

January 24, 2005

Alameda County Health Care Services Agency
Department of Environmental Health, Hazardous Materials Division
Local Oversight Program
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502

Subject: Fourth Quarter 2004 Groundwater Monitoring and Annual Summary Report
Redwood Regional Park Service Yard Site, Oakland, California
Alameda County Health Case No. 4145

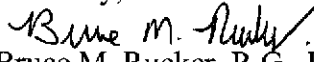
To Whom It May Concern:


The attached Stellar Environmental Solutions, Inc. (SES) report is for the underground fuel storage tank (UFST) site at the Redwood Regional Park Service Yard, located at 7867 Redwood Road, Oakland, California. This project is being conducted for the East Bay Regional Park District, and follows previous site investigation and remediation activities associated with former leaking UFSTs, conducted since 1993. The key regulatory agencies for this investigation are the Alameda County Health Care Services Agency, the Regional Water Quality Control Board, and the California Department of Fish and Game.

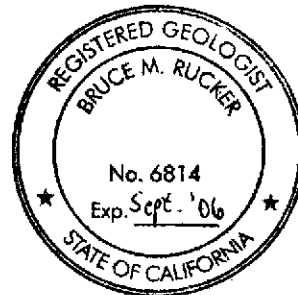
This report summarizes activities conducted from October through December 2004, including groundwater monitoring and sampling of site wells and surface water sampling. This report also presents an evaluation of hydrochemical trends over the year of monitoring, including an evaluation of the plume extent and stability. In our professional opinion, continued groundwater monitoring is warranted to evaluate plume stability over time. It is also our opinion that the bioventing system proposed in our October 2004 Bioventing Pilot Test Results Report be implemented.

If you have any questions regarding this report, please contact Mr. Neal Fujita of the East Bay Regional Park District, or contact us directly at (510) 644-3123.

Sincerely,


Bruce M. Rucker, R.G., R.E.A.
Project Manager


Richard S. Makdisi, R.G., R.E.A.
Principal



cc: Carl Wilcox, California Department of Fish and Game; Roger Brewer, California Regional Water Quality Control Board;
Neal Fujita, East Bay Regional Park District

**FOURTH QUARTER 2004 GROUNDWATER
MONITORING AND ANNUAL SUMMARY
REPORT**

**REDWOOD REGIONAL PARK
SERVICE YARD
OAKLAND, CALIFORNIA**

Prepared for:

**EAST BAY REGIONAL PARK DISTRICT
OAKLAND, CALIFORNIA**

Prepared by:

**STELLAR ENVIRONMENTAL SOLUTIONS, INC.
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January 24, 2005

Project No. 2004-02

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1.0 INTRODUCTION

PROJECT BACKGROUND

The subject property is the East Bay Regional Park District (EBRPD) Redwood Regional Park Service Yard located at 7867 Redwood Road in Oakland, Alameda County, California. The site has undergone site investigations and remediation since 1993 to address subsurface contamination caused by leakage from one or both of two former underground fuel storage tanks (UFSTs) that contained gasoline and diesel fuel. The Alameda County Health Care Services Agency, Environmental Health Department (Alameda County Health) has provided regulatory oversight of the investigation since its inception. Other regulatory agencies with historical involvement in site review include the Regional Water Quality Control Board (RWQCB) and the California Department of Fish and Game (CDFG).

OBJECTIVES AND SCOPE OF WORK

This report discusses the following activities conducted/coordinated by Stellar Environmental Solutions, Inc. (SES) between October 1 and December 31, 2004:

- Collecting water levels in site wells to determine shallow groundwater flow direction;
- Sampling site wells for contaminant analysis;
- Collecting surface water samples for contaminant analysis; and
- Evaluating hydrochemical and groundwater elevation trends.

