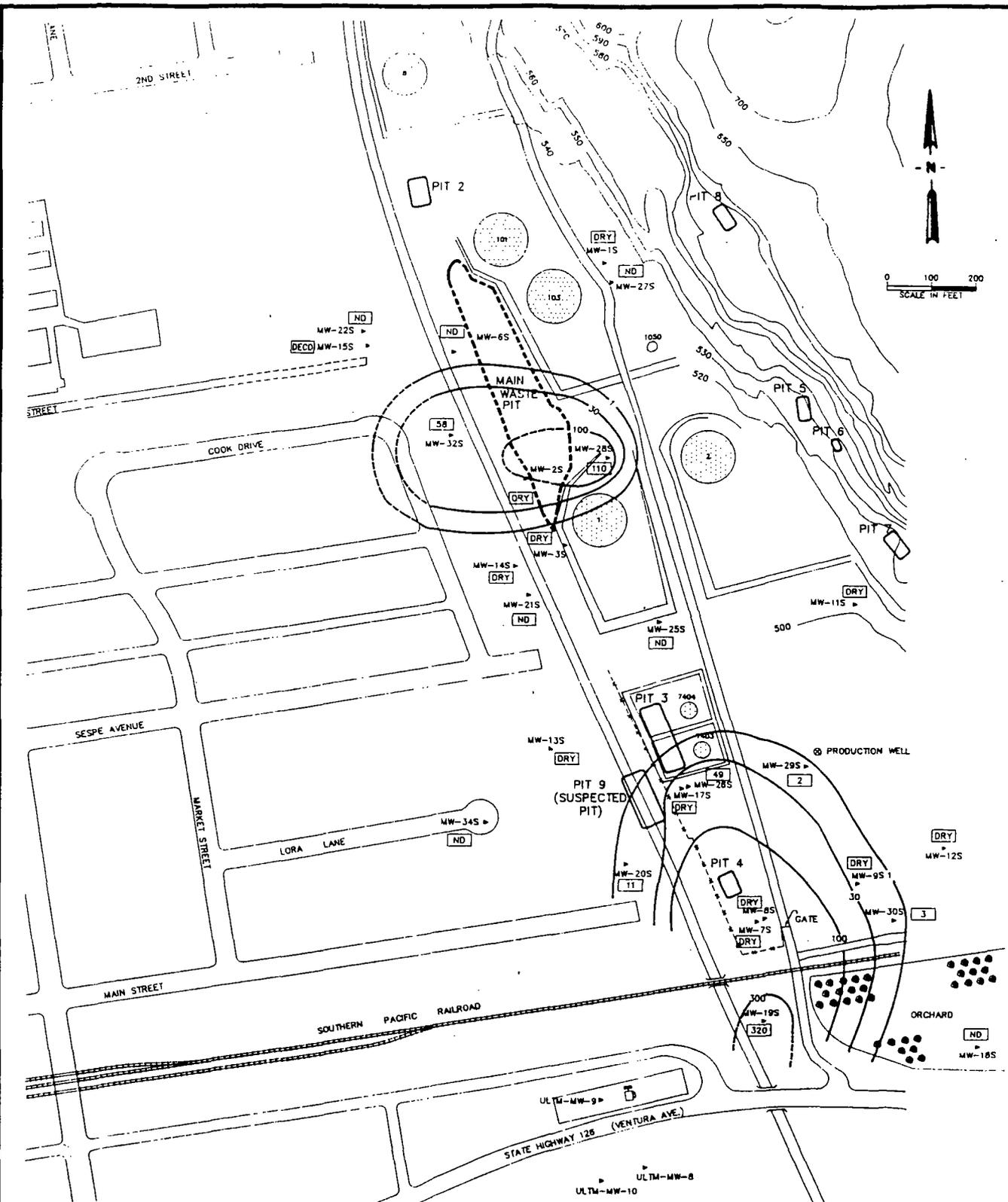
Perched Groundwater

Concentrations in MW-10, reported in the ENSR data base (October 1990 to May 1991), indicate that benzene, toluene, xylene, 2-methylnaphthalene, and 4-methyl-2-pentanone are present at levels exceeding detection limits in perched groundwater. In addition, C1 through C14 aliphatic hydrocarbons, cyclic and aromatic hydrocarbons (unspecified), fuel hydrocarbons and total extractable C6-C22 hydrocarbons were detected.

Aquifer I

Two general plumes of petroleum-related contamination exist in the first aquifer; one centered below the MWP that is characterized by data from MW-6S, MW-32S, and MW-28S, and the second centered around the intersection of the Southern Pacific Railroad and the Pole Creek Channel that includes MW-11S, MW-34S, MW-20S, MW-8S, MW-19S, MW-25S, MW-26S, MW-29S, MW-30S, ULTM-MW-9, ULTM-MW-8, and ULTM-MW-10. Figure 2-7 shows historical (1986 to 1990) benzene concentrations for this aquifer. Figures 2-8 and 2-9 show January and May 1991 benzene plumes.

Elevated, detectable concentrations of monocyclic aromatic hydrocarbons (BETX) and phenols have been measured in groundwater samples from these two areas. Free product (floating hydrocarbon) has also been observed in monitoring wells in the southwestern corner of the site (ENSR, March 1990). 1,2-Dichloroethane has also been found in MW-26S, which is located below the soil gas area where chlorinated volatiles have been detected in subsurface soil. Naphthalene and 2-methylnaphthalene have been found in the southern plume.



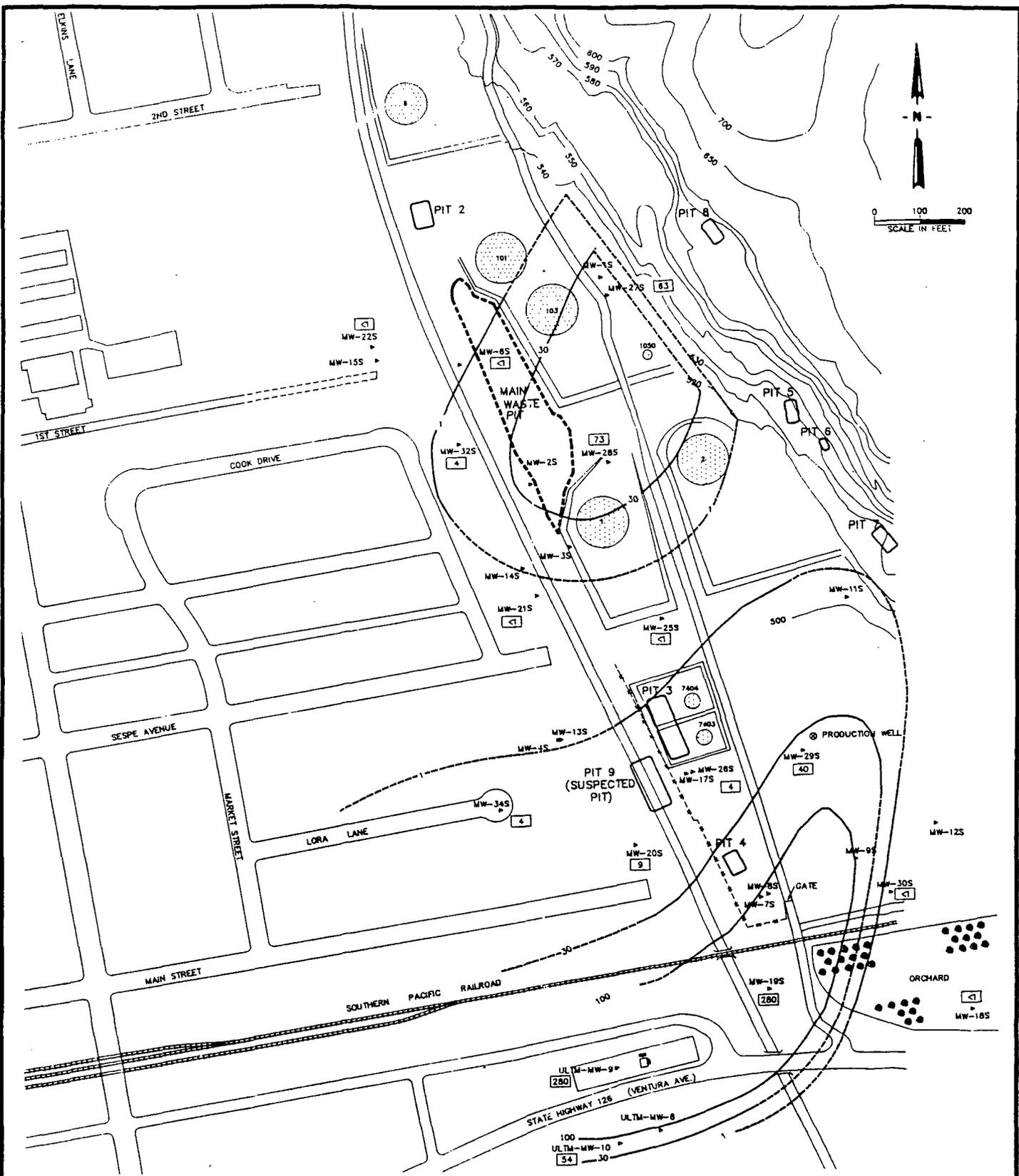
LEGEND

- ▶ GROUNDWATER MONITORING WELL
- 100 BENZENE, ppb
- 100- BENZENE CONCENTRATION CONTOUR
- ND NOT DETECTED

**FIGURE 2-8
FIRST QUARTER (JANUARY 1991)
AQUIFER I BENZENE PLUME
TEXACO FILLMORE SITE**

SOURCE: ENSR, 1991





LEGEND

-  GROUNDWATER MONITORING WELL
-  BENZENE, ppb
-  BENZENE CONCENTRATION CONTOUR

**FIGURE 2-9
SECOND QUARTER (MAY 1991)
AQUIFER I BENZENE PLUME
TEXACO FILLMORE SITE**

SOURCE: ENSR, 1991



Aquifer II

Contamination in the deeper aquifer, separated from aquifer I by a low permeability aquitard that becomes very thin toward the southern end of the site, is not as great as in aquifer I. MW-16, MW-22D, MW-23, MW-24 and MW-25D are screened in aquifer II and presently have water.

No detectable concentrations of hydrocarbon-related compounds are reported in the data base for MW-16, which represents concentrations found in aquifer II in the far northern end of the facility, generally downgradient from the majority of the site.

North and west of the MWP (wells MW-22D, MW-23 and MW-24) higher end aliphatic hydrocarbons (C22 to C28), butyl cellosolve phosphate, methyl pyrrolidinone, phthalate, and carboxylic acid were detected.

South of the MWP (well MW-25D) BETX compounds, chlorobenzene, 2-butanone, naphthalene, and other hydrocarbon-related compounds were detected. The thinner aquitard in this region coupled with the possible historical existence of a waste/water impoundment upgradient of the area may explain why there is more deep aquifer contamination in the southern portion of the site. However, this area is upgradient of the remainder of the deep aquifer monitoring wells and it is expected that similar compounds would be detected downgradient in the other deep wells after transport occurs. It is possible that groundwater flow directions shift from northerly to northwesterly due to seasonal influences, and that the drought conditions that have been measured over the period of the investigation do not represent seasonal groundwater flow in the past, especially prior to the time that Lake Piru was used to regulate and stabilize water level elevations in the basin.

A second reason why concentrations of BETX compounds and other petroleum-related compounds are not detected downgradient of the site may be due to increased degradation of these compounds once they reach the aquifer. If recharge water carries oxygen to groundwater and the concentrations of hydrocarbons are low enough, accelerated degradation may occur in groundwater rendering concentrations below detection by the time many of the compounds reach site boundaries.

Chapter 3
EXPOSURE ASSESSMENT

Chapter 3 EXPOSURE ASSESSMENT

3.1 CHARACTERIZATION OF EXPOSURE SETTING

The following sections briefly describe the physical characteristics and demographic features of the Texaco Fillmore site and vicinity.

3.1.1 PHYSICAL SETTING

The Texaco Fillmore facility consists of approximately 20 acres located northeast of the intersection of the Pole Creek flood control channel and California State Highway 126 in the Santa Clara Valley (Figure 1-1).

Climate. The average annual precipitation in the Santa Clara River Drainage is approximately 16.9 inches (ENSR, January 1991). The 1990 National Oceanic and Atmospheric Administration (NOAA) records for nearby Santa Paula showed an annual total of 5.92 inches, about 12 inches short of average. Southern California has relatively distinct dry (spring, summer, and early fall) and wet (late fall and winter) seasons, even though several recent years have been dryer than normal.

The average temperatures by month show a relatively narrow range, from 52 degrees (Fahrenheit) in February to 70 degrees (Fahrenheit) in July. The predominant wind direction is southwesterly to northwesterly, typical of wind patterns in the Santa Clara Valley (Radian, September 1984). Airflow in the Los Angeles Basin area is predominantly onshore (west to southwesterly) during the day, and offshore (east to northeasterly) at night.

Geologic Setting. Subsurface geologic units of interest at the facility are the Quaternary terrace and colluvial deposits, and the Late Eocene to Early Miocene Sespe Formation. The surface geology in the vicinity of the site consists primarily of Quaternary terrace and colluvial deposits which are generally less than 100 feet thick. Terrace deposits consist mainly of sand, gravel, boulders, and clay. Colluvial deposits consist of sand, silt, clay, gravel, and mudslides and mudflow. The facility is thought to be predominantly underlain by colluvium rather than terrace deposits (ENSR, March 1990).

The uppermost bedrock geologic unit underlying the site is the Sespe Formation. This formation is divided into three areally extensive informal members consisting of coarse-grained upper and lower members and a poorly sorted fine to very fine middle member (ENSR, March 1990).

The site directly overlies the surficial plane of the San Cayetano thrust fault. The upper plate of the thrust is manifested in the abrupt topographic changes at the eastern

edge of the facility (ENSR, March 1990). The fault dips to the north at angles ranging from between 30 and 40 degrees (Radian, September 1986 and ENSR, March 1990).

Subsurface investigations at the site indicate that the facility is underlain by sediments consisting of sand, gravel, clay, silt, shale, and possibly mud flows. The deposits are generally lenticular and discontinuous. A red-brown clay occurs beneath the surface, which may act as a confining layer for perched groundwater beneath the southern portion of the site (ENSR, March 1990).

Land Use and Vegetation. Areas of mixed use surround the site. Vacant land with some agricultural use lies adjacent to and to the north and east of the site. Industrial and residential properties are located to the south, a Fast Gas (Kayo Oil) station to the southwest, and residential homes and a secondary school along the western border of the facility (ENSR, March 1990). More information on site habitat and vegetation is given in Chapter 6, Environmental Assessment.

The future land use map of the General Plan for the City of Fillmore indicates zoning surrounding the site (see Figure 3-1). The area to the north and the east of the site is zoned Rural Residential, at less than one dwelling unit per acre. At the south end of the site, between the Southern Pacific Railroad tracks and State Highway 126, is an area zoned Commercial. Within this Commercial zone is a small area, approximately 300 feet square, zoned for park land. To the south of State Highway 126 is another area of industrially-zoned land extending approximately 500 feet south. South of the Industrial zone is Medium Density Residential zoning, at 7 to 11 dwelling units per acre.

The land bordering directly to the west of the site is zoned mixed residential, public, and park land. The residential zoning ranges from Low Density at 1 to 7 dwelling units per acre, to High Density, at 11 to 15 dwelling units per acre. The public land, which contains the secondary school, is located next to the northern half of the site. The park land runs approximately 600 feet along the western border of the southern half of the site.

Soil Type. In general, site surface soils consist of "gravelly, silty sands containing a trace (<5 percent) to little (<12 percent) clay" (ENSR, January 1991).

Groundwater Hydrology. The facility is located at the eastern edge of the Fillmore Groundwater Basin. Water level data from the Texaco Fillmore well network indicates the groundwater flow beneath the site is predominantly towards the northwest. Groundwater in the principal water-bearing zone occurs approximately 50 feet below the surface in the southern area of the site. Depth to groundwater increases to the north to approximately 85 feet below the surface in the vicinity of the MWP and to 150 feet at the northernmost portion of the facility. Perched groundwater was encountered in four monitoring wells installed by ENSR south of the MWP. Perched

LEGEND

RESIDENTIAL

-  RURAL RESIDENTIAL (<1 Du/Ac)¹
-  LOW DENSITY (1-7 Du/Ac)
-  MEDIUM DENSITY (7-11 Du/Ac)
-  HIGH DENSITY (11-15 Du/Ac)

COMMERCIAL

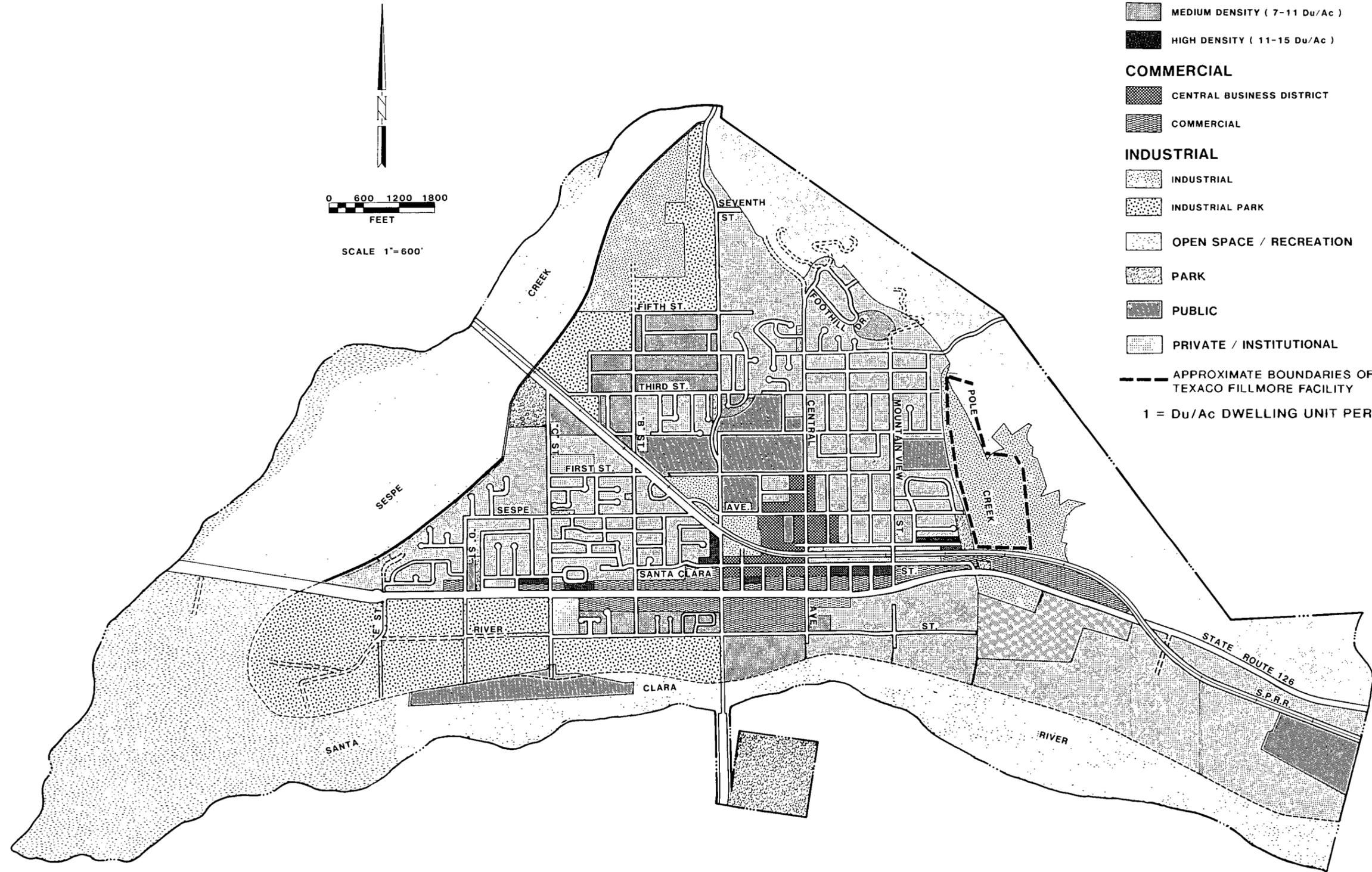
-  CENTRAL BUSINESS DISTRICT
-  COMMERCIAL

INDUSTRIAL

-  INDUSTRIAL
-  INDUSTRIAL PARK
-  OPEN SPACE / RECREATION
-  PARK
-  PUBLIC
-  PRIVATE / INSTITUTIONAL

--- APPROXIMATE BOUNDARIES OF TEXACO FILLMORE FACILITY

1 = Du/Ac DWELLING UNIT PER ACRE



BASE MAP SOURCE: FILLMORE PLANNING DEPARTMENT
(UNDATED, OBTAINED MARCH 1991)

FIGURE 3-1
CITY OF FILLMORE
LAND USE MAP



water in these wells ranges from 44 to 56 feet below the surface (ENSR, March 1990). Groundwater in the area of the site is used for agricultural (irrigation) and domestic use.

Surface Water. The site is located between the TopaTopa Mountains to the northwest and the Fillmore Groundwater Basin to the southwest. Elevations onsite range from 480 to 625 feet above mean sea level. The site slopes generally to the south and west. The average topographic gradient is more than 0.05 feet per foot. Surface water runoff at the site generally flows south. The main surface water feature in proximity to the site is Pole Creek, located along the western border of the site. Pole Creek drains to the south from the TopaTopa Mountains to the Santa Clara River located approximately 2/3 mile south of the facility. Pole Creek is concrete-lined in the segment adjacent to the facility, extending approximately 500 feet downstream (south) of Highway 126, and approximately 1,200 feet upstream of Tank No. 8 (ENSR, January 1991).

3.1.2 POTENTIALLY EXPOSED POPULATIONS

Populations on and near the Fillmore facility have been identified by site tours, census records, and existing reports on the facility. Potential future populations were determined through land use plans, census projections, and general trends for the area.

Potential Onsite Receptors

Currently, only 1 to 2 employees are onsite during a normal work week to maintain the crude oil pumping operations.

The site is bordered by a fence, and is also separated from the City of Fillmore to the west by the Pole Creek Flood Control Channel. Graffiti was noticed by CH2M HILL staff during a site visit; this may indicate occasional trespass to at least the "creek" area by younger area residents.

Potential Offsite Receptors

The City of Fillmore primarily consists of medium density residential development. The area west of the Fillmore facility is predominately single family housing.

The 1990 population for Fillmore was 11,992. Fillmore's population increased 25 percent from 1980 census figures compared with a 52 percent increase from 1970 to 1980 (U.S. Census Bureau, 1990).

Future land uses in the area as designated in the City of Fillmore General Plan are shown in Figure 3-1. According to the City of Fillmore General Plan, the Texaco

Fillmore Facility will remain zoned Industrial. Land use around the facility is characterized as follows:

- EAST--rural residential land
- WEST--bordered along the length of the west side by residential, public, and park land
- NORTH--rural residential land
- SOUTH--commercial/industrial (insert from page 314)

According to EPA supplemental guidance (1991), residential exposure scenarios and assumptions "should be used whenever there are or may be occupied residences on or adjacent to the site." The assumptions in this case "account for daily exposure over the long term and generally result in the highest potential exposures and risk." As a conservative estimate, risks for the Texaco site have been calculated assuming a future onsite residential exposure scenario. Risk to onsite workers, who would have a shorter frequency and duration of exposure, would be expected to be less.

3.2 IDENTIFICATION OF EXPOSURE PATHWAYS

An exposure pathway is the route by which a contaminant moves from a source to a receptor. Exposure cannot occur unless a pathway is complete. A complete exposure pathway has five elements:

- Contaminant source
- Mechanism for contaminant release
- Environmental transport medium
- Exposure point (receptor location)
- Route of exposure (e.g., ingestion, inhalation)

The following paragraphs discuss the potential exposure pathways for the Texaco Fillmore site. Exposure pathways retained for final consideration assume a future onsite residential scenario.

3.2.1 TYPES OF POTENTIAL EXPOSURE

Groundwater. Onsite groundwater is not currently used as a source of drinking water. However, future onsite residents could be exposed to contaminants in groundwater through the use of groundwater as a drinking water supply. In residences, people can be also be exposed through inhalation of volatile compounds released from the water during showering, bathing, cooking, or other water uses. They can also be exposed through dermal absorption of contaminants, primarily during bathing and showering.

Future onsite employees who use groundwater can be exposed in similar ways, although with correspondingly lower exposure frequency and duration.

Soils. Routes of exposure typically associated with direct contact of waste material or contaminated soil are ingestion and dermal absorption. Exposure to surface soils could occur through commercial, residential, or recreational use of the site.

Both commercial and residential development of the site would require the excavation of subsurface material for building foundations and utility lines. Excavation could expose buried waste or contaminated soil. Contact with excavated material could be short term (e.g., for construction workers) or long term if the material is left in place on the surface and comes into contact with frequent site visitors or future occupants. Wind-blown soils can also be inhaled and can deposit contaminants offsite.

Surface Water. Human exposure to contaminants in surface waters can be through dermal contact, ingestion, or inhalation of volatilized compounds. The frequency and duration of such exposures, especially in the arid site region, are expected to be low.

Ambient Air. Volatilization of contaminants from surface and subsurface soils is a possible source of inhalation exposures. Migration of soil gas or prevailing winds can carry contaminants offsite.

3.2.2 CONCEPTUAL MODEL

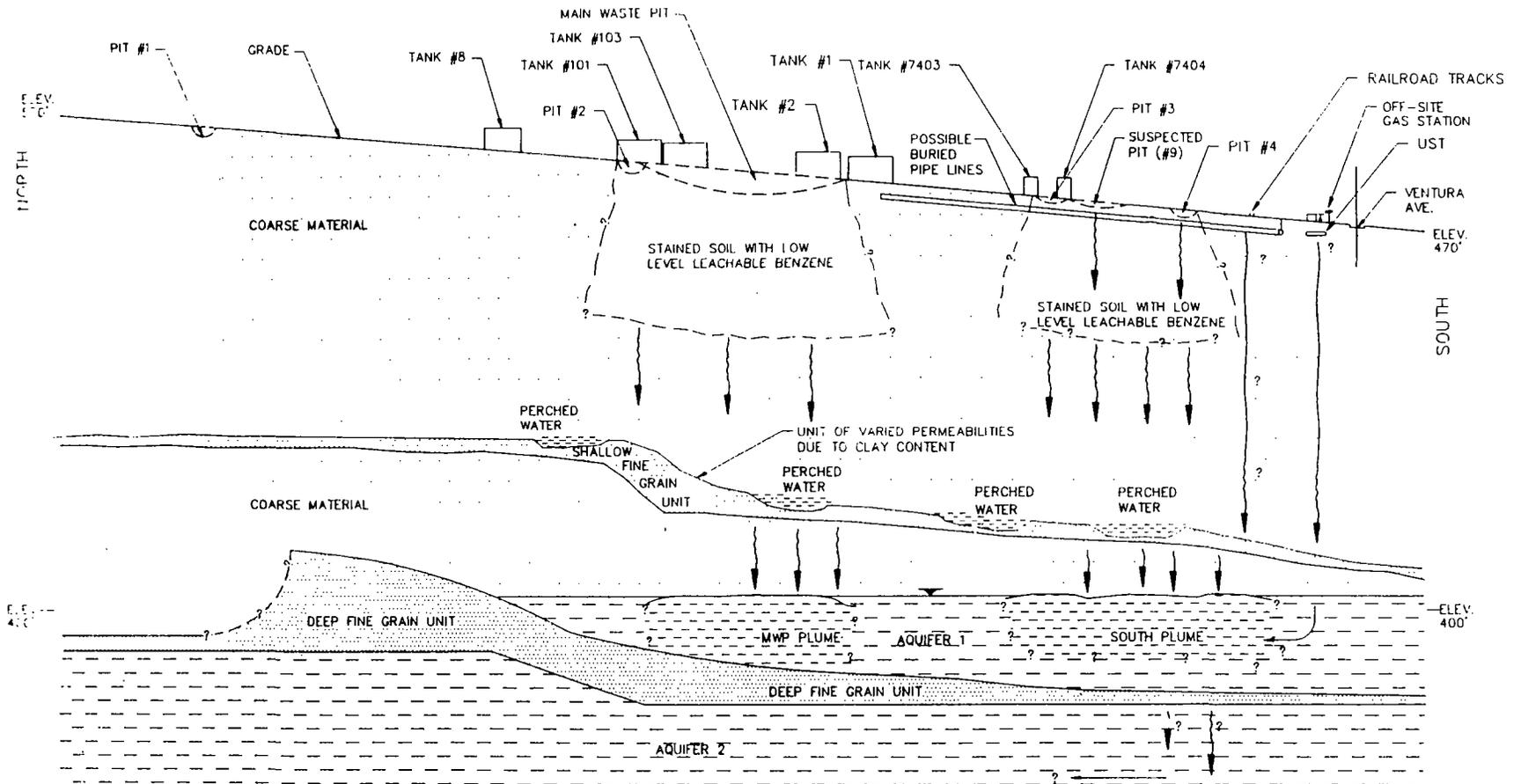
A conceptual site model is used to show relationships between potential sources, exposure pathways, and receptors. A conceptual model is based on existing data and can be updated as more analytical data and receptor information are gathered.

Figure 3-2 presents the conceptual model developed for the Texaco Fillmore site as part of the RI investigation. This diagram shows potential subsurface contaminant migration pathways, with benzene as the specific example. It is also a good representation of the variability of site subsurface hydrogeology.

Figure 3-3 presents an example of the many types of potential exposure pathways that might be associated with contaminated surface and subsurface soils at the site. Though many exposure pathways may be possible, it is expected that the magnitude of human exposure resulting through many of these pathways will be of low magnitude and short duration (e.g., contact with surface water, site trespass). In addition, there is a limited number of workers onsite.

3.3 QUANTIFICATION OF EXPOSURE

Exposure is defined as the contact of an organism with a chemical or physical agent. In this assessment, exposure (or intake) is normalized for time and body weight and is



NOT TO SCALE

ENSR	CLIENT NAME: TEXACO INC.	
	REPORT TITLE: TEXACO FILLMORE DRAFT REMEDIAL INVESTIGATION REPORT	
	FIGURE: 5-1 CONCEPTUAL MODEL	
	DATE:	PROJECT NO. 8600-047
	DRAFTED BY: M.S.	APP. BY:
	REVISED BY:	DWG: CUTEAST

SOURCE: ENSR, 1991

FIGURE 3-2
SITE CONCEPTUAL MODEL



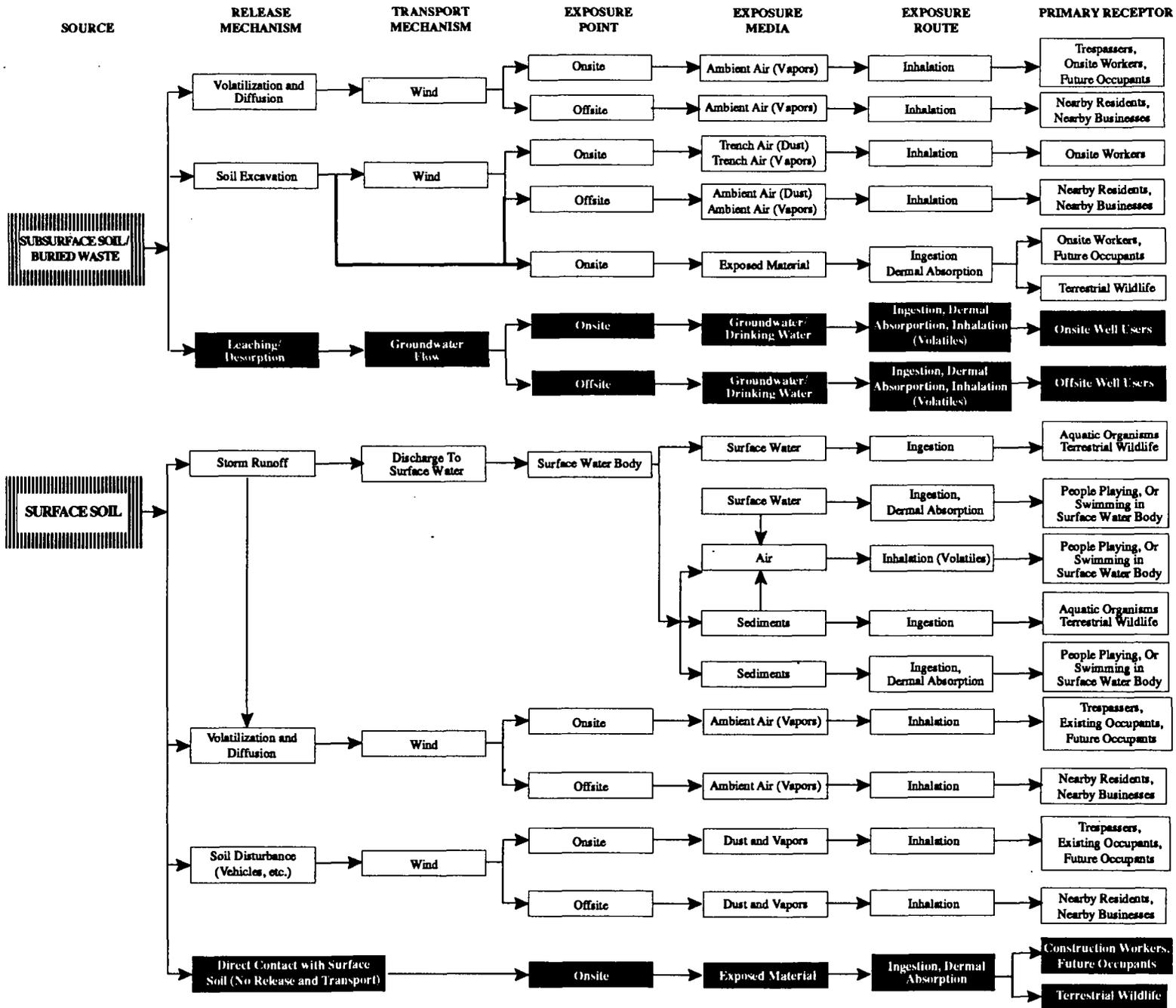


FIGURE 3-3
POTENTIAL EXPOSURE PATHWAYS
TEXACO FILLMORE SITE

expressed as milligrams of chemical per kilogram of body weight per day (mg/kg-day). Six basic factors are used to estimate intake: exposure frequency, exposure duration, contact rate, chemical concentrations, body weight, and averaging time.

EPA guidance states that actions at Superfund sites should be based on an estimate of the "reasonable maximum exposure" (RME) expected to occur under both current and future land use conditions. The reasonable maximum exposure is defined as the "highest exposure that is reasonably expected to occur at a site" (EPA, December 1989a). The intent of the RME is to "estimate a conservative exposure case (i.e., well above the average case) that is still within the range of possibilities" (EPA, December 1989a). Each exposure factor has a range of possibilities. To the extent possible, this assessment uses values for the exposure factors that result in an estimate of the RME.

Table 3-1 presents the exposure scenarios and assumptions to be considered in this assessment. More information on estimating exposure and intake is given in Chapter 4, Toxicity Assessment, and Appendix B.

Dermal absorption from soil during contact is expected to be small compared to exposure through soil ingestion and there is considerable uncertainty with such an estimate. Therefore, dermal absorption from direct contact with contaminated soil is not estimated in this assessment. For further discussion of dermal absorption see Appendix B.

This assessment assumes that the intake of VOCs released from domestic use of water will be equal to the intake of contaminants estimated to occur by ingestion of drinking water (EPA, 1989).

**Table 3-1
Exposure Scenarios and Assumptions
Baseline Risk Assessment
Texaco Fillmore Site**

	Major Exposure Pathways	Exposure Scenarios	Exposure Assumptions^a
Groundwater	Ingestion; Inhalation/Dermal (in-home use)	No known current use as drinking water. Private wells within 1/2 mile. Conservative assumption of future residential ingestion of groundwater based on importance of area groundwater as eventual drinking water source.	Adult: 70-kg body weight 2 liters per day ingestion Child: 10-kg body weight 1 liter per day ingestion 30-year exposure duration (except children) 350 days per year exposure frequency
Surface Water/ Sediments	Dermal Contact; Ingestion	Stream often dry; exposures of low frequency, duration, and magnitude. Channel is fenced; assume occasional trespass by children. Not a drinking water source.	Screening assessment to check detected compounds.
Surface Soils	Ingestion; Dermal Contact; Inhalation (particulates)	Only consistent, current exposures are to onsite personnel. Conservative assumption is future residential use.	Adult: 70-kg body weight 100 mg per day soil ingestion 24-year exposure duration Child: 15 kg body weight 200 mg per day soil ingestion 6-year exposure duration Total exposure (Adult+Child) = 30 yrs 350 days per year exposure frequency

**Table 3-1
Exposure Scenarios and Assumptions
Baseline Risk Assessment
Texaco Fillmore Site**

	Major Exposure Pathways	Exposure Scenarios	Exposure Assumptions^a
Subsurface Soils	<p>Current: Incidental Ingestion/Dermal Contact for Onsite Worker</p> <p>Future: Incidental Ingestion/Dermal Contact for Residential or Recreational Use</p>	<p>No direct exposure expected unless soils are excavated.</p> <p>Exposures of low frequency, duration, and magnitude.</p>	Screening Assessment
Air	Inhalation	Exposure to residents at boundary represents realistic potential scenario.	<p>Adult: 70-kg body weight 20 m³/day inhalation</p> <p>Child: 10-kg body weight 5 m³/day inhalation</p> <p>30-year exposure duration (except children)</p> <p>350 days per year exposure frequency</p>
Soil-Gas	None	<p>No direct exposure expected except as compounds move into ambient air.</p> <p>Important as evidence of continuing sources and site-specificity of contaminants.</p> <p>Conservative assumptions of worker in trench.</p>	<p>Workers: 8 hours per day 20 m³/day inhalation</p> <p>25-year exposure duration</p> <p>250 days per year exposure frequency</p>

^aFrom EPA, 1980, 1989 and 1990a

Chapter 4
TOXICITY ASSESSMENT

Chapter 4

TOXICITY ASSESSMENT

This toxicity assessment briefly summarizes the toxicity and health effects associated with human exposure to the chemicals of concern associated with the Texaco Fillmore site. This chapter includes a summary of the dose-response relationship for those chemicals and a review of the standards and criteria that apply to these chemicals. This toxicity assessment relies on information available from EPA references and toxicity data bases.

The potential human health effects of exposure to chemicals at this site have been divided into two broad categories: carcinogenic effects and noncarcinogenic effects. This division is based on the mechanism of toxicity associated with each category.

The toxicity of a chemical is dependent on the dose or concentration of the substance. Critical toxicity values are a quantitative expression of the dose-response relationship for a chemical. Critical toxicity values for carcinogenic and noncarcinogenic effects are defined by the slope factor (or cancer potency factor) and the reference dose, respectively. Both of these dose-response expressions are specific to the exposure route (i.e., ingestion, inhalation, or dermal). Two sources of critical toxicity values were used in this preliminary RA, with EPA's Integrated Risk Information System (IRIS) data base (EPA, 1991) as the primary source. The secondary source for values not available through IRIS was the quarterly update of the Health Effects Assessment Summary Tables (HEAST) (EPA, 1991).

4.1 CARCINOGENIC EFFECTS

The potential for carcinogenic effects is evaluated by estimating excess lifetime cancer risk. Excess lifetime cancer risk is the incremental increase in the probability of developing cancer during a lifetime over the background probability of developing cancer (i.e., if no exposure to site contaminants occurred). For example, a 1×10^{-6} excess lifetime cancer risk means that for every 1 million people exposed to the carcinogen throughout their lifetime (which is typically assumed to be 70 years), the average incidence of cancer is increased by 1 extra case.

Chemical carcinogenesis is thought to proceed by a nonthreshold mechanism; there is no level of exposure to a carcinogen below, which there is zero probability of developing cancer (EPA, December 1989a). Because of the methods followed by EPA in estimating cancer potency factors, the excess lifetime cancer risks estimated in the assessment should be regarded as upper bounds of the potential cancer risks.

4.1.1 CARCINOGEN CLASSIFICATION

EPA has developed a carcinogen classification system (EPA, December 1989a) using a weight-of-evidence approach to classify the likelihood of a chemical being a human carcinogen. Information considered in the weight-of-evidence classification includes human studies of the association between cancer incidence and exposure as well as long-term animal studies under controlled laboratory conditions. Other supporting evidence considered includes short-term tests for genotoxicity, metabolic and pharmacokinetic properties, toxicological effects other than cancer, structure-activity relationships with other carcinogens, and physical/chemical properties. Table 4-1 shows the EPA carcinogen classification system.

4.1.2 TOXICITY VALUES

The slope factor (or cancer potency factor) is a toxicity value that defines quantitatively the relationship between the dose of the carcinogen and the development of cancer. This value is used in risk assessments to estimate an upper bound lifetime probability of an individual developing cancer as a result of exposure to a particular level of a potential carcinogen. The slope factor is usually, but not always, the upper 95th percent confidence limit of the slope of the dose-response curve and is expressed in $(\text{mg}/\text{kg}/\text{d})^{-1}$. The slope factor, therefore, is the risk per mg/kg -day.

Group	Description
A	Human carcinogen
B1	Probable human carcinogen, limited human data are available
B2	Probable human carcinogen, sufficient evidence in animals and inadequate or no evidence in humans
C	Possible human carcinogen
D	Not classifiable as to human carcinogenicity
E	Evidence of noncarcinogenicity for humans

Toxicity values for carcinogenic effects can also be expressed in terms of the risk for developing cancer per unit concentration of the chemical in the medium where human contact occurs, or the "unit risk." An air unit risk is reported as the risk per ug/m^3 ; a water unit risk is reported as the risk per ug/l .

The cancer slope factors and weight-of-evidence classification for the carcinogenic chemicals of potential concern are presented in Table 4-2. Based on guidance from the U.S. EPA, it was assumed that each B2 carcinogenic PAH, is as potent as benzo(a)-pyrene (EPA, September 18, 1990). Benzo(a)anthracene, benzo(b)fluoranthene, and chrysene are B2 carcinogenic PAHs detected at the site that do not have specific slope factors. Therefore, the cancer slope factor for benzo(a)pyrene was used to estimate cancer risks associated with these chemicals. A further explanation of the methods for estimating intake of contaminants, and potential resultant health risk, is included in Appendix B.