Previous SES reports (see Section 8.0, References and Bibliography) have provided a full discussion of prior site remediation and investigations; site geology and hydrogeology; residual site contamination; conceptual model for contaminant fate and transport; and evaluation of hydrochemical trends and plume stability. Historical site groundwater and surface water analytical results are presented in Appendix A. The following major phases of site work have been conducted:

- An October 2000 Feasibility Study report for the site, submitted to Alameda County Health, provided detailed analyses of the regulatory implications of the site contamination and an assessment of viable corrective actions (SES, 2000d).

- Two instream bioassessment events were conducted in April 1999 and January 2000 to evaluate potential impacts to stream biota associated with the site contamination (no impacts were documented).
- Additional monitoring well installations and corrective action by ORC™ injection proposed by SES were approved by the Alameda County Health, in its January 8, 2001 letter to the EBRPD. Two phases of ORC™ injection were conducted: September 2001 and July 2002.
- A total of 32 groundwater monitoring events have been conducted on a quarterly basis since inception (November 1994), and a total of 11 groundwater monitoring wells are currently available for monitoring.
- A bioventing pilot test was conducted in September and October 2004 to evaluate the feasibility of this corrective action strategy, and a full-scale bioventing system design was submitted to Alameda County Health. Alameda County Health has not responded to the submittal and the work has not begun. Bioventing activities conducted to date have been discussed in bioventing-specific technical reports, and updates will be provided in groundwater monitoring progress reports as they relate to this ongoing program.

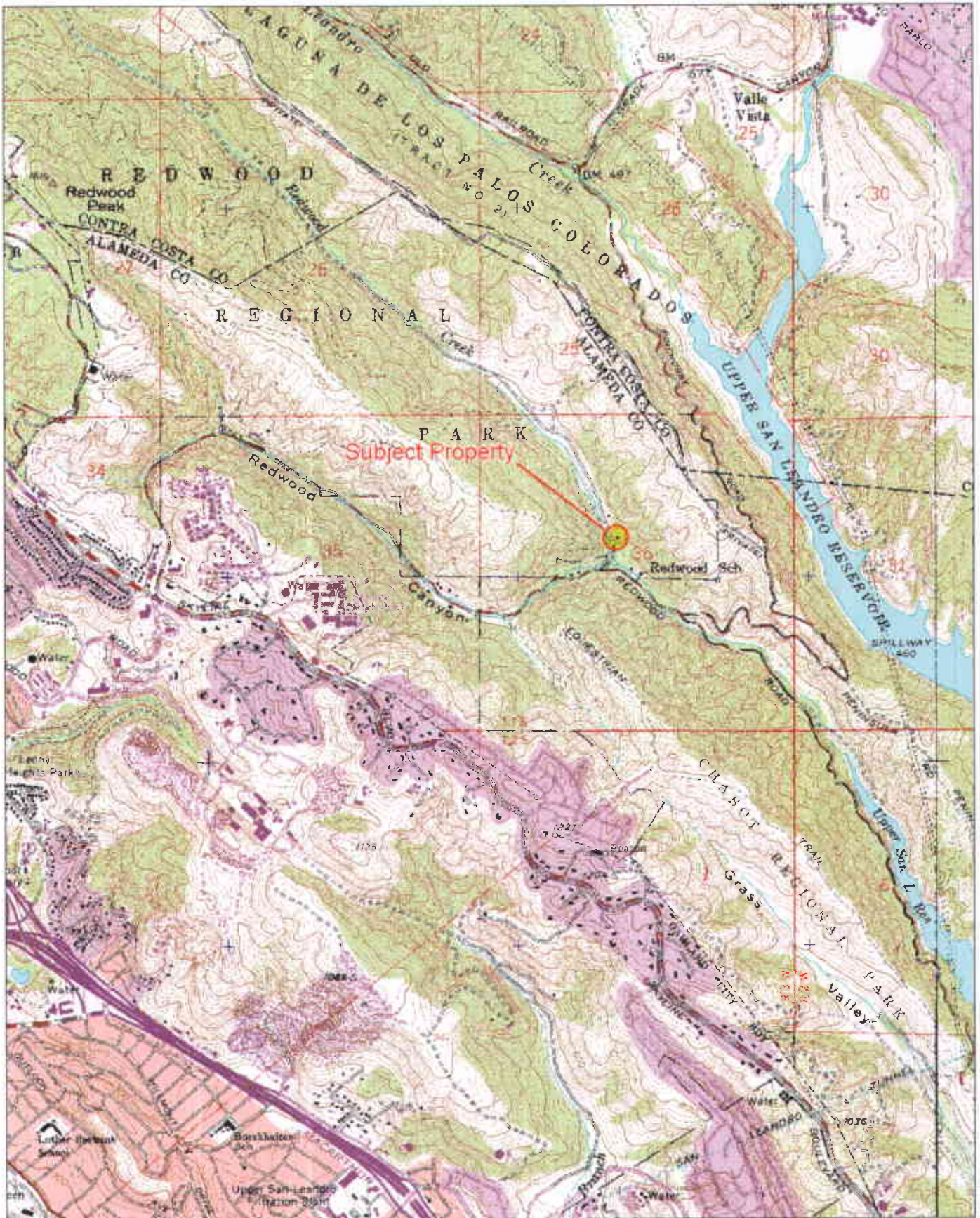
SITE DESCRIPTION

Figure 1 shows the location of the project site. The site slopes to the southwest, from an elevation of approximately 564 feet above mean sea level (amsl) at the eastern edge of the service yard, to approximately 545 feet amsl at Redwood Creek. Figure 2 shows the site plan.

REGULATORY OVERSIGHT

The lead regulatory agency for the site investigation and remediation is Alameda County Health. (Case No. 4145), with oversight provided by the RWQCB. The CDFG is also involved with regard to water quality impacts to Redwood Creek. All workplans and reports have been submitted to these agencies. Historical Alameda County Health-approved revisions to the groundwater sampling program have included:

- Discontinuing hydrochemical sampling and analysis in wells MW-1, MW-3, MW-5, and MW-6;
- Discontinuing creek surface water sampling at upstream location SW-1;
- Discontinuing field measurement and laboratory analyses for natural attenuation indicators, to be re-implemented following the bioventing corrective action; and



5-D TopoQuads Copyright © 1999 Delorme Yamashita, ME 04066 Source Data: USGS 750 B Scale: 1 : 25,000 Detail: 13-0 Datum: WGS84