4.2 NONCARCINOGENIC EFFECTS

In contrast to the nonthreshold mechanism of toxicity for carcinogens, most non-carcinogenic effects are thought to occur by a threshold mechanism. A threshold level of exposure for a particular chemical is the exposure concentration below which health effects are not expected to occur and above which health effects may occur. Noncarcinogenic health effects include a variety of toxic effects on body systems, which are assessed through a review of toxic effects noted in short-term (acute) studies, long-term (chronic) studies, and epidemiological investigations.

The reference dose (RfD) is the toxicity value used most often in evaluating non-carcinogenic effects resulting from exposures to hazardous materials. A chronic RfD is defined as an estimate (with uncertainty spanning about an order of magnitude) of a daily exposure level for humans, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects during a lifetime. Chronic RfDs are specifically developed to be protective for long-term exposure to a compound.

Noncarcinogenic risk is assessed by a comparison of the estimated daily intake of a contaminant to its RfD. To assess the potential for noncarcinogenic effects posed by exposure to multiple chemicals, a "hazard index" approach has been adopted (EPA, December 1989a). The method assumes dose additivity. The estimated daily intake of each chemical by an individual route of exposure is divided by its RfD (i.e., a hazard quotient), and the resulting quotients are summed to provide a hazard index. When the hazard quotient or hazard index exceeds 1, there is potential for a noncarcinogenic health risk.

Chronic RfDs for potential compounds of concern are presented in Table 4-2.

4.3 TOXICITY PROFILES

Summary toxicity profiles for selected chemicals of concern are provided in Appendix B. The toxicity profiles describe specific toxic effects associated with exposure to

Table 4-2
Selected Toxicity Values for Compounds of Concern
Texaco Fillmore Site

Sheet 1 of 4

Compound	Oral RfD(mg/kg/d)	Inhalation RfD(mg/kg/d)	Weight of Evidence	Oral CSF(kg-d/mg)	Inhalation UR(/ug/m ³)	Inhalation CSF (kg-d/mg)
Acenaphthene	0.06	--	--	--	--	--
Benzene	--	--	A	0.029	8.3E-06	0.029
Benzo(a)anthracene	--	--	B2	11.5 ^b	1.7E-03 ^b	6.1 ^b
Benzo(a)pyrene	--	--	B2	11.5 ^a	1.7E-3 ^a	6.1 ^a
Benzo(b)fluoranthene	--	--	B2	11.5 ^b	1.7-E-03 ^b	6.1 ^b
Benzoic Acid	4.0	--	D	--	--	--
Bis(2-ethylhexyl) phthalate	0.02 ^a	--	B2	0.014 ^a	--	--
2-Butanone (MEK)	0.05	0.09 ^a	D	--	--	--
Carbon disulfide	0.1	0.003 ^c	--	--	--	--
Chlorobenzene	0.02	0.005 ^a	D	--	--	--
2-Chlorophenol	0.005	--	--	--	--	--
Chrysene	--	--	B2	11.5 ^b	1.75-03 ^b	6.1 ^b
1,2-Dibromoethane (EDB)	--	--	B2	85 ^a	2.2E-04 ^a	0.76
1,4-Dichlorobenzene	--	0.2 ^c	--	0.024	--	--
1,2-Dichloroethane	--	--	B2	0.091	2.6E-05	0.091
1,1-Dichloroethylen	0.009	--	C	0.6	6E-05	1.2

Table 4-2
Selected Toxicity Values for Compounds of Concern
Texaco Fillmore Site

Sheet 2 of 4

Compound	Oral RfD(mg/kg/d)	Inhalation RfD(mg/kg/d)	Weight of Evidence	Oral CSF(kg-d/mg)	Inhalation UR(/ug/m ³)	Inhalation CSF (kg-d/mg)
Cis 1,2-Dichloroethylene	0.01 ^a	--	D	--	--	--
trans 1,2-Dichloroethylene	0.02	--	--	--	--	--
Dimethyl phthalate	1.0 ^a	--	D	--	--	--
2,4-Dinitrotoluene	--	--	B2 ^a	0.68 ^a	--	--
Ethylbenzene	0.1	0.286 ^{ac}	D	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--
Naphthalene	0.004 ^a	--	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--
N-nitroso-di-n-propylamine	--	--	B2	7.0	--	--
N,N-Dimethyl acetamide	--	--	--	--	--	--
Phenanthrene	--	--	D	--	--	--
Phenol	0.6	--	D	--	--	--
Pyrene	0.03 ^a	--	--	--	--	--

Table 4-2
Selected Toxicity Values for Compounds of Concern
Texaco Fillmore Site

Sheet 3 of 4

Compound	Oral RfD(mg/kg/d)	Inhalation RfD(mg/kg/d)	Weight of Evidence	Oral CSF(kg-d/mg)	Inhalation UR(/ug/m ³)	Inhalation CSF (kg-d/mg)
Styrene	0.2	--	B2	0.03 ^a	5.7E-07 ^a	0.002 ^a
Toluene	0.2	0.572 ^c	D	--	--	--
1,1,1-Trichloroethane	0.09	0.3 ^a	D	--	--	--
1,1,2,2-Tetrachloroethane	--	--	C	0.2	5.8E-05	0.2 ^a
Trichloroethylene	--	--	B2 ^a	0.011 ^a	1.7E-06 ^a	0.017 ^a
1,1,2-Trichloro-1,2,2-trifluoroethane	30	7.7 ^c	--	--	--	--
Vinyl acetate	1.0 ^a	0.057 ^c	--	--	--	--
Xylenes, total	2	0.086 ^c	D	--	--	--
Arsenic	0.001 ^a	--	A	-- ^d	4.53E-03	50
Barium	0.07	0.0001 ^a	--	--	--	--
Cadmium	0.0005 ^e 0.001 ^f	--	B1	--	1.8E-03 ^a	6.1
Chromium III	1	5.7E-07 ^c	--	--	--	--
Chromium VI	0.005	5.7E-07 ^c	A	--	1.2E-02	41
Copper	--	--	D	--	--	--

Table 4-2
Selected Toxicity Values for Compounds of Concern
Texaco Fillmore Site

Sheet 4 of 4

Compound	Oral RfD(mg/kg/d)	Inhalation RfD(mg/kg/d)	Weight of Evidence	Oral CSF(kg-d/mg)	Inhalation UR(/ug/m ³)	Inhalation CSF (kg-d/mg)
Lead	--	--	B2	--	--	--
Nickel	0.02	--	--	--	--	--
Vanadium	0.007	--	--	--	--	--

Notes:

Source of Toxicity Values = IRIS 1991, unless noted.

^aFrom HEAST, Annual FY1991

Oral RfD = Oral Reference Dose

Inh RfD = Inhalation Reference Dose

Oral CSF = Oral Cancer Slope Factor

Inh UR = Inhalation Unit Risk

Inh CSF = Inhalation Cancer Slope Factor

CA Weight-of-Evidence Classifications:

A Human carcinogen

B1 Probable human carcinogen, limited human data

B2 Probable human carcinogen, adequate animal evidence and inadequate or no human data

C Possible human carcinogen

D Not classified as to human carcinogenicity

"--" = Not available or not applicable

^bToxicity assumed equal to benzo(a)pyrene. Based on U.S. EPA policy (Memo from Pei-Fung Hurst/U.S. EPA Coordinator, Superfund Technology Support center, to Dana Davoli/U.S. EPA Region IX, September 18, 1990).

^cBackcalculated from HEAST value in mg/m³ using 20 m³ inhalation rate and 70 kg body weight.

^dUnit risk of 5E-05 (μg/L) proposed (IRIS, February, 1991).

^eWater

^fFood

the specified chemical. Detailed toxicity profiles can be found in EPA reference documents and in the toxicological literature.

4.4 REGULATORY AND COMPARISON VALUES

Table 4-3 gives selected regulatory and comparison values for the compounds of concern. These may be used for direct comparison to site data, particularly for those compounds not having readily available toxicity values. The following values have been included:

- Maximum Contaminant Level Goal (MCLG). Under the National Primary Drinking water regulations, the U.S. EPA promulgates MCLGs as a first step in establishing MCLs. MCLGs are health-based values and are set at zero for known and probable carcinogens.
- Maximum Contaminant Level (MCL). State and federal MCLs are part of the drinking water standards adopted by the State of California Department of Health Services and U.S. EPA. They are health-based standards modified with technologic and economic factors relating to the feasibility of achieving and monitoring concentrations in water.
- Health Advisories - The Office of Drinking Water (ODW) provides Drinking Water Health Advisories (HA) as technical guidance for the protection of public health. HAs are not enforceable federal standards. HAs are concentrations of a substance in drinking water estimated to have negligible deleterious effects in humans, when ingested, for a specified period of time. The lifetime HA is calculated from the Drinking Water Equivalence Level (DWEL) which, in turn, is based on the Oral Chronic RfD. HAs do not consider cancer risk.
- DOHS Action Level (AL) - California Department of Health Services ALs are health-based criteria, which are derived like the U.S. EPA and the National Academy of Sciences Health Advisories. Action Levels are levels at which DOHS strongly urge water purveyors to take corrective action to reduce the level of contamination in the water they supply.
- Action Levels (AL) - Taken from the Proposed Rule for Corrective Action for Solid Waste Management Units at Hazardous Waste Management Facilities (Federal Register, July 27, 1990). The proposed rule states that "Substantive provisions of the rule, when promulgated, generally will be applicable to response actions under CERCLA involving releases of hazardous waste (including hazardous constituents). These provisions are used here as comparison values.

Table 4-3
Selected Regulatory and Comparison Values for Compounds of Concern
Texaco Fillmore Site

Compound	MCL ^{a,b} (ug/l)	MCLG (ug/l)	Safe Drinking Water Act Health Advisories			DOHS ^e Action Level (ug/l)	U.S. EPA Proposed Action Levels ^f		
			Child,10-d (ug/l)	Chronic ^c (ug/l)	Effect ^d		Air (ug/m3)	Water (mg/l)	Soil (mg/kg)
Acenaphthene	--	--	--	--	--	--	--	--	--
Benzene	1 S	zero F	200	1	C	--	--	--	--
Benzo(a)anthracene	--	--	--	--	--	--	--	--	--
Benzo(a)pyrene	0.2 FP	zero FP	--	--	--	--	--	--	--
Benzo(b)fluoranthene	--	--	--	--	--	--	--	--	--
Benzoic Acid	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	--	--	--	--	--	--	--	0.003	50
2-Butanone (MEK)	--	--	8000	200	NC	--	300	2	4000
Carbon disulfide	--	--	--	--	--	--	--	4	8000
Chlorobenzene	30 S	100 F	2000	100	NC	--	20	0.7	2000
2-Chlorophenol	--	--	50	40	NC	--	--	0.2	400
Chrysene	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane (EDB)	0.02 S	zero F	8	0.004	C	--	--	--	--
1,4-Dichlorobenzene	5 S	75 F	10000	75	NC	--	--	--	--
1,2-Dichloroethane	0.5 S	zero F	700	--	--	--	0.04	--	8
1,1-Dichloroethylene	6.0 S	7.0 F	1000	7.0	C	--	0.03	--	10
cis-1,2-dichloroethylene	6.0 F	70 F	1000	70.0	NC	--	--	--	--

Table 4-3
Selected Regulatory and Comparison Values for Compounds of Concern
Texaco Fillmore Site

Compound	MCL ^{a,b} (ug/l)	MCLG (ug/l)	Safe Drinking Water Act Health Advisories			DOHS ^e Action Level (ug/l)	U.S. EPA Proposed Action Levels ^f		
			Child,10-d (ug/l)	Chronic ^c (ug/l)	Effect ^d		Air (ug/m3)	Water (mg/l)	Soil (mg/kg)
trans-1,2-Dichloroethylene	10 S	100 F	2000	100.0	NC	--	--	--	--
Dimethyl phthalate	--	--	--	--	--	--	--	--	--
2,4-Dinitrotoluene	--	--	--	--	--	--	--	--	--
Ethylbenzene	680 S ¹	700 F	3000	700	NC	--	--	4	8000
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	500	40	NC	--	--	--	--
4-Nitrophenol	--	--	--	--	--	--	--	--	--
N-nitroso-di-n-propylamine	--	--	--	--	--	--	--	0.000005	0.1
N,N-Dimethyl acetamide	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--
Phenol	--	--	6000	4000	NC	5	--	20	50000
Pyrene	--	--	--	--	--	--	--	--	--
Styrene	100 F ²	100 F	2000	0.01	C	--	--	7	20000
Toluene	1000 F ³	1000 F	3000	1000	NC	100	7000	10	20000
1,1,1-Trichloroethane	200 F	200 F	40000	200	NC	--	1000	3	7000
1,1,2,2-Trichloroethane	1 S	--	--	--	--	--	0.2	0.002	40
Trichlorotrifluoroethane	--	--	--	--	--	--	--	--	--

**Table 4-3
Selected Regulatory and Comparison Values for Compounds of Concern
Texaco Fillmore Site**

Compound	MCL ^{a,b} (ug/l)	MCLG (ug/l)	Safe Drinking Water Act Health Advisories			DOHS ^c Action Level (ug/l)	U.S. EPA Proposed Action Levels ^f		
			Child,10-d (ug/l)	Chronic ^c (ug/l)	Effect ^d		Air (ug/m3)	Water (mg/l)	Soil (mg/kg)
Vinyl acetate	--	--	--	--	--	--	--	--	--
Xylenes, total	1750 S	10ppm F	40000	10000	NC	--	1000	70	200000
Arsenic	50 F	--	--	--	--	--	7E-05	--	8E+01
Barium	1000 F	5 ^g F	--	--	--	--	4E-01	--	4E+03
Cadmium	10 F	5 F	40	5	C	--	6E-04	--	4E+01
Chromium	50 S	100 F	1000	100	--	--	--	--	--
Chrome VI	50 F	--	1000	100	C	--	9E-05	--	4E+02
Copper	1000 F	1300 F	--	--	--	--	--	--	--
Lead	50 F	zero F	--	--	--	--	--	--	--
Nickel	100 FP	100 FP	1000	100	--	--	--	7E-01	2E+03
Vanadium	--	--	--	--	--	--	--	--	--

^aMaximum Contaminant Levels, from Region IX EPA Drinking Water Standards and Health Advisory Table, January 1991

^bS = State; F = Federal; FP = Federal Proposed

^cSafe Drinking Water Act Chronic Health Advisory

^dHA based on Cancer (C) or Noncancer (NC) effects

^eDepartment of Health Services

^fFrom EPA Proposed Rule for Corrective Action for Solid Waste Management Facilities (Federal Register, July 27, 1990)

¹Proposed Secondary EPA MCL for Ethylbenzene is 30 ug/l

²Proposed Secondary EPA MCL for Styrene is 10 ug/l

³Proposed Secondary EPA MCL for Toluene is 40 ug/l

ALs are defined as "health- and environmental-based levels determined by the Agency to be indicators for protection of human health and the environment. Where appropriate, action levels are based on promulgated standards (e.g., MCLs). In other cases, action levels are established by the Regional Administrator on the basis of general criteria."

These ALs are based on toxicity information and exposure assumptions that are further described in the Proposed Rule text. The ALs rely on the assumption of direct exposure to a medium (e.g., soil ingestion), and do not appear to take into account the potential of contaminants to migrate to other media.

4.4.1 GROUNDWATER CONCENTRATIONS COMPARED WITH MCLS

The MCLs were exceeded by the maximum detected concentration in groundwater for three compounds of concern: benzene; 1,2-dichloroethane, and 1,1,2,2-tetrachloroethane; and four metals of concern: arsenic; barium; cadmium; and nickel. The State MCL for benzene is 1.0 ug/l. The maximum detected value for benzene, as shown in Table 2-3, is 720 ug/l from MW-26. MW-26 intersects the shallow aquifer, is screened at the interval of 421-401 feet-MSL, and has a total well depth of 90.51 feet below grade (Table 2-1). MW-26 is located south of Pit 3 and east of suspected Pit 9 (Figure 2-1). The State MCL for 1,2-dichloroethane is 0.5 ug/l. The highest detected concentration was 9 ug/l, also at MW-26. The State MCL for 1,1,2,2-tetrachloroethane is 1.0 ug/l. 1,1,2,2-Tetrachloroethane was detected only once, and that was at 1 ug/l. The detection limits for this chemical ranged from 1 to 50 ug/l. 1,1,2,2-Tetrachloroethane was detected at MW-20, located offsite, east of Pole Creek Flood Control Channel and south of suspected Pit 9. The well intersects the shallow aquifer, is screened at the interval of 415 to 395 feet-MSL, and has a total well depth of 93.54 feet below grade.

Three of the four metals of concern were detected at their highest concentrations in MW-24. Barium was detected at 1,880 ug/l; the Federal MCL is 1,000 ug/l. Cadmium was detected at 48.7 ug/l; the proposed Federal MCL is 100 ug/l. MW-24 intersects the deep aquifer, is screened at 390-370 feet-MSL, and has a total well depth of 163.54 feet below grade. MW-24 is located north of Pit 2. The fourth metal of concern for which the highest concentration exceeded the MCL was arsenic. Arsenic was detected in MW-8 at 316 ug/l. The Federal MCL is 50 ug/l. MW-8 intersects the shallow aquifer, has a screened interval at 439 to 409 feet-MSL, and has a total well depth of 72.22 feet below grade. MW-8 is located south of Pit 4.

Chapter 5
RISK CHARACTERIZATION

Chapter 5 RISK CHARACTERIZATION

5.1 RISK CHARACTERIZATION FOR GROUNDWATER AND ONSITE SOILS

This section presents an evaluation of the potential risks to a future onsite resident associated with the Texaco Fillmore site. Exposure scenarios are evaluated by estimating the carcinogenic and noncarcinogenic risks associated with them. Risk calculation spreadsheets are included in Appendix C.

Chemical concentrations used to evaluate groundwater and soil exposures were the 95 percent upper confidence limit on the mean of the data set, unless the upper confidence limit was above the maximum detected value. In this situation, the maximum detected value was used to estimate exposure concentrations (EPA, December 1989a). The mean and 95 percentile upper confidence on the mean groundwater and soil concentrations are presented in Section 2, Tables 2-3 through 2-5.

Metals have not been included in the risk characterizations for onsite soils. Preliminary results indicate no significant difference between concentrations of metals in onsite and background surface soils.

Capital letters given in parentheses throughout are carcinogenic weight-of-evidence classifications.

5.1.1 GROUNDWATER

The results of the groundwater risk characterization are shown in Table 5-1. With the exception of 2-methylnaphthalene, the listed compounds had either carcinogenic or noncarcinogenic toxicity values available.

Excess lifetime cancer risks, assuming future residential groundwater use (ingestion and inhalation), totaled 6×10^{-5} (6 in 10,000). The carcinogens contributing to this overall risk were benzene (A), 1,2-dichloroethane (B2), and 1,1,2,2-tetrachloroethane (C). It should be noted that 1,1,2,2-tetrachloroethane was detected only one time in groundwater. This chemical remained in the RA due to sampling detection limits at or above the corresponding chemical-specific MCL.

Noncarcinogenic hazard quotients (HQ) and hazard indices (HI) are shown for child exposure (adult intake rates for the same pathway will be lower as shown in the risk calculation tables in Appendix C). The total estimated HI is 5.0, with the HI for ingestion, 4.4, and inhalation, 0.2. The major contributors to the ingestion HI are arsenic with a HQ of 2 and cadmium with a HQ of 0.9. Chronic oral toxic effects for

**Table 5-1
Risk Characterization for Groundwater
Texaco Fillmore Site**

Compound ^(a)	Groundwater Concentration ^(b) (mg/l)	Onsite Residential Scenario Excess Lifetime Cancer Risk			Child Residential Scenario Noncarcinogenic Hazard Quotients		
		Ingestion	Inhalation	TOTAL	Ingestion	Inhalation	TOTAL
Benzene (A)	0.071	2.4E-05 ^c	2.4E-05	4.8E-05	--	--	--
Carbon disulfide	0.0032	--	--	--	0.0031	0.10	0.10
Chlorobenzene	0.001	--	--	--	0.0048	0.019	0.024
1,2-Dichloroethane (B2)	0.0021	2.2E-06	2.2E-06	4.4E-06	--	--	--
Ethylbenzene (D)	0.01	--	--	--	0.01	0.0034	0.013
2-Butanone (MEK) (D)	0.018	--	--	--	0.034	0.019	0.053
Naphthalene	0.011	--	--	--	0.26	--	0.26
2-Methylnaphthalene	0.0073	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane (C)	0.001	2.3E-06	2.3E-06	4.6E-06	--	--	--
Toluene (D)	0.015	--	--	--	0.0072	0.0025	0.0097
Xylenes (D)	0.01	--	--	--	0.00048	0.011	0.011
Arsenic (A)	0.018	--	NC	--	1.7	NC	1.7
Barium	0.324	--	NC	--	0.44	NC	0.44
Cadmium (B1)	0.0048	--	NC	--	0.92	NC	0.92
Chromium	0.015	--	NC	--	0.0014	NC	0.0014

**Table 5-1
Risk Characterization for Groundwater
Texaco Fillmore Site**

Compound ^(a)	Groundwater Concentration ^(b) (mg/l)	Onsite Residential Scenario Excess Lifetime Cancer Risk			Child Residential Scenario Noncarcinogenic Hazard Quotients		
		Ingestion	Inhalation	TOTAL	Ingestion	Inhalation	TOTAL
Chromium VI	0.02	--	NC	--	0.38	NC	0.38
Copper	0.022	--	NC	--	--	NC	--
Lead (B2)	0.0029	--	NC	--	--	NC	--
Nickel	0.04	--	NC	--	0.19	NC	0.19
Vanadium	0.032	--	NC	--	0.44	NC	0.44
TOTALS		3E-05	3E-05	6E-05	4.4	0.2	5

^(a)Letters in parentheses are carcinogenic weight-of-evidence classifications.

^(b)95% upper confidence limit of the mean or the maximum detected value, whichever is lower (from Table 1-3).

^(c)9.7E-05 = 9.7×10^{-5}

--No toxicity value available.

NC = Not calculated

arsenic include skin changes, peripheral neuropathy, liver injury, cardiovascular disorders, and peripheral vascular disease. Chronic oral exposures to cadmium can cause renal toxicity and hypertension (for further details see toxicity profiles in Appendix B).

5.1.2 SURFACE SOILS

The results of the surface soil risk characterization are shown in Table 5-2. Toxicity values were not available for 4-nitrophenol, or phenanthrene.

Excess lifetime cancer risks, assuming future onsite residential surface soil ingestion, totaled 4×10^{-5} . The major contributors to this risk were the PAHs (B2) (benzo[a]pyrene, benzo[b]fluoranthene, chrysene), and n-nitrosodi-n-propylamine (B2). N-nitrosodi-n-propylamine was detected once in surface soils and twice in subsurface soils.

The total estimated hazard index for the future onsite resident is 0.005. Noncarcinogenic hazard quotients and HIs are shown for child exposure (adult intake rates for the same pathway will be lower as shown in the risk calculation tables in Appendix C). None of the available RfDs were exceeded.

5.1.3 SUBSURFACE SOILS

Exposure to subsurface soils at the site could occur during excavation of subsurface material for building foundations and utility lines. In addition, future development of the site could remove current surface soils and expose subsurface soils.

For this scenario, it was assumed that future site excavation may occur to depths of approximately 20 feet. Although six carcinogenic chemicals of potential concern were detected in subsurface soils, none were detected above 20 feet. Three chemicals with RfDs listed in Table 4-2 were detected in subsurface soils less than 20 feet. These chemicals were: ethylbenzene detected at a maximum of 2300 ug/kg; toluene detected at a maximum of 560 ug/kg; and xylene detected at a maximum of 1600 ug/kg. As a screening calculation, future residential risks due to ingestion of these chemicals in subsurface soil at the site were calculated. These screening risks were based on the maximum detected concentrations. The estimated hazard index for exposure to these chemicals in subsurface soils is 0.0003.

5.2 SCREENING RISK ESTIMATES

This section discusses the results of applying potential future onsite residential exposure assumptions to the maximum detected concentrations for ambient air, stream sediment, and surface water. Potential future onsite residential was used due to the limited number of samples taken from each environmental media. Worker exposure assumptions were applied to soil gas concentrations. Screening estimates were done for these

Table 5-2
Risk Characterization for Surface Soils
Texaco Fillmore Site

Compound	Conc ^a ($\mu\text{g}/\text{kg}$)	Excess Lifetime Cancer Risk Ingestion	Noncarcinogenic Hazard Quotients Child/Ingestion
Acenaphthene	1169	--	2.49E-04
Benzene (A) ^b	10.9	4.95E-10	--
Benzo(a)anthracene (B2)	61	1.10E-06	--
Benzo(a)pyrene (B2)	250	4.50E-06	--
Benzo(b)fluoranthene (B2)	93	1.62E-06	--
Bis(2-ethylhexyl)phthalate (B2)	890	1.95E-08	5.69E-04
2-Butanone (MEK) (D)	19.6	--	5.01E-06
Chlorobenzene (D)	7.61	--	4.86E-06
2-Chlorophenol	1263	--	3.23E-03
Chrysene (B2)	800	1.44E-05	--
1,2-Dibromoethane (B2)	3.22	4.28E-07	--
1,4-Dichlorobenzene	1162	4.37E-08	--
1,1-Dichloroethylene	6.45	6.06E-09	9.16E-06
2,4-Dinitrotoluene (B2)	1181	1.26E-06	--
Ethylbenzene (D)	4.67	--	5.97E-07
4-Nitrophenol	5591	--	--
N-nitrosodi-n-propylamine (B2)	1178	1.29E-05	--
Phenanthrene (D)	110	--	--
Phenol (D)	1220	--	2.60E-05
Pyrene	1177	--	5.02E-04
Toluene (D)	173	--	1.11E-05
1,1,1-Trichloroethane (D)	4.7	--	6.68E-07
Trichloroethylene (B2)	6.99	1.20E-10	--
Vinyl acetate	15.3	--	1.96E-07
Xylenes (Total) (D)	9.69	--	6.19E-08
TOTALS		4E-05	0.005

^aNinety-five percent upper confidence limit on the mean (from Table 2-2).

^bLetters in parentheses are carcinogenic weight-of-evidence classifications.

media to determine where possible sources of risk might be. The estimates are conservative comparisons. No summary statistics were calculated for these media due to low numbers of samples. Calculation spreadsheets are included in Appendix C.

5.2.1 AMBIENT AIR

Of the eight detected VOCs in ambient air, only benzene had a carcinogenic slope factor in IRIS or HEAST (see Table 4-2). When applied to the maximum concentration (1.4 parts per billion [ppb] at the downwind station), the resulting excess cancer risk was 4×10^{-5} for a future onsite resident.

For the noncarcinogenic risk estimation, ethylbenzene, 1,1,2-trichloro-1,2,2-trifluoroethane, and xylene had available RfDs. The estimated HI for child exposure is 0.08.

5.2.2 STREAM SEDIMENT

The results of the sediment risk characterization are shown in Table 5-3. All the listed compounds had either carcinogenic or noncarcinogenic toxicity values readily available.

Table 5-3 Risk Characterization for Sediment Texaco Fillmore Site			
Compound	Conc ^a (ug/kg)	Excess Lifetime Cancer Risk Ingestion	Noncarcinogenic Hazard Quotients Child/Ingestion
Benzoic Acid	420	--	1.34E-06
Bis(2-ethylhexyl)phthalate (B2) ^b	130	2.85E-09	8.31E-05
Chrysene (B2)	110	1.98E-06	--
Dimethyl phthalate (D)	2500	--	3.20E-05
Pyrene	68	--	2.90E-05
Styrene (B2)	8.8	4.13E-10	5.63E-07
Trichloroethylene (B2)	27	4.65E-10	--
TOTALS		2E-06	1E-04

^aMaximum detected value.
^bLetters in parentheses are carcinogenic weight-of-evidence classifications.

Excess lifetime cancer risks, assuming residential ingestion of sediment, totaled 2×10^{-6} . The major contributor to this risk is chrysene.

The HQs and HIs are shown for child exposure. The total estimated HI is 0.0001.

5.2.3 SURFACE WATER

Styrene (B2) was the only VOC detected in surface water (summary table not included). Excess lifetime cancer risk, assuming residential use (ingestion and inhalation) of surface water at the maximum detected concentration, totaled 5×10^{-6} . Since surface water flow is infrequent, it is likely that the potential for exposure and resultant risk will be significantly lower.

In addition to styrene, five metals were detected in surface water. The total estimated HI based on exposure to these chemicals is 0.5.

5.2.4 SOIL GAS

Maximum detected soil gas concentrations were used with worker exposure assumptions to determine which compounds might have the greatest potential to contribute to health risk. Since the air wells from which samples were taken were screened about 6 to 7 feet bgs; the assumption was made that the worker was working in a trench at that depth. Of the seven detected VOCs, all but 4-ethyltoluene and 1,2,4-trimethylbenzene had available toxicity values.

When applied to the maximum detected concentration, the excess lifetime cancer risk was 4×10^{-3} . The benzene UR was also applied to detected benzene concentrations from other gas wells (data not shown). The detected concentrations for the other three wells ranged from 5.4 (average of two duplicates) to 60 mg/m^3 . The corresponding excess lifetime cancer risks ranged from 4×10^{-5} to 5×10^{-4} .

None of the available inhalation RfCs were exceeded in the worker exposure scenario.

5.3 UNCERTAINTIES

5.3.1 UNCERTAINTIES

This assessment is subject to uncertainty from a variety of sources, including:

- Sampling and analysis
- Data transfer, interpretation, and use
- Fate and transport assumptions
- Exposure estimation
- Toxicological data

Uncertainty associated with sampling and analysis includes the inherent variability in the analyses, representativeness of the samples, sampling errors, and heterogeneity of the sample matrix. While the QA/QC program used in the remedial investigation serves to reduce these uncertainties, it cannot eliminate them.

Data used in this assessment were gathered largely throughout the remedial investigation activities conducted by Texaco. Several uncertainties were associated with acquiring, interpreting, and applying the data to the risk assessment. Some of these uncertainties and issues are further discussed in Section 2 and Appendix A.

This assessment makes simplified assumptions about the environmental fate and transport of the site contaminants. The choice of data to represent exposure-point concentrations is potentially an additional source of uncertainty.

Exposure estimation requires several assumptions. There are a number of uncertainties regarding assumptions made about the likelihood of exposure, frequency of contact with contaminated media, concentrations of contaminants at exposure points, and exposure durations. Simplifying assumptions may not be representative of a given individual's true exposure.

EPA has outlined several sources of uncertainty associated with the development of toxicity factors used in risk assessment (EPA, December 1989a). They include: extrapolation from high to low doses, and from animals to humans; species, gender, age, and strain differences in uptake, metabolism, organ distribution, and target site susceptibility; and human population variability with respect to diet, environment, activity patterns, and cultural factors.

Table 5-4 lists examples of general types of uncertainties in risk assessment. Table 5-5 lists several sources of uncertainty factors specific to the Texaco Fillmore site.

**Table 5-4
General Uncertainty Factors for Risk Assessment**

Uncertainty Factor	Effect of Uncertainty	Comment
Cancer slope factors	May overestimate risk	Many cancer potency values are upper 95 percent confidence limits derived from the linearized model. Considered unlikely to underestimate true risk.
Risks within a single pathway are assumed to be additive	May under- or overestimate risk	Risks may not be additive because of synergistic or antagonistic actions of chemicals.
Toxicity data degree of certainty	May under- or overestimate risk	Not all potencies or reference doses represent the same degree of certainty. All are subject to change as new information becomes available.
Carcinogenic risk estimation	May under- or overestimate risk	Assumes effect of less-than-lifetime exposures can be approximated by averaging the exposure dose over a typical lifetime. This may or may not be true for any given carcinogen.
Standard exposure assumptions	May under- or overestimate risk	Standard assumptions about body weight and other population characteristics may not represent specific situations.

Table 5-5
Uncertainty Factors for the Baseline Risk Assessment
Texaco Fillmore Site

Sheet 1 of 2

Uncertainty Factor	Effect of Uncertainty	Comment
Metals analyses for either total or dissolved metals only in each medium	May under- or overestimate risk	Did not distinguish between valence, speciation, or dissolved vs. total metals.
Not all chemicals detected at the site have available EPA-verified toxicity values	May underestimate risks	Risks have not been quantitatively estimated for these chemicals.
Not all exposure pathways have been quantified	May underestimate risk	Dermal exposure and trespasser exposures are examples of pathways that have not been quantified, but might contribute to health risks for a given population.
Residential exposure scenarios considered	May overestimate current risk	Current setting not residential.
Exposure estimates assume chemical concentrations remain constant over the exposure period	May under- or overestimate risk	Transport and transformation processes may alter chemical concentrations in a medium.
The amount of media intake is assumed to be constant	May under- or overestimate risk	Lifestyle changes may change intake rates.
Method detection limits	May underestimate risk	For some chemicals, the detection limit is close to or above concentration values usually associated with potential risks under certain scenarios.
Metals not included in risk characterizations	May underestimate risk	Limited comparisons of onsite and background metals showed metals potentially within background concentration ranges. Comparisons still being made.
Petroleum hydrocarbons and tentatively identified compounds (TICs) not included in risk characterizations	May underestimate risk	Potential risks from exposure to groups of petroleum hydrocarbons (e.g. Total Petroleum Hydrocarbons/TPH, Diesel Fuel, C6-C22 Hydrocarbons) difficult to quantify; toxicity factors not readily available for these or many TICs.
Split data not used	May under- or overestimate risks	Quantitative comparisons of split data not yet completed

Table 5-5
Uncertainty Factors for the Baseline Risk Assessment
Texaco Fillmore Site

Sheet 2 of 2

Uncertainty Factor	Effect of Uncertainty	Comment
Risk characterizations based on maximum (screening) values	May overestimate risks	Due to low detection frequencies and/or high detection limits, these values may overestimate representative concentrations.
Estimation of daily inhalation exposure made from data representing ambient air concentrations of contaminants	May under- or overestimate risks	Release and buildup of volatiles in the home varies with ventilation, water use, and activity patterns.

Chapter 6
ENVIRONMENTAL ASSESSMENT

Chapter 6

ENVIRONMENTAL ASSESSMENT

For this qualitative environmental assessment, information regarding the sensitive species and habitats in the area and water quality criteria and objectives were considered. The California Natural Diversity Data Base (CNDDDB) (Department of Fish and Game [DFG], 1991) and Wildlife Habitat Relationships (WHR) data base (DFG, 1989) were searched for information in the vicinity of the Texaco Fillmore site. The Water Quality Control Plan, Santa Clara River Basin (Regional Water Quality Control Board, 1975) was reviewed for beneficial uses and background information on ground and surface waters in the area. The California Inland Surface Waters Plan (Water Resources Control Board, 1991) and the EPA's Integrated Risk Information System (IRIS) were reviewed.

6.1 SENSITIVE SPECIES AND HABITATS

A brief explanation of the different terms and designations for federal and state listed species follows.

Section 3 of the federal Endangered Species Act defines an **endangered** species as any species, including subspecies of plant, invertebrate, or vertebrate that is in danger of extinction throughout all or a significant portion of its range. This section further defines **threatened** species as any species likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. **Listed**, often used in conjunction with endangered or threatened, indicates that a species has been the subject of a proposed and final rule or regulation published in the Federal Register.

Candidate species are taxa the U.S. Fish and Wildlife Service (Service) is considering for listing as endangered or threatened species. These species, however, have yet to be the subject of a proposed rule; they are divided into two groups. **Category 1** candidates are taxa for which the Service currently has on file substantial information on biological vulnerability (relating to autecology and distribution) and threat(s) to support the appropriateness of proposing to list the taxa as endangered or threatened species. **Category 2** candidates are taxa for which information now in the possession of the Service indicates that proposing to list them as endangered or threatened species is possibly appropriate, but for which substantial data on biological vulnerability and threat(s) are not currently known or on file to support the immediate preparation of rules. However, candidate species may be designated as regionally sensitive and gain protection. Candidate species determined to be at significant risk may be listed under the Emergency Listing of the Endangered Species Act (16USC1533).

Under the California Endangered Species Act, candidate species do not have any protection under the Endangered Species Act; proposed species are granted limited

protection under the Endangered Species Act; listed Endangered and Threatened species receive the full protection and authorities of the Endangered Species Act (Fish and Game Code [FGC] Section 2050 et seq.).

A native California species or subspecies of animal or plant is considered **endangered** by the state when it is in serious danger of becoming extinct throughout all, or a significant portion of, its range due to one or more causes, including loss of habitat, change of habitat, over-exploitation, predation, competition, or disease (Fish and Game Code [FGC] Section 2062). A **threatened** species is one that is not presently threatened with extinction, but is likely to become an endangered species in the foreseeable future in the absence of special protection and management efforts. Any animal listed as "rare" by the Commission on or before January 1, 1985, is a "threatened" species (FGC Section 2067).

A native California species or subspecies of animal or plant is a state **candidate** when the Fish and Game Commission has formally noticed it as being under review by the Department to determine whether listing as threatened or endangered is warranted, or when it is the subject of a proposed rulemaking by the Commission to list as threatened or endangered (FGC Section 2068).

State Species of Special Concern are divided into three categories: highest, second, and third priorities (Remsen, 1978; Williams, 1986). These categories are defined on the basis of the urgency of the situation. Species in the **Highest Priority** category face immediate extirpation of their entire California population or their California breeding population if current trends continue. Species in the **Second Priority** category are declining in a large portion of their range in California, but their populations are still sufficiently substantial that danger is not immediate. Species in the **Third Priority** category are not in any present danger of extirpation and their populations within most of their range do not appear to be declining seriously; however, simply by virtue of their small populations in California, they are vulnerable to extirpation should a threat materialize.

Sensitive species are designated by the U.S. Forest Service as those species known or highly suspected to occur on National Forest lands that are considered viable candidates for federal threatened or endangered classification under the Endangered Species Act of 1973. The term "sensitive" removes the basic confusion of using terms such as "rare," "threatened," or "endangered," because these categories have legal meanings under various federal or state laws.

Harvested species are those species that are potentially used for sport or commercial purposes.

6.1.1 CALIFORNIA NATURAL DIVERSITY DATA BASE

The CNDDDB is a compilation of locality, habitat, and status information for special-status species and sensitive habitats maintained by the California Department of Fish

and Game. It includes records of plant and animal species and sensitive habitats in California. Data included in the CNDDDB are compiled by opportunistic rather than systematic means, from a variety of sources including herbaria, university staffs, scientific publications, members of organizations such as the California Native Plant Society and the Audubon Society, agency biologists, and environmental consultants. It may not, therefore, include all species and habitats of concern for all geographic areas. The information should be used as a supplement to field work, not as a substitute for it. Data may be accessed by United States Geological Survey (USGS) quadrangle, county, or element name (species or habitat). The Fillmore 7.5' USGS quadrangle was used for the CNDDDB search.

The CNDDDB search found only three species of concern potentially occurring in the area (Table 6-1). Two of the species require water (the turtle and the sucker) and would more likely be found nearer the Santa Clara River or the drainage canal and probably do not occur on the site. The California condor has been extirpated from the wild and would not occur now on the site. The habitats on the site have no recognized special status according to CNDDDB. However, captive-produced California condors may be released to the wild in the next few years and this species could occur again in this general vicinity.

<p align="center">Table 6-1 Species List from CNDDDB Search for the Texaco Fillmore Site</p>		
Common Name	Scientific Name	Status
Birds		
California condor	<i>Gymnogyps californianus</i>	Federal Endangered
Reptiles		
Southwestern pond turtle	<i>Clemmys marmorato pallida</i>	Federal Category 2
Fish		
Santa Ana Sucker	<i>Catostomus santaanae</i>	California Species of Special Concern

The complete search output, including the sightings of the species in the table as well as habitats, is found in Appendix D.

6.1.2 WILDLIFE HABITAT RELATIONSHIPS DATA BASE

The WHR is an information system created through multiagency cooperation and maintained by DFG. It consists of many components used to assess terrestrial

vertebrate species occurrence, habitat requirements, life history information, and relative abundance. The information in the data base is from a variety of sources such as university staffs, scientific publications, members of organizations such as the Audubon Society, agency biologists, and environmental consultants. The emphasis on the need for a predictive ability in the system has resulted in a systematic and thorough treatment of the information.

The WHR searches using a variety of elements. The data for a specific location are accessed by selecting such parameters as the location (by a variety of parameters including county, resource agency region, hydrologic unit); the dominant habitat type; special elements; and others. The Ventura-San Gabriel Hydrologic Unit, Ventura County, and the Saugus Latitude-Longitude block (34-35° by 118-119°) were chosen for location search elements. Only animals that occurred in all three elements were included in the list. The habitat search element, Annual Grassland, was selected after review of maps and literature and a telephone conversation with Steve Goodbred, U.S. Fish and Wildlife Service Biologist (Goodbred, 1991).

The list of the bird and mammal species potentially occurring in the vicinity of the site was generated from the WHR and then the list was modified to be more specific for the site. Special-status species that could be expected to occur there are listed in Table 6-2, and a general species list is included in Appendix D.

6.2 WATER QUALITY

The Porter-Cologne Water Quality Control Act (1969 Statutes) requires each California Regional Water Quality Control Board to develop and adopt water quality control plans for basins within their areas; these plans then become part of the California Water Plan. The water quality control plans designate beneficial uses of the local water resources, and set forth water quality objectives designed to protect or restore these beneficial uses. The Texaco Fillmore site is located within the Fillmore Hydrographic Subarea, beneficial uses for which are given in the Santa Clara River Basin Water Quality Control Plan (RWQCB, 1975).

6.2.1 BENEFICIAL USES

The present and potential beneficial water uses for the Fillmore Subarea are stipulated in the Santa Clara River Basin Water Quality Control Plan for the Sespe Creek, the Santa Clara River, and groundwater in general. Pole Creek is not mentioned, although it does flow into Pole Creek Flood Control Channel along the western border of the site and eventually to the Santa Clara River. These beneficial uses are summarized in Table 6-3. Of special interest to this qualitative environmental assessment are the following beneficial uses: Warm Freshwater Habitat, Cold Freshwater Habitat, Wildlife Habitat, and Preservation of Rare and Endangered Species.