SITE LOCATION ON U.S.G.S. TOPOGRAPHIC MAP

Redwood Reg. Park Service Yard
Oakland, CA

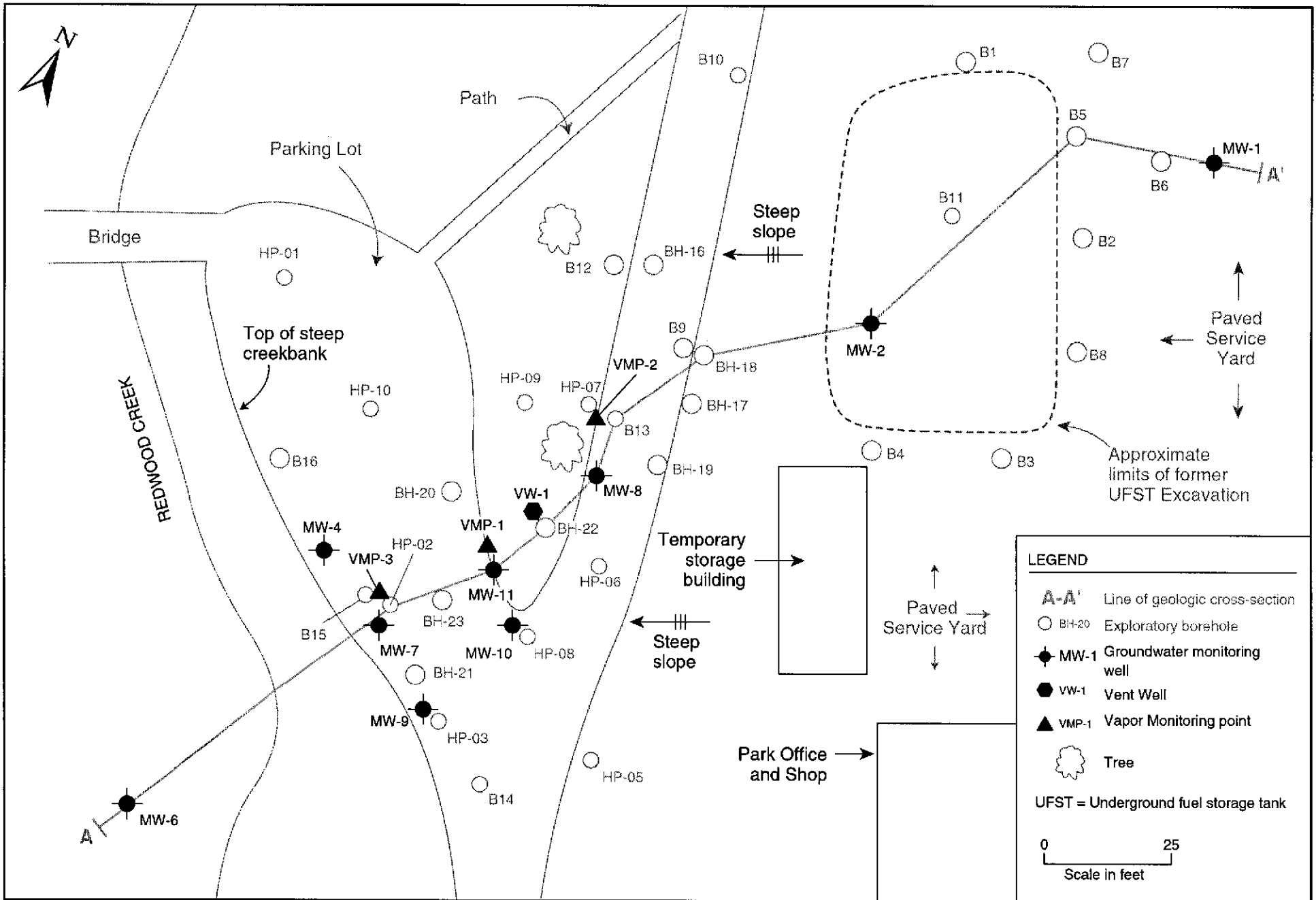
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APRIL 2004

Figure 1

★ Stellar Environmental Solutions, Inc.
Geoscience & Engineering Consulting

2004-02-01



LEGEND

- A-A' Line of geologic cross-section
- BH-20 Exploratory borehole
- MW-1 Groundwater monitoring well
- VW-1 Vent Well
- ▲ VMP-1 Vapor Monitoring point
- 🌳 Tree

UFST = Underground fuel storage tank

0 25
Scale in feet

- Reducing the frequency of creek surface water sampling from quarterly to semi-annually. The latter recommendation has not yet been implemented due to the EBRPD's continued concern over potential impacts to Redwood Creek.

Electronic Data Format (EDF) groundwater analytical results from the groundwater monitoring events beginning in the third quarter of 2001 have been successfully uploaded to the State Water Resources Control Board's GeoTracker database, in accordance with that agency's requirements for EDF submittals.