TABLE 6-2
SPECIAL STATUS SPECIES
SUMMARY LIST* OF WILDLIFE
POTENTIALLY OCCURRING IN THE VICINITY OF
THE TEXACO FILLMORE SITE, VENTURA COUNTY, CALIFORNIA

SPECIES NAME	SCIENTIFIC NAME	SEASON	STATUS								
			1 F E	2 F T	3 C E	4 C T	5 C P	6 C F S	7 B S	8 H	9 C A S C
BIRDS											
BLACK-SHOULDERED KITE	<i>Elanus caeruleus</i>	Yearlong					5				
GOLDEN EAGLE	<i>Aquila chrysaetos</i>	Yearlong					5	6			1
MERLIN	<i>Falco columbarius</i>	Winter									1
PEREGRINE FALCON	<i>Falco peregrinus</i>	Yearlong	1		3		5				
PRAIRIE FALCON	<i>Falco mexicanus</i>	Yearlong						6			
BURROWING OWL	<i>Athene cunicularia</i>	Yearlong									1
LONG-EARED OWL	<i>Asio otus</i>	Yearlong									1
SHORT-EARED OWL	<i>Asio flammeus</i>	Yearlong									1
TRICOLORED BLACKBIRD	<i>Agelaius tricolor</i>	Yearlong									1
MAMMALS											
SPOTTED BAT	<i>Euderma maculatum</i>	Yearlong									1
TOWNSEND'S BIG-EARED BAT	<i>Plecotus townsendii</i>	Yearlong									1
WESTERN MASTIFF BAT	<i>Eumops perotis</i>	Yearlong									1
RINGTAIL	<i>Bassariscus astutus</i>	Yearlong					5				
BADGER	<i>Taxidea taxus</i>	Yearlong								8	1
WESTERN SPOTTED SKUNK	<i>Spilogale gracilis</i>	Yearlong								8	1
MOUNTAIN LION	<i>Felis concolor</i>	Yearlong								8	1
TOTAL SPECIES: 16											

Status Definitions:

- | | | |
|------------------------------|---------------------------------|-----------------------------------|
| 1. FE: Federally Endangered | 5. CP: California Protected | CalSC: California Special Concern |
| 2. FT: Federally Threatened | 6. FS: Forest Service Sensitive | |
| 3. CE: California Endangered | 7. BS: BLM Sensitive | |
| 4. CT: California Threatened | 8. H: Harvest | |

* Based On California Department Of Fish And Game Wildlife Habitat Relationship System Programmed By Irene Timossi For Pacific Gas And Electric Company. This list assumes basic food and water requirements are met.

Database Version: 08/08/89 Data Base Run: 11:20:58 06/20/91

SELECTION CRITERIA:

Locations: VENTURA-SAN GABRIEL HYDROLOGIC REGION-

VENTURA COUNTY-

SAUGUS LATILONG 34-35 by 118-119

Habitats:

1 ANNUAL GRASS	SHORT HERB	SPARSE	2-09%	(1S)
2 ANNUAL GRASS	SHORT HERB	OPEN	10-39%	(1P)
3 ANNUAL GRASS	SHORT HERB	MODRTE	40-59%	(1M)
4 ANNUAL GRASS	SHORT HERB	DENSE	60-100%	(1D)
5 ANNUAL GRASS	TALL HERB	SPARSE	2-09%	(2S)
6 ANNUAL GRASS	TALL HERB	OPEN	10-39%	(2P)
7 ANNUAL GRASS	TALL HERB	MODRTE	40-59%	(2M)
8 ANNUAL GRASS	TALL HERB	DENSE	60-100%	(2D)

**Table 6-3
Present and Potential Beneficial Water Uses
in the Fillmore Hydrographic Subarea**

Beneficial Use	Santa Clara River	Sespe Creek	Groundwater
Municipal and Domestic Supply	--	Potential	Existing
Industrial Service Supply	Existing	Existing	Existing
Industrial Process Supply	Existing	Existing	Existing
Agricultural Supply	Existing	Existing	Existing
Groundwater Recharge	Existing	Existing	--
Warm Freshwater Habitat	Existing	Existing	--
Cold Freshwater Habitat	--	Existing	--
Wildlife Habitat	Existing	Existing	--
Preservation of Rare/ Endangered Species	--	--	--
Water Contact Recreation	Existing	Existing	--
Non-Contact Water Recreation	Existing	Existing	--

The components of the Fillmore Hydrographic Subarea are designated as follows. Both the Santa Clara River and Sespe Creek have designated existing beneficial water use as Warm Freshwater Habitats. They provide a warm-water habitat to sustain aquatic resources associated with a warm-water environment. Sespe Creek alone is designated as an existing Cold Freshwater Habitat providing a cold-water habitat to sustain aquatic resources associated with a cold-water environment. Both the Santa Clara River and Sespe Creek have existing beneficial uses as water supply and habitat for the maintenance of wildlife. Pole Creek goes dry most of the year with a mean daily flow of less than 1 cubic foot per second (cfs) (L. Causey, personal communication with Ventura County Flood Control District, December 1991). However, none of the components of the Fillmore Hydrographic Subarea is designated as providing an aquatic habitat necessary, at least in part, for the survival of certain species established as being rare and endangered species.

6.2.2 GROUNDWATER

Water-bearing formations comprise approximately half the area of the Fillmore Hydrographic Subarea. The Fillmore Basin is the fourth basin downstream in the Santa Clara River system, and receives surface and subsurface inflow from the Piru Basin and from tributary streams and canyons including Sespe, Pole, and Boulder Creeks, and Grimes, Baloom, Snow, and Timber Canyons.

The groundwater in the Fillmore Basin ranges from "suitable to unsuitable for domestic and irrigation uses. The best quality groundwater in the Basin is found near the mouths of Snow Canyon and Boulder Creek Canyon. However, most of the groundwater is marginal in quality for domestic and irrigation purposes" (RWQCB, 1975).

The City of Fillmore derives its domestic water supply solely from groundwater sources. The water obtained is generally low in quality with high concentrations of total dissolved solids (TDS) and other minerals. TDS for the Fillmore wastewater treatment plant ranges from 1,200 to 1,900 mg/l.

"The area along Pole Creek near the confluence of the Santa Clara River and Sespe Creek (an area referred to as the Pole Creek fan) contains groundwater generally marginal to unsuitable for domestic use but usable for irrigation of tolerant crops. The aquifers beneath the Pole Creek fan are only minimally recharged by percolation of storm runoff from the Santa Clara River and Sespe Creek" (RWQCB, 1975).

6.2.3 SURFACE WATERS

Surface water in the Santa Clara River is generally of poor quality during low flows. Flood flows, however, are of good quality. The water is unsuitable for domestic purposes. Rising water appears at the lower end of the Fillmore Basin (the principal groundwater basin within the Sespe Subunit) so that surface water quality during low flows resembles the groundwater quality at this point.

Sespe Creek flows are normally of good quality except during very low flows. Excessive boron concentrations lower the water's quality for irrigation. The water is suitable for domestic purposes, however. The Sespe Hot Springs are one of the principal sources of boron, which is unusually high in Sespe Creek. The Springs are also the cause of particularly high concentrations of chloride and fluoride found in Sespe Creek waters (RWQCB, 1975).

Very high flows in Sespe Creek carry tremendous amounts of suspended sediment. For example, the USGS measured 100,000 mg/l of suspended sediment on January 25, 1969, when the discharge was 45,000 cfs. During the January 1969 storm, suspended sediment concentrations were over 10,000 mg/l most of the time (USGS, 1969). This sediment is the result of natural erosion. The Sespe Creek watershed is little developed and there are very few roads in the area.

Bacteriological contamination of Sespe Creek has taken place in recent years from recreational activity above the Fillmore Irrigation Company's domestic water intake. The company ceased using Sespe Creek as a domestic water source in the spring of 1972 (CDPH, 1972). Water quality degradation as a result of development along the creek appears to be insignificant, as the watershed is for the most part inside the Los Padres National Forest (RWQCB, 1975).

6.3 CHEMICALS OF POTENTIAL CONCERN

As previously described, site investigations included sampling of the following media: groundwater, surface soil, subsurface soil, ambient air, surface water, and creek sediment. There were approximately 40 chemicals of potential concern detected at the site including monocyclic aromatics (e.g., BTEX), polycyclic aromatics (e.g., naphthalene, benzo(a)pyrene), phenolics, phthalate esters, halogenated aliphatics (1,2-dichloroethane), and metals. Metals in onsite surface and subsurface soils samples were detected in concentrations similar to concentrations detected in offsite background samples. The chemicals of potential concern are presented in Chapter 2, Table 2-13.

6.4 EXPOSURE CHARACTERIZATION

Environmental receptors at or near the site may be exposed to chemicals of potential concern onsite or that have migrated from the site. Potential environmental receptors include terrestrial wildlife and aquatic species in nearby surface waters. Special status species and habitats were discussed in the previous sections. Characterization of species and habitats has not been conducted at the site, therefore the exact composition of potentially exposed environmental receptors is not certain.

For an exposure to occur, it must include a source, a mechanism of release, transport to a receptor location, a receptor, and receptor exposure (i.e., ingestion, dermal contact, inhalation).

Wildlife could be exposed to chemicals of potential concern present in site soils through dermal contact, direct ingestion (e.g., while preening), and through the food chain (e.g., ingestion of invertebrates that may have bioaccumulated chemicals of potential concern).

Exposure to environmental receptors from groundwater under the site is not likely. Groundwater was detected at a depth of 50 to 150 feet below ground surface, making contact with it by environmental receptors unlikely. Environmental receptors could be exposed to chemicals of potential concern in either surface water or creek sediment, which have been found to contain chemicals of potential concern. Exposure routes would include ingestion of surface water, inhalation of volatile chemicals in surface water, and ingestion or dermal contact with creek sediment.

6.5 WATER QUALITY CRITERIA

Water Quality Objectives for Protection of Freshwater Aquatic Life, set forth by the State Water Resources Control Board, and Ambient Water Quality Criteria, Aquatic Organisms, as contained in the Clean Water Act are shown in Table 6-4.

These criteria are compared to the surface water sample results from Table 2-6. The only compounds detected in surface water were arsenic, barium, chromium, copper, nickel, vanadium, and styrene. Of these, arsenic, chromium, copper, and nickel have available criteria values.

Arsenic was detected at concentrations ranging from 1.7 to 2.6 ug/l. These are well below both the acute (360 ug/l) and chronic (190 ug/l) water quality criteria.

The water quality criteria for many metals are hardness-dependent. Although hardness values for surface water were not listed in the RI Report, total hardness reported for nearby Sespe Creek was about 380 mg/l (Table 6-4). In addition, the Fillmore area is one of many in the region that has traditionally had high total hardness values (above 200 mg/l, as noted in RWQCB, 1975). Since the water quality criteria values for nickel and copper would increase with increasing hardness, a conservative comparison can be made using a hardness value below what might actually be expected in the site vicinity, such as 50 mg/l.

Detected concentrations for chromium ranged from <3 to 6 ug/l. These values are less than half the 4-day (11 ug/l) and 1-hour (16 ug/l) average water quality objective values.

**Table 6-4
Water Quality Criteria and Objectives**

Compound	Ambient Water Quality Criteria ^a (ug/l)		Water Quality Objectives ^b		Surface Water Quality Data
	Acute	Chronic	ug/l	Type ^c	ug/l
Styrene	--	--	--	--	<1-12
Arsenic	360 Arsenic III	190 Arsenic III	190 360	4-Day 1-Hour	1.7-2.6
Barium	--	--	--	--	215-248
Chromium	16 ^d	11 ^d	11 16	4 day 1-Hour	<3-6
Copper	9.2 ^d	6.5 ^d	6.5 ^e 9.2 ^e	4-Day 1-Hour	<3-6.8
Nickel	790 ^f	88 ^f	88 ^g 790 ^g	4-Day 1-Hour	13.6-18.5
Vanadium	--	--	--	--	6.3-9.5

-- = Not available.

^a Clean Water Act, Ambient Water Quality Criteria for Freshwater (IRIS, 1991).

^b California Inland Surface Water Plan 91-12WQ. Water Quality Objectives for Protection of Freshwater Aquatic Life (WRCB, 1991)

^c 4-Day = 4-Day Average; Daily = Daily Average; 1-Hour = 1-Hour Average; Max = Instantaneous Maximum.

^d from U.S. EPA, 1987, Water Quality Criteria for Water 1986.

^e 4-Day Average Copper = $e^{0.8545H - 1.465}$; 1-Hour Average Copper = $e^{0.9422H - 1.464}$.

e.g. where hardness is 50 mg/l, the 4-Day Average Copper = 6.5 ug/l and the 1-Hour Average Copper = 9.2 ug/l.

^f Reference: 56FR 58420 November 19, 1991. EPA proposal to Establish Water Quality Criteria for Toxic Pollutants in states that lack such standards.

^g 4-Day Average Nickel = $e^{0.846H + 1.1645}$; 1-Hour Average Nickel = $e^{0.846H + 3.3612}$.

e.g. where hardness is 50 mg/l, the 4-Day Average Nickel = 88 ug/l and the 1-Hour Average Nickel = 790 ug/l.

Detected concentrations for copper ranged from <3.0 to 6.8 ug/l. Only one sample, TF-C-D1-W-B1, 3/2/91, at 6.8 ug/l, was above the 4-day (6.5 ug/l) average water quality objective values. All the other concentrations were below the 4-day (6.5 ug/l) and 1-hour (9.2 ug/l) average water quality objective values, assuming a representative hardness value of 50 mg/l CaCO₃.

Detected concentrations for nickel ranged from 13.6 to 18.5 ug/l. These values are below the 4-day (88 ug/l) and 1-hour (790 ug/l) average water quality objective values, assuming a representative hardness value of 50 mg/l CaCO₃.

Since the actual hardness of the Pole Creek surface water probably exceeds 50 mg/l, the detected values of copper and nickel are not likely to exceed the corresponding water quality criteria.

Chapter 7
CONCLUSIONS

Chapter 7

CONCLUSIONS

The purpose of the risk assessment was to identify potential sources of risk to human health and the environment at the Texaco Fillmore site. Risk estimates for the Texaco site have been calculated assuming a future onsite residential exposure scenario. Potential residential exposure pathways assessed include ingestion of chemicals detected in groundwater, inhalation of volatile chemicals detected in groundwater, direct contact with site surface soil, ingestion of surface water, inhalation of volatile chemicals in surface water, ingestion of stream sediment, and inhalation of ambient air. In addition, worker exposure to soil gas while trenching onsite was also evaluated.

The estimated excess lifetime cancer risk due to ingestion of groundwater and inhalation of volatile chemicals in groundwater was 6×10^{-5} . The major contributor to this risk was benzene with an estimated excess lifetime cancer risk of 5×10^{-5} . The total estimated hazard index for this scenario was 5.0. The major contributors to the hazard index were arsenic and cadmium through groundwater ingestion. The hazard quotient for arsenic was 2.0 while the hazard quotient for cadmium was 0.9. Both chemicals were detected in onsite groundwater in concentrations exceeding their state and federal MCLs.

The estimated excess lifetime cancer risk was 4×10^{-5} for residential exposure through soil ingestion. The major contributor to the surface soil risk was chrysene with an estimated excess lifetime cancer risk of 1×10^{-5} . Four additional chemicals benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and 2,4-dinitrotoluene had estimated risks greater than 1×10^{-6} . The total estimated hazard index due to soil ingestion was 0.005.

The estimated excess lifetime cancer risk due to inhalation of chemicals detected in ambient air was 4×10^{-5} . Benzene was the only chemical contributing to this risk estimate. The estimated hazard index for this pathway is 0.08.

The estimated excess lifetime cancer risk due to ingestion and inhalation of chemicals detected in surface water was 5×10^{-6} . The major contributor to this risk was styrene through ingestion, with an estimated excess lifetime cancer risk of 4×10^{-6} . The hazard index for this scenario was less than one (0.5). These are conservative estimates since the surface water flow is infrequent and, therefore, the potential for exposure and the resultant risk will be significantly lower.

The estimated excess lifetime cancer risk due to residential exposure through ingestion of chemicals detected in stream sediment was 2×10^{-6} . The major contributor to this risk was chrysene. The hazard index for this scenario was less than one (0.0001).

Calculated risks for exposure to chemicals in groundwater, soil, ambient air, surface water, and creek sediment are based on residential exposure assumptions. Risks to onsite workers, visitors, or trespassers, who would have shorter frequency and duration of exposure, would be expected to be lower.

Potentially exposed environmental receptors at the site include special status species potentially occurring in the vicinity of the site and aquatic life in nearby surface waters. Both the Sespe Creek, which is located approximately one and one-quarter miles west of the site, and the Santa Clara River, which is approximately one-half mile south of the site, have designated existing beneficial water use for aquatic habitats and as water supply and habitat for the maintenance of wildlife. Chemicals concentrations detected in the Pole Creek, which flows into the Pole Creek Flood Control Channel along the western border of the site and eventually to the Santa Clara River, were compared to regulatory standards for the protection of freshwater aquatic life. All chemicals concentrations were below the corresponding chemical-specific standards.

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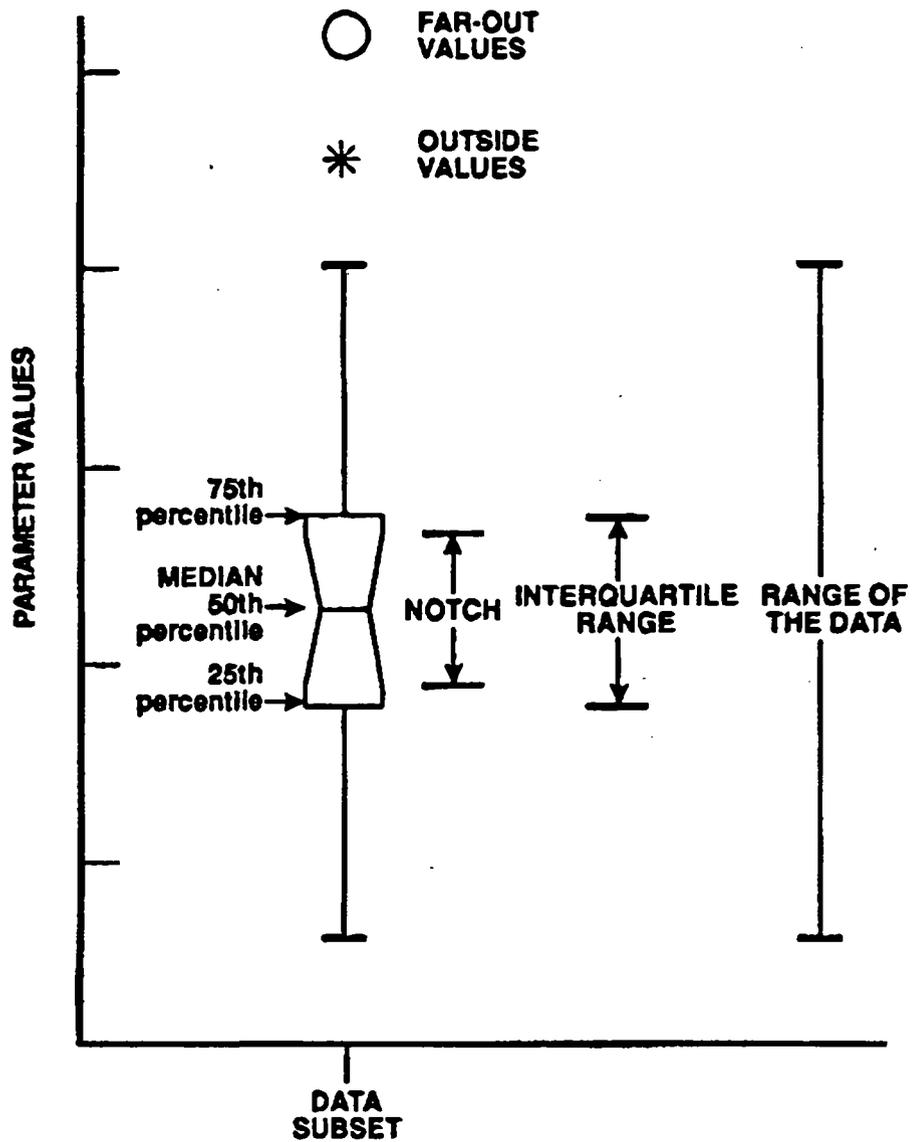
Alta Turner/CH2M HILL. Telephone conversation with ENSR staff. July 19, 1991.

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Appendix A
RESULTS OF STATISTICAL COMPARISONS

- **Generic Box Plot**
- **Surface Soil Metals: Onsite versus Background**
- **Subsurface Soil Metals: Onsite versus Background**
- **Groundwater: Detects versus Nondetects**
- **Benzene in Groundwater: Plots TSY Monitoring Well and Time Series**

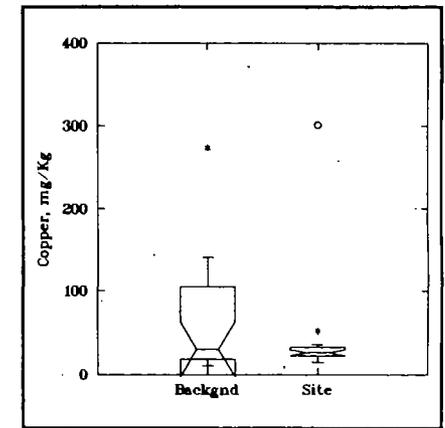
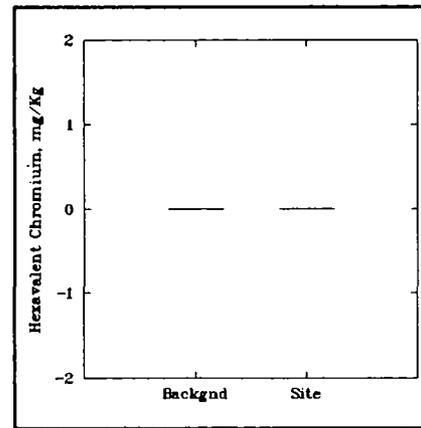
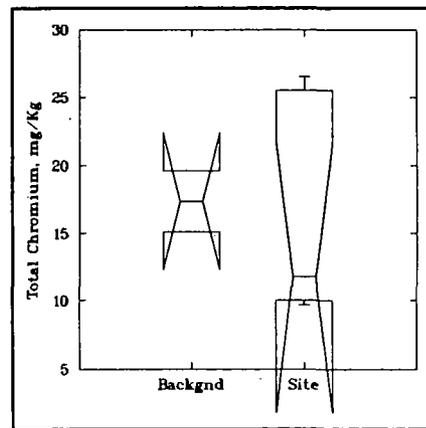
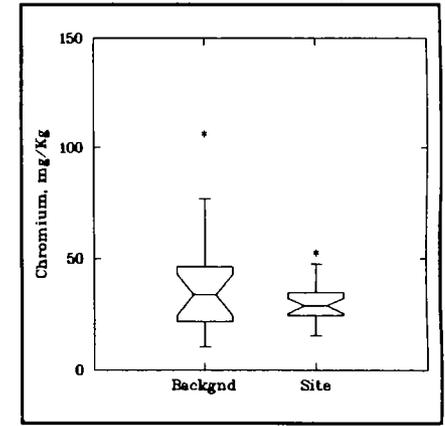
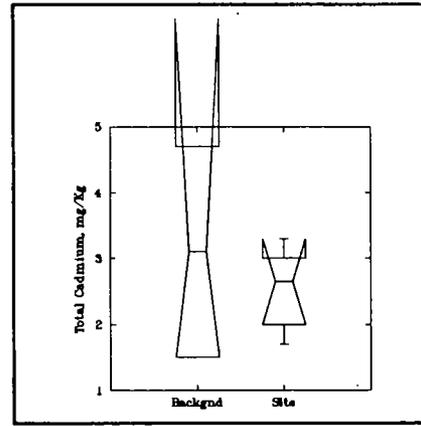
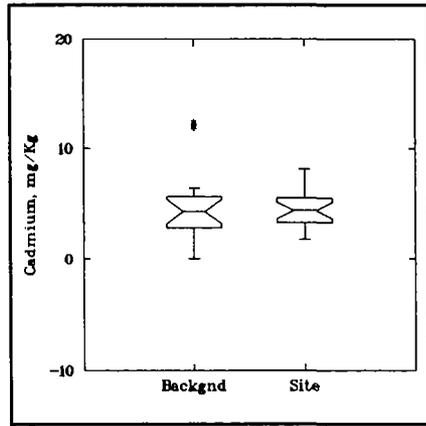
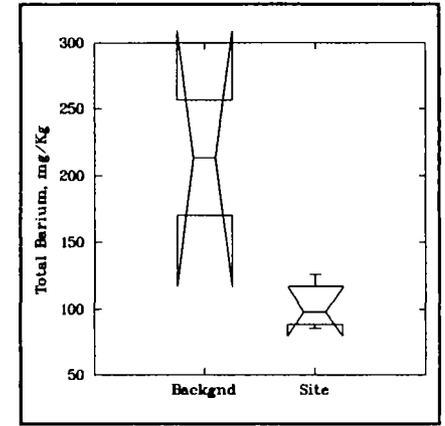
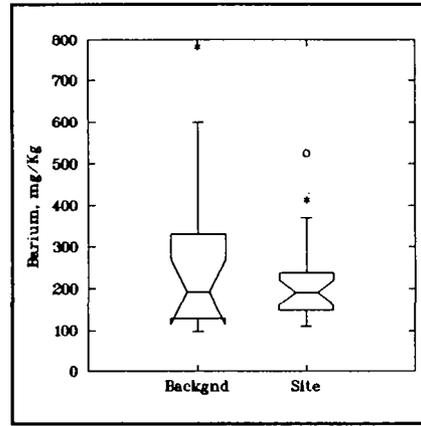
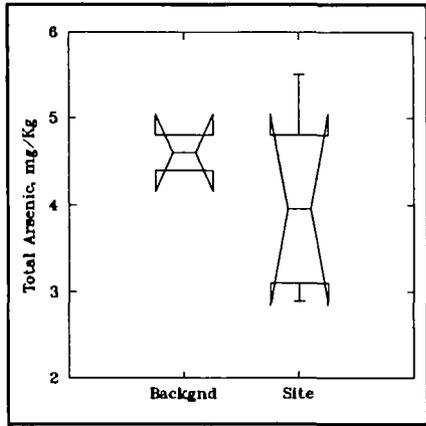
Generic Box Plot

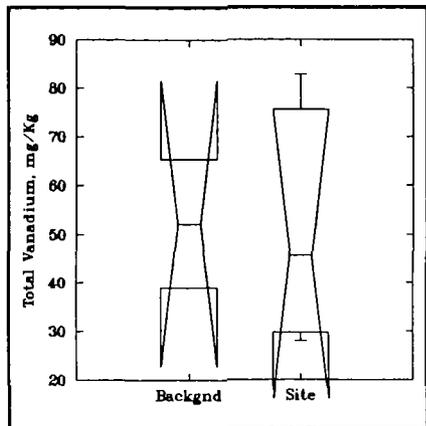
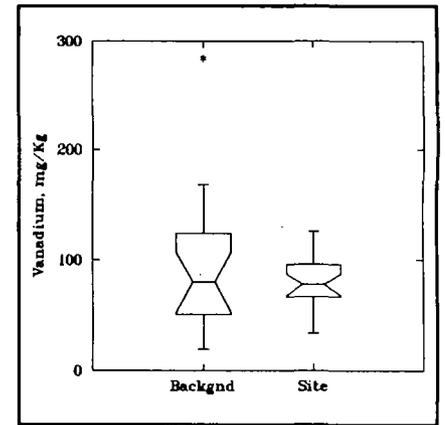
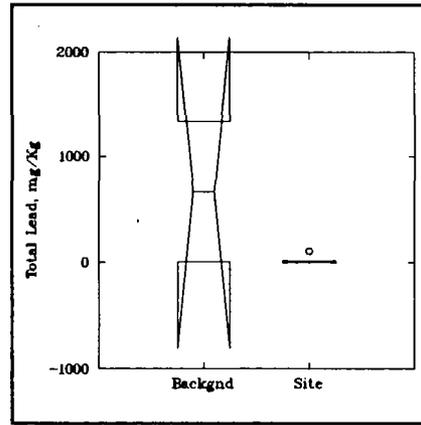
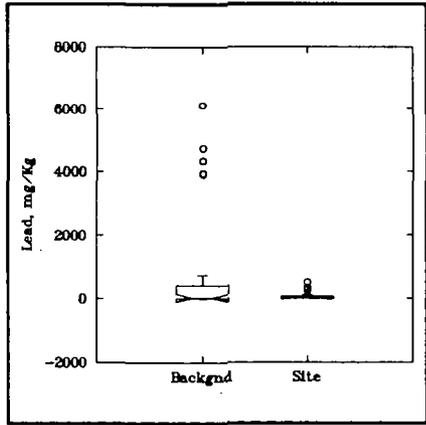
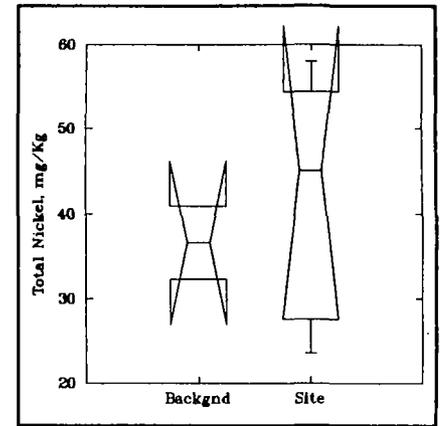
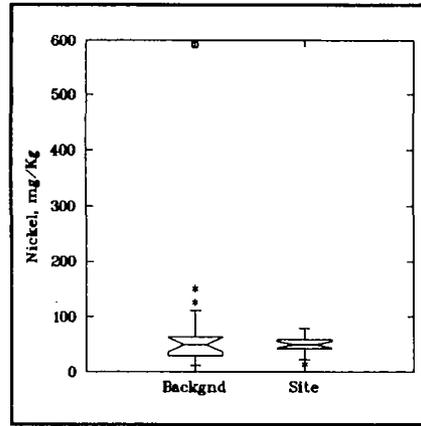
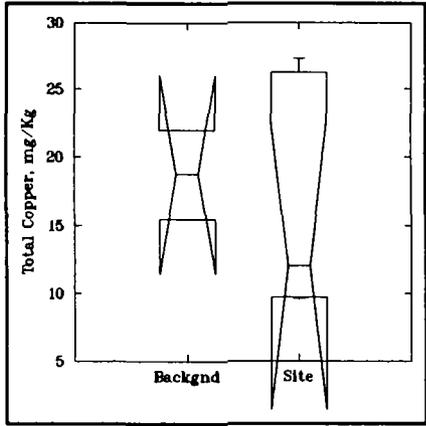


A BOX PLOT identifies the MEDIAN, (50th percentile), the lower and upper quartiles (25th and 75th percentiles), and the extreme spread of the data. The edges of the box demarcate the 25th and 75th percentiles, and so represent the middle 50 percent range (INTERQUARTILE RANGE) of the parameter values for the data subset. The line inside the box is the MEDIAN. The lines, or whiskers, extend outward from the box through the RANGE OF THE DATA, excluding outliers. Two outliers are defined, based on their distance from the nearest edge of the box, relative to the range of the box. OUTSIDE VALUES lie 1 1/2 to 3 interquartile ranges away from the nearest box edge, and FAR-OUT VALUES lie three or more interquartile ranges away from the nearest box edge. The NOTCH represents the approximate 95 percent confidence interval around the median.

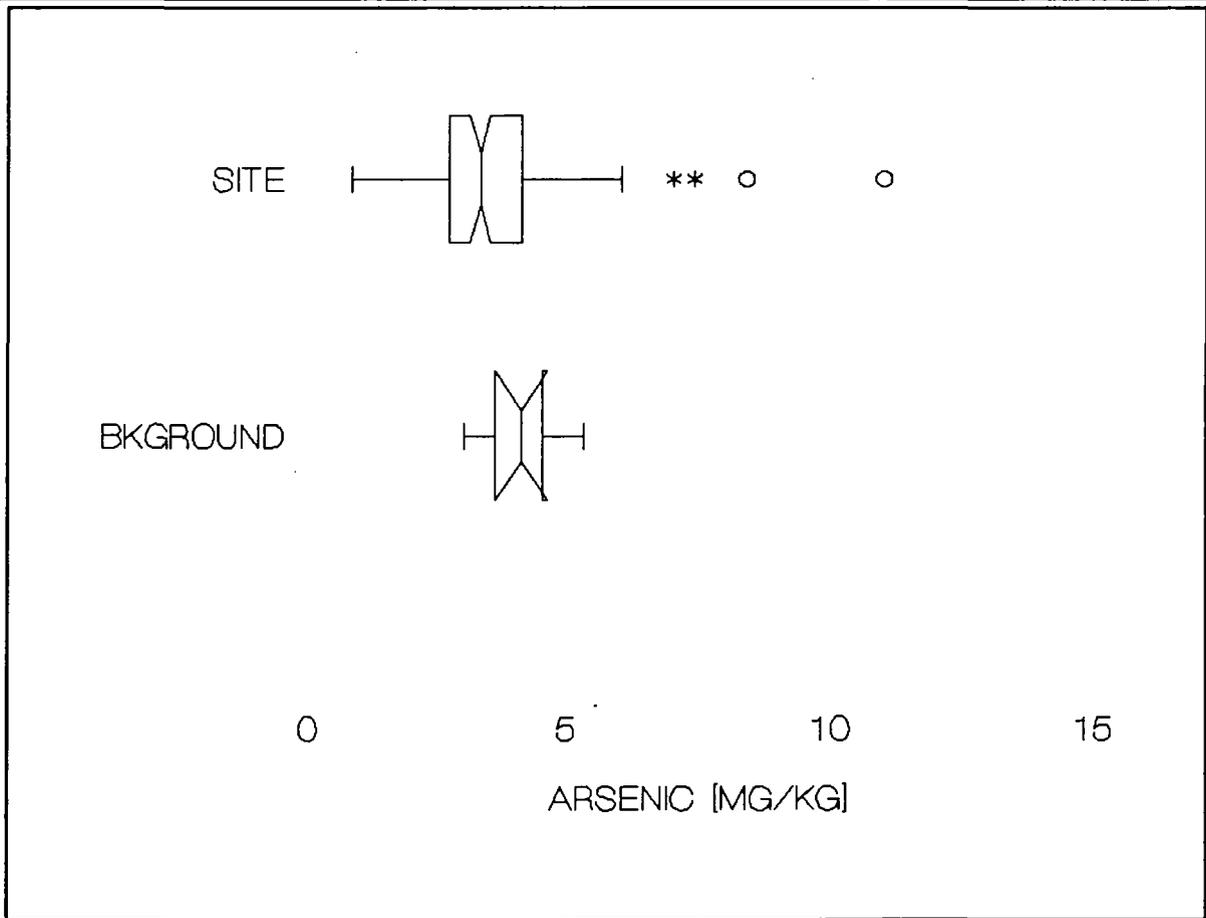
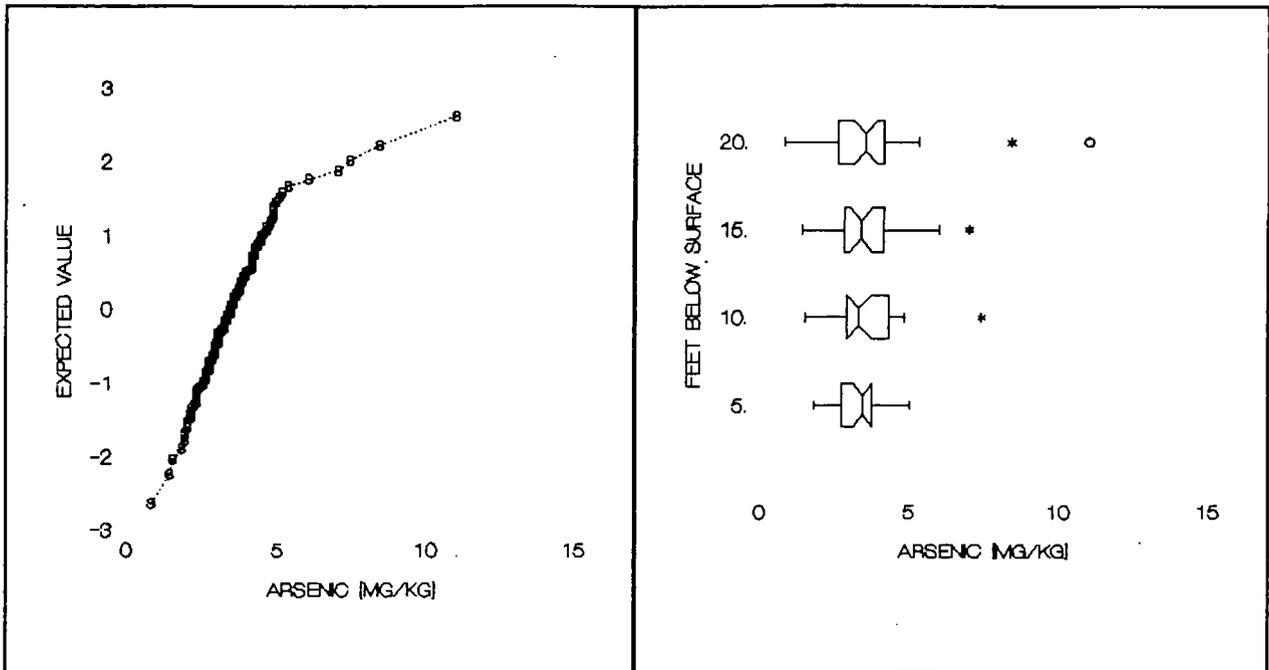
In comparing box plots from two data subsets, overlapping notches indicate that the subsets are samples from the same population. If subset notches do not overlap, there is 95 percent confidence that the subsets are samples from different populations. The box plot provides an easily interpreted graphical display of similar/dissimilar populations. More explicit probability statements require hypothesis testing.

**Subsurface Soil Metals:
Onsite versus Background**

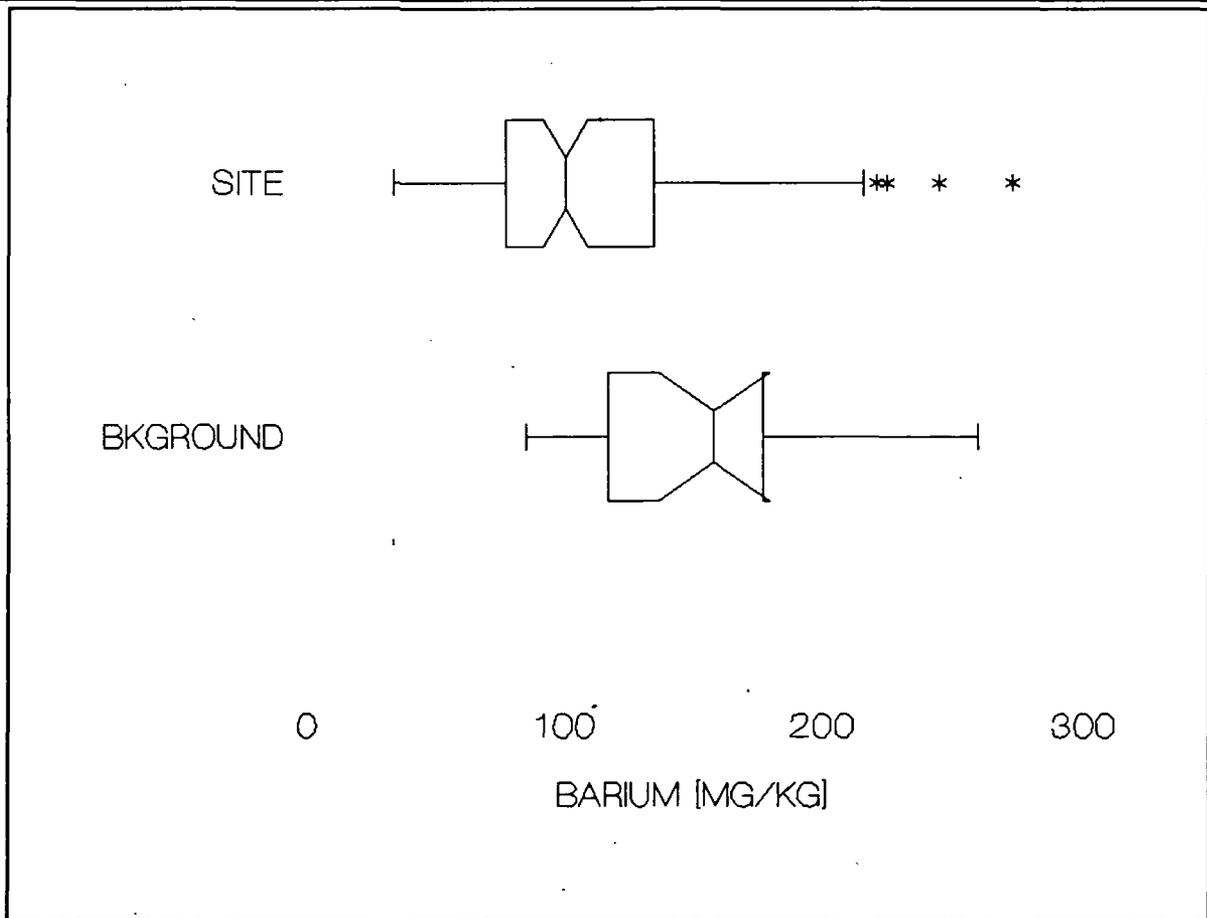
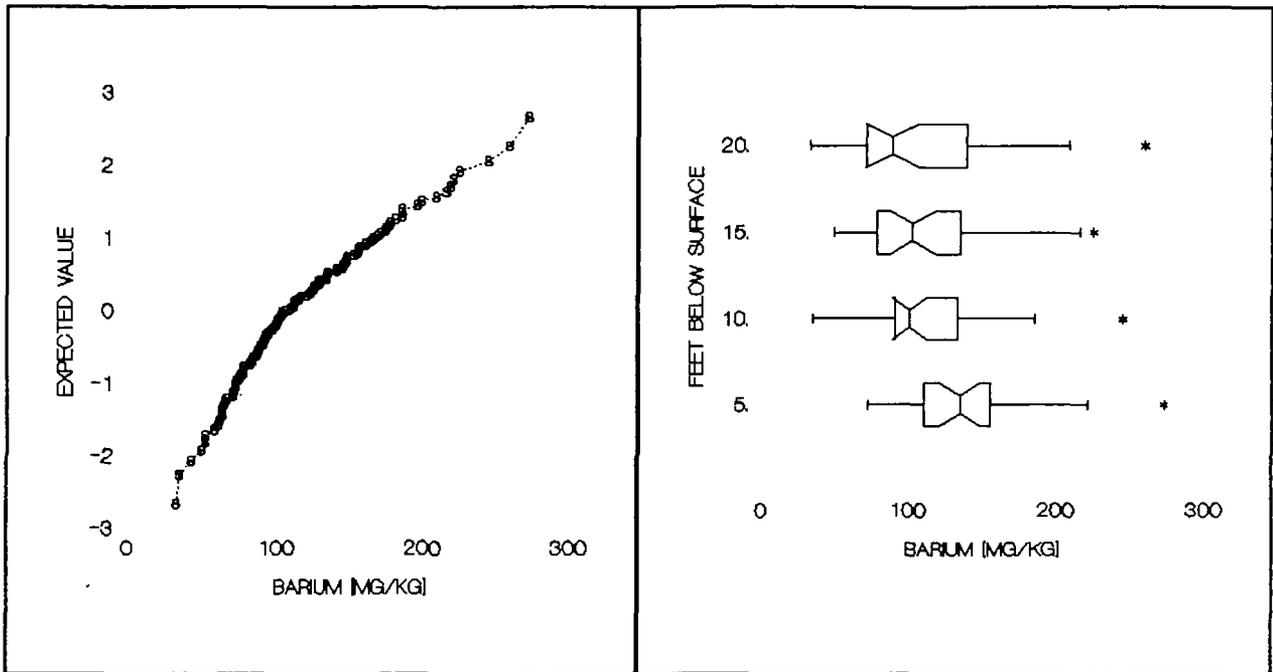




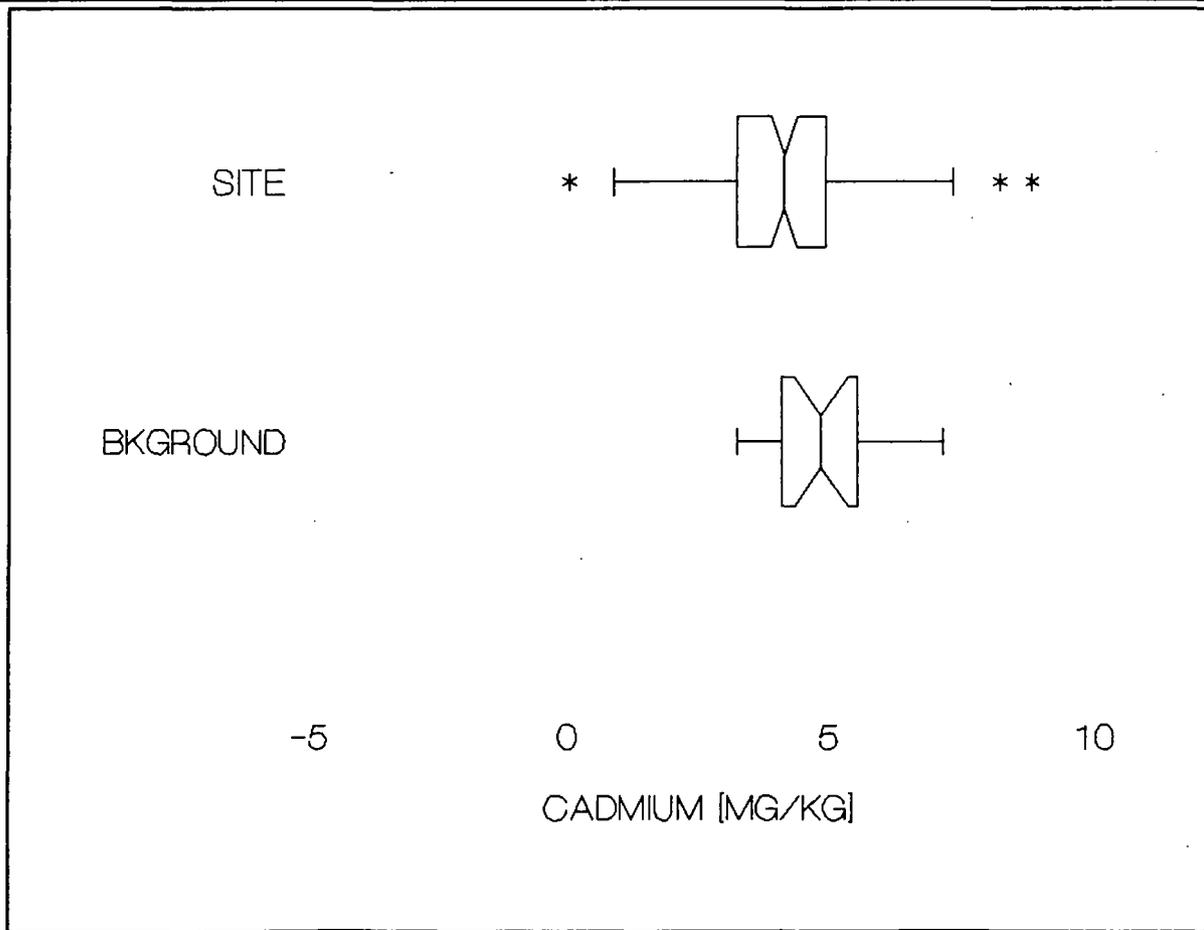
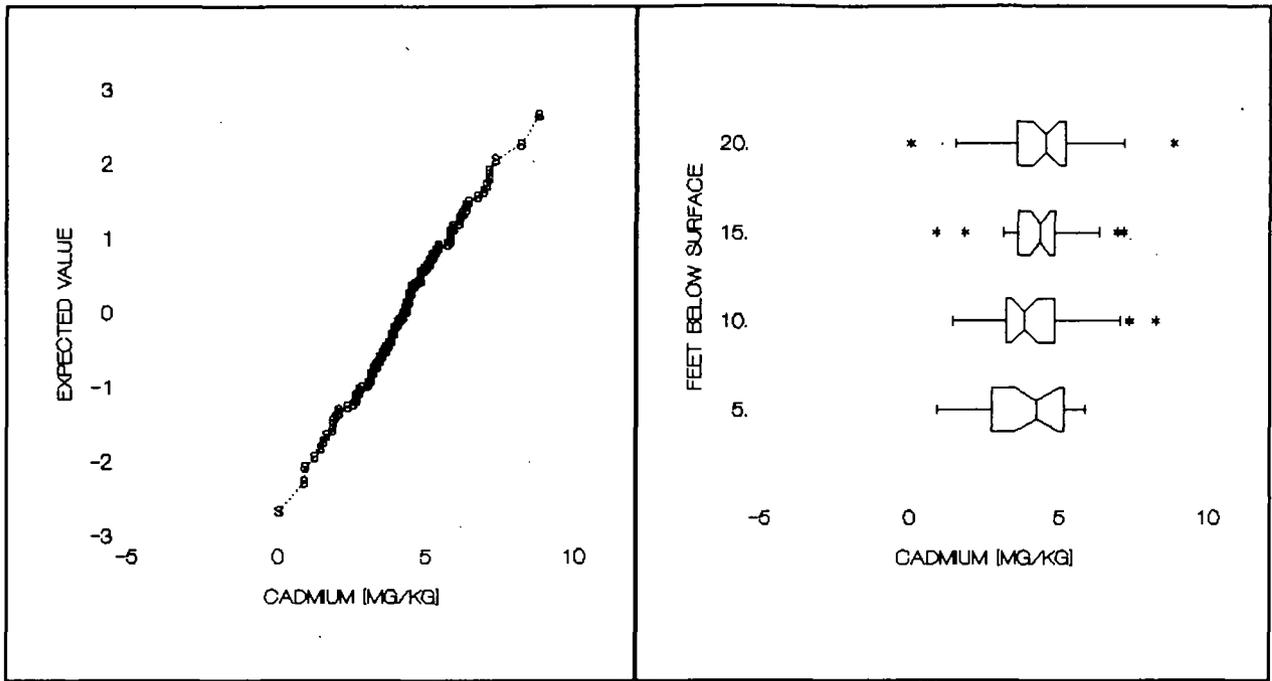
**Surface Soil Metals:
Onsite versus Background**



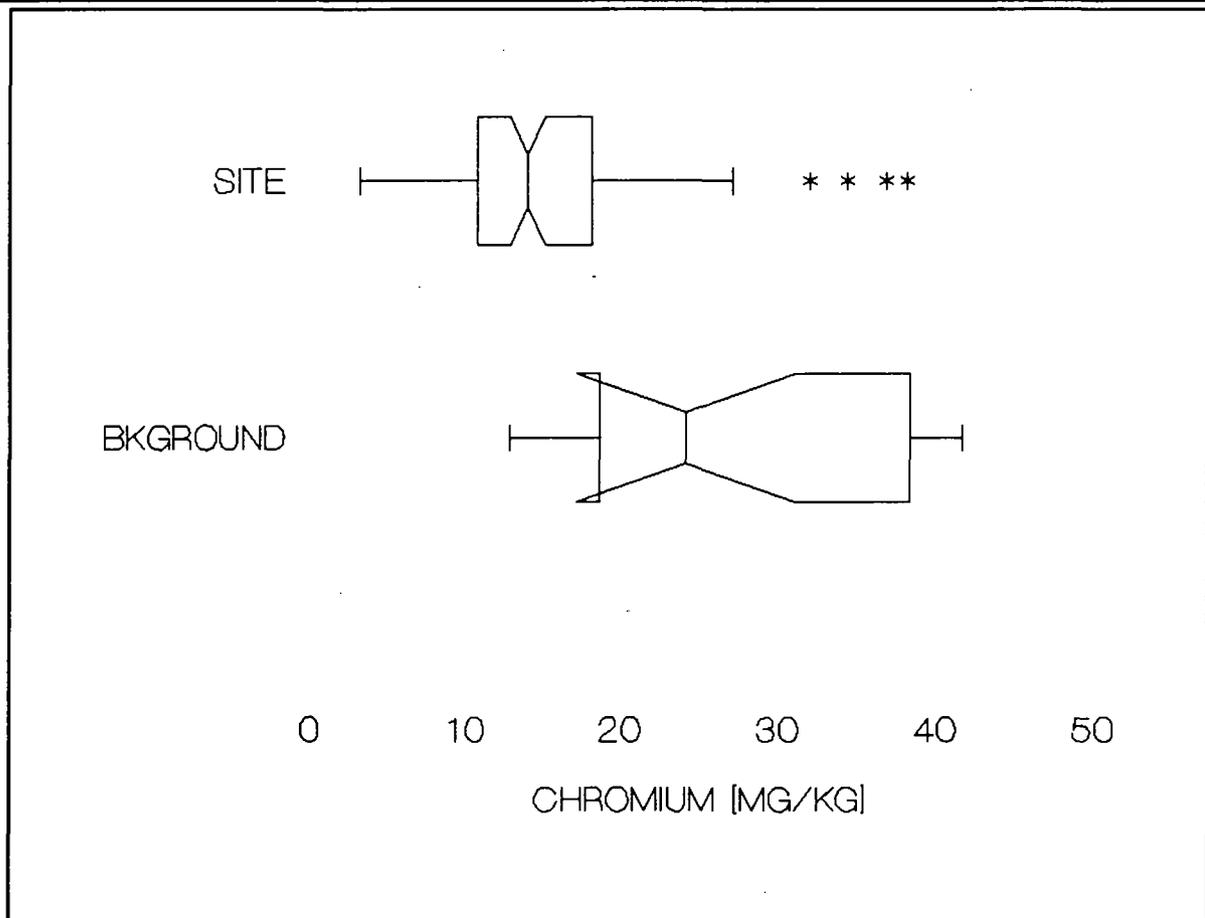
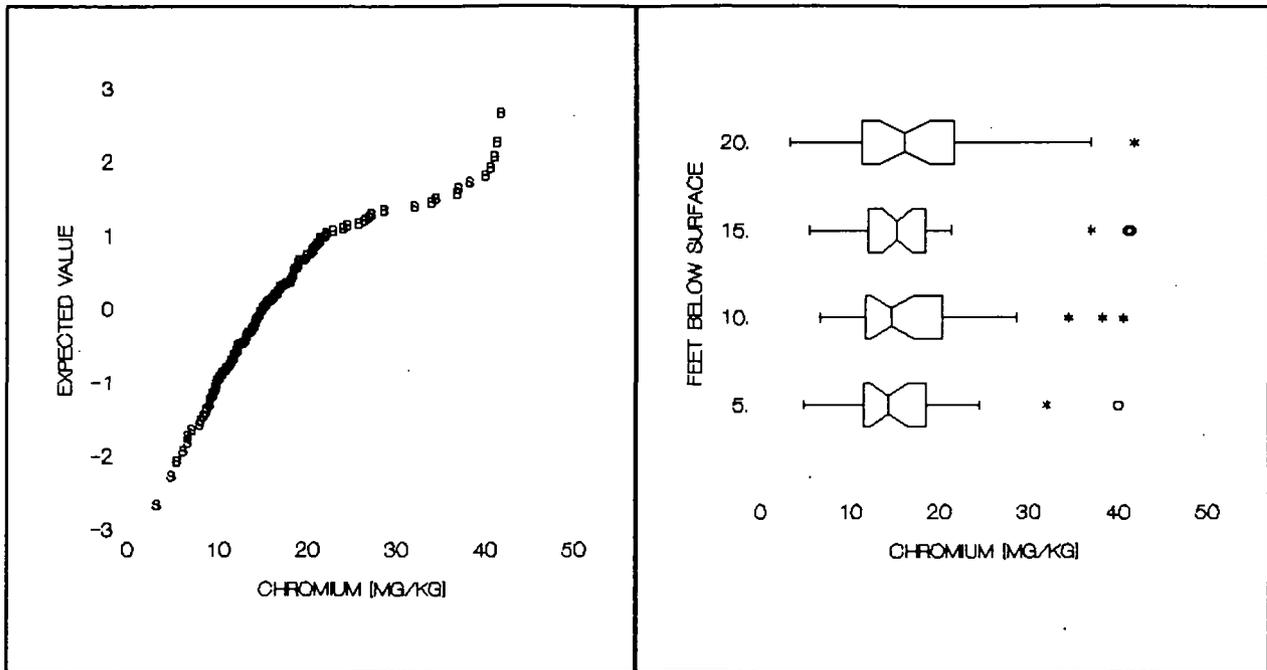
TEXACO SUBSURFACE ARSENIC SAMPLES



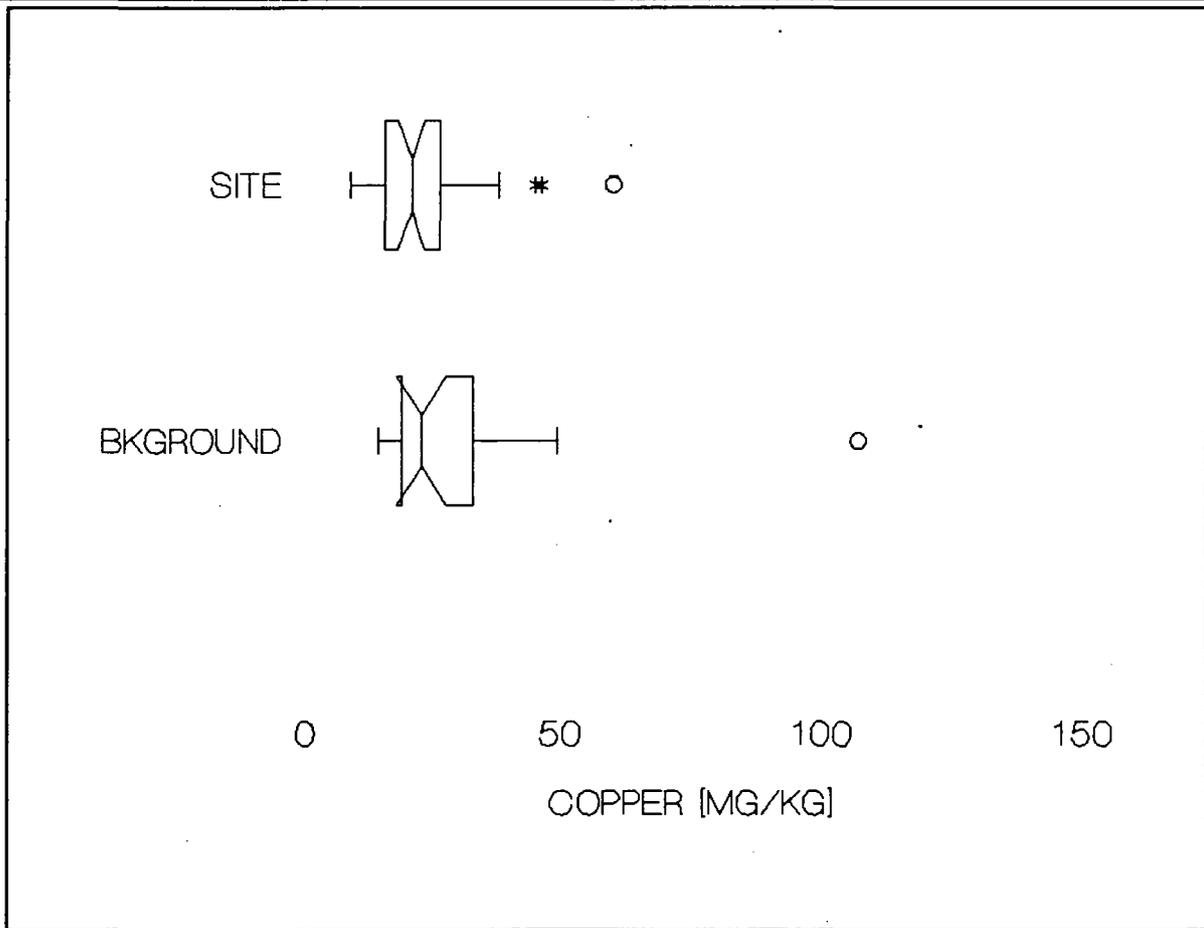
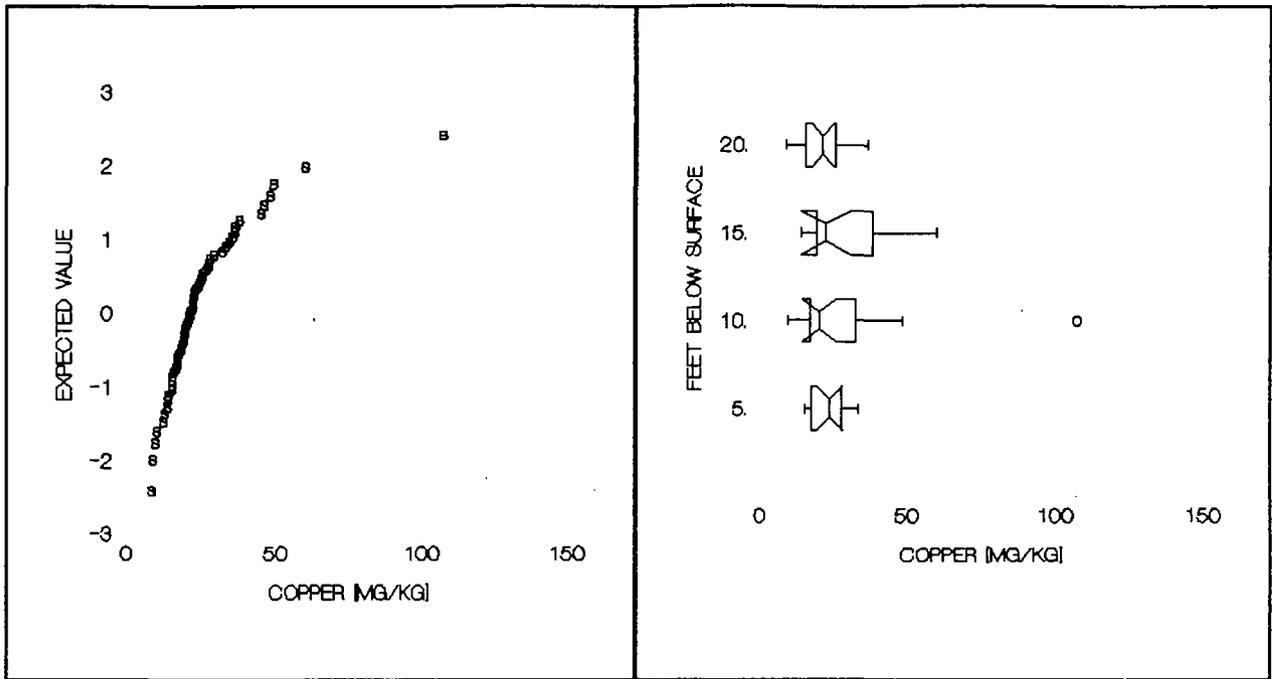
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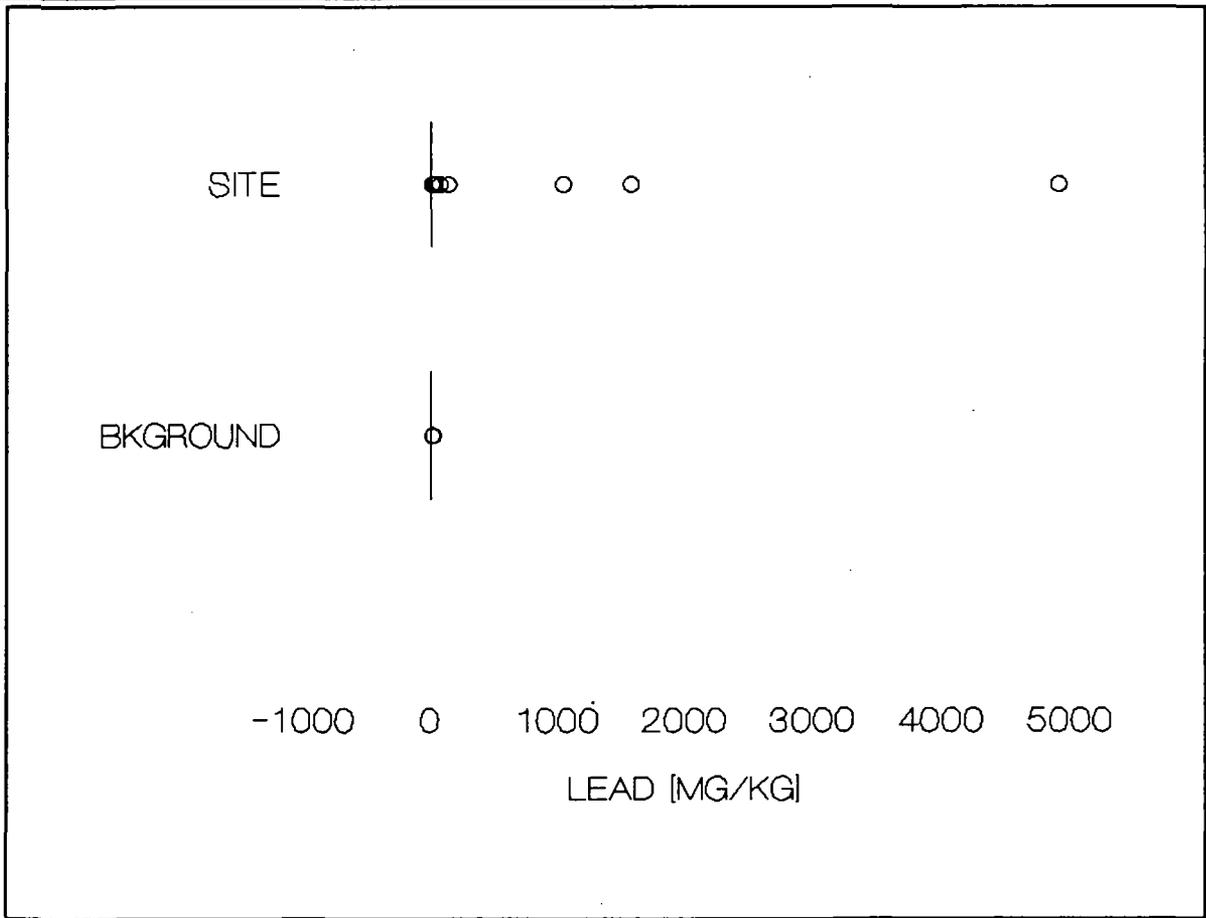
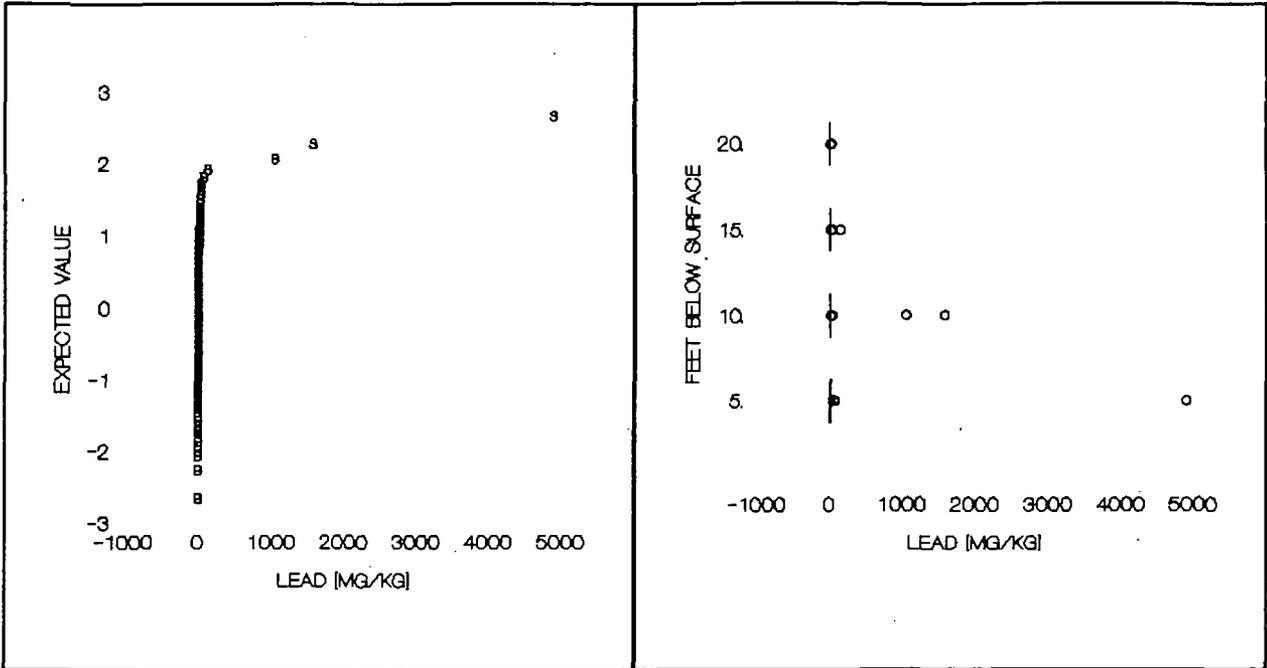
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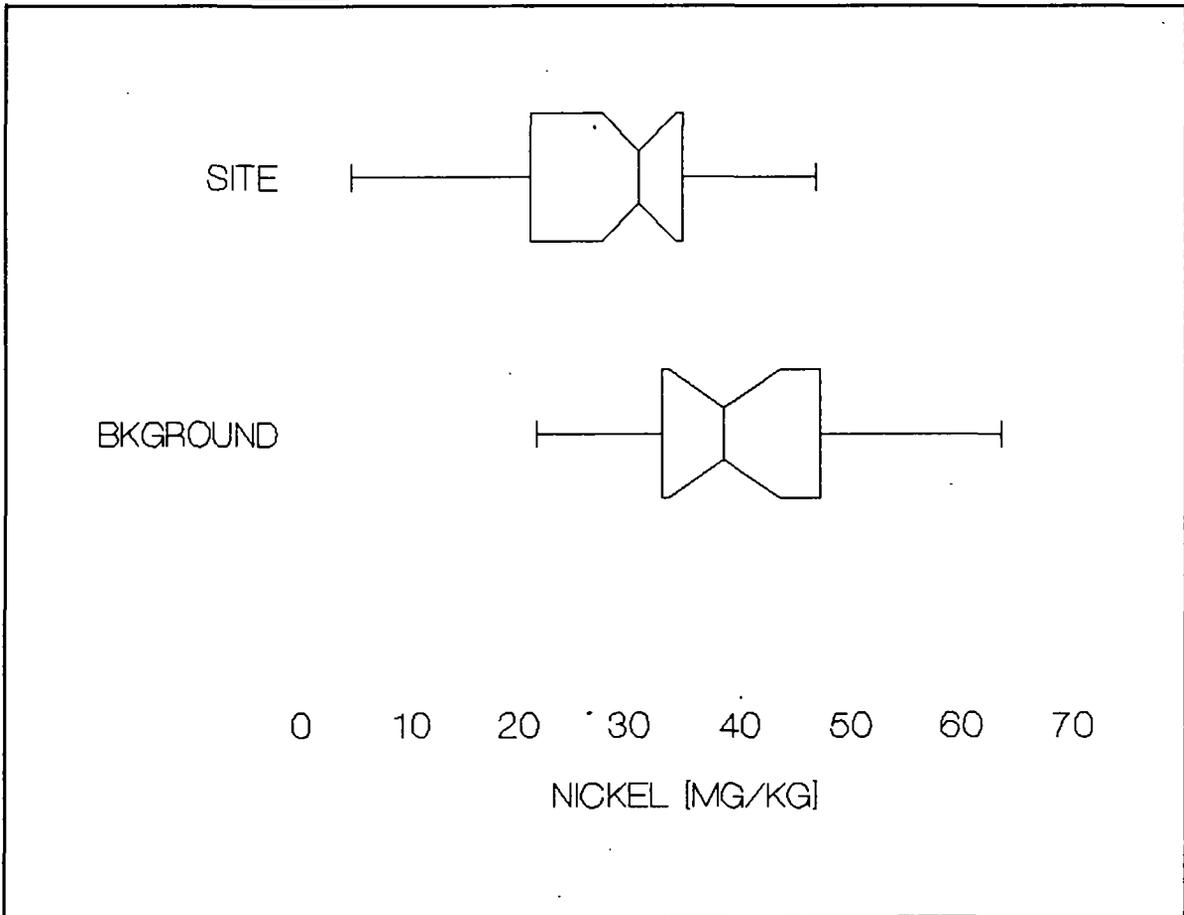
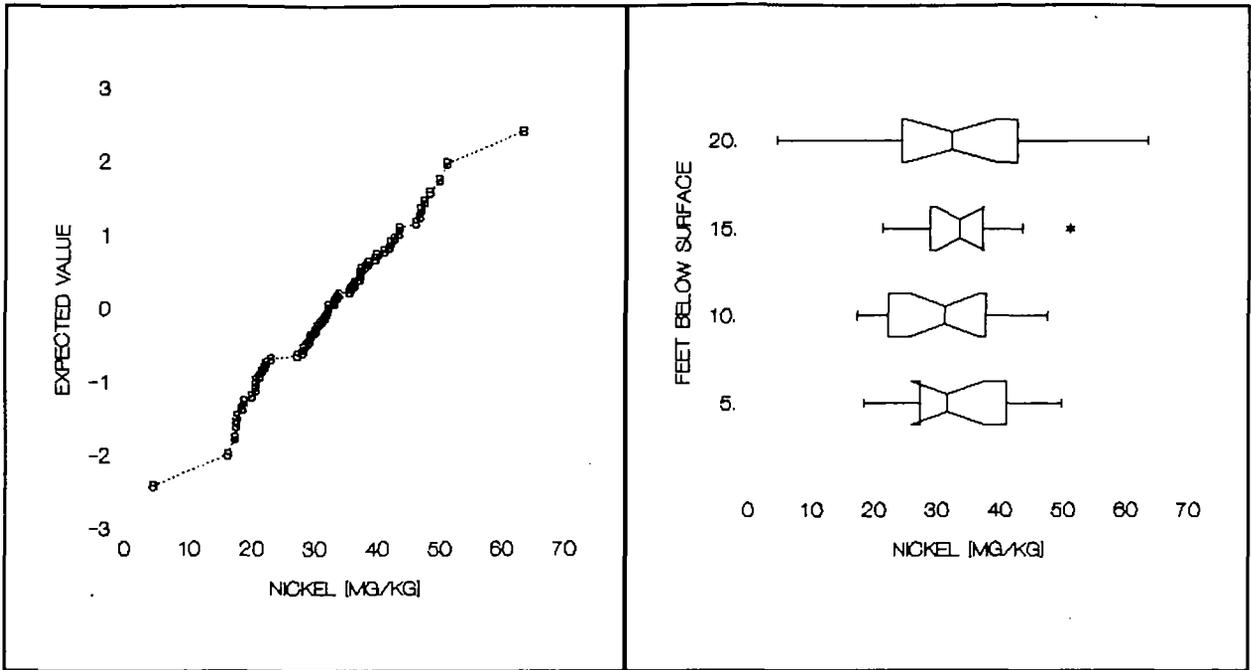
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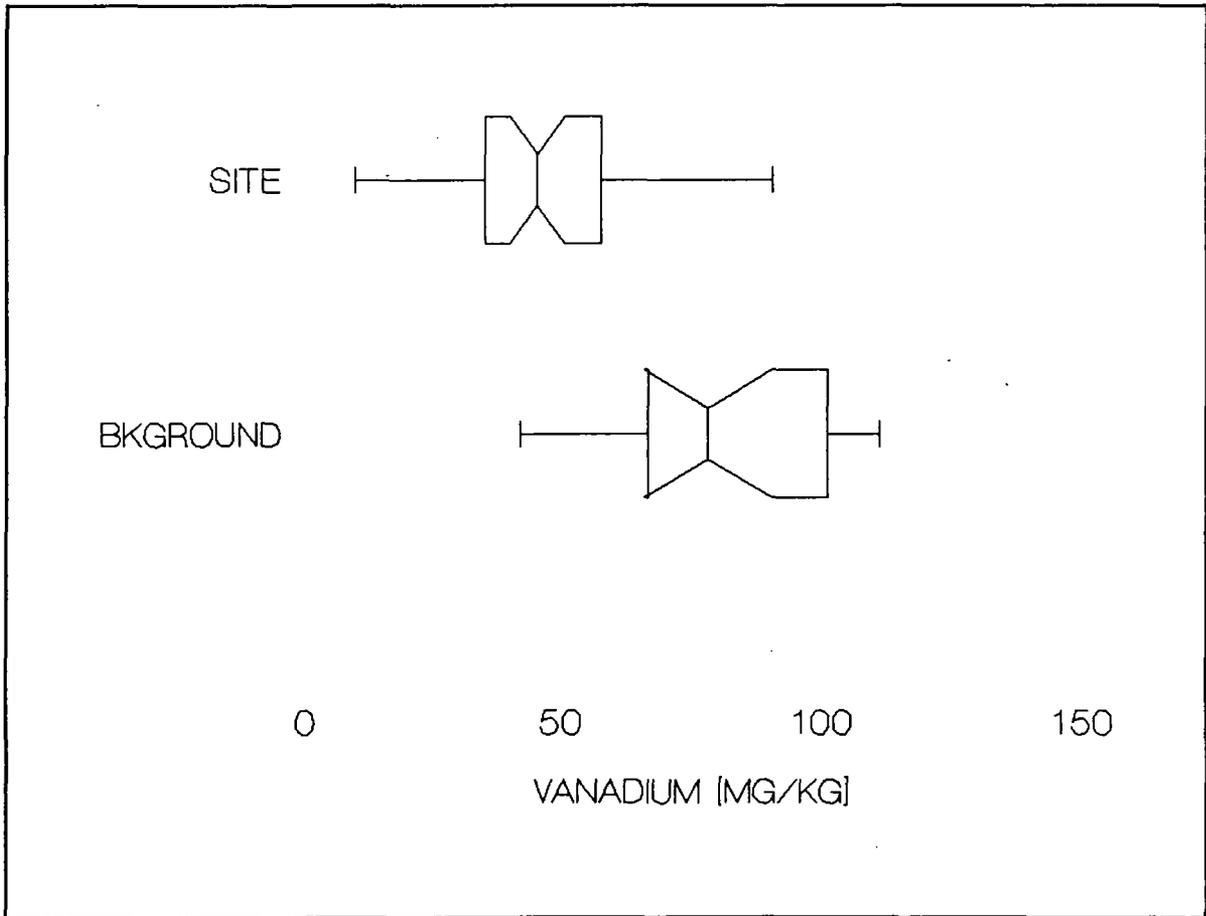
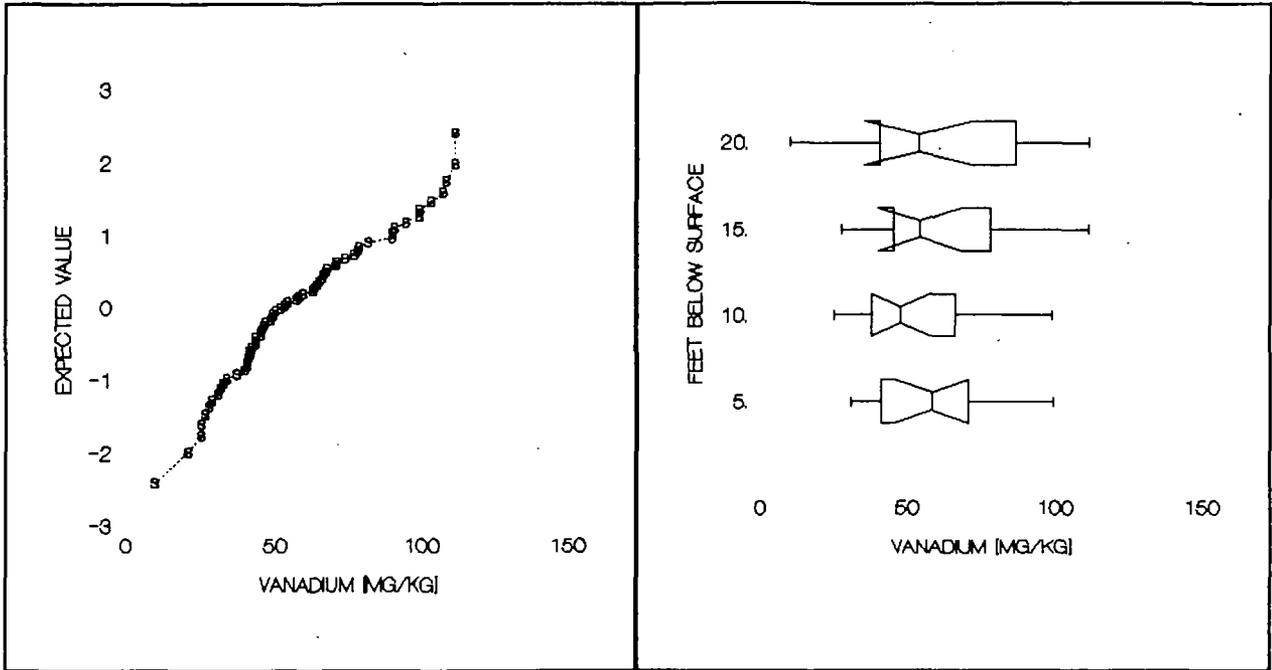
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TEXACO SUBSURFACE LEAD SAMPLES

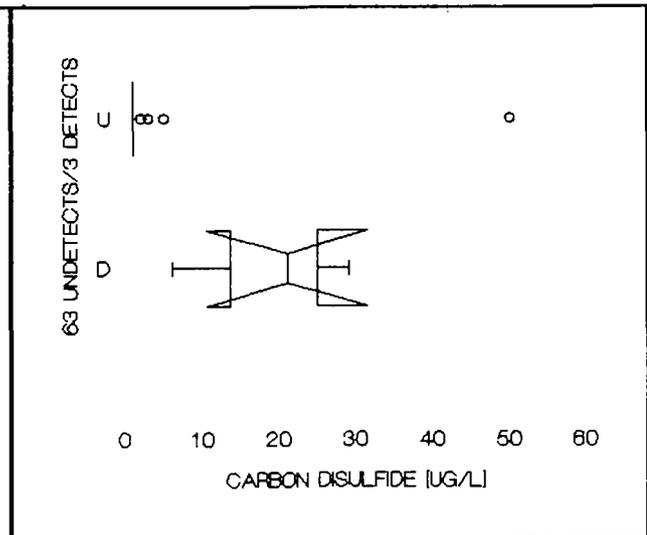
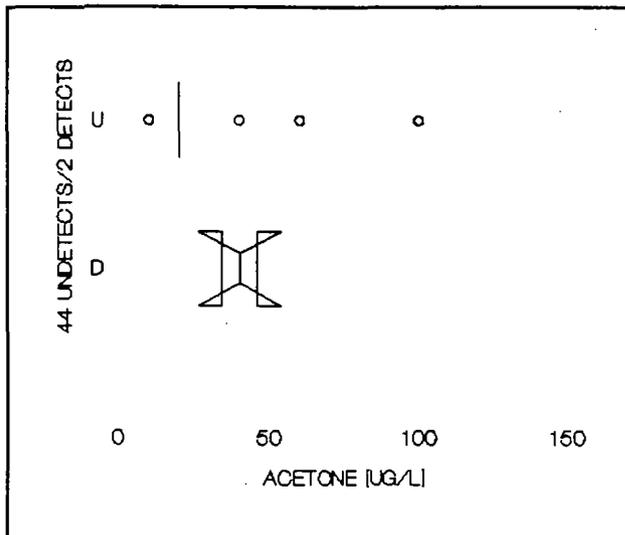
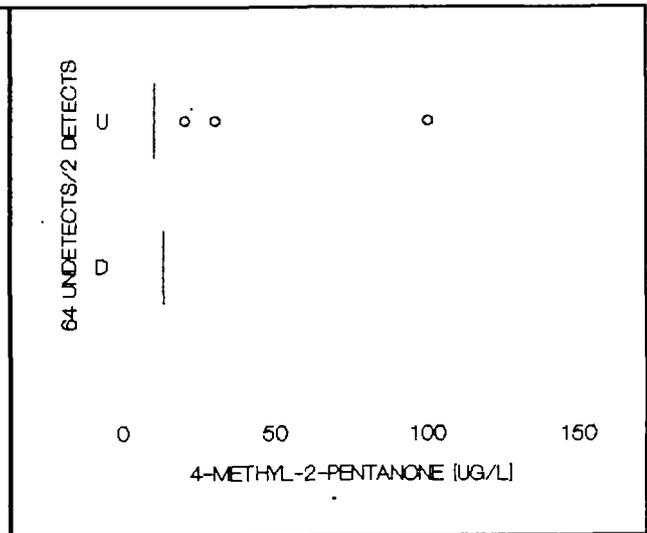
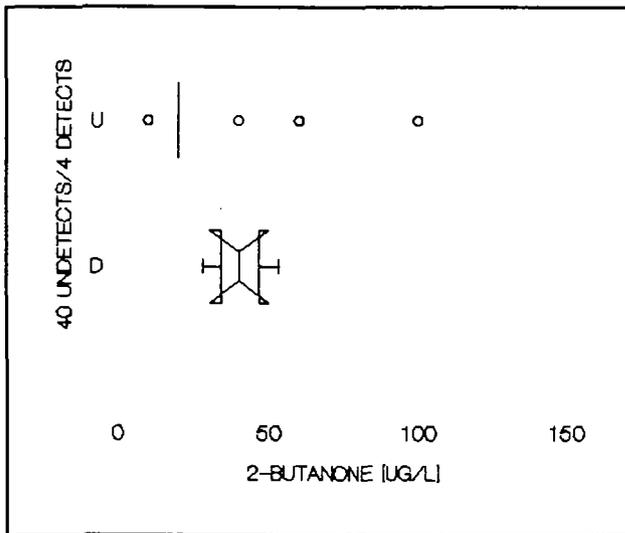
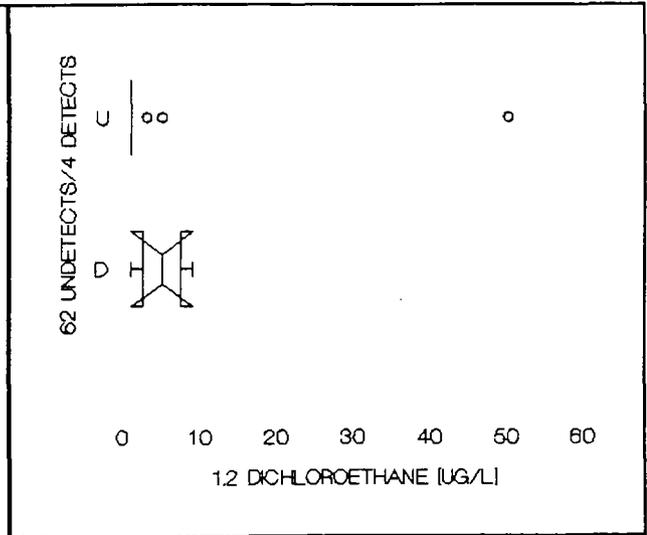
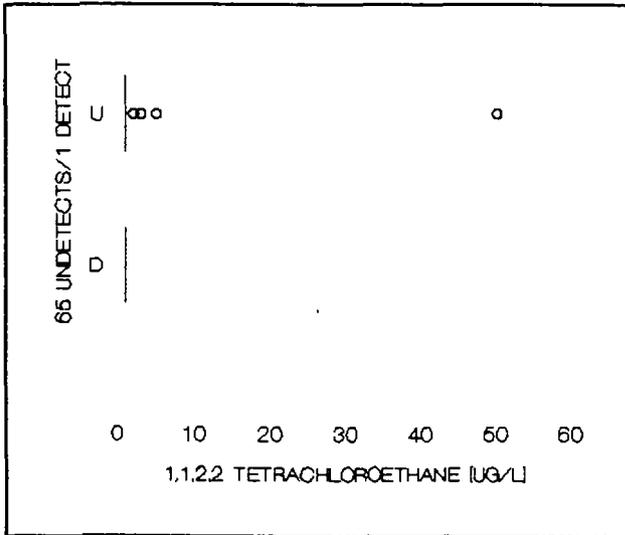


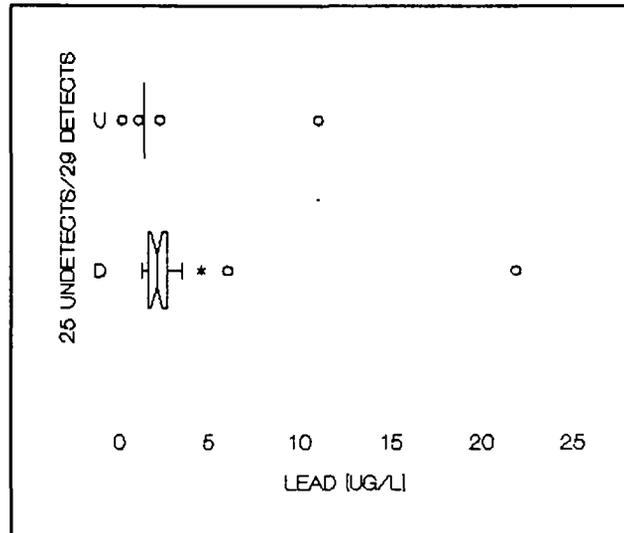
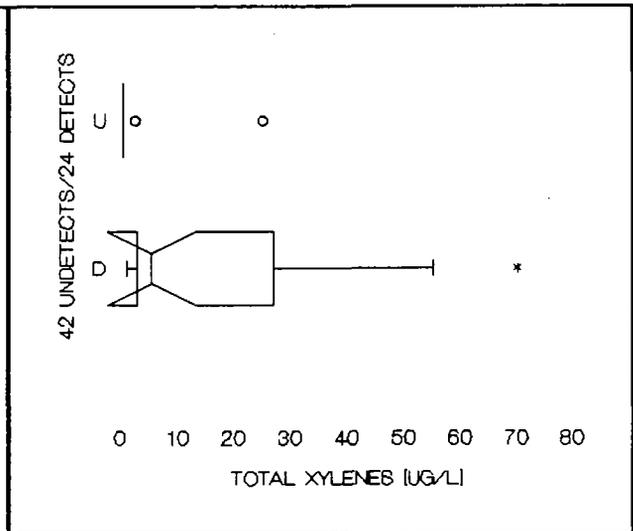
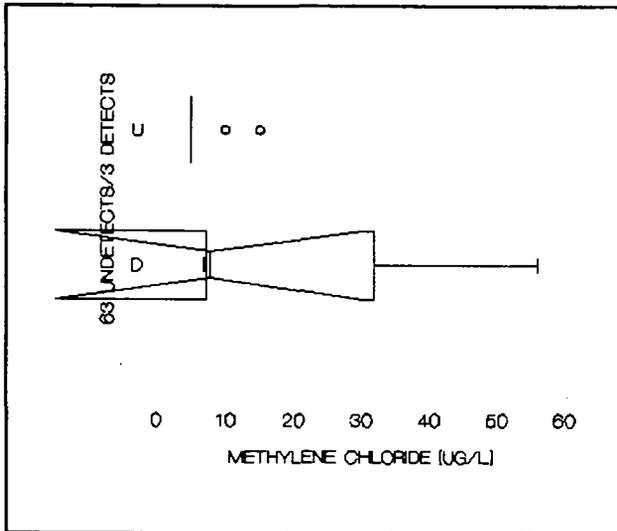
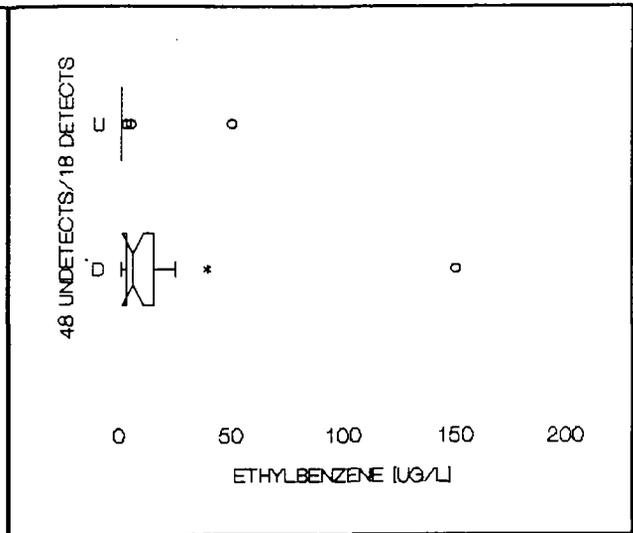
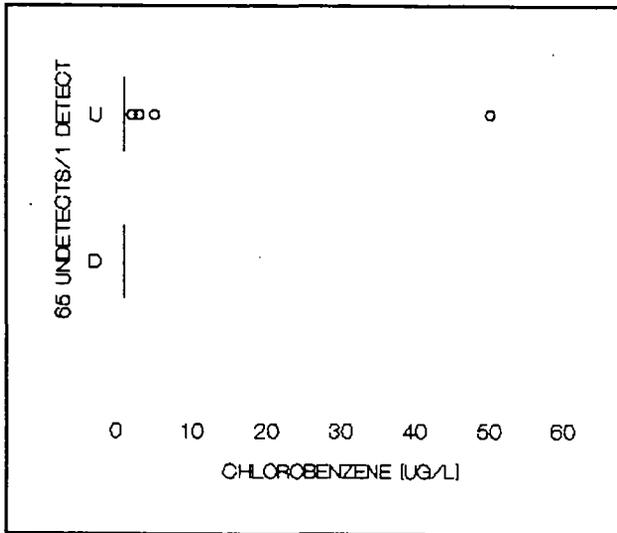
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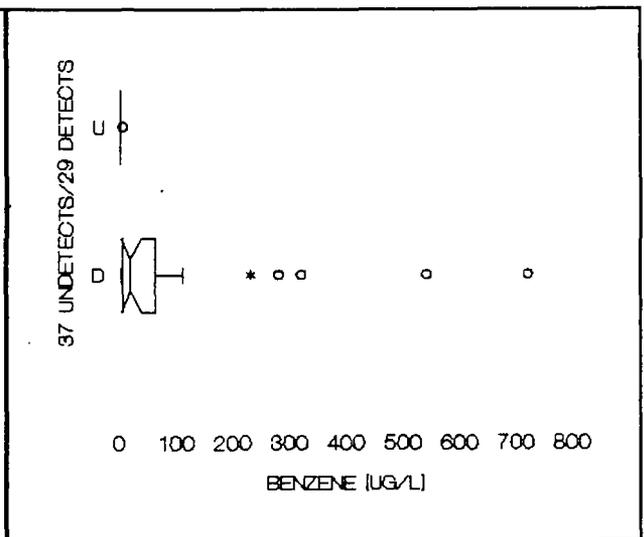
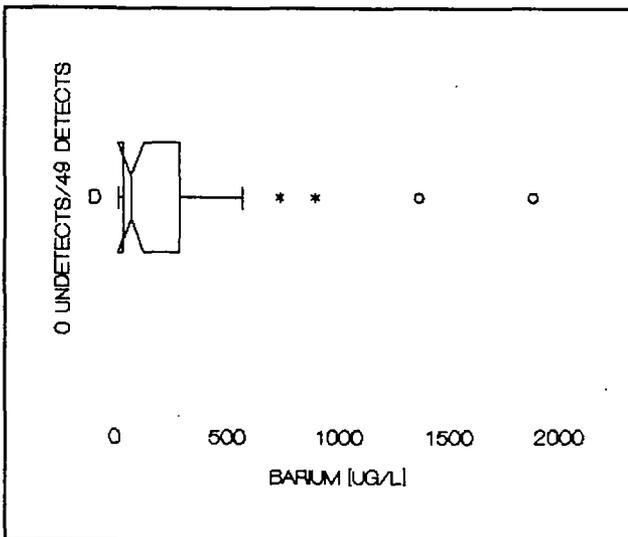
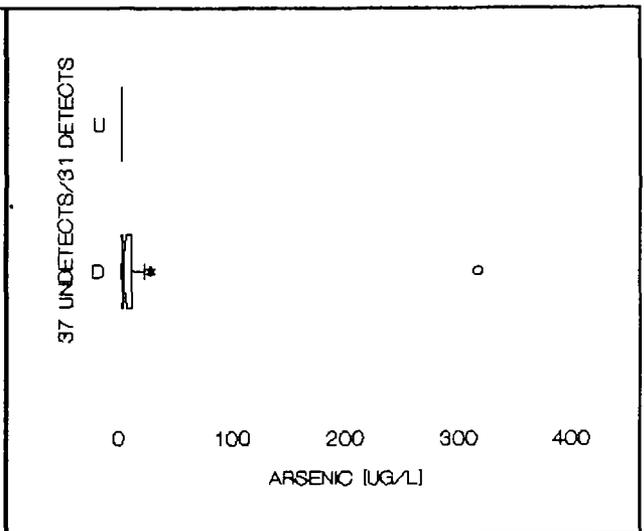
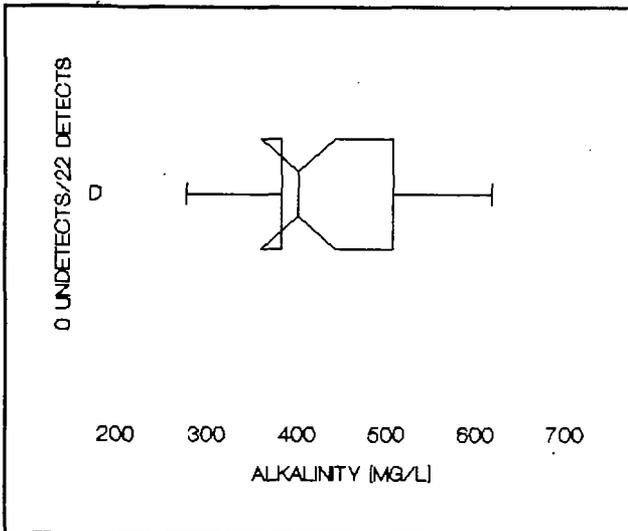
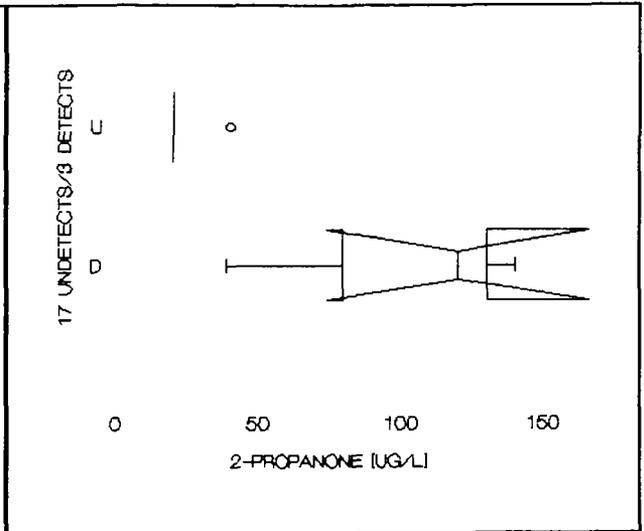
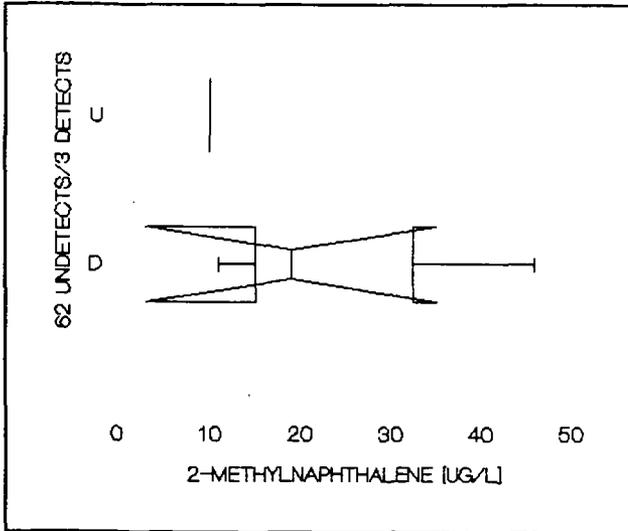


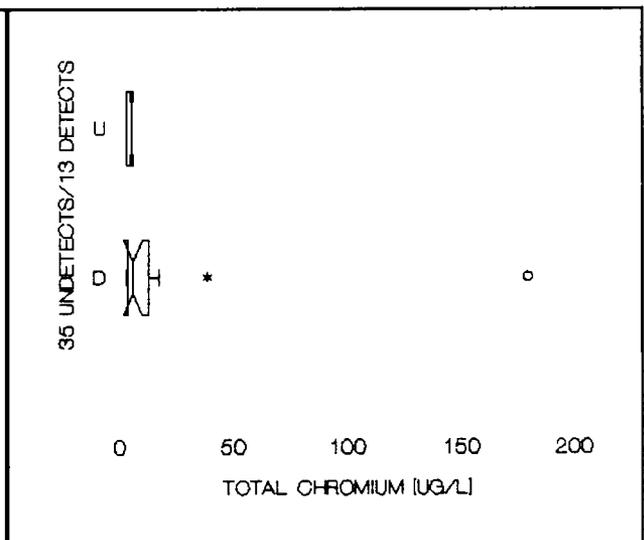
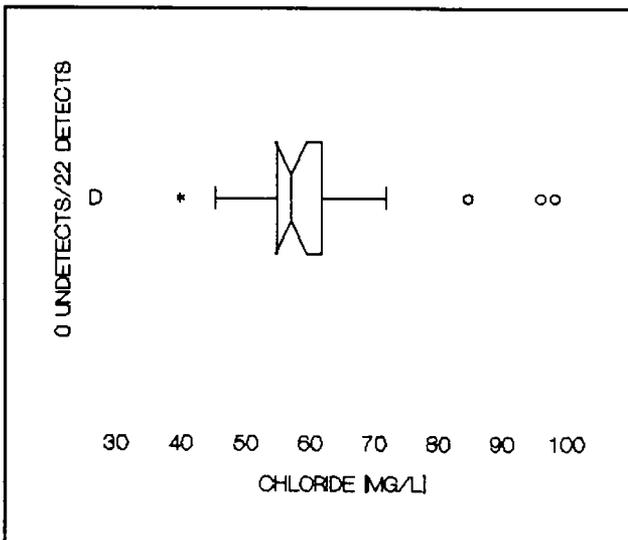
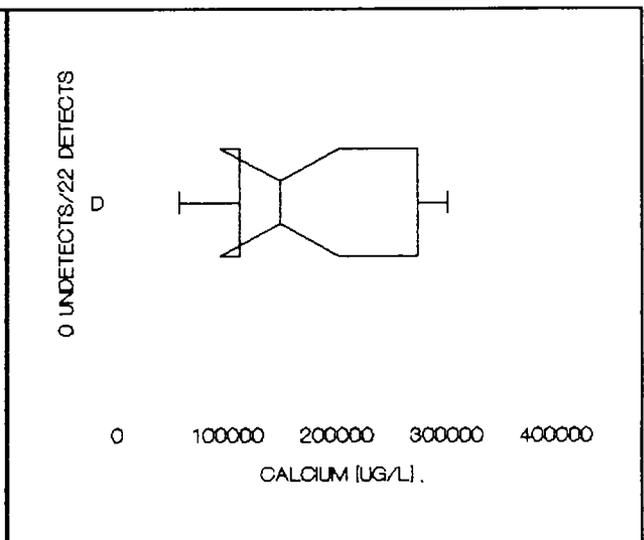
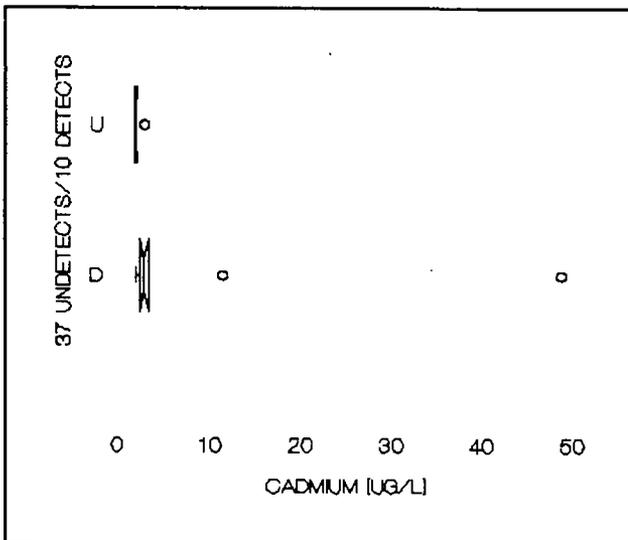
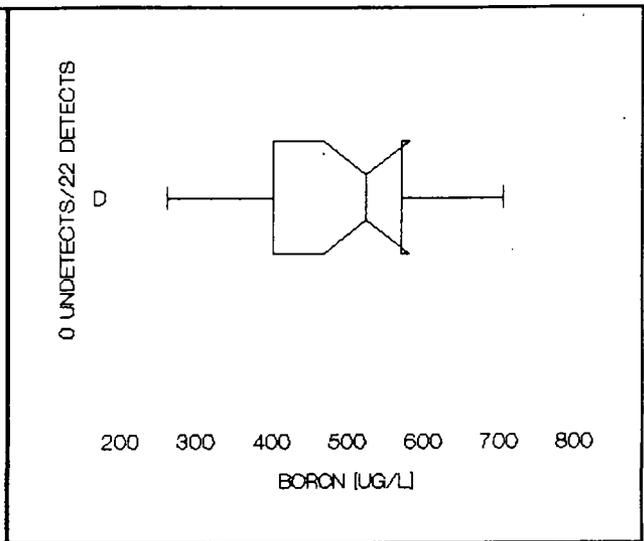
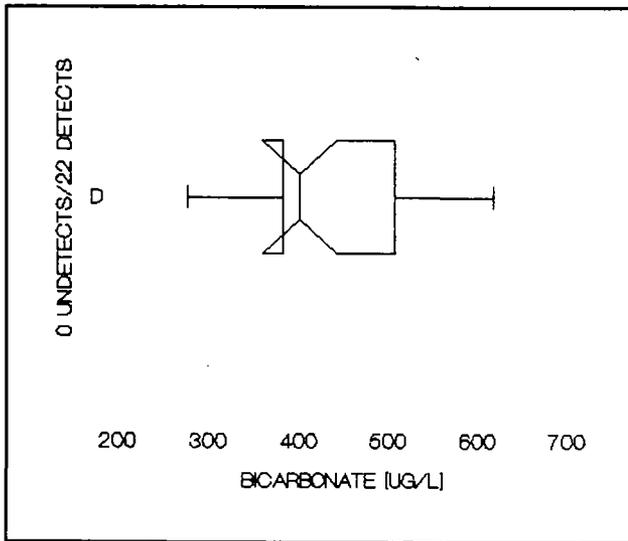
TEXACO SUBSURFACE VANADIUM SAMPLES

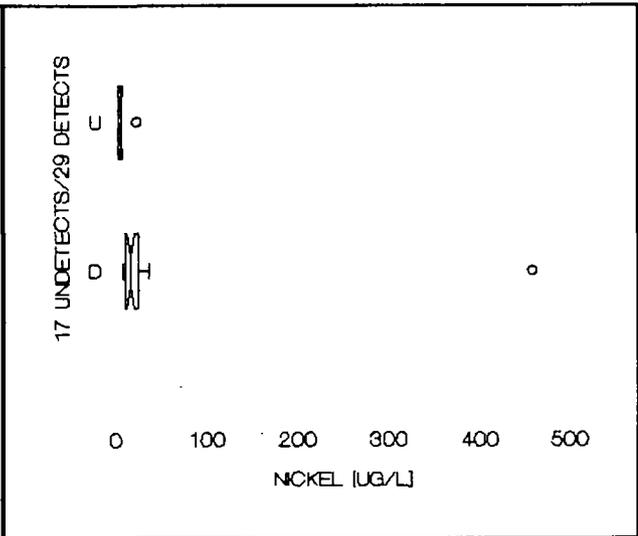
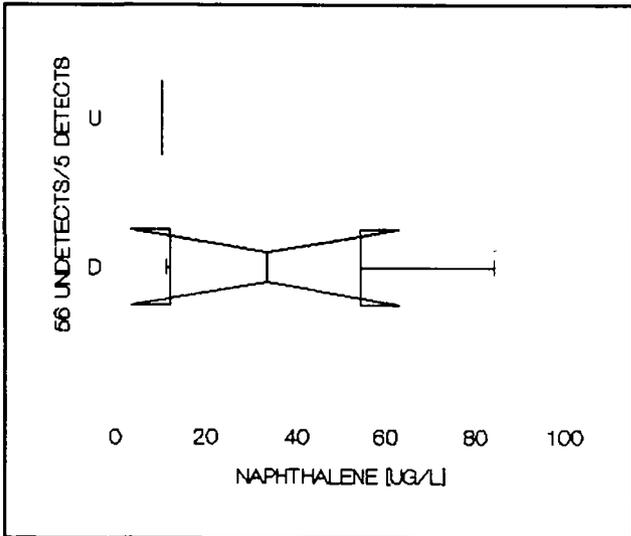
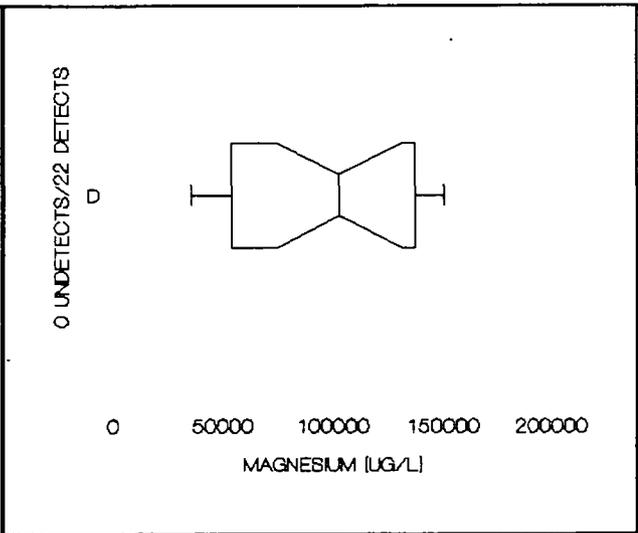
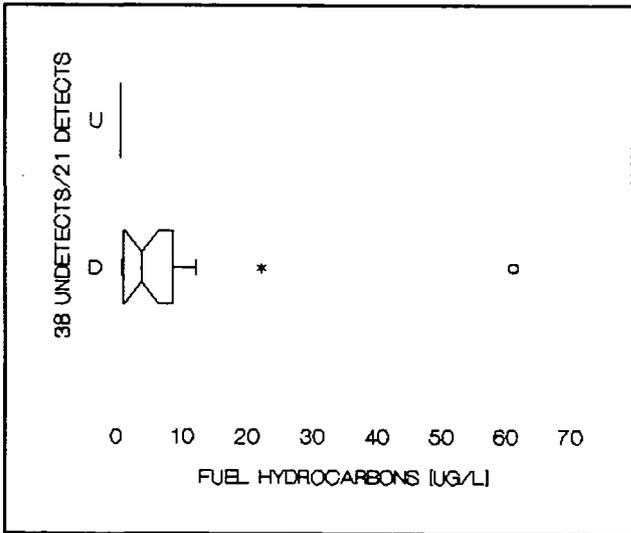
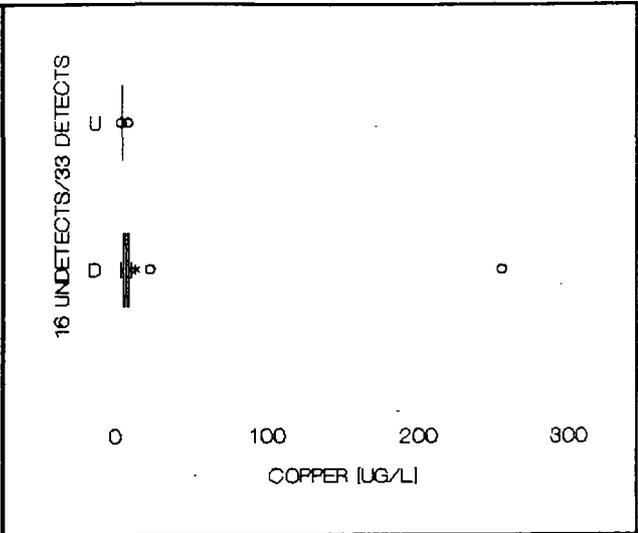
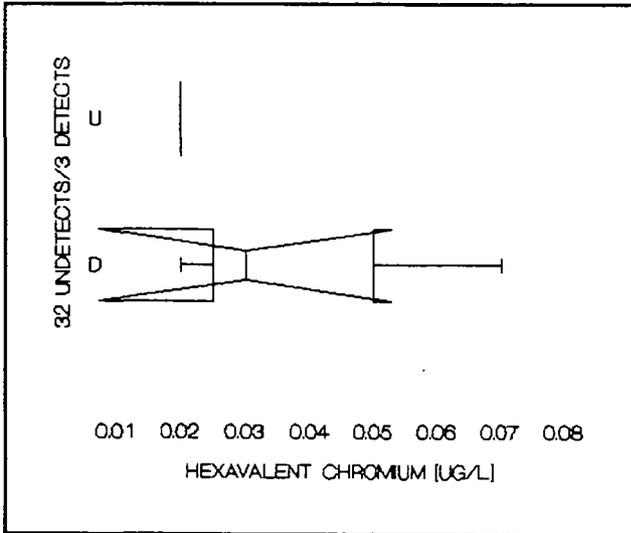
**Groundwater:
Detects versus Nondetects**

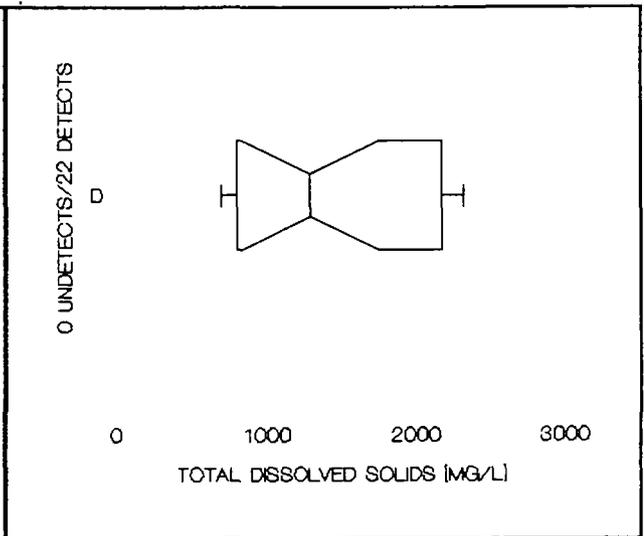
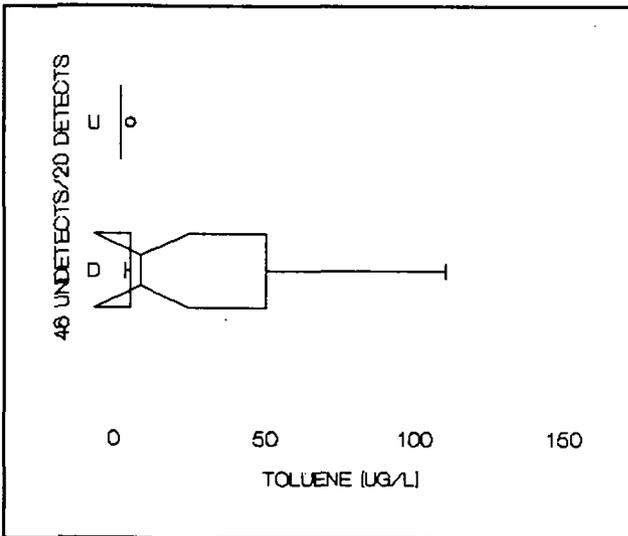
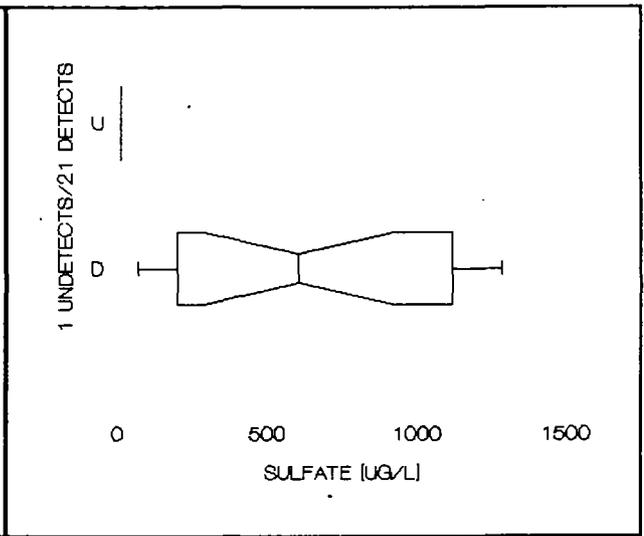
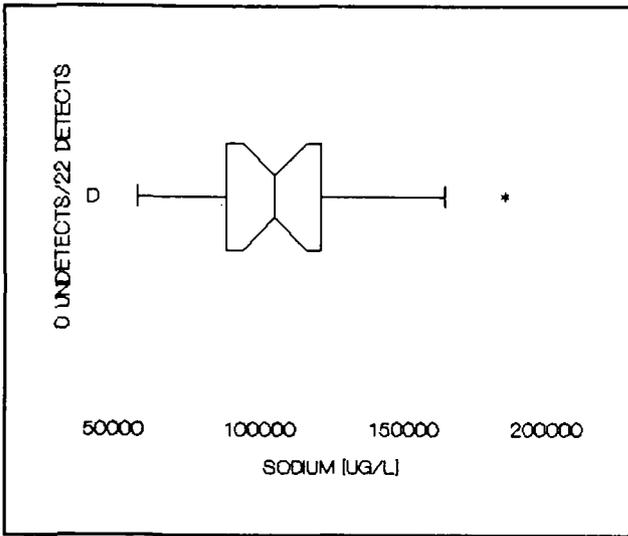
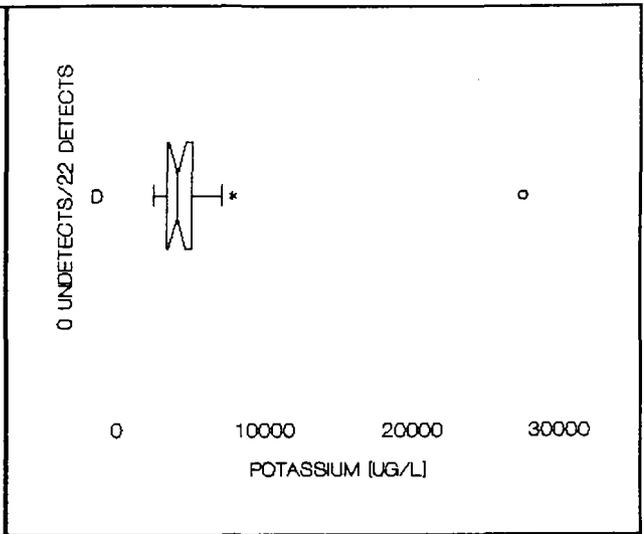
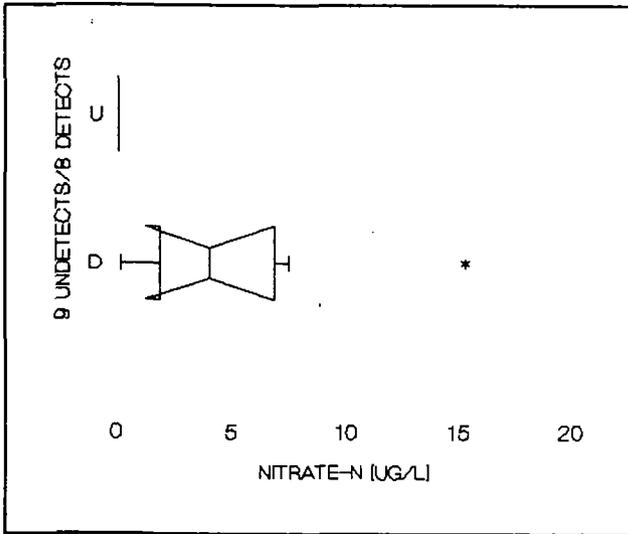


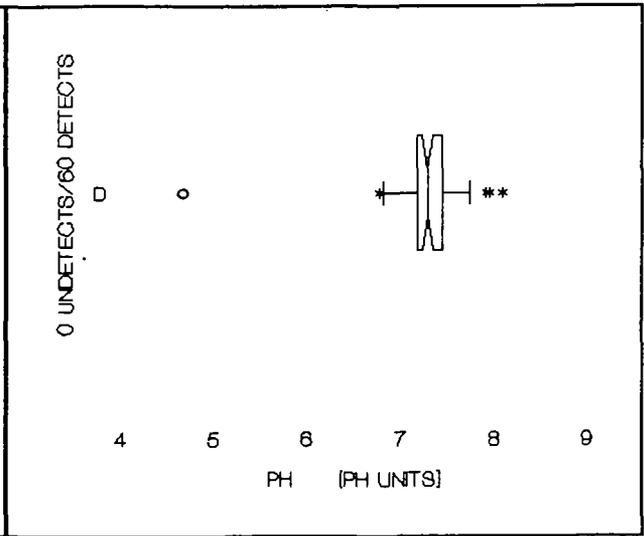
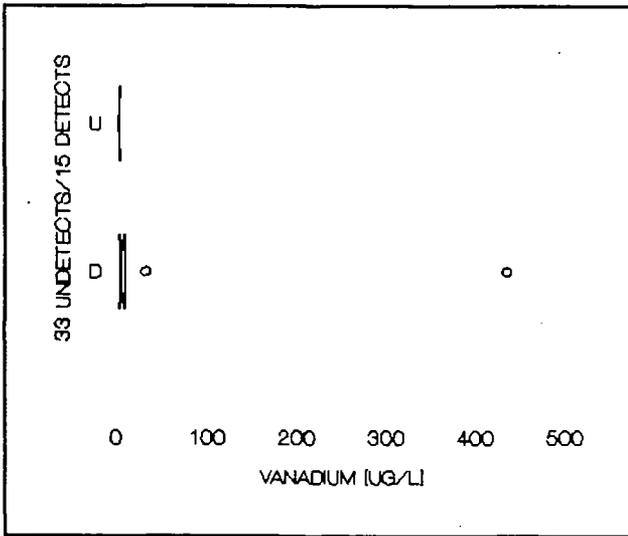












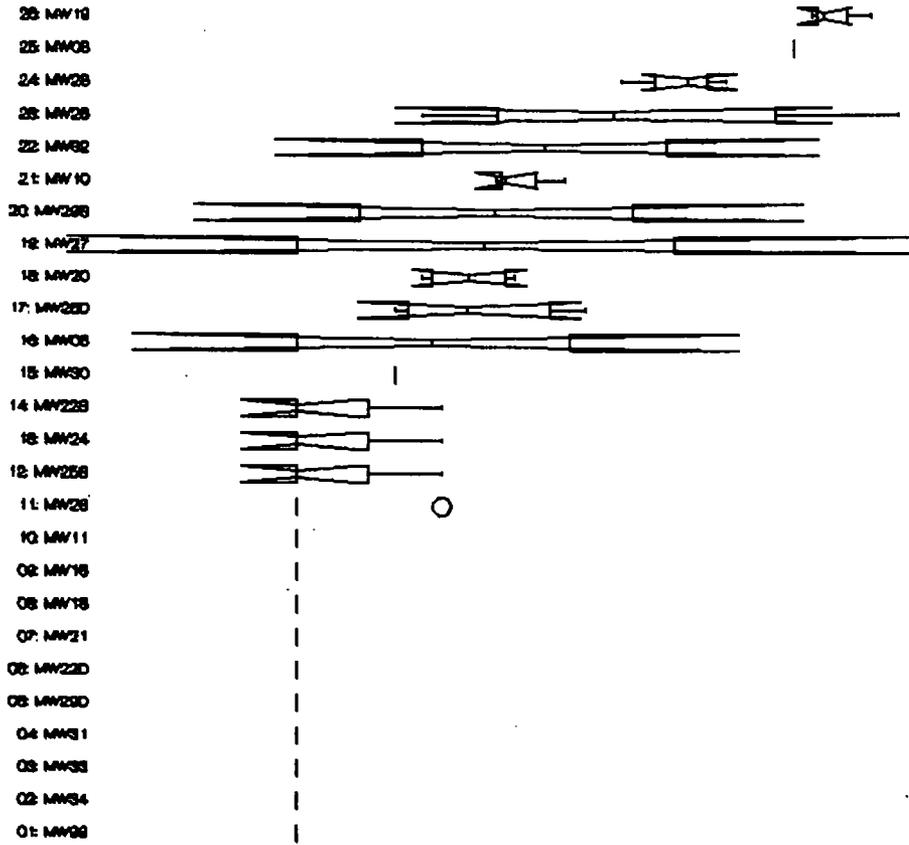
**Benzene in Groundwater:
Plots by Monitoring Well
and Time Series**

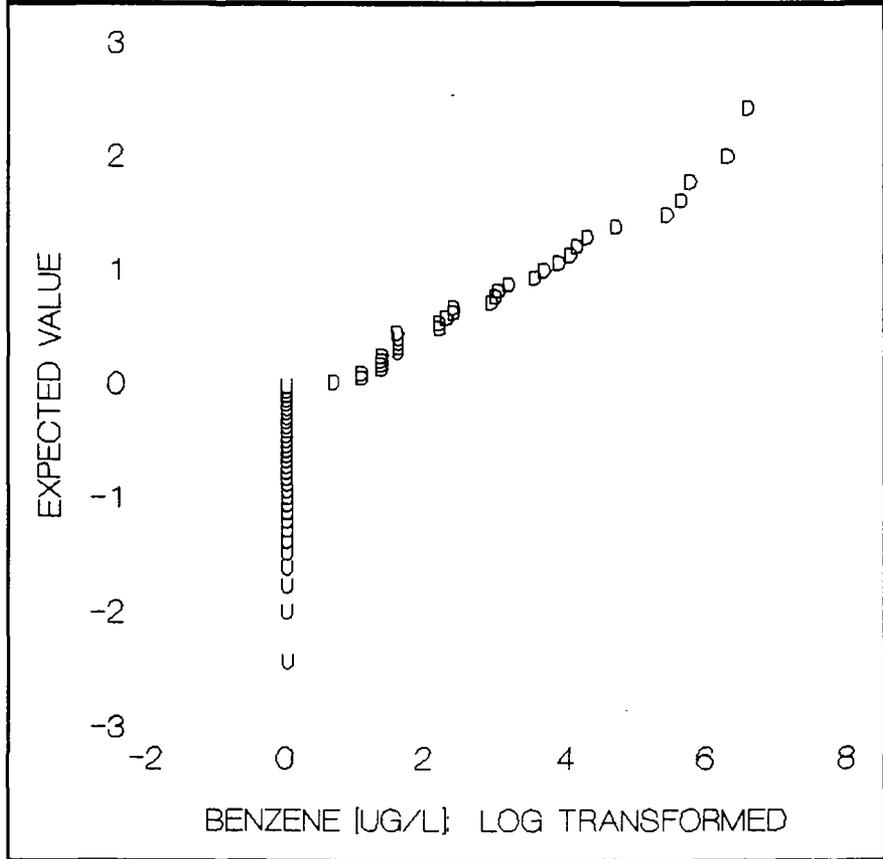
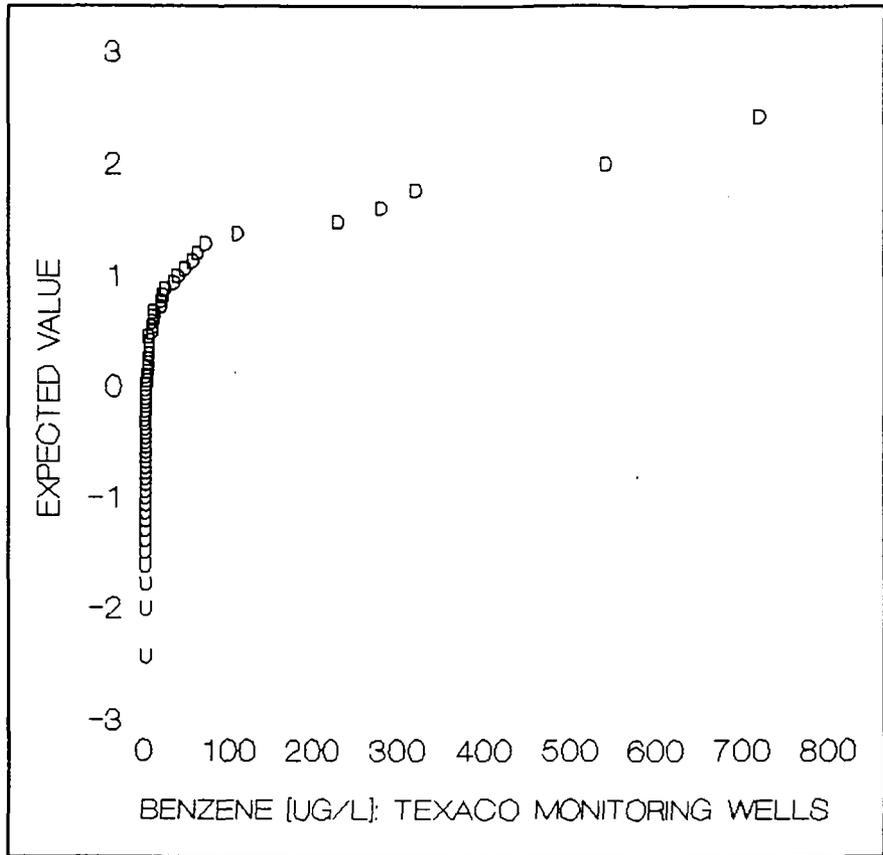
TEXACO MONITORING WELL

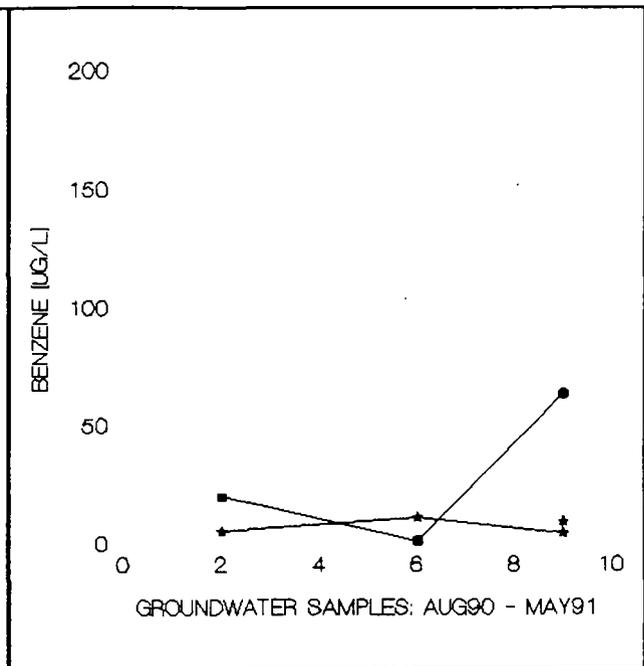
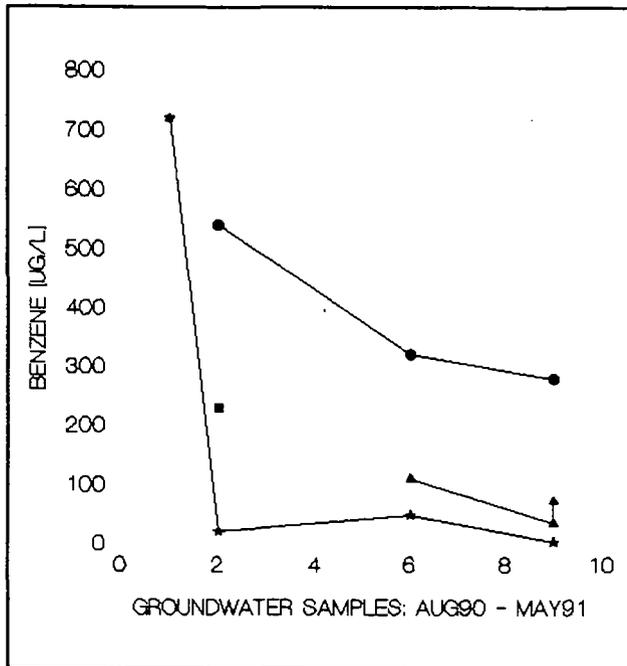
- 26 MW10
- 25 MW08
- 24 MW28
- 23 MW28
- 22 MW32
- 21 MW10
- 20 MW28
- 19 MW27
- 18 MW20
- 17 MW28D
- 16 MW08
- 15 MW30
- 14 MW28
- 13 MW24
- 12 MW28
- 11 MW28
- 10 MW11
- 09 MW18
- 08 MW18
- 07 MW21
- 06 MW22D
- 05 MW23D
- 04 MW31
- 03 MW33
- 02 MW34
- 01 MW08

-2 0 2 4 6 8

BENZENE [UG/L] LOG TRANSFORMED

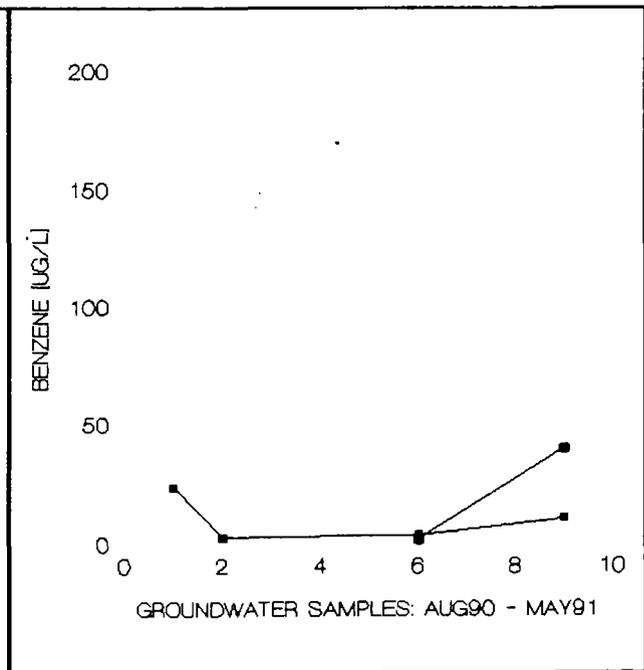
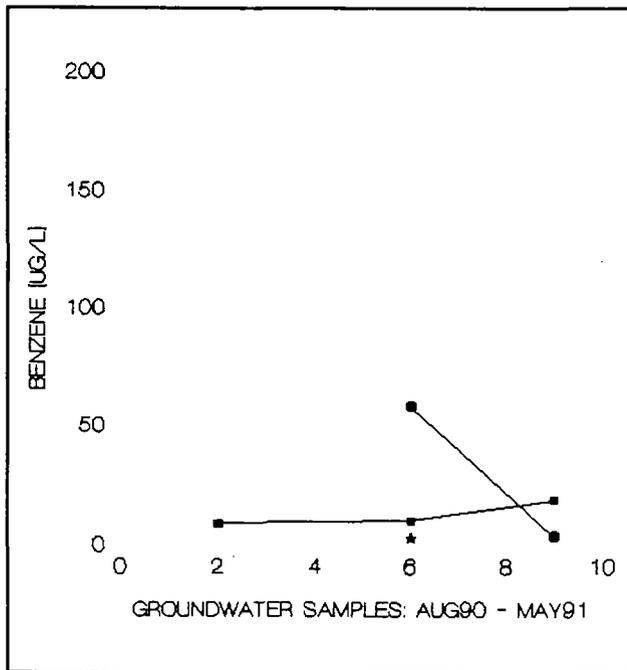






○ MW-19 □ MW-08
 ★ MW-26 ▲ MW-28

○ MW-27 □ MW-06
 ★ MW-20



○ MW-32 □ MW-10
 ★ MW-30

○ MW-29S □ MW-25D

Appendix B
RISK ASSESSMENT METHODOLOGY AND
TOXICITY PROFILES

Appendix B

RISK ASSESSMENT METHODOLOGY AND TOXICITY PROFILES

The following sections describe methods of estimating contaminant intake, including a description of carcinogenic risk estimation and hazard index approaches used in health risk assessment. Following the methodology description are short summaries of toxicity information regarding many of the contaminants of concern for the Texaco Fillmore site.

B.1 RISK ASSESSMENT METHODOLOGY

GENERAL ESTIMATION OF INTAKE

Equation B-1 presents a general equation for calculating chemical intake.

$$I = (C \times CR \times EF \times ED) / (BW \times AT) \quad (B-1)$$

where:

I	=	Chemical intake (mg/kg body weight-day)
C	=	Chemical concentration (e.g., mg/liter)
CR	=	Contact rate (e.g., liters/day)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
BW	=	Body weight (kg)
AT	=	Averaging time (days)

Carcinogenic Effects

A lifetime average intake (or chronic daily intake) of the chemical is estimated for carcinogens. This acts to prorate the total cumulative intake over a lifetime. An averaging time (AT) of a lifetime of 70 years is used for carcinogens.

Intake can change over a lifetime as body weight, contact rate, exposure frequency, and chemical concentrations change. Equation B-1 can be modified to address this issue:

$$I = (1/AT) \sum_{i=1}^M (C_i \times CR_i \times EF \times ED) / BW_i \quad (B-2)$$

where:

I	=	Chronic daily intake of the chemical (mg/kg body weight-day)
C _i	=	Chemical concentration in i th time period (e.g, mg/liter)
CR _i	=	Contact rate in i th time period (e.g., liters/day)
EF _i	=	Exposure frequency in i th time period (days/year)
M	=	Number of time periods
ED	=	Exposure duration in i th time period (years)
BW _i	=	Body weight in i th time period (kg)
AT	=	Averaging time (days)

U.S. EPA typically assumes a constant body weight (typically 70 kg) in estimating life-time cancer risk. This assumption would alter equation B-2 to yield the following:

$$I = \frac{1}{(AT \times BW)} \sum_{i=1}^M (C_i \times CR_i \times EF_i \times ED) \quad (B-3)$$

Noncarcinogenic Effects

The chemical intake of chemicals with noncarcinogenic effects is estimated over the appropriate exposure period or averaging time. The averaging time selected depends on the toxic endpoint being assessed.

When evaluating exposures to developmental toxicant, intakes are calculated by averaging over the exposure event (e.g., a day or single exposure incident). For acute toxicant, intakes are calculated by averaging over the shortest exposure period that could produce an effect, usually an exposure event or one day. For both situations, it can be assumed that the averaging time and the exposure period are equal. Therefore, equation B-1 can be simplified to:

$$I = (C \times CR) / (BW) \quad (B-4)$$

where:

I	=	Chemical intake (mg/kg body weight-day)
C	=	Chemical concentration (e.g, mg/liter)
CR	=	Contact rate (e.g., liters/day)
BW	=	Body weight (kg)

When evaluating exposure to systemic toxicant, intakes are calculated by averaging intakes over the period of exposure.

MEDIUM-SPECIFIC INTAKES

The following sections present the methodology for estimating intake from specific environmental media.

Drinking Water Ingestion

Equation B-5 is an equation for calculating chemical intake from ingestion of drinking water.

$$I = (CW \times IR \times EF \times ED) / (BW \times AT) \quad (B-5)$$

where:

I	=	Chemical intake (mg/kg body weight-day)
CW	=	Chemical concentration in water (mg/liter)
IR	=	Ingestion rate (liters/day)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
BW	=	Body weight (kg)
AT	=	Averaging time (days)

Soil Ingestion

Equation B-6 is an equation for calculating chemical intake from ingestion of soil or sediment.

$$I = (CS \times IR \times EF \times DF \times ED \times CF) / (BW \times AT) \quad (B-6)$$

where:

I	=	Chemical intake (mg/kg body weight-day)
CS	=	Chemical concentration in soil ($\mu\text{g}/\text{kg}$)
IR	=	Ingestion rate (grams/day)
EF	=	Exposure frequency (days/year)
DF	=	Desorption factor (fraction)
ED	=	Exposure duration (years)
BW	=	Body weight (kg)
AT	=	Averaging time (days)
CF	=	Conversion factor ($10^{-3} \text{ mg}/\mu\text{g} \times 10^{-3} \text{ kg}/\text{g}$)

Dermal Absorption

Dermal absorption is a complex process, with considerable uncertainty in estimating its magnitude. Dermal absorption from soil is a function of the concentration of contaminants in the soil, the amount of soil in contact with the skin, the amount of skin in contact with soil, the duration and frequency of the contact, and the type of contaminant.

The amount of soil that accumulates on a person's skin is controlled by several factors including soil type, type of activity, soil conditions, body surface area exposed, hygiene habits, and time of contact. Schaum (1984) used a range of soil accumulation of 0.5 to 1.5 mg/cm². OHEA also suggests this range, with an average value of 1.0 mg/cm². U.S. EPA's *Superfund Exposure Assessment Manual* suggests a range of 1.45 to 2.77 mg/cm² (U.S. EPA, 1988a).

The surface area of skin exposed is a function of the activity in which the individual is engaged and the climate. For example, the hands and face are the areas most likely to be exposed. If gloves are worn, exposure could be significantly reduced. The surface area of the head is estimated as 1,180 cm² for males and 1,100 cm² for females based on one reference (Anderson et al., 1984), and 1,350 cm² for males and 1,200 cm² for females based on a second reference (ICRP, 1974). The surface areas of the hands and arms are estimated respectively as 840 cm² and 2,280 cm² for men and 746 cm² and 2,100 cm² for women (Anderson et al., 1984). Schaum (1984) estimated that 910 cm² of skin would be exposed by an individual wearing long sleeves, gloves, pants, and shoes and 2,940 cm² by an individual wearing short sleeves, open-necked shirts, pants, and shoes, but no hat or gloves.

In addition to factors influencing the amount of contact of soil with the skin, numerous factors control the absorption process. A significant factor in soil exposures is the transfer of the chemical from the soil to the skin. This is a multistep process that requires the chemical to first desorb from the soil and then diffuse across the outer skin layer. Desorption will be governed by the chemical's relative affinity for the soil as compared to the skin or water (i.e., sweat or water associated with the soil). It will also be governed by the amount of moisture present on the skin or in the soil, skin conditions (e.g., health, thickness, hydration), and the time in contact.

These factors are not generally estimated or well correlated and understood. In lieu of these relationships, it has been suggested that a certain percentage of contaminants present in the soil adhering to the skin be assumed to be absorbed by the skin. Varying amounts have been suggested from 0.07 to 3 percent for dioxin (Schaum), 5 percent for PCBs (U.S. EPA, 1986g), up to 100 percent for compounds where no absorption information is available.

Based on the above, a conservative estimate of dermal absorption exposure can be estimated if one assumes the following:

- Body weight (bw) 70 kg
- Soil deposition 1 mg/cm²
- Surface area of hands 840cm²
- Absorption 5 percent
- Frequency One event per day

With these assumptions,

$$\begin{aligned} \text{Exposure} &= 1 \text{ mg/cm}^2 \times 840 \text{ cm}^2 \times 5 \text{ percent} \times 1/70 \text{ kg} \\ &= 0.60 \text{ mg of soil/kg bw/day} \end{aligned}$$

If this is compared to intake of 1.4 mg of soil/kg bw/day, through ingestion (assume 100 mg/day; 70 kg body weight), it is seen that dermal absorption from soil during contact might not be as great as ingestion exposures, and, as discussed, that there is uncertainty with such an estimate. Consequently, dermal absorption from direct contact with contaminated soil is not estimated in this assessment.

CARCINOGENIC RISK ESTIMATION

For carcinogens, risks are estimated as the incremental increase in the probability of an individual developing cancer over a lifetime as a result of exposure to a potential carcinogen. The cancer potency factor or slope factor (SF) gives the incremental risk when applied to the estimated daily chemical intakes averaged over a lifetime of exposure. This section describes the methodology for estimating cancer risks from exposure to either a single carcinogen or multiple carcinogens.

SINGLE CARCINOGEN

The "one-hit" equation (Equation B-9) can be used to describe excess lifetime cancer risk from exposure to one carcinogen (U.S. EPA, 1989e).

$$\text{Risk} = 1 - \exp^{-(\text{SF} \times \text{CDI})} \quad (\text{B-9})$$

where:

Risk	=	Excess lifetime cancer risk as a unitless probability
SF	=	Slope factor or cancer potency factor (mg/kg-day) ⁻¹
CDI	=	Chronic daily intake averaged over a lifetime (mg/kg-day)

Where the risks are low (risk < 10⁻³), it can generally be assumed that the dose-response relationship will be in the linear low-dose portion of the dose-response curve. Under this assumption, the slope factor is a constant and risk is related directly to intake. This can be described by:

$$\text{Risk} = \text{SF} \times \text{CDI} \quad (\text{B-10})$$

MULTIPLE CARCINOGENS

Exposure situations could involve more than one carcinogen. To assess the potential for carcinogenic effects from exposure to multiple carcinogens, it is assumed that, in the absence of information on synergistic or antagonistic effects, carcinogenic risks are additive. This approach is based on EPA's Guidelines for Health Risk Assessment of Chemical Mixtures (U.S. EPA, 1986) and EPA's Guidelines for Carcinogen Risk Assessment (U.S. EPA, 1986).

For estimating cancer risks from exposure to multiple carcinogens from a single exposure route, the following equation is used:

$$\text{Risk}_T = \sum_{i=1}^N \text{Risk}_i \quad (\text{B-11})$$

where:

$Risk_T$ = Total cancer risk from route of exposure
 $Risk_i$ = Cancer risk for the i^{th} chemical
 N = Number of chemicals

Risks may then be additive across exposure units if both exposures occur for the same population of receptors.

NONCARCINOGENIC RISK ESTIMATION

COMPARISON OF INTAKE TO REFERENCE DOSE

The potential for noncancer health effects from exposure to a contaminant is evaluated by comparing an exposure level over a specified time period with a RfD for a similar time period. This ratio of exposure to toxicity is called a hazard quotient and is described as follows:

$$HQ = E / RfD \quad (B-12)$$

where:

HQ = Noncancer hazard quotient
E = Exposure level (or intake in mg/kg-day)
RfD = Reference dose (mg/kg-day)

The results can be interpreted as follows (U.S. EPA, 1989e):

$HQ \geq 1$ There is a potential for health effects.

$HQ < 1$ Health effects are unlikely.

HAZARD INDEX APPROACH

For exposure situations involving more than one chemical, a "hazard index" approach can be used. This approach, which is based on EPA's Guidelines for Health Risk Assessment of Chemical Mixtures (U.S. EPA, 1986), assumes dose additivity and sums the ratios of the daily intakes of individual chemicals to their reference doses. This sum is called the hazard index (HI).

$$HI = \sum_{i=1}^N E_i/RfD_i \quad (B-13)$$

where:

HI = Hazard index
 E_i = Daily intake of the ith chemical (mg/kg-day)
 RfD_i = Reference dose of the ith chemical (mg/kg-day)
 N = Number of Chemicals

When the hazard index exceeds unity, it is a numerical indicator of the transition between acceptable and unacceptable exposure levels and there might be concern for potential health effects (U.S. EPA, 1989). Any single chemical with an estimated daily intake greater than the corresponding reference dose will cause the hazard index to exceed unity.

For multiple chemical exposures, the hazard index can exceed unity even if no single chemical exposure exceeds the reference dose for that chemical. The assumption of additivity is most properly applied to chemicals that induce the same effect by the same mechanism or in the same target organ. If the hazard index is near or exceeds unity, the chemicals in the mixture may be segregated by critical effect or target organ and separated indices are derived for each effect or target organ. If any of these separate indices exceeds unity, there might be a concern for potential health effects. Chemicals that are essential nutrients are excluded from the index when in the range of essentiality.

B.2 TOXICITY PROFILES

ACENAPHTHENE

Acute Toxicity Summary

In humans, may be irritating to skin and mucous membranes. Ingestion of large quantities may cause vomiting.

Chronic Toxicity Summary

Subchronic oral exposure in laboratory animals has caused morphological damage to liver and kidneys and mild bronchitis.

Cancer Potential

No evidence of carcinogenic effects, but data are lacking.

ARSENIC

Acute Toxicity Summary

Acute oral exposure can cause muscular cramps, facial swelling, cardiovascular reactions, severe gastrointestinal damage, and vascular collapse leading to death. Sensory loss and hematopoietic symptoms delayed after exposure to high concentrations are usually reversible. Inhalation exposures can cause severe irritation of nasal lining, larynx, and bronchi.

Chronic Toxicity Summary

Chronic oral or inhalation exposure can produce changes in skin, including hyperpigmentation and hyperkeratosis; peripheral neuropathy; liver injury; cardiovascular disorders; oral exposures associated with peripheral vascular disease; and blackfoot disease.

Cancer Potential

Known human carcinogen; oral exposures associated with skin cancer, inhalation exposures with lung cancer.

Other

Toxicity varies for different compounds; inorganic trivalent arsenic compounds usually more toxic than pentavalent compounds; high doses of some inorganic arsenic compounds to pregnant laboratory animals produced malformations in offspring.

BARIUM

Acute Toxicity Summary

Ingestion of barium salts can cause prolonged muscular stimulation, gastroenteritis, hypokalemia, and cardiovascular effects such as ventricular fibrillation and extra systoles.

Chronic Toxicity Summary

Prolonged occupational inhalation has resulted in baritosis--a benign, reversible pneumoconiosis.

Cancer Potential

Not indicated.

Other

Toxicity of compounds depends on solubility.

BENZENE

Acute Toxicity Summary

Acute exposures (inhalation) to high levels of benzene may lead to depression of the central nervous system, unconsciousness, and death or may cause fatal cardiac arrhythmias.

Chronic Toxicity Summary

Major toxic effect is hematopoietic toxicity (affects formation of blood); chronic exposure of workers to low levels has been associated with blood disorders, such as leukemia and aplastic anemia (depression of all three cell types of the blood in the absence of functioning marrow).

Cancer Potential

Sufficient evidence that benzene is a human and animal carcinogen; classified by EPA as an A human carcinogen. There is a strong correlation between exposure to benzene by inhalation and leukemia (specifically acute myeloid leukemia).

Other

Chromosomal aberrations in bone marrow and blood have been reported in experimental animals and some workers.

BENZO[A]ANTHRACENE

Acute Toxicity Summary

No information is available on short-term dermal or inhalation effects.

Chronic Toxicity Summary

No information on systemic effects. PAHs as a group may cause skin disorders and immunosuppressive effects.

Cancer Potential

Evidence exists that benzo[a]anthracene is carcinogenic to laboratory animals through dermal and ingestion exposure routes. Inhalation data is not available. May cause skin and lung cancer. No reports relating cancer in humans from exposure to benzo[a]anthracene exclusively, but exposure from PAH mixtures.

Other

Mutagenic in laboratory experiments. Benzo[a]anthracene may be metabolized into reactive derivatives.

BENZO[A]PYRENE

Acute Toxicity Summary

Acute toxicity appears low when administered by oral or dermal routes to laboratory animals.

Chronic Toxicity Summary

Prolonged exposure may produce chronic dermatitis and reproductive changes. Repeated oral doses to mice have caused hypoplastic anemia. Induction of cancer is the key toxic endpoint from intermediate and long-term exposure.

Cancer Potential

Benzo[a]pyrene is a constituent of coal tar, which is classified as a Level 1 known carcinogen by IARC and a Level B2 probable carcinogen by the EPA. Ingestion may produce stomach tumors, and inhalation may produce lung cancer. Prolonged skin

exposure has been linked to an increase in skin cancer among workers. Benzo[a]pyrene is considered to be the most potent carcinogenic PAH.

Other

Benzo[a]pyrene is a mutagen.

BENZO[B]FLUORANTHENE

Acute Toxicity Summary

No information is available.

Chronic Toxicity Summary

Systemic effects specific to benzo[b]fluoranthene have not been reported. Skin disorders and immunosuppressive effects have been reported for PAH mixtures.

Cancer Potential

Experimental evidence that it causes lung and skin cancer in laboratory animals by dermal absorption and intratracheal distillation.

Other

No evidence of reproductive or teratogenic effects.

BIS(2-ETHYLHEXYL)PHTHALATE

(Di(2-ethylhexyl)phthalate or DEHP or BEHP)

Acute Toxicity Summary

In general, low acute toxicity in experimental animals; accidental acute exposure in man resulted in mild gastric disturbance and catharsis.

Chronic Toxicity Summary

Chronic exposure at relatively high concentration have retarded growth and resulted in increased liver and kidney weight in experimental animals.

Cancer Potential

Oral administration to rats and mice resulted in increased hepatocellular carcinomas or neoplastic nodules. Classified by EPA as a B2 carcinogen.

Other

Some evidence in animals of teratogenic and fetotoxic effects. Reproductive effects, decreased fertility, and testicular damage have been noted in rodents. Poorly absorbed through skin; rapidly metabolized.

CADMIUM

Acute Toxicity Summary

For acute exposures by ingestion, symptoms of cadmium toxicity included nausea, vomiting, diarrhea, muscular cramps, salivation, spasms, drop in blood pressure, vertigo, loss of consciousness, and collapse. Acute renal failure, liver damage, and death may occur. Exposure by inhalation can cause irritation, coughing, labored respiration, vomiting, acute chemical pneumonitis, and pulmonary edema.

Chronic Toxicity Summary

Respiratory and renal toxicity are major effects in workers. Chronic oral exposures can produce kidney damage. Cadmium accumulates in kidney, and nephropathy results after critical concentration in kidney is reached, probably about 200 ug/g. Inhalation can cause chronic obstructive pulmonary disease, including bronchitis, progressive fibrosis, and emphysema. Chronic exposure affects calcium metabolism and can cause loss of calcium from bone, bone pain, osteomalacia, and osteoporosis. Chronic exposure may be associated with hypertension. Cadmium can produce testicular atrophy, sterility, and teratogenic effects in experimental animals.

Cancer Potential

Increased risk of prostate cancer and perhaps respiratory tract cancer in workers exposed by inhalation. No evidence of carcinogenicity from chronic oral exposure.

Other

A nonessential element.

CHLOROBENZENE

Acute Toxicity Summary

Central nervous system depression and irritation of the eye and respiratory tract have been reported in humans exposed to chlorobenzene. Workers exposed to chlorobenzene and perhaps to contaminants exhibited blood dyscrasias. Cardiac effects and toxemia of pregnancy were noted in workers exposed to chlorobenzene and other chemicals. Liver necrosis and interference with porphyrin metabolism occurred in rats

dosed orally with chlorobenzene. Kidneys of rabbits were swollen after injection with chlorobenzene.

Chronic Toxicity Summary

In dogs inhaling chlorobenzene, increased adrenal weights, increased liver-to-body weight ratios, and emesis were seen. In rats administered chlorobenzene orally, increased liver and kidney weights and histopathological changes in the liver were observed. Histopathological changes in lymphoid, liver, and kidney and depressed body weight gain were also found in another study with mice and rats receiving chlorobenzene by gavage. In the Notice to Proceed (NTP) chronic study of rats and mice receiving chlorobenzene by gavage, liver necrosis occurred in rats and decreased survival was found in low-dose male mice but not high-dose male mice.

Cancer Potential

Increased incidence of neoplastic nodules were observed in the liver of male rats receiving chlorobenzene in corn oil by gavage, but judged to be of borderline significance because of carcinomas in vehicle controls.

Other

Lipophilic. No teratogenic effects in 2-phase inhalation study of rats and rabbits. Mutagenicity tests mixed.

CHROMIUM

Acute Toxicity Summary

Major acute effect from oral exposure is renal tubular necrosis. Inhalation of chromate salts results in irritation and inflammation of nasal mucosa, ulceration, and perforation of nasal septum.

Chronic Toxicity Summary

Chronic exposure to hexavalent chromium has resulted in kidney damage in animals and humans. Inhalation exposures to chromates in industrial settings have resulted in nasal membrane inflammation, chronic rhinitis, laryngitis, and pharyngitis. Exposures to skin can result in allergic skin reactions in sensitive individual. Overall, hexavalent forms are usually more toxic than trivalent forms.

Cancer Potential

Excess lung cancer has been associated with chromate-producing industry workers. Chromatic salts are carcinogenic in rats exposed by inhalation.

Other

Essential element. Toxicity is related to valence state.

CHRYSENE**Acute Toxicity Summary**

Absorbed by oral and dermal doses.

Chronic Toxicity Summary

Chrysene accumulates in adipose and mammary tissues. Chronic toxic effects have not been described.

Cancer Potential

Carcinogenic in laboratory animals exposed to long-term dermal doses.

Other

Limited evidence that chrysene is mutagenic. Epidemiological reports incidences of skin cancer when exposed to PAH mixtures that included chrysene.

COPPER**Acute Toxicity Summary**

Inhalation of copper dusts result in symptoms similar to metal fume fever. Exposure to metal fumes results in upper respiratory tract irritation, metallic or sweet taste, metal fume fever, and skin and hair discoloration. Exposure to dusts and mists of copper salt result in congestion of nasal mucous membranes, sometimes of pharynx, and occasional ulceration with perforation of nasal septum. Acute copper sulfate poisoning in humans (oral) sometimes fatal; includes vomiting, diarrhea, hypotension, coma, and jaundice.

Chronic Toxicity Summary

Hemolytic anemia after chronic exposure in some dialysis patients. Sensitive individuals with disorders of metabolism--Wilson's disease and Menke's disease.

Cancer Potential

Not indicated.

Other

Essential nutrient. Organoleptic threshold in water between 1 to 5 mg/l.

1,2-DICHLOROETHANE**Acute Toxicity Summary**

Central Nervous System (CNS) depression, lung irritation, and injury to liver, kidney, and adrenal have been reported. Deaths in humans exposed by ingestion or inhalation may result from circulatory and respiratory failure.

Chronic Toxicity Summary

Chronic exposure can cause liver degeneration and kidney damage in laboratory animals. Eye damage (necrosis of corneal epithelium) has been observed in dogs injected with 1,2-dichloroethane. Repeated exposures have been associated with anorexia, nausea, liver and kidney dysfunction, and neurological disorders in workers.

Cancer Potential

Carcinogenic in mice and rats exposed orally.

Other

Mutagenic in some tests in bacteria, barley, and fruit flies.

1,1-DICHLOROETHENE (VINYLIDENE CHLORIDE)**Acute Toxicity Summary**

Liver appears to be principal target. Biochemical changes and necrosis in liver in fasted rats have been reported to develop rapidly after inhalation. Liver damage in fasted rats can occur after one oral dose. At high concentrations, inhalation of 1,1-DCE can cause CNS depression in humans and unconsciousness.

Chronic Toxicity Summary

Described as "exquisite hepatotoxin" because it is more potent and faster acting than classic hepatotoxin, carbon tetrachloride. Kidney injury can also occur at relatively low doses. Reports of health effects on workers exposed to 1,1-DCE include liver function abnormalities, headaches, vision problems, weakness, fatigue, and neurological sensory disturbances.

Cancer Potential

One group of investigators reported an increased incidence of kidney tumors in mice exposed by inhalation and possibly mammary tumors in rats. Tumor initiator activity in mouse skin following several treatments with phorbol as promoter has been described.

Other

Structure similar to vinyl chloride, a known human carcinogen; mutagenic in bacterial tests; may be fetotoxic in laboratory animals.

CIS-1,2-DICHLOROETHENE

Acute Toxicity Summary

Anesthetic at high concentrations; appears half as potent as trans isomer in depressing Central Nervous System (CNS); elevated liver enzymes in rats reported after one exposure.

Chronic Toxicity Summary

Minimal fatty accumulation in liver of rats chronically exposed to high doses of cis-1,2-DCE in drinking water.

Cancer Potential

Not indicated.

TRANS-1,2-DICHLOROETHENE

Acute Toxicity Summary

Inhalation exposure to high levels can cause narcosis and death in rats.

Chronic Toxicity Summary

Rats exposed by inhalation exhibited fatty accumulation in liver and infiltration of lungs.

Cancer Potential

Not indicated.

DICHLOROMETHANE (METHYLENE CHLORIDE)

Acute Toxicity Summary

Dichloromethane acts as a mild narcotic irritating to eyes and upper respiratory passages. Fatalities have been associated with acute or prolonged exposure.

Chronic Toxicity Summary

In animals chronic exposure can affect the liver and kidney. May substantially increase carboxyhemoglobin levels, preventing the transfer of oxygen to tissues. Damage to liver and CNS following long-term occupational exposure has been reported.

Cancer Potential

Carcinogen in female rats and male and female mice; classified as B2 by EPA.

Other

Mutagenic in some bacterial tests.

ETHYLBENZENE

Acute Toxicity Summary

Ethylbenzene is irritating to eyes, mucous membranes, and skin. It can cause headaches and narcosis.

Chronic Toxicity Summary

Data limited.

Cancer Potential

Not indicated.

LEAD

Acute Toxicity Summary

Acute inorganic lead intoxication in humans is characterized by encephalopathy, abdominal pain, hemolysis, liver damage, renal tubular necrosis, seizures, coma, and respiratory arrest.

Chronic Toxicity Summary

Chronic low levels of exposure to lead can affect the hematopoietic system, the nervous system, and the cardiovascular system. Lead inhibits several key enzymes involved in

heme biosyntheses. One characteristic effect of chronic lead intoxication is anemia, by reduced hemoglobin production and shortened erythrocyte survival. In humans, lead exposure has resulted in nervous system injury including reduced hand-eye coordination, reaction time, visual motor performance, and nerve conduction velocity. The developing child appears especially sensitive to lead-induced nervous system injury. Lead can also affect the immune system and produce gingival lead lines. Epidemiological studies have indicated that chronic lead exposure may be associated with increased blood pressure in humans. Exposure to lead is associated with sterility, abortion, neonatal mortality, and morbidity. Organolead compounds are neurotoxic.

Cancer Potential

Lead salts have some evidence of carcinogenicity in animals.

Other

Children are especially sensitive to low level effects.

NAPHTHALENE

Acute Toxicity Summary

Inhalation of vapor may cause eye irritation, headache, and confusion. Ingestion may cause abdominal pain, nausea, and vomiting. Skin or eye contact may lead to systemic effects such as bladder irritation, kidney effects, and nemoletic effects such as anemia and decreased hemoglobin. In animal studies, bronchial necrosis was observed in rats.

Chronic Toxicity Summary

Occurrence of cataracts upon naphthalene vapor and dust exposure has been observed in humans. Subchronic animal studies have shown that oral doses produced cataracts and degeneration of the retina. Dermatitis has been reported with repeated skin exposure. Two studies have reported hemolytic anemia in infants born to women exposed during pregnancy.

Cancer Potential

Studies have not shown that naphthalene is carcinogenic. Naphthalene is commonly found in coal tar and epidemiological studies have shown coal tar to be carcinogenic. The role of naphthalene alone could not be determined.

Other

Acute exposures to large doses may cause hemolytic effects (destruction of red blood cells). This effect is most pronounced in individuals with a hereditary deficiency of glucose-6-phosphate dehydrogenase.

NICKEL

Acute Toxicity Summary

Signs of acute nickel toxicity may include headaches, nausea, vomiting, chest pain, cough, hyperpnea, cyanosis, gastrointestinal and CNS effects, weakness, fever, pneumonia, respiratory failure, cerebral edema, and death. Acute exposures to nickel containing dust may result in chemical pneumonitis.

Chronic Toxicity Summary

Rhinitis, nasal sinusitis, and nasal mucosal injury are among the effects reported among workers chronically exposed to various nickel compounds. Allergic contact dermatitis and other dermatological effects are the most frequent effects of dermal exposure to nickel and nickel-containing compounds.

Cancer Potential

There is extensive epidemiological evidence indicating excess cancer of the lung and nasal cavity for workers exposed to certain nickel compounds. Nickel compounds implicated as having carcinogenic potential include insoluble dusts of nickel subsulfide and nickel oxides, vapor of nickel carbonyl and soluble sulfate, nickel carbonyl.

Other

May or may not be an essential element.

PHENANTHRENE

Acute Toxicity Summary

An irritant through inhalation and ingestion exposure. May also be dermally absorbed.

Chronic Toxicity Summary

May be an allergen.

Cancer Potential

Inadequate data for the evaluation in experimental animals.

Other

Can cause photosensitization of the skin.

PHENOL

Acute Toxicity Summary

Corrosive to tissue. Severe eye damage and blindness may result from direct eye contact. Skin contact may produce whitening of skin, burn, or systemic poisoning. Paleness, weakness, sweating, headaches, cyanosis, kidney damage, and death may occur.

Chronic Toxicity Summary

Chronic phenol poisoning is rare. It induces vomiting, difficulty swallowing, diarrhea, lack of appetite, headaches, fainting, dizziness, and neural disturbances. Liver and kidney damage may occur.

Cancer Potential

Phenol may promote the effects of certain carcinogens.

PYRENE

Acute Toxicity Summary

Limited information is available.

Chronic Toxicity Summary

Limited information is available.

Cancer Potential

Evidence suggests that pyrene is cocarcinogenic in laboratory animal experiments.

STYRENE

Acute Toxicity Summary

Irritating to eyes, skin, mucous membranes, and respiratory system. Can cause CNS impairment in humans and animals. A case of accidental human poisoning has been reported. In animals, depression of growth and of liver and kidney weight gain have been observed. In oral subacute exposures, styrene was highly irritating to the esophagus and gastrointestinal tract. Rats and guinea pigs exposed to fatal doses of styrene died acutely from CNS depression or experienced delayed death from pneumonia and congestion of lungs, liver, and kidney.

Chronic Toxicity Summary

Irritating to eyes; dermatitis with repeated or prolonged contact. "Styrene sickness" of a few hours duration was reported in some workers, with symptoms of nausea, vomiting, decreased appetite, drowsiness, headache, fatigue, and weakness. Neurological and psychological disturbances have been reported often. In animals, decreased growth and changes in organ weight have been noted. Eye and nasal irritation and extensive irritation to stomach and esophagus have also been observed. Effects on liver and red blood cells have been demonstrated in dogs.

Cancer Potential

Positive and negative results in bioassays; increased incidence of lung or liver tumors in offspring of mice exposed orally; possible increased frequency of lymphoid or hematopoietic tumors in rats; epidemiology on styrene-butadiene copolymer workers suggests increased incidence of lymphatic and hematopoietic tumors. IARC classification of limited evidence for carcinogenicity to animals, inadequate evidence for humans; classified as Category C by EPA but other classifications being considered.

Other

Malformations in chick embryos have been seen. Embryotoxicity occurred in rats inhaling styrene throughout pregnancy. Rates of spontaneous abortions were increased in Finnish female styrene industry workers and increased rate of malformations was suggested in Finnish reinforced plastic industry workers exposed to styrene and other chemicals. Conflicting mutation data in bacterial tests; chromosomal aberrations in bone marrow of rats exposed by inhalation and in cultured peripheral lymphocytes of some workers. Absorbed rapidly after respiratory and oral exposures; absorbed through skin after direct contact with liquid; metabolites differ with route and dose of administration; styrene oxide may be active metabolite.

1,1,2,2-TETRACHLOROETHANE

Acute Toxicity Summary

Acute exposure to 1,1,2,2-tetrachloroethane may cause fatigue, dizziness, unconsciousness, coma and death. Acute and chronic exposures cause fatty degeneration of the liver, hepatic necrosis, and cirrhosis. Inhalation route of exposure causes respiratory irritation and pulmonary edema. Skin irritation including dryness, scaling, inflammation, and rash are caused by dermal exposure.

Chronic Toxicity Summary

Humans exposed in the workplace may exhibit gastric pain, nausea, vomiting, loss of appetite and loss of body weight. Long term exposure can be hepatotoxic, resulting in jaundice, and enlargement of the liver. Oral administration to rats caused irreversible histopathological changes in the testes.

Cancer Potential

1,1,2,2-Tetrachloroethane is a class C carcinogen; possible human carcinogen based on increased incidence of hepatocellular carcinomas in mice following oral exposure. Exposure of rats did not induce cancer.

Other

Some evidence of mutagenicity has been shown. Absorption occurs readily through skin, lungs, or gastrointestinal tract. Has a sweet chloroform-like odor.

TETRACHLOROETHENE (PERCHLOROETHYLENE)

Acute Toxicity Summary

Tetrachloroethene can depress the CNS and cause narcosis. It is irritating to mucous membranes and skin and can cause lung edema. Neurological effects on dry-cleaners have been reported.

Chronic Toxicity Summary

Chronic exposure may result in pathological changes in liver of laboratory animals. It may also affect the kidney. In humans, inhalation exposure may produce irritation of respiratory tract, nausea, headache, sleeplessness, and abdominal pains. Fatalities have been reported.

Cancer Potential

Carcinogenic in laboratory animals. An increased incidence of cancers among dry-cleaning workers exposed to several solvents has been described.

TOLUENE

Acute Toxicity Summary

Humans exposed by inhalation experimentally, occupationally, or by intentional abuse may exhibit excitation, then CNS depression and necrosis. Neurotoxic effects include nausea, fatigue, and coordination at low levels and confusion, ataxia, and weakness at

higher levels. In rats, irritation of mucous membranes and incoordination have been observed, as well as pulmonary irritation with subchronic exposure.

Chronic Toxicity Summary

Central Nervous System effects have been reported in workers, such as disturbances in memory and thinking, psychomotor skills, visual accuracy, sensorimotor speed, and performance tests. Indications of cerebral and cerebellar dysfunction include tremors, ataxia, and equilibrium disorders, bizarre behavior, and emotional lability may occur. In cases of abuse, changes in liver and kidney function have been observed. In rats, a decrease in hematocrit has been reported.

Cancer Potential

Embryotoxicity and possible teratogenicity in mice have been reported in an abstract. In rats, skeletal retardation of offspring has been described.

Other

Not determined.

1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE (CFC-113)

Acute Toxicity Summary

CFC-113 can depress the CNS and produce narcotic effects, anesthesia, and death (usually at approximately 100,000 ppm or 770,000 mg/m³ for rodents following acute or subchronic exposures). In one study with two humans, psychomotor impairment, including decreased ability to concentrate, drowsiness, and dizziness, was reported after short exposures to high doses of CFC-113 (2,500 ppm, 0.5 to 1 hour); effects were reversible with cessation of exposure. Cardiotoxic effects have been observed in mice, dogs, rats, and monkeys, among them tachycardia, arrhythmia, and effects on blood pressure. Cardiac sensitization has been described in dogs inhaling CFC-113 in the presence of challenging doses of exogenous epinephrine. Some acute studies of laboratory animals have noted effects on liver, kidney, and thyroid.

Chronic Toxicity Summary

Studies in dogs, rabbits, and rats report negative results; data base for chronic toxicity is limited. EPA reference dose is based on absence of effects in humans occupationally exposed for 2.77 years (or exposed to lower concentrations for 11 years).

Cancer Potential

Negative findings suggested in rat inhalation study; one case of mammary carcinoma noted in group of 20 female mice (compared to zero in other groups) but statistical significance of data not evaluated.

Other

Negative in limited mutagenicity tests. Possible indirect health effects of chlorofluorocarbons postulated, based on potential to deplete stratospheric ozone, possible increase of more damaging ultraviolet radiation reaching earth, and possible increases in incidence of skin cancers.

1,1,1-TRICHLOROETHANE

Acute Toxicity Summary

Trichloroethane is a CNS depressant and may impair psychophysiological functions. Human fatalities have been reported following deliberate inhalation or occupational exposures; lung congestion was found. Acute, high-level exposures can also adversely affect the cardiovascular system. It is irritating to the skin and liquid can be absorbed through the skin.

Chronic Toxicity Summary

Exposure by inhalation can produce liver damage in mice and affects drug metabolism in liver of rats.

Cancer Potential

National Toxicology program study not finalized.

Other

Mutagenic in some in vitro tests.

TRICHLOROETHENE (TCE)

Acute Toxicity Summary

Exposure to TCE can cause depression of the CNS, including dizziness, headaches, incoordination similar to that induced by alcohol, nausea, vomiting, and unconsciousness.

Chronic Toxicity Summary

Long-term inhalation exposure can affect liver and kidneys in animals. In humans, changes in liver enzymes have been associated with TCE exposure.

Cancer Potential

Exposure of mice (orally and by inhalation) and rats have produced increases in liver or lung or kidney tumors.

Other

"Degreasers flush" has been described in TCE-exposed workers who consume alcohol.

TRICHLOROFLUOROMETHANE

Acute Toxicity Summary

In man, inhalation of large, acute doses can cause narcotic effects, confusion, tremors, pulmonary irritation, cardiac sensitization and arrhythmia, and bronchial constriction leading to death. Bradycardia has been reported in humans. Cardiac effects have been observed in rodents, dogs and monkeys, and loss of reflexes in rats. Toxicity is relatively low, but fatalities have occurred in abuse situations. Cardiovascular and neurological effects vary in different species, with depression or stimulation occurring.

Chronic Toxicity Summary

Chronic oral doses to mice caused only slight effects in food utilization.

Cancer Potential

No available evidence of carcinogenic activity. Negative results were reported in two types of mutagenicity tests.

Other

Results from chlorination of natural organic precursors in raw water. Used as a propellant and refrigerant. Subject to inhalation abuse. Studies with rats or rabbits failed to show embryotoxic or teratogenic effects. Toxic products such as phosgene can be formed from decomposition of propellant in an open flame.

XYLENE

Acute Toxicity Summary

Acute exposures to inhaled xylene can depress the CNS and irritate mucous membranes.

Chronic Toxicity Summary

Changes in behavioral tests, manual coordination, balance, and EEG patterns have been reported in humans exposed to xylenes. Development of tolerance against some of these effects has been described. Effects on liver of rats have been reported.

Cancer Potential

Not indicated.

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NOTE: Health effects may be based on animal studies and do not imply that human exposure will have the same results.

Appendix C
RISK CALCULATION TABLES

TABLE C-1
 CARCINOGENIC HEALTH RISK EVALUATION OF GROUNDWATER INGESTION
 Texaco Fillmore Site

Chemical	AVERAGE EXPOSURE ASSUMPTIONS			REASONABLE MAXIMUM EXPOSURE ASSUMPTIONS					
	U.S.EPA Carcinogen Classification	Slope Factor kg-day/mg	Conc in Water mg/L	Lifetime Average Chemical Intake mg/kg-day	Excess Lifetime Cancer Risk	Percent of Risk	Lifetime Maximum Chemical Intake mg/kg-day	Excess Lifetime Cancer Risk	Percent of Risk
Benzene	A	0.029	0.071	2.50E-04	7.25E-06	84.0	8.34E-04	2.42E-05	84.0
Carbon disulfide	--	--	0.0032	1.13E-05	0.00E+00	0.0	3.76E-05	0.00E+00	0.0
Chlorobenzene	D	--	0.001	3.52E-06	0.00E+00	0.0	1.17E-05	0.00E+00	0.0
1,2-Dichloroethane	B2	0.091	0.0021	7.40E-06	6.73E-07	7.8	2.47E-05	2.24E-06	7.8
Ethyl benzene	D	--	0.01	3.52E-05	0.00E+00	0.0	1.17E-04	0.00E+00	0.0
Methyl ethyl ketone	D	--	0.018	6.34E-05	0.00E+00	0.0	2.11E-04	0.00E+00	0.0
Naphthalene	--	--	0.011	3.87E-05	0.00E+00	0.0	1.29E-04	0.00E+00	0.0
2-Methylnapthalene	--	--	0.0073	2.57E-05	0.00E+00	0.0	8.57E-05	0.00E+00	0.0
1,1,2,2-Tetrachloroethane	C	0.2	0.001	3.52E-06	7.05E-07	8.2	1.17E-05	2.35E-06	8.2
Toluene	D	--	0.015	5.28E-05	0.00E+00	0.0	1.76E-04	0.00E+00	0.0
Xylenes	D	--	0.01	3.52E-05	0.00E+00	0.0	1.17E-04	0.00E+00	0.0
Arsenic	A	--	0.018	6.34E-05	0.00E+00	0.0	2.11E-04	0.00E+00	0.0
Barium	--	--	0.324	1.14E-03	0.00E+00	0.0	3.80E-03	0.00E+00	0.0
Cadmium	B1	--	0.0048	1.69E-05	0.00E+00	0.0	5.64E-05	0.00E+00	0.0
Chromium	--	--	0.015	5.28E-05	0.00E+00	0.0	1.76E-04	0.00E+00	0.0
Chromium VI	--	--	0.02	7.05E-05	0.00E+00	0.0	2.35E-04	0.00E+00	0.0
Copper	--	--	0.022	7.75E-05	0.00E+00	0.0	2.58E-04	0.00E+00	0.0
Lead	B2	--	0.0029	1.02E-05	0.00E+00	0.0	3.41E-05	0.00E+00	0.0
Nickel	--	--	0.04	1.41E-04	0.00E+00	0.0	4.70E-04	0.00E+00	0.0
Vanadium	--	--	0.032	1.13E-04	0.00E+00	0.0	3.76E-04	0.00E+00	0.0
Total Excess Lifetime Cancer Risks					9E-06		3E-05		
EXPOSURE ASSUMPTIONS			AVERAGE	REASONABLE MAXIMUM					
Ingestion rate (L/day)			2	2					
Body weight (kilograms)			70	70					
Exposure Frequency (days/year)			350	350					
Exposure Duration (years)			9	30					
Avaraging Time (years)			70	70					
Conversion Factor 1 (year to day)			365	365					

TABLE C-2
 CARCINOGENIC HEALTH RISK EVALUATION OF GROUNDWATER INHALATION
 Texaco Fillmore Site

Chemical	U.S.EPA Carcinogen Classification	AVERAGE EXPOSURE ASSUMPTIONS			REASONABLE MAXIMUM EXPOSURE ASSUMPTIONS				
		Inh Slope Factor kg-day/mg	Lifetime Average Chemical Intake mg/kg-day	Excess Lifetime Cancer Risk	Percent of Risk	Lifetime Maximum Chemical Intake ug/m3	Excess Lifetime Cancer Risk	Percent of Risk	
Benzene	A	0.029	2.50E-04	7.25E-08	84.0	8.34E-04	2.42E-05	84.1	
Carbon disulfide	—	—	1.13E-05	0.00E+00	0.0	3.76E-05	0.00E+00	0.0	
Chlorobenzene	—	—	3.52E-06	0.00E+00	0.0	1.17E-05	0.00E+00	0.0	
1,2-Dichloroethane	B2	0.091	7.40E-06	6.73E-07	7.8	2.47E-05	2.25E-06	7.8	
Ethyl benzene	—	—	3.52E-05	0.00E+00	0.0	1.17E-04	0.00E+00	0.0	
Methyl ethyl ketone	—	—	6.34E-05	0.00E+00	0.0	2.11E-04	0.00E+00	0.0	
Naphthalene	—	—	3.87E-05	0.00E+00	0.0	1.29E-04	0.00E+00	0.0	
2-Methylnaphthalene	—	—	2.57E-05	0.00E+00	0.0	8.57E-05	0.00E+00	0.0	
1,1,2,2-Tetrachloroethane	C	0.2	3.52E-06	7.04E-07	8.2	1.17E-05	2.34E-06	8.1	
Toluene	—	—	5.28E-05	0.00E+00	0.0	1.76E-04	0.00E+00	0.0	
Xylenes	—	—	3.52E-05	0.00E+00	0.0	1.17E-04	0.00E+00	0.0	
Total Excess Lifetime Cancer Risks				9E-06			3E-05		
EXPOSURE ASSUMPTIONS				REASONABLE MAXIMUM					
Exposure Time (hour/day)									
Exposure Frequency (days/year)									
Exposure Duration (years)		[Inhalation dose is assumed equal to ingestion dose]							
Averaging Time (years)									
Conversion Factor 1 (day to hour)									
Conversion Factor 2 (year to day)									

Sources of Slope Factors: HEAST, January 1991

Slope Factors used to calculate risks directly from intake
 (inhalation and ingestion intake assumed equal).

TABLE C-3
NONCARCINOGENIC HEALTH RISK EVALUATION OF GROUNDWATER INGESTION
Texaco Fillmore Site

Chemical	Reference Dose (RfD) mg/kg-day	CHILD EXPOSURE ASSUMPTIONS			ADULT EXPOSURE ASSUMPTIONS					
		Conc in Water mg/L	Average Daily Intake (DI) mg/kg-day	Hazard Quotient DI/RfD	Does Intake Exceed RfD?	Percent of HI	Maximum Daily Intake (DI) mg/kg-day	Hazard Quotient DI/RfD	Does Intake Exceed RfD?	Percent of HI
Benzene	—	0.071	6.81E-03	—	—	0.0	1.95E-03	—	—	0.0
Carbon disulfide	0.1	0.0032	3.07E-04	3.07E-03	NO	0.1	8.77E-05	8.77E-04	NO	0.1
Chlorobenzene	0.02	0.001	9.59E-05	4.79E-03	NO	0.1	2.74E-05	1.37E-03	NO	0.1
1,2-Dichloroethane	—	0.0021	2.01E-04	—	—	0.0	5.75E-05	—	—	0.0
Ethyl benzene	0.1	0.01	9.59E-04	9.59E-03	NO	0.2	2.74E-04	2.74E-03	NO	0.2
Methyl ethyl ketone	0.05	0.018	1.73E-03	3.45E-02	NO	0.8	4.93E-04	9.86E-03	NO	0.8
Naphthalene	0.004	0.011	1.05E-03	2.64E-01	NO	6.0	3.01E-04	7.53E-02	NO	6.0
2-Methylnaphthalene	—	0.0073	7.00E-04	—	—	0.0	2.00E-04	—	—	0.0
1,1,2,2-Tetrachloroethane	—	0.001	9.59E-05	—	—	0.0	2.74E-05	—	—	0.0
Toluene	0.2	0.015	1.44E-03	7.19E-03	NO	0.2	4.11E-04	2.05E-03	NO	0.2
Xylenes	2	0.01	9.59E-04	4.79E-04	NO	0.0	2.74E-04	1.37E-04	NO	0.0
Arsenic	0.001	0.018	1.73E-03	1.73E+00	YES	39.0	4.93E-04	4.93E-01	NO	39.0
Barium	0.07	0.324	3.11E-02	4.44E-01	NO	10.0	8.88E-03	1.27E-01	NO	10.0
Cadmium	0.0005	0.0048	4.60E-04	9.21E-01	NO	20.8	1.32E-04	2.63E-01	NO	20.8
Chromium	1	0.015	1.44E-03	1.44E-03	NO	0.0	4.11E-04	4.11E-04	NO	0.0
Chromium VI	0.005	0.02	1.92E-03	3.84E-01	NO	8.7	5.48E-04	1.10E-01	NO	8.7
Copper	—	0.022	2.11E-03	—	—	0.0	6.03E-04	—	—	0.0
Lead	—	0.0029	2.78E-04	—	—	0.0	7.95E-05	—	—	0.0
Nickel	0.02	0.04	3.84E-03	1.92E-01	NO	4.3	1.10E-03	5.48E-02	NO	4.3
Vanadium	0.007	0.032	3.07E-03	4.38E-01	NO	9.9	8.77E-04	1.25E-01	NO	9.9
Hazard Index (Sum of DI/RfD)				4.43				1.27		
EXPOSURE ASSUMPTIONS		CHILD		ADULT						
Ingestion rate (L/day)		1		2						
Body weight (kilograms)		10		70						
Exposure Frequency (days/year)		350		350						
Exposure Duration (years)		6		30						
Averaging Time (years)		6		30						
Conversion Factor 1 (year to day)		365		365						

TABLE C-4
 NONCARCINOGENIC HEALTH RISK EVALUATION OF GROUNDWATER INHALATION
 Texaco Fillmore Site

Chemical	CHILD EXPOSURE ASSUMPTIONS					ADULT EXPOSURE ASSUMPTIONS				
	Inh Reference Dose (mg/kg/d)	Average Daily Intake (DI) (mg/kg-day)	Hazard Quotient DI/RfD	Does Intake Exceed RfC?	Percent of HI	Daily Intake (DI) (mg/kg/d)	Hazard Quotient DI/RfD	Does Intake Exceed RfD?	Percent of HI	
Benzene	—	6.81E-03	—	—	0.0	1.95E-03	—	—	0.0	
Carbon disulfide	0.003	3.07E-04	1.02E-01	NO	64.9	8.77E-05	2.92E-02	NO	64.9	
Chlorobenzene	0.005	9.59E-05	1.92E-02	NO	12.2	2.74E-05	5.48E-03	NO	12.2	
1,2-Dichloroethane	—	2.01E-04	—	—	0.0	5.75E-05	—	—	0.0	
Ethyl benzene	0.286	9.59E-04	3.35E-03	NO	2.1	2.74E-04	9.58E-04	NO	2.1	
Methyl ethyl ketone	0.09	1.73E-03	1.92E-02	NO	12.2	4.93E-04	5.48E-03	NO	12.2	
Naphthalene	—	1.05E-03	—	—	0.0	3.01E-04	—	—	0.0	
2-Methylnaphthalene	—	7.00E-04	—	—	0.0	2.00E-04	—	—	0.0	
1,1,2,2-Tetrachloroethane	—	9.59E-05	—	—	0.0	2.74E-05	—	—	0.0	
Toluene	0.571	1.44E-03	2.52E-03	NO	1.6	4.11E-04	7.20E-04	NO	1.6	
Xylenes	0.086	9.59E-04	1.12E-02	NO	7.1	2.74E-04	3.19E-03	NO	7.1	
Hazard Index (Sum of EC/RfC)			0.16				0.05			
EXPOSURE ASSUMPTIONS										
Exposure Time (hour/day)	Assume equal to average daily									
Exposure Frequency (days/year)	intake estimated in groundwater									
Exposure Duration (years)	ingestion scenario									
Averaging Time (years)	(inhaled dose = ingested dose)									
Conversion Factor 1 (day to hour)										
Conversion Factor 2 (year to day)										

TABLE C-5
 CARCINOGENIC HEALTH RISK EVALUATION OF SURFACE SOIL INGESTION
 Texaco Fillmore Site

Chemical	U.S.EPA Carcinogen Classification	Oral Slope Factor kg-day/mg	Concentration in Surface Soil ug/kg	CHILD EXPOSURE			ADULT EXPOSURE			TOTAL RISK (Adult+Child)
				Chemical Intake mg/kg-day	Excess Lifetime Cancer Risk	% of Risk	Chemical Intake mg/kg-day	Excess Lifetime Cancer Risk	% of Risk	
Acenaphthene	—	—	1189	1.28E-06	0.00E+00	0.0	5.49E-07	0.00E+00	0.0	0.00E+00
Benzene	A	0.029	10.9	1.19E-08	3.46E-10	0.0	5.12E-09	1.48E-10	0.0	4.95E-10
Benzo(a)anthracene	B2	11.5	81	6.88E-08	7.89E-07	3.0	2.86E-08	3.29E-07	3.0	1.10E-06
Benzo(a)pyrene	B2	11.5	250	2.74E-07	3.15E-06	12.4	1.17E-07	1.35E-06	12.4	4.50E-06
Benzo(b)fluoranthene	B2	11.5	93	1.02E-07	1.17E-06	4.8	4.37E-08	5.02E-07	4.8	1.67E-06
Bis(2-ethylhexyl)phthalate	B2	0.014	890	9.75E-07	1.37E-08	0.1	4.18E-07	5.85E-09	0.1	1.95E-08
2-Butanone (MEK)	D	—	19.6	2.15E-08	0.00E+00	0.0	9.21E-09	0.00E+00	0.0	0.00E+00
Chlorobenzene	—	—	7.61	8.34E-09	0.00E+00	0.0	3.57E-09	0.00E+00	0.0	0.00E+00
2-Chlorophenol	—	—	1263	1.38E-06	0.00E+00	0.0	5.93E-07	0.00E+00	0.0	0.00E+00
Chrysene	B2	11.5	800	8.77E-07	1.01E-05	39.8	3.76E-07	4.32E-06	39.8	1.44E-05
1,2-Dibromoethane	B2	85	3.22	3.53E-09	3.00E-07	1.2	1.51E-09	1.29E-07	1.2	4.28E-07
1,4-Dichlorobenzene	—	0.024	1162	1.27E-06	3.06E-08	0.1	5.46E-07	1.31E-08	0.1	4.37E-08
1,1-Dichloroethylene	C	0.6	6.45	7.07E-09	4.24E-09	0.0	3.03E-09	1.82E-09	0.0	6.06E-09
2,4-Dinitrotoluene	B2	0.68	1181	1.29E-06	8.80E-07	3.5	5.55E-07	3.77E-07	3.5	1.26E-06
Ethylbenzene	D	—	4.67	5.12E-09	0.00E+00	0.0	2.19E-09	0.00E+00	0.0	0.00E+00
4-Nitrophenol	—	—	5591	6.13E-06	0.00E+00	0.0	2.63E-06	0.00E+00	0.0	0.00E+00
N-nitrosodi-n-propylamine	B2	7	1178	1.29E-06	9.04E-06	35.5	5.53E-07	3.87E-06	35.5	1.29E-05
Phenanthrene	D	—	110	1.21E-07	0.00E+00	0.0	5.17E-08	0.00E+00	0.0	0.00E+00
Phenol	D	—	1220	1.34E-06	0.00E+00	0.0	5.73E-07	0.00E+00	0.0	0.00E+00
Pyrene	—	—	1177	1.29E-06	0.00E+00	0.0	5.53E-07	0.00E+00	0.0	0.00E+00
Toluene	D	—	173	1.90E-07	0.00E+00	0.0	8.13E-08	0.00E+00	0.0	0.00E+00
1,1,1-Trichloroethane	D	—	4.7	5.15E-09	0.00E+00	0.0	2.21E-09	0.00E+00	0.0	0.00E+00
Trichloroethylene	B2	0.011	6.99	7.66E-09	8.43E-11	0.0	3.28E-09	3.81E-11	0.0	1.20E-10
Vinyl acetate	—	—	15.3	1.68E-08	0.00E+00	0.0	7.19E-09	0.00E+00	0.0	0.00E+00
Xylenes (Total)	D	—	9.89	1.06E-08	0.00E+00	0.0	4.55E-09	0.00E+00	0.0	0.00E+00
Total Excess Lifetime Cancer Risks					2.54E-05			1.09E-05		3.63E-05
EXPOSURE ASSUMPTIONS			CHILD	ADULT						
Soil intake (grams/day)			0.2	0.1						
Body weight (kilograms)			15	70						
Fraction ingested from contaminated soil (unitless)			1	1						
Exposure Frequency (days/year)			350	350						
Exposure Duration (years)			6	24						
Averaging Time (years)			70	70						
Conversion Factor 1 (gram to kilogram)			0.001	0.001						
Conversion Factor 2 (microgram to milligram)			0.001	0.001						
Conversion Factor 3 (year to day)			385	385						

TABLE C-6
NONCARCINOGENIC HEALTH RISK EVALUATION OF SURFACE SOIL INGESTION
Texaco Fillmore Site

Chemical	Chronic Reference Dose (RfD) mg/kg-day	CHILD EXPOSURE ASSUMPTIONS				ADULT EXPOSURE ASSUMPTIONS				
		Concentration in Soil ug/kg	Average Daily Intake (DI) mg/kg-day	Hazard Quotient DI/RfD	Does Intake Exceed RfD?	Percent of HI	Maximum Daily Intake (DI) mg/kg-day	Hazard Quotient DI/RfD	Does Intake Exceed RfD?	Percent of HI
Acenaphthene	0.06	1169	1.49E-05	2.49E-04	NO	5.4	1.60E-06	2.67E-05	NO	5.4
Benzene	—	10.9	1.39E-07	—	—	—	1.49E-08	—	—	—
Benzo(a)anthracene	—	81	7.80E-07	—	—	—	8.36E-08	—	—	—
Benzo(a)pyrene	—	250	3.20E-06	—	—	—	3.42E-07	—	—	—
Benzo(b)fluoranthene	—	93	1.19E-06	—	—	—	1.27E-07	—	—	—
Bis(2-ethylhexyl)phthalate	0.02	890	1.14E-05	5.69E-04	NO	12.4	1.22E-06	6.10E-05	NO	12.4
2-Butanone (MEK)	0.05	19.8	2.51E-07	5.01E-06	NO	0.1	2.68E-08	5.37E-07	NO	0.1
Chlorobenzene	0.02	7.61	9.73E-08	4.86E-06	NO	0.1	1.04E-08	5.21E-07	NO	0.1
2-Chlorophenol	0.005	1263	1.61E-05	3.23E-03	NO	70.1	1.73E-06	3.46E-04	NO	70.1
Chrysene	—	800	1.02E-05	—	—	0.0	1.10E-06	—	—	0.0
1,2-Dibromoethane	—	3.22	4.12E-08	—	—	0.0	4.41E-09	—	—	0.0
1,4-Dichlorobenzene	—	1162	1.49E-05	—	—	0.0	1.59E-06	—	—	0.0
1,1-Dichloroethylene	0.009	6.45	8.25E-08	9.16E-06	NO	0.2	8.84E-09	9.82E-07	NO	0.2
2,4-Dinitrotoluene	—	1181	1.51E-05	—	—	0.0	1.62E-06	—	—	0.0
Ethylbenzene	0.1	4.67	5.97E-08	5.97E-07	NO	0.0	6.40E-09	6.40E-08	NO	0.0
4-Nitrophenol	—	5591	7.15E-05	—	—	0.0	7.66E-06	—	—	0.0
N-nitrosodi-n-propylamine	—	1178	1.51E-05	—	—	0.0	1.61E-06	—	—	0.0
Phenanthrene	—	110	1.41E-06	—	—	0.0	1.51E-07	—	—	0.0
Phenol	0.6	1220	1.56E-05	2.60E-05	NO	0.6	1.67E-06	2.79E-08	NO	0.6
Pyrene	0.03	1177	1.50E-05	5.02E-04	NO	10.9	1.61E-06	5.37E-05	NO	10.9
Toluene	0.2	173	2.21E-06	1.11E-05	NO	0.2	2.37E-07	1.18E-06	NO	0.2
1,1,1-Trichloroethane	0.09	4.7	6.01E-08	6.68E-07	NO	0.0	6.44E-09	7.15E-08	NO	0.0
Trichloroethylene	—	6.99	8.94E-08	—	—	0.0	9.58E-09	—	—	0.0
Vinyl acetate	1	15.3	1.96E-07	1.96E-07	NO	0.0	2.10E-08	2.10E-08	NO	0.0
Xylenes (Total)	2	6.69	1.24E-07	6.19E-08	NO	0.0	1.33E-08	6.64E-09	NO	0.0
Hazard Index (Sum of DI/RfD)				0.005				0.0005		
EXPOSURE ASSUMPTIONS		CHILD		ADULT						
Soil intake (grams/day)		0.2		0.1						
Body weight (kilograms)		15		70						
Fraction ingested from contaminated soil (unitless)		1		1						
Exposure Frequency (days/year)		350		350						
Exposure Duration (years)		6		30						
Averaging Time (years)		6		30						
Conversion Factor 1 (gram to kilogram)		0.001		0.001						
Conversion Factor 2 (microgram to milligram)		0.001		0.001						
Conversion Factor 3 (year to day)		365		365						

** SCREENING **

TABLE C-7
 CARCINOGENIC HEALTH RISK EVALUATION FOR INHALATION OF AMBIENT AIR
 Texaco Fillmore Site

COMPOUND	Carcinogenic Weight of Evidence	Maximum Concentration(a) ppb	Maximum Concentration Location(b)	Maximum Concentration(c) ug/m3	INH UR (c) (/ug/m3)	EXCESS CANCER RISK (CONC X UR)
Benzene	A	1.4	D	4.48	8.30E-08	3.70E-05
N,N-Dimethyl Acetamide		300	U	—	—	—
Ethylbenzene	D	1.2	D	—	—	—
2-Methylnaphthalene		—	D	0.068	—	—
Naphthalene	D	—	D	0.631	—	—
Phenol	D	100	U	—	—	—
Toluene	D	18	D	—	—	—
Trichlorotrifluoroethane		50	U	—	—	—
Xylenes, Total	D	4.1	D	—	—	—
Total Excess Cancer Risk						3.70E-05

(a) Maximum Concentration refers to maximum detected concentration from Table 2-8

(b) Maximum Location refers to either upwind (U) or downwind (D) sampler

(c) $(\text{ppb} \times \text{MW})/24.5$

(d) Inhalation Unit Risk, in /ug/m3

UR is applied directly to ambient air concentration to estimate risk

TABLE C-8
 NONCARCINOGENIC HEALTH RISK EVALUATION OF AMBIENT AIR INHALATION
 Texaco Fillmore Site

Chemical	Reference Concentration mg/m3	CHILD EXPOSURE ASSUMPTIONS			ADULT EXPOSURE ASSUMPTIONS					
		Maximum Concentration In Air mg/m3	Average Daily Intake (DI) mg/m3	Hazard Quotient DI/RfD	Does Intake Exceed RfD?	Percent of HI	Maximum Daily Intake (DI) mg/m3	Hazard Quotient DI/RfD	Does Intake Exceed RfD?	Percent of HI
Benzene	—		0.00E+00	—	—	0.0	0.00E+00	—	—	0.0
N,N-Dimethyl Acetamide	—		0.00E+00	—	—	0.0	0.00E+00	—	—	0.0
Ethylbenzene	1	0.005	4.79E-03	4.79E-03	NO	6.3	4.79E-03	4.79E-03	NO	6.3
2-Methylnaphthalene	—		0.00E+00	—	—	0.0	0.00E+00	—	—	0.0
Naphthalene	—		0.00E+00	—	—	0.0	0.00E+00	—	—	0.0
Phenol	—		0.00E+00	—	—	0.0	0.00E+00	—	—	0.0
Trichlorotrifluoroethane	27	0.38	3.64E-01	1.35E-02	NO	17.8	3.64E-01	1.35E-02	NO	17.8
Xylenes, Total	0.3	0.018	1.73E-02	5.75E-02	NO	75.9	1.73E-02	5.75E-02	NO	75.9
Hazard Index (Sum of DI/RfD)				0.0758				0.0758		
EXPOSURE ASSUMPTIONS		CHILD		ADULT						
Exposure Time (hour/day)		24		24						
Exposure Frequency (days/year)		350		350						
Exposure Duration (years)		6		30						
Averaging Time (years)		6		30						
Conversion Factor 1 (day to hour)		24		24						
Conversion Factor 2 (year to day)		365		365						

TABLE C-9
 CARCINOGENIC HEALTH RISK EVALUATION OF SEDIMENT INGESTION
 Texaco Fillmore Site

** Maximum Concentrations **			CHILD EXPOSURE				ADULT EXPOSURE			
Chemical	U.S.EPA Carcinogen Classification	Oral Slope Factor kg-day/mg	MAX Concentration in Surface Soil ug/kg	Chemical Intake mg/kg-day	Excess Lifetime Cancer Risk	% of Risk	Chemical Intake mg/kg-day	Excess Lifetime Cancer Risk	% of Risk	TOTAL RISK (Adult+Child)
Benzoic Acid	D	—	420	4.60E-07	0.00E+00	0.0	1.97E-07	0.00E+00	0.0	0.00E+00
Bis(2-ethylhexyl)phthalate	B2	0.014	130	1.42E-07	1.99E-09	0.1	6.11E-08	8.55E-10	0.1	2.85E-09
Chrysene	B2	11.5	110	1.21E-07	1.39E-08	99.8	5.17E-08	5.94E-07	99.8	1.98E-08
Dimethyl phthalate	D	—	2500	2.74E-06	0.00E+00	0.0	1.17E-06	0.00E+00	0.0	0.00E+00
Pyrene	—	—	68	7.45E-08	0.00E+00	0.0	3.19E-08	0.00E+00	0.0	0.00E+00
Styrene	B2	0.03	8.8	9.64E-09	2.89E-10	0.0	4.13E-09	1.24E-10	0.0	4.13E-10
Trichloroethylene	B2	0.011	27	2.96E-08	3.25E-10	0.0	1.27E-08	1.39E-10	0.0	4.65E-10
Total Excess Lifetime Cancer Risks					1.39E-06			5.95E-07		1.98E-06
EXPOSURE ASSUMPTIONS (From OSWER Directive 3/91)			CHILD	ADULT						
Soil intake (grams/day)			0.2		0.1					
Body weight (kilograms)			15		70					
Fraction ingested from contaminated soil (unitless)			1		1					
Exposure Frequency (days/year)			350		350					
Exposure Duration (years)			6		24					
Avaraging Time (years)			70		70					
Conversion Factor 1 (gram to kilogram)			0.001		0.001					
Conversion Factor 2 (microgram to milligram)			0.001		0.001					
Conversion Factor 3 (year to day)			365		365					

TABLE C-10
 NONCARCINOGENIC HEALTH RISK EVALUATION OF SEDIMENT INGESTION
 Texaco Fillmore Site

** MAXIMUM CONCENTRATIONS **		CHILD EXPOSURE ASSUMPTIONS						SLT EXPOSURE ASSUMPTIONS			
Chemical	Chronic Reference Dose (RfD) mg/kg-day	MAX Concentration in Soil ug/kg	Average Daily Intake (DI) mg/kg-day	Hazard Quotient DI/RfD	Does Intake Exceed RfD?	Percent of HI	Maximum Daily Intake (DI) mg/kg-day	Hazard Quotient DI/RfD	Does Intake Exceed RfD?	Percent of HI	
Benzoic Acid	4	420	5.37E-06	1.34E-06	NO	0.9	5.75E-07	1.44E-07	NO	0.9	
Bis(2-ethylhexyl)phthalate	0.02	130	1.66E-06	8.31E-05	NO	56.9	1.78E-07	8.90E-06	NO	56.9	
Chrysene	—	110	1.41E-06	—	—	0.0	1.51E-07	—	—	0.0	
Dimethyl phthalate	1	2500	3.20E-05	3.20E-05	NO	21.9	3.42E-06	3.42E-06	NO	21.9	
Pyrene	0.03	68	8.69E-07	2.90E-05	NO	19.9	9.32E-08	3.11E-06	NO	19.9	
Styrene	0.2	8.8	1.13E-07	5.63E-07	NO	0.4	1.21E-08	6.03E-08	NO	0.4	
Trichloroethylene	—	27	3.45E-07	—	—	0.0	3.70E-08	—	—	0.0	
Hazard Index (Sum of DI/RfD)				0.0001			0.00002				
EXPOSURE ASSUMPTIONS		CHILD		ADULT							
Soil intake (grams/day)		0.2		0.1							
Body weight (kilograms)		15		70							
Fraction ingested from contaminated soil (unitless)		1		1							
Exposure Frequency (days/year)		350		350							
Exposure Duration (years)		6		30							
Averaging Time (years)		6		30							
Conversion Factor 1 (gram to kilogram)		0.001		0.001							
Conversion Factor 2 (microgram to milligram)		0.001		0.001							
Conversion Factor 3 (year to day)		365		365							

TABLE C-11
 CARCINOGENIC HEALTH RISK EVALUATION OF SURFACE WATER INGESTION
 Texaco Fillmore Site

Chemical	AVERAGE EXPOSURE ASSUMPTIONS			REASONABLE MAXIMUM EXPOSURE ASSUMPTIONS					
	U.S.EPA Carcinogen Classification	Slope Factor kg-day/mg	MAX of Mean Conc in Water mg/L	Lifetime Average Chemical Intake mg/kg-day	Excess Lifetime Cancer Risk	Percent of Risk	Lifetime Maximum Chemical Intake mg/kg-day	Excess Lifetime Cancer Risk	Percent of Risk
Styrene	B2	0.03	0.012	4.23E-05	1.27E-08	100.0	1.41E-04	4.23E-08	100.0
Arsenic (a)	A	--	0.0028	9.16E-08	0.00E+00	0.0	3.05E-05	0.00E+00	0.0
Barium	--	--	0.248	8.74E-04	0.00E+00	0.0	2.91E-03	0.00E+00	0.0
Chromium (total) (a)	--	--	0.006	2.11E-05	0.00E+00	0.0	7.05E-05	0.00E+00	0.0
Copper	D	--	0.007	2.47E-05	0.00E+00	0.0	8.22E-05	0.00E+00	0.0
Nickel	--	--	0.018	6.34E-05	0.00E+00	0.0	2.11E-04	0.00E+00	0.0
Vanadium	--	--	0.01	3.52E-05	0.00E+00	0.0	1.17E-04	0.00E+00	0.0
Total Excess Lifetime Cancer Risks					1E-08		4E-08		
EXPOSURE ASSUMPTIONS			AVERAGE	REASONABLE MAXIMUM					
Ingestion rate (L/day)			2	2					
Body weight (kilograms)			70	70					
Exposure Frequency (days/year)			350	350					
Exposure Duration (years)			9	30					
Averaging Time (years)			70	70					
Conversion Factor 1 (year to day)			365	365					

(a) Chromium VI analyzed for but not detected at DL = 20 ug/L

TABLE C-13
NONCARCINOGENIC HEALTH RISK EVALUATION OF SURFACE WATER INGESTION
Texaco Fillmore Site

Chemical	CHILD EXPOSURE ASSUMPTIONS				ADULT EXPOSURE ASSUMPTIONS					
	Reference Dose (RfD) mg/kg-day	MAX Conc in Water mg/L	Daily Intake (DI) mg/kg-day	Hazard Quotient DI/RfD	Does Intake Exceed RfD?	Percent of HI	Daily Intake (DI) mg/kg-day	Hazard Quotient DI/RfD	Does Intake Exceed RfD?	Percent of HI
Styrene	0.2	0.012	7.67E-04	3.84E-03	NO	0.7	3.29E-04	1.64E-03	NO	0.7
Arsenic	0.001	0.0026	1.66E-04	1.66E-01	NO	30.5	7.12E-05	7.12E-02	NO	30.5
Barium	0.07	0.248	1.59E-02	2.26E-01	NO	41.5	6.79E-03	9.71E-02	NO	41.5
Chromium (total) (a)	1	0.006	3.84E-04	3.84E-04	NO	0.1	1.64E-04	1.64E-04	NO	0.1
Copper	—	0.007	4.47E-04	—	—	0.0	1.92E-04	—	—	0.0
Nickel	0.02	0.018	1.15E-03	5.75E-02	NO	10.5	4.93E-04	2.47E-02	NO	10.5
Vanadium	0.007	0.01	6.39E-04	9.13E-02	NO	16.7	2.74E-04	3.91E-02	NO	16.7
Hazard Index (Sum of DI/RfD)				0.546	0.234					
EXPOSURE ASSUMPTIONS		CHILD		ADULT						
Ingestion rate (L/day)	1		2							
Body weight (kilograms)	15		70							
Exposure Frequency (days/year)	350		350							
Exposure Duration (years)	6		30							
Averaging Time (years)	6		30							
Conversion Factor 1 (year to day)	365		365							

(a) Chromium VI analyzed for but not detected at DL = 20 ug/L

TABLE C-15
 CARCINOGENIC HEALTH RISK EVALUATION FOR INHALATION OF SOIL GAS
 Texaco Fillmore Site

COMPOUND	Carcinogenic Weight of Evidence	Maximum Concentration(a) (ppb)	Maximum Location	CONC (b) ug/m3	Inhalation UR (c) (ug/m3)	Excess Cancer Risk (Conc X UR)
Benzene	A	140	AW-2	446	8.30E-06	3.70E-03
Ethylbenzene	D	87	AW-5		--	0.00E+00
4-Ethyltoluene		0.64	AW-4		--	0.00E+00
Toluene	D	3.4	AW-2		--	0.00E+00
1,1,1-Trichloroethane		0.18	AW-3		--	0.00E+00
1,2,4-Trimethylbenzene		4	AW-5		--	0.00E+00
1,3,5-Trimethylbenzene		1.5	AW-2		--	0.00E+00
Xylene	D	4.6	AW-2		--	0.00E+00
Total Excess Cancer Risk						3.70E-03

(a) Maximum detected concentration, from Table 2-9
 (b) (ppb X MW)/24.5
 (c) Inhalation Unit Risk, in ug/m3
 UR is applied directly to ambient air concentration to estimate risk

TABLE C-16
 NONCARCINOGENIC HEALTH RISK EVALUATION OF SOIL GAS INHALATION
 Texaco Fillmore Site

WORKER EXPOSURE ASSUMPTIONS						
Chemical	Reference Concentration (ug/m3)	Maximum(a) Concentration In Soil Gas (ug/m3)	Average Daily Intake (DI) (mg/m3)	Hazard Quotient DI/RfC	Does Intake Exceed RfC?	Percent of Hazard Index
Benzene	—	—	0.00E+00	—	—	0.0
Ethylbenzene	1000	377	8.61E+01	8.61E-02	NO	83.6
4-Ethyltoluene	—	—	0.00E+00	—	—	0.0
Toluene	2000	12.8	2.92E+00	1.46E-03	NO	1.4
1,1,1-Trichloroethane	1000	0.98	2.24E-01	2.24E-04	NO	0.2
1,2,4-Trimethylbenzene	—	—	0.00E+00	—	—	0.0
Xylenes, Total	300	19.9	4.54E+00	1.51E-02	NO	14.7
Hazard Index (Sum of DI/RfD)				0.103		
EXPOSURE ASSUMPTIONS		WORKER				
Exposure Time (hour/day)		8				
Exposure Frequency (days/year)		250				
Exposure Duration (years)		25				
Averaging Time (years)		25				
Conversion Factor 1 (day to hour)		24				
Conversion Factor 2 (year to day)		365				

(a) Concentration in ppmv from Table 2-9; (ppmv X MW)/24.5

Appendix D
SPECIES DATA BASE SEARCH RESULTS

- **Species Summary List**
- **Species Listings**

SPECIES SUMMARY LIST
Wildlife Habitat
Relationship (WHR) Data Base

SPECIES SUMMARY LIST* OF WILDLIFE
 POTENTIALLY OCCURRING IN THE VICINITY OF
 THE TEXACO FILLMORE SITE, VENTURA COUNTY, CALIFORNIA

SPECIES NAME	SCIENTIFIC NAME	SEASON	STATUS								
			1 F E	2 F T	3 C E	4 C T	5 C P	6 F S	7 B S	8 H	1 CA SC
AMPHIBIANS											
CALIFORNIA NEWT	<i>Taricha torosa</i>	Yearlong									
WESTERN SPADEFOOT	<i>Scaphiopus hammondi</i>	Yearlong									
WESTERN TOAD	<i>Bufo boreas</i>	Yearlong									
PACIFIC TREEFROG	<i>Hyla regilla</i>	Yearlong									
BULLFROG	<i>Rana catesbeiana</i>	Yearlong								8	
REPTILES											
WESTERN POND TURTLE	<i>Clemmys marmorata</i>	Yearlong									
WESTERN FENCE LIZARD	<i>Sceloporus occidentalis</i>	Yearlong									
SIDE-BLOTCHED LIZARD	<i>Uta stansburiana</i>	Yearlong									
COAST HORNED LIZARD	<i>Phrynosoma coronatum</i>	Yearlong									
WESTERN SKINK	<i>Eumeces skiltonianus</i>	Yearlong									
GILBERT'S SKINK	<i>Eumeces gilberti</i>	Yearlong									
WESTERN WHIPTAIL	<i>Cnemidophorus tigris</i>	Yearlong									
SOUTHERN ALLIGATOR LIZARD	<i>Gerrhonotus multicarinatus</i>	Yearlong									
RINGNECK SNAKE	<i>Diadophis punctatus</i>	Yearlong									
RACER	<i>Coluber constrictor</i>	Yearlong									
COACHWHIP	<i>Masticophis flagellum</i>	Yearlong									
WESTERN PATCH-NOSED SNAKE	<i>Salvadora hexalepis</i>	Yearlong									
GLOSSY SNAKE	<i>Arizona elegans</i>	Yearlong									
GOPHER SNAKE	<i>Pituophis melanoleucus</i>	Yearlong									
COMMON KINGSSNAKE	<i>Lampropeltis getulus</i>	Yearlong									
LONG-NOSED SNAKE	<i>Rhinocheilus lecontei</i>	Yearlong									
COMMON GARTER SNAKE	<i>Thamnophis sirtalis</i>	Yearlong									
WESTERN AQUATIC GARTER SNAKE	<i>Thamnophis couchi</i>	Yearlong									
WESTERN BLACK-HEADED SNAKE	<i>Tantilla planiceps</i>	Yearlong									
NIGHT SNAKE	<i>Hypsiglena torquata</i>	Yearlong									
WESTERN RATTLESNAKE	<i>Crotalus viridis</i>	Yearlong									
BIRDS											
GREAT BLUE HERON	<i>Ardea herodias</i>	Yearlong									
GREAT EGRET	<i>Casmerodius albus</i>	Yearlong									
CATTLE EGRET	<i>Bubulcus ibis</i>	Yearlong									
CANADA GOOSE	<i>Branta canadensis</i>	Winter								8	
MALLARD	<i>Anas platyrhynchos</i>	Yearlong								8	
CINNAMON TEAL	<i>Anas cyanoptera</i>	Yearlong								8	
GADWALL	<i>Anas strepera</i>	Yearlong								8	
TURKEY VULTURE	<i>Cathartes aura</i>	Yearlong									
BLACK-SHOULDERED KITE	<i>Elanus caeruleus</i>	Yearlong					5				
NORTHERN HARRIER	<i>Circus cyaneus</i>	Yearlong								1	
SHARP-SHINNED HAWK	<i>Accipiter striatus</i>	Yearlong								1	
COOPER'S HAWK	<i>Accipiter cooperii</i>	Yearlong								1	
RED-SHOULDERED HAWK	<i>Buteo lineatus</i>	Yearlong									
RED-TAILED HAWK	<i>Buteo jamaicensis</i>	Yearlong									
FERRUGINOUS HAWK	<i>Buteo regalis</i>	Winter								1	
ROUGH-LEGGED HAWK	<i>Buteo lagopus</i>	Winter									

**SPECIES SUMMARY LIST* OF WILDLIFE
POTENTIALLY OCCURRING IN THE VICINITY OF
THE TEXACO FILLMORE SITE, VENTURA COUNTY, CALIFORNIA**

SPECIES NAME	SCIENTIFIC NAME	SEASON	STATUS									
			1 F E	2 F T	3 C E	4 C T	5 C P	6 F S	7 B S	8 H	1 C A S C	
BLACK-TAILED HARE	<i>Lepus californicus</i>	Yearlong									8	
CALIFORNIA GROUND SQUIRREL	<i>Spermophilus beecheyi</i>	Yearlong										
BOTTA'S POCKET GOPHER	<i>Thomomys bottae</i>	Yearlong										
SAN JOAQUIN POCKET MOUSE	<i>Perognathus inornatus</i>	Yearlong										1
CALIFORNIA POCKET MOUSE	<i>Chaetodipus californicus</i>	Yearlong										
PACIFIC KANGAROO RAT	<i>Dipodomys agilis</i>	Yearlong										
WESTERN HARVEST MOUSE	<i>Reithrodontomys megalotis</i>	Yearlong										1
DEER MOUSE	<i>Peromyscus maniculatus</i>	Yearlong										1
BRUSH MOUSE	<i>Peromyscus boylii</i>	Yearlong										
PINYON MOUSE	<i>Peromyscus truei</i>	Yearlong										
CALIFORNIA VOLE	<i>Microtus californicus</i>	Yearlong										1
HOUSE MOUSE	<i>Mus musculus</i>	Yearlong										
COYOTE	<i>Canis latrans</i>	Yearlong									8	
RED FOX	<i>Vulpes vulpes</i>	Yearlong										
RINGTAIL	<i>Bassariscus astutus</i>	Yearlong					5					
RACCOON	<i>Procyon lotor</i>	Yearlong									8	
LONG-TAILED WEASEL	<i>Mustela frenata</i>	Yearlong									8	
BADGER	<i>Taxidea taxus</i>	Yearlong									8	1
WESTERN SPOTTED SKUNK	<i>Spilogale gracilis</i>	Yearlong									8	1
STRIPED SKUNK	<i>Mephitis mephitis</i>	Yearlong									8	
MOUNTAIN LION	<i>Felis concolor</i>	Yearlong									8	1
BOBCAT	<i>Felis rufus</i>	Yearlong									8	
MULE DEER	<i>Odocoileus hemionus</i>	Yearlong									8	
TOTAL SPECIES: 154												

Status Definitions:

- | | | |
|------------------------------|---------------------------------|-----------------------------------|
| 1. FE: Federally Endangered | 5. CP: California Protected | CalSC: California Special Concern |
| 2. FT: Federally Threatened | 6. FS: Forest Service Sensitive | |
| 3. CE: California Endangered | 7. BS: BLM Sensitive | |
| 4. CT: California Threatened | 8. H: Harvest | |

* Based On California Department Of Fish And Game Wildlife Habitat Relationship System Programmed By Irene Timossi For Pacific Gas And Electric Company. This list assumes basic food and water requirements are met.

Database Version: 08/08/89 Data Base Run: 11:20:58 06/20/91

SELECTION CRITERIA:

Locations: VENTURA-SAN GABRIEL HYDROLOGIC REGION--
VENTURA COUNTY-- SAUGUS LATILONG 34-35 by 118-119

Habitats:

1 ANNUAL GRASS	SHORT HERB	SPARSE	2-09%	(1S)
2 ANNUAL GRASS	SHORT HERB	OPEN	10-39%	(1P)
3 ANNUAL GRASS	SHORT HERB	MODRTE	40-59%	(1M)
4 ANNUAL GRASS	SHORT HERB	DENSE	60-100%	(1D)
5 ANNUAL GRASS	TALL HERB	SPARSE	2-09%	(2S)
6 ANNUAL GRASS	TALL HERB	OPEN	10-39%	(2P)
7 ANNUAL GRASS	TALL HERB	MODRTE	40-59%	(2M)
8 ANNUAL GRASS	TALL HERB	DENSE	60-100%	(2D)

**SPECIES LISTINGS
California Natural
Diversity Data Base**

** California Department of Fish and Game ***** Natural Diversity Data Base **

* GYMNOGYPS CALIFORNIANUS *
* California Condor *

* -----Status----- NDDB Element Ranks -----Other Lists----- *
* Federal: Endangered Global: GXC CDFG: *
* State: Endangered State: SC Audubon: *

* ---Habitat Associations--- CNPS RED Code: *
* General: REQUIRE VAST EXPANSES OF OPEN SAVANNAH, GRASSLANDS, AND *
* FOOTHILL CHAPARRAL IN MOUNTAIN RANGES OF MODERATE ALTITUDE. *
* Microhabitat: DEEP CANYONS CONTAINING CLEFTS IN THE ROCKY WALLS PROVIDE *
* NESTING SITES. FORAGES UP TO 100 MILES FROM ROOST/NEST. *

*** Element ID: ABNKA03010 *****

Occurrence Number: 1 --Dates Last Seen--
Quality: Unknown Element: 1976/12/21
Type: Natural/Native occurrence Site: 1976/12/21
Presence: Presumed Extant
Trend: Unknown

Main Info Source: WILBUR, S. 1981 (PERS)

Quad Summary: Santa Paula Peak, Fillmore, San Guillermo, Lockwood Valley,
Alamo Mountain, Black Mtn., Piru, Additional Quads NOT Listed
County(ies): Los Angeles, Ventura

Location: SESPE-PIRU CONDOR AREA.

Lat/Long: 34d 34m 16s / 118d 57m 56s Township: 06N
UTM: Zone-11 N3827070 E319674 Range: 20W
Mapping Precision: SPECIFIC (0 Mile) Section: 27
Symbol Type: POLYGON Quarter: --
Group Number: 00018 More Information? Y Meridian: S
Map Index Number: 00018 More Map Detail? Y Elevation: 2900 ft

Threat Summary: Unknown

Comments: General Comments: YEAR-LONG USE; NESTING AND ROOSTING.
Owner/Manager: USFS, PVT

** California Department of Fish and Game ***** Natural Diversity Data Base **
 *
 * CATOSTOMUS SANTAANAE *
 * Santa Ana Sucker *
 *
 * -----Status----- NDDB Element Ranks -----Other Lists----- *
 * Federal: None Global: G1 CDFG: Special Concern *
 * State: None State: S1 Audubon: *
 * CNPS List: *
 * ---Habitat Associations--- CNPS RED Code: *
 * General: ENDEMIC TO LOS ANGELES BASIN SOUTH COASTAL STREAMS. *
 * Microhabitat: HABITAT GENERALISTS, BUT PREFER SAND-RUBBLE-BOULDER BOTTOMS, *
 * CLEAR WATER, & ALGAE. *
 *** Element ID: AFCJC02190 *****

Occurrence Number: 9 --Dates Last Seen--
 Quality: Unknown Element: 1983/XX/XX
 Type: Natural/Native occurrence Site: 1983/XX/XX
 Presence: Presumed Extant
 Trend: Unknown
 Main Info Source: WELLS & DIANA, 1975 (LIT)

Quad Summary: Santa Paula, Moorpark, Fillmore, Piru, Val Verde, Newhall
 County(ies): Los Angeles, Ventura

Location: SANTA CLARA RIVER DRAINAGE FROM SAN FRANCISQUITO CYN TO VICINITY
 OF SANTA PAULA.

Lat/Long: 34d 22m 10s / 118d 59m 07s	Township: 04N
UTM: Zone-11 N3804717 E317423	Range: 18W
Mapping Precision: SPECIFIC (0 Mile)	Section: --
Symbol Type: POLYGON	Quarter: --
Group Number: 00497	Meridian: S
Map Index Number: 00497	Elevation: 1055 ft
More Information? N	
More Map Detail? N	

Threat Summary: Unknown

Comments: Ecological Comments: AT STA 4, 14 WERE TAKEN. AT STA 5, 3
 TAKEN. HYBRIDIZES W/ OWENS SUCKER IN LOWER PARTS OF DRAINAGE (S
 OF FILMORE). 18 TAKEN FROM SESPE CR, 1975. INCL S HALF PIRU
 CREEK. Owner/Manager: PVT

** California Department of Fish and Game ***** Natural Diversity Data Base **
 *
 * CLEMMYS MARMORATA PALLIDA *
 * Southwestern Pond Turtle *
 *
 * -----Status----- NDDB Element Ranks -----Other Lists----- *
 * Federal: Category 2 Global: G2G3 CDFG: Special Concern *
 * State: None State: S2S3 Audubon: *
 * CNPS List: *
 * ---Habitat Associations--- CNPS RED Code: *
 * General: INHABITS PERMANENT OR NEARLY PERMANENT BODIES OF WATER IN *
 * MANY HABITAT TYPES; BELOW 6000 FT ELEV. *
 * Microhabitat: REQUIRE BASKING SITES SUCH AS PARTIALLY SUBMERGED LOGS, *
 * VEGETATION MATS, OR OPEN MUD BANKS. *
 *** Element ID: ARAAD02032 *****

Occurrence Number: 24 --Dates Last Seen--
 Quality: Unknown Element: 1966/07/08
 Type: Natural/Native occurrence Site: 1966/07/08
 Presence: Presumed Extant
 Trend: Unknown
 Main Info Source: BRODE, J. ND (PERS)

Quad Summary: Fillmore, Devils Heart Peak
 County(ies): Ventura
 * SENSITIVE *

Location: Locational Information Supressed - Call Local California
 Department of Fish and Game Office for Details

Lat/Long:	Township:
UTM:	Range:
Mapping Precision:	Section:
Symbol Type:	Quarter:
Group Number:	Meridian:
Map Index Number:	Elevation:
	More Information?
	More Map Detail?

Threat Summary: Unknown

Comments: Locational Information Supressed - Call Local California
 Department of Fish and Game Office for Details

** California Department of Fish and Game ***** Natural Diversity Data Base **
 *
 * CLEMMYS MARMORATA PALLIDA *
 * Southwestern Pond Turtle *
 *
 * -----Status----- NDDB Element Ranks -----Other Lists----- *
 * Federal: Category 2 Global: G2G3 CDFG: Special Concern *
 * State: None State: S2S3 Audubon: *
 * CNPS List: *
 * ---Habitat Associations--- CNPS RED Code: *
 * General: INHABITS PERMANENT OR NEARLY PERMANENT BODIES OF WATER IN *
 * MANY HABITAT TYPES; BELOW 6000 FT ELEV. *
 * Microhabitat: REQUIRE BASKING SITES SUCH AS PARTIALLY SUBMERGED LOGS, *
 * VEGETATION MATS, OR OPEN MUD BANKS. *
 *** Element ID: ARAAD02032 *****

Occurrence Number: 25 --Dates Last Seen--
 Quality: Unknown Element: 1962/04/13
 Type: Natural/Native occurrence Site: 1962/04/13
 Presence: Presumed Extant
 Trend: Unknown
 Main Info Source: BRODE, J. ND (PERS)

Quad Summary: Fillmore
 County(ies): Ventura
 * SENSITIVE *
 Location: Locational Information Supressed - Call Local California
 Department of Fish and Game Office for Details

Lat/Long:		Township:
UTM:		Range:
Mapping Precision:		Section:
Symbol Type:		Quarter:
Group Number:	More Information?	Meridian:
Map Index Number:	More Map Detail?	Elevation:

Threat Summary: Unknown

Comments: Locational Information Supressed - Call Local California
 Department of Fish and Game Office for Details

** California Department of Fish and Game ***** Natural Diversity Data Base **

* CLEMMYS MARMORATA PALLIDA *
* Southwestern Pond Turtle *

* -----Status----- NDDB Element Ranks -----Other Lists----- *
* Federal: Category 2 Global: G2G3 CDFG: Special Concern *
* State: None State: S2S3 Audubon: *

* ---Habitat Associations--- CNPS RED Code: *
* General: INHABITS PERMANENT OR NEARLY PERMANENT BODIES OF WATER IN *
* MANY HABITAT TYPES; BELOW 6000 FT ELEV. *
* Microhabitat: REQUIRE BASKING SITES SUCH AS PARTIALLY SUBMERGED LOGS, *
* VEGETATION MATS, OR OPEN MUD BANKS. *

*** Element ID: ARAAD02032 *****

Occurrence Number: 26 --Dates Last Seen--
Quality: Unknown Element: 1965/10/XX
Type: Natural/Native occurrence Site: 1965/10/XX
Presence: Presumed Extant
Trend: Unknown
Main Info Source: BRODE, J. ND (PERS)

Quad Summary: Fillmore
County(ies): Ventura
* SENSITIVE *
Location: Locational Information Supressed - Call Local California
Department of Fish and Game Office for Details

Lat/Long: Township:
UTM: Range:
Mapping Precision: Section:
Symbol Type: Quarter:
Group Number: More Information? Meridian:
Map Index Number: More Map Detail? Elevation:

Threat Summary: Unknown
Comments: Locational Information Supressed - Call Local California
Department of Fish and Game Office for Details

** California Department of Fish and Game ***** Natural Diversity Data Base **
 *
 * CLEMMYS MARMORATA PALLIDA *
 * Southwestern Pond Turtle *
 *
 * -----Status----- NDDB Element Ranks -----Other Lists----- *
 * Federal: Category 2 Global: G2G3 CDFG: Special Concern *
 * State: None State: S2S3 Audubon: *
 * CNPS List: *
 * ---Habitat Associations--- CNPS RED Code: *
 * General: INHABITS PERMANENT OR NEARLY PERMANENT BODIES OF WATER IN *
 * MANY HABITAT TYPES; BELOW 6000 FT ELEV. *
 * Microhabitat: REQUIRE BASKING SITES SUCH AS PARTIALLY SUBMERGED LOGS, *
 * VEGETATION MATS, OR OPEN MUD BANKS. *
 *** Element ID: ARAAD02032 *****

Occurrence Number: 104 --Dates Last Seen--
 Quality: Unknown Element: 1977/09/XX
 Type: Natural/Native occurrence Site: 1977/09/XX
 Presence: Presumed Extant
 Trend: Unknown
 Main Info Source: HOLLAND, D. 1988 (PERS)

Quad Summary: Moorpark, Fillmore
 County(ies): Ventura
 * SENSITIVE *
 Location: Locational Information Supressed - Call Local California
 Department of Fish and Game Office for Details

Lat/Long:	Township:
UTM:	Range:
Mapping Precision:	Section:
Symbol Type:	Quarter:
Group Number:	Meridian:
Map Index Number:	Elevation:
	More Information?
	More Map Detail?

Threat Summary: Unknown
 Comments: Locational Information Supressed - Call Local California
 Department of Fish and Game Office for Details

** California Department of Fish and Game ***** Natural Diversity Data Base **
 *
 * SOUTHERN COAST LIVE OAK RIPARIAN FOREST *
 * No Common Name *
 *
 * -----Status----- NDDB Element Ranks -----Other Lists----- *
 * Federal: None Global: G4 CDFG: *
 * State: None State: S4 Audubon: *
 * CNPS List: *
 * ---Habitat Associations--- CNPS RED Code: *
 * General: *
 * Microhabitat: *
 *** Element ID: CTT61310CA *****

Occurrence Number: 53 --Dates Last Seen--
 Quality: Unknown Element: 1986/12/10
 Type: Natural/Native occurrence Site: 1986/12/10
 Presence: Presumed Extant
 Trend: Unknown
 Main Info Source: HOLLAND & ROYE, 1987 (MAP)

Quad Summary: Fillmore
 County(ies): Ventura

Location: CREEK TO EAST OF GOODENOUGH RD ABOUT 2 MI NORTH OF FILLMORE UNION
 HIGH SCHOOL. INTERPRETED FROM 1986 AERIAL PHOTOS.

Lat/Long: 34d 25m 30s / 118d 54m 28s	Township: 04N
UTM: Zone-11 N3810757 E324683	Range: 19W
Mapping Precision: SPECIFIC (0 Mile)	Section: 18
Symbol Type: POLYGON	Quarter: S
Group Number: 00186 More Information? N	Meridian: S
Map Index Number: 00186 More Map Detail? Y	Elevation: 1000 ft

Threat Summary: Unknown

Comments: Ecological Comments: VEGETATION COMPOSITION UNKNOWN.
 Owner/Manager: UNKNOWN

** California Department of Fish and Game ***** Natural Diversity Data Base **
 *
 * SOUTHERN COAST LIVE OAK RIPARIAN FOREST *
 * No Common Name *
 *
 * -----Status----- NDDB Element Ranks -----Other Lists----- *
 * Federal: None Global: G4 CDFG: *
 * State: None State: S4 Audubon: *
 * CNPS List: *
 * ---Habitat Associations--- CNPS RED Code: *
 * General: *
 * Microhabitat: *
 *** Element ID: CTT61310CA *****

Occurrence Number: 54 --Dates Last Seen--
 Quality: Unknown Element: 1986/12/10
 Type: Natural/Native occurrence Site: 1986/12/10
 Presence: Presumed Extant
 Trend: Unknown
 Main Info Source: HOLLAND & ROYE, 1987 (MAP)

Quad Summary: Fillmore
 County(ies): Ventura

Location: CREEK TO WEST OF GRAND AVENUE, ABOUT 0.8 AIR MI NNE OF BROWNSTONE
 RESERVOIR. INTERPRETED FROM 1986 AERIAL PHOTOS.

Lat/Long: 34d 25m 38s / 118d 56m 40s	Township: 04N
UTM: Zone-11 N3811071 E321310	Range: 20W
Mapping Precision: SPECIFIC (0 Mile)	Section: 14
Symbol Type: POLYGON	Quarter: E
Group Number: 00122 More Information? N	Meridian: S
Map Index Number: 00122 More Map Detail? Y	Elevation: 640 ft

Threat Summary: Unknown

Comments: Ecological Comments: VEGETATION COMPOSITION UNKNOWN.
 Owner/Manager: UNKNOWN

** California Department of Fish and Game ***** Natural Diversity Data Base **
 *
 * SOUTHERN COTTONWOOD WILLOW RIPARIAN FOREST *
 * No Common Name *
 *
 * -----Status----- NDDB Element Ranks -----Other Lists----- *
 * Federal: None Global: G3 CDFG: *
 * State: None State: S3 Audubon: *
 * CNPS List: *
 * ---Habitat Associations--- CNPS RED Code: *
 * General: *
 * Microhabitat: *
 *** Element ID: CTT61330CA *****

Occurrence Number: 28 --Dates Last Seen--
 Quality: Unknown Element: 1976/06/XX
 Type: Natural/Native occurrence Site: 1976/06/XX
 Presence: Presumed Extant
 Trend: Unknown
 Main Info Source: WIESLANDER, 1934 (MAP)

Quad Summary: Fillmore
 County(ies): Ventura

Location: SESPE CR FROM ABOUT 0.5 MI N OF TAR CR D/S TO ABOUT 0.8 MI S OF
 DEVILS GATE. MAPPED BY NWI FROM INTERPRETATION OF 1976 AERIAL
 PHOTOS.

Lat/Long: 34d 28m 49s / 118d 56m 18s	Township: 05N
UTM: Zone-11 N3816932 E321988	Range: 20W
Mapping Precision: SPECIFIC (0 Mile)	Section: --
Symbol Type: POLYGON	Quarter: --
Group Number: 00115 More Information? N	Meridian: S
Map Index Number: 00115 More Map Detail? Y	Elevation: 880 ft

Threat Summary: Unknown

Comments: Ecological Comments: CLOSED CANOPY FOREST OF QUERCUS AGRIFOLIA,
 PLANTUS RACEMOSA, ALNUS RHOMBIFOLIA , ACER MACROPHYLLUM &
 POPULUS TRICHOCARPA ACCORDING TO WIESLANDER SURVEY.
 Owner/Manager: UNKNOWN

** California Department of Fish and Game ***** Natural Diversity Data Base **
 *
 * SOUTHERN MIXED RIPARIAN FOREST *
 * No Common Name *
 *
 * -----Status----- NDDB Element Ranks -----Other Lists----- *
 * Federal: None Global: CDFG: *
 * State: None State: Audubon: *
 * CNPS List: *
 * ---Habitat Associations--- CNPS RED Code: *
 * General: *
 * Microhabitat: *
 *** Element ID: CTT61340CA *****

Occurrence Number: 5 --Dates Last Seen--
 Quality: Unknown Element: 1987/11/19
 Type: Natural/Native occurrence Site: 1987/11/19
 Presence: Presumed Extant
 Trend: Unknown
 Main Info Source: WIESLANDER, 1934 (MAP)

Quad Summary: Piru, Fillmore
 County(ies): Ventura

Location: POLE CREEK, FROM NEAR FILLMORE U/S FOR SEVERAL MILES. LOWER REACH
 MAPPED FROM 1986 AERIAL PHOTOS; UPPER FROM INTERP OF 1976 PHOTOS.

Lat/Long: 34d 25m 49s / 118d 53m 05s	Township: 04N
UTM: Zone-11 N3811281 E326817	Range: 19W
Mapping Precision: SPECIFIC (0 Mile)	Section: 17
Symbol Type: POLYGON	Quarter: E
Group Number: 17335 More Information? Y	Meridian: S
Map Index Number: 17335 More Map Detail? Y	Elevation: 760 ft

Threat Summary: Unknown

Comments: Ecological Comments: MAPPED BY WIESLANDER SURVEY (1935) AS
 CLOSED CANOPY QUERCUS AGRIFOLIA, POPULUS FREMONTII, PLANTUS
 RACEMOSA, SALIX SPP, JUGLANS CALIFORNICA AND ACER MACROPHYLLUM.
 VEG COMPOSITION VARIES IN DIFFERENT REACHES OF THE STREAM.
 Owner/Manager: UNKNOWN

** California Department of Fish and Game ***** Natural Diversity Data Base **
 *
 * SOUTHERN SYCAMORE ALDER RIPARIAN WOODLAND *
 * No Common Name *
 *
 * -----Status----- NDDB Element Ranks -----Other Lists----- *
 * Federal: None Global: G4 CDFG: *
 * State: None State: S4 Audubon: *
 * CNPS List: *
 * ---Habitat Associations--- CNPS RED Code: *
 * General: *
 * Microhabitat: *
 *** Element ID: CTT62400CA *****

Occurrence Number: 24 --Dates Last Seen--
 Quality: Unknown Element: 1986/12/XX
 Type: Natural/Native occurrence Site: 1986/12/XX
 Presence: Presumed Extant
 Trend: Unknown
 Main Info Source: WIESLANDER, 1934 (MAP)

Quad Summary: Fillmore
 County(ies): Ventura

Location: CREEK TO W OF BOULDER CR, WNW OF SESPE VILLAGE. EXTENT MAPPED
 ACCORDING TO 1987 AIR PHOTOS.

Lat/Long: 34d 24m 27s / 118d 59m 17s	Township: 04N
UTM: Zone-11 N3808958 E317271	Range: 20W
Mapping Precision: SPECIFIC (0 Mile)	Section: 20
Symbol Type: POLYGON	Quarter: SE
Group Number: 00017	Meridian: S
Map Index Number: 00017	Elevation: 1280 ft
More Information? N	
More Map Detail? Y	

Threat Summary: Unknown

Comments: Ecological Comments: QUERCUS AGRIFOLIA AND PLANTUS RACEMOSA
 FORMING CLOSED CANOPY ACCORDING TO WIESLANDER SURVEY.
 Owner/Manager: UNKNOWN

** California Department of Fish and Game ***** Natural Diversity Data Base **
 *
 * SOUTHERN SYCAMORE ALDER RIPARIAN WOODLAND *
 * No Common Name *
 *
 * -----Status----- NDDB Element Ranks -----Other Lists----- *
 * Federal: None Global: G4 CDFG: *
 * State: None State: S4 Audubon: *
 * CNPS List: *
 * ---Habitat Associations--- CNPS RED Code: *
 * General: *
 * Microhabitat: *
 *** Element ID: CTT62400CA *****

Occurrence Number: 25 --Dates Last Seen--
 Quality: Unknown Element: 1986/12/10
 Type: Natural/Native occurrence Site: 1986/12/10
 Presence: Presumed Extant
 Trend: Unknown
 Main Info Source: WIESLANDER, 1934 (MAP)

Quad Summary: Fillmore
 County(ies): Ventura

Location: BOULDER CREEK, FROM ABOUT 1 MI N OF SYCAMORE RD U/S FOR ABOUT 2
 MI. NORTH PORTION OF MAPPED EXTENT FROM INTERPRETATION OF 1976
 AERIALS BY NWI, SOUTH PART FROM 1986 AERIALS. FORMERLY ALSO
 EXTENDED UP FORK TO NW, INTO SECTION 17.

Lat/Long: 34d 25m 03s / 118d 58m 56s	Township: 04N
UTM: Zone-11 N3810063 E317829	Range: 20W
Mapping Precision: SPECIFIC (0 Mile)	Section: 21
Symbol Type: POLYGON	Quarter: --
Group Number: 00030 More Information? N	Meridian: S
Map Index Number: 00030 More Map Detail? Y	Elevation: 1480 ft

Threat Summary: Unknown

Comments: Ecological Comments: QUERCUS AGRIFOLIA & PLANTUS RACEMOSA
 FORMING CLOSED CANOPY ACCORDING TO WIESLANDER SURVEY.
 Owner/Manager: UNKNOWN

** California Department of Fish and Game ***** Natural Diversity Data Base **
 *
 * SOUTHERN SYCAMORE ALDER RIPARIAN WOODLAND *
 * No Common Name *
 *
 * -----Status----- NDDB Element Ranks -----Other Lists----- *
 * Federal: None Global: G4 CDFG: *
 * State: None State: S4 Audubon: *
 * CNPS List: *
 * ---Habitat Associations--- CNPS RED Code: *
 * General: *
 * Microhabitat: *
 *** Element ID: CTT62400CA *****

Occurrence Number: 26 --Dates Last Seen--
 Quality: Unknown Element: 1986/12/10
 Type: Natural/Native occurrence Site: 1986/12/10
 Presence: Presumed Extant
 Trend: Unknown
 Main Info Source: WIESLANDER, 1934 (MAP)

Quad Summary: Fillmore
 County(ies): Ventura

Location: SNOW CANYON, ABOUT 1/2 MI N OF SYCAMORE RD, EXTENDING U/S FOR
 ABOUT 1 MI. U/S EXTENT MAPPED FROM NWI INTERPRETATION OF 1976
 AERIALS; D/S FROM 1986 AERIALS, ONCE EXTENDED FARTHER D/S.

Lat/Long: 34d 25m 33s / 118d 57m 25s	Township: 04N
UTM: Zone-11 N3810931 E320147	Range: 20W
Mapping Precision: SPECIFIC (0 Mile)	Section: 15
Symbol Type: POLYGON	Quarter: E
Group Number: 00078 More Information? N	Meridian: S
Map Index Number: 00078 More Map Detail? Y	Elevation: 1400 ft

Threat Summary: Unknown

Comments: Ecological Comments: LOWER PORTION QUERCUS AGRIFOLIA & PLANTUS
 RACEMOSA FORMING CLOSED CANOPY ACCORDING TO WIESLANDER SURVEY.
 UPPER PART OPEN STANDS OF Q. AGRIFOLIA, JUGLANS CALIFORNICA,
 SALVI LEUCOPHYLLA, ARTEMESIA. Owner/Manager: UNKNOWN

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** California Department of Fish and Game ***** Natural Diversity Data Base **
*
* SOUTHERN SYCAMORE ALDER RIPARIAN WOODLAND
* No Common Name
*
* -----Status----- NDDB Element Ranks -----Other Lists-----
* Federal: None Global: G4 CDFG:
* State: None State: S4 Audubon:
* CNPS List:
* ---Habitat Associations--- CNPS RED Code:
* General:
* Microhabitat:
*** Element ID: CTT62400CA *****

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Occurrence Number: 38 --Dates Last Seen--
Quality: Unknown Element: 1976/06/XX
Type: Natural/Native occurrence Site: 1976/06/XX
Presence: Presumed Extant
Trend: Unknown
Main Info Source: WIESLANDER, 1934 (MAP)

```

Quad Summary: Fillmore
County(ies): Ventura

Location: TAR CR & MAPLE CR, EXTENDING FROM CONFL W/ SESPE CR U/S FOR OVER 3.5 MI. UPPER TAR CREEK ALSO HAS POPULUS FREMONTII PER WIESLANDER. EXTENT MAPPED FROM NWI INTERPRETATION OF 1976 AERIAL PHOTOS.

```

Lat/Long: 34d 29m 10s / 118d 53m 55s Township: 05N
UTM: Zone-11 N3817526 E325645 Range: 20W
Mapping Precision: SPECIFIC (0 Mile) Section: --
Symbol Type: POLYGON Quarter: --
Group Number: 00172 More Information? N Meridian: S
Map Index Number: 00172 More Map Detail? Y Elevation: 2000 ft

```

Threat Summary: Unknown

Comments: Ecological Comments: QUERCUS AGRIFOLIA, ALNUS RHOMBIFOLIA, ACER MACROPHYLLUM & PLANTUS RACEMOSA FORMING CLOSED CANOPY ACCORDING TO WIESLANDER SURVEY. General Comments: TAR CREEK IS NATIONAL FOREST BNDRY. Owner/Manager: USFS-LOS PADRES NF & UNKNOWN

** California Department of Fish and Game ***** Natural Diversity Data Base **
 *
 * SOUTHERN SYCAMORE ALDER RIPARIAN WOODLAND *
 * No Common Name *
 *
 * -----Status----- NDDB Element Ranks -----Other Lists----- *
 * Federal: None Global: G4 CDFG: *
 * State: None State: S4 Audubon: *
 * CNPS List: *
 * ---Habitat Associations--- CNPS RED Code: *
 * General: *
 * Microhabitat: *
 *** Element ID: CTT62400CA *****

Occurrence Number: 64 --Dates Last Seen--
 Quality: Unknown Element: 1934/XX/XX
 Type: Natural/Native occurrence Site: 1934/XX/XX
 Presence: Presumed Extant
 Trend: Unknown
 Main Info Source: WIESLANDER, 1934 (MAP)

Quad Summary: Fillmore
 County(ies): Ventura

Location: INTERMITTENT STREAM WEST OF SNOW CANYON, NW OF FILLMORE. RECENT
 AIR PHOTOS UNAVAILABLE.

Lat/Long: 34d 25m 32s / 118d 58m 18s	Township: 04N
UTM: Zone-11 N3810914 E318803	Range: 20W
Mapping Precision: SPECIFIC (0 Mile)	Section: 15
Symbol Type: POLYGON	Quarter: SW
Group Number: 00050 More Information? N	Meridian: S
Map Index Number: 00050 More Map Detail? Y	Elevation: 2200 ft

Threat Summary: Unknown

Comments: Ecological Comments: CLOSED CANOPY QUERCUS AGRIFOLIA & PLANTUS
 RACEMOSA ACCORDING TO WIESLANDER SURVEY. A Owner/Manager:
 USFS-LOS PADRES NF

** California Department of Fish and Game ***** Natural Diversity Data Base **
 *
 * SOUTHERN RIPARIAN SCRUB *
 * No Common Name *
 *
 * -----Status----- NDDB Element Ranks -----Other Lists----- *
 * Federal: None Global: G3 CDFG: *
 * State: None State: S3 Audubon: *
 * CNPS List: *
 * ---Habitat Associations--- CNPS RED Code: *
 * General: *
 * Microhabitat: *
 *** Element ID: CTT63300CA *****

Occurrence Number: 25 --Dates Last Seen--
 Quality: Unknown Element: 1986/12/10
 Type: Natural/Native occurrence Site: 1986/12/10
 Presence: Presumed Extant
 Trend: Unknown
 Main Info Source: WIESLANDER, 1934 (MAP)

Quad Summary: Moorpark, Santa Paula, Saticoy, Fillmore
 County(ies): Ventura

Location: SANTA CLARA RIVER BED FROM NEAR CONFL CALUMET CYN D/S TO VICINITY
 OF SATICOY. SEEN IN 1986 AERIALS.

Lat/Long: 34d 23m 04s / 118d 56m 43s	Township: 04N
UTM: Zone-11 N3806303 E321155	Range: 20W
Mapping Precision: SPECIFIC (0 Mile)	Section: 35
Symbol Type: POLYGON	Quarter: --
Group Number: 00106 More Information? N	Meridian: S
Map Index Number: 00106 More Map Detail? Y	Elevation: 360 ft

Threat Summary: Unknown

Comments: Ecological Comments: MAPPED BY WIESLANDER SURVEY AS SCRUB
 W/DOMINANTS BACCHARIS VIMINEA, NICTOCIA GLAUCA, LEPIDOSPARTUM
 SQUAMATUM, ERIOGONUM FASCICULATUM, CORETHROGYNE FILAGINIFOLIA,
 GRASSES AND WILLOWS. DOMINANCE CHANGES ALONG STREAM COURSE.
 Owner/Manager: UNKNOWN

** California Department of Fish and Game ***** Natural Diversity Data Base **
 *
 * CALIFORNIA WALNUT WOODLAND *
 * No Common Name *
 *
 * -----Status----- NDDB Element Ranks -----Other Lists----- *
 * Federal: None Global: G2 CDFG: *
 * State: None State: S2.1 Audubon: *
 * CNPS List: *
 * ---Habitat Associations--- CNPS RED Code: *
 * General: *
 * Microhabitat: *
 *** Element ID: CTT71210CA *****

Occurrence Number: 32 --Dates Last Seen--
 Quality: Unknown Element: 1987/XX/XX
 Type: Natural/Native occurrence Site: 1987/XX/XX
 Presence: Presumed Extant
 Trend: Unknown
 Main Info Source: WIESLANDER, 1934 (MAP)

Quad Summary: Fillmore
 County(ies): Ventura

Location: EAST OF GOODENOUGH RD, FROM JUST NORTH OF FILLMORE TO SOUTH OF
 SESPE CR.

Lat/Long: 34d 26m 03s / 118d 54m 44s	Township: 04N
UTM: Zone-11 N3811776 E324277	Range: 19W
Mapping Precision: SPECIFIC (0 Mile)	Section: 18
Symbol Type: POLYGON	Quarter: --
Group Number: 00179 More Information? N	Meridian: S
Map Index Number: 00179 More Map Detail? Y	Elevation: 1000 ft

Threat Summary: Unknown

Comments: Ecological Comments: MAPPED BY WIESLANDER SURVEY AS FOUR STANDS
 OF OPEN JUGLANS CALIFORNICA AND QUERCUS AGRIFOLIA OVER SALVIA
 LEUCOPHYLLA AND ARTEMESIA CALIFORNICA W/DOMINANCE BY THE TREE
 SPP VARYING AMOUNG STANDS. Owner/Manager: UNKNOWN

** California Department of Fish and Game ***** Natural Diversity Data Base **
 *
 * CALIFORNIA WALNUT WOODLAND *
 * No Common Name *
 *
 * -----Status----- NDDB Element Ranks -----Other Lists----- *
 * Federal: None Global: G2 CDFG: *
 * State: None State: S2.1 Audubon: *
 * CNPS List: *
 * ---Habitat Associations--- CNPS RED Code: *
 * General: *
 * Microhabitat: *
 *** Element ID: CTT71210CA *****

Occurrence Number: 33 --Dates Last Seen--
 Quality: Unknown Element: 1987/01/XX
 Type: Natural/Native occurrence Site: 1987/01/XX
 Presence: Presumed Extant
 Trend: Unknown
 Main Info Source: WIESLANDER, 1934 (MAP)

Quad Summary: Fillmore, Piru
 County(ies): Ventura

Location: SLOPES ABOVE POLE CR EAST OF FILLMORE ABOUT 1 MI & SMALL PATCHES
 NORTH FOR 1 MI. PORTIONS SEEN IN 1987 AERIALS, OTHRE PARTS
 OUTSIDE COVERAGE.

Lat/Long: 34d 25m 28s / 118d 52m 58s	Township: 04N
UTM: Zone-11 N3810651 E326972	Range: 19W
Mapping Precision: SPECIFIC (0 Mile)	Section: 21
Symbol Type: POLYGON	Quarter: W
Group Number: 00240	Meridian: S
Map Index Number: 00240	Elevation: 1000 ft
	More Information? N
	More Map Detail? Y

Threat Summary: Unknown

Comments: Ecological Comments: MAPPED BY WIESLANDER SURVEY AS JUGLANS
 CALIFORNICA AND QUERCUS AGRIFOLIA OVER SALVIA LEUCOPHYLLA AND
 ARTEMESIA CALIFORNICA. Owner/Manager: UNKNOWN

Other Elements to Look for on FILLMORE Quad

COCYZUS AMERICANUS OCCIDENTALIS ABNRB02022
WESTERN YELLOW BILLED CUCKOO 13
Federal Staus: Category 3B Global Rank: G5T2T3
State Status.: Endangered State Rank: S1
Habitat Associations-----
General.: RIPARIAN FOREST NESTER, ALONG THE BROAD, LOWER
FLOOD-BOTTOMS OF LARGER RIVER SYSTEMS.
Micro...: NESTS IN RIPARIAN JUNGLES OF WILLOW, OFTEN MIXED WITH
COTTONWOODS, W/ LOWER STORY OF BLACKBERRY, NETTLES, OR
WILD GRAPE.
Location...: SANTA CLARA RIVER AT SANTA PAULA.
Source....: GAINES, D. 1977 (LIT)
Last Seen.: 1904-06-XX

RIPARIA RIPARIA ABPAU08010
BANK SWALLOW 1
Federal Staus: None Global Rank: G5
State Status.: Threatened State Rank: S2S3
Habitat Associations-----
General.: COLONIAL NESTER; NESTS PRIMARILY IN RIPARIAN AND OTHER
LOWLAND HABITATS WEST OF THE DESERT.
Micro...: REQUIRES VERTICAL BANKS/CLIFFS WITH FINE-TEXTURED/SANDY
SOILS NEAR STREAMS, RIVERS, LAKES, OCEAN TO DIG NESTING
HOLE.
Location...: SIMI
Source....: APPLETON, J.S. 1897 (MUS)
Last Seen.: 1897-05-15