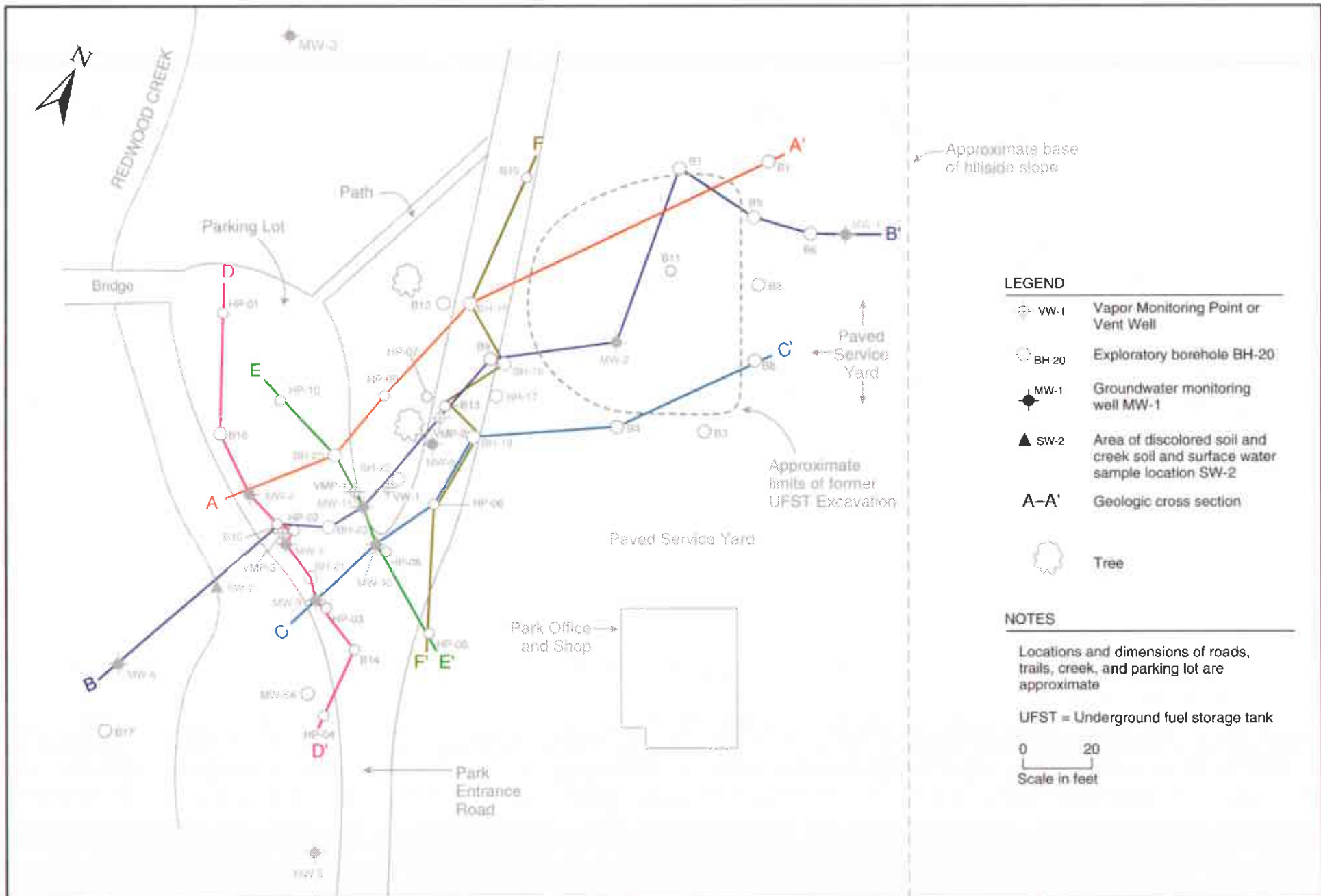
2.0 PHYSICAL SETTING

Following is a brief summary of the site hydrogeologic conditions based on geologic logging and water level measurements collected at the site since September 1993. Section 4.0 contains a discussion of historical groundwater elevations, flow direction, and seasonal trend analysis.

Shallow soil stratigraphy consists of a surficial 3- to 10-foot-thick clayey silt unit underlain by a 5- to 15-foot-thick silty clay unit. In the majority of boreholes, a 5- to 10-foot-thick clayey coarse-grained sand and clayey gravel unit that laterally grades to a clay or silty clay was encountered. This unit overlies a weathered siltstone at the base of the observed soil profile. Soils in the vicinity of MW-1 are inferred to be landslide debris. Figure 3 shows the locations of six site geologic cross-sections; Figures 4 and 5 depict the cross-sections.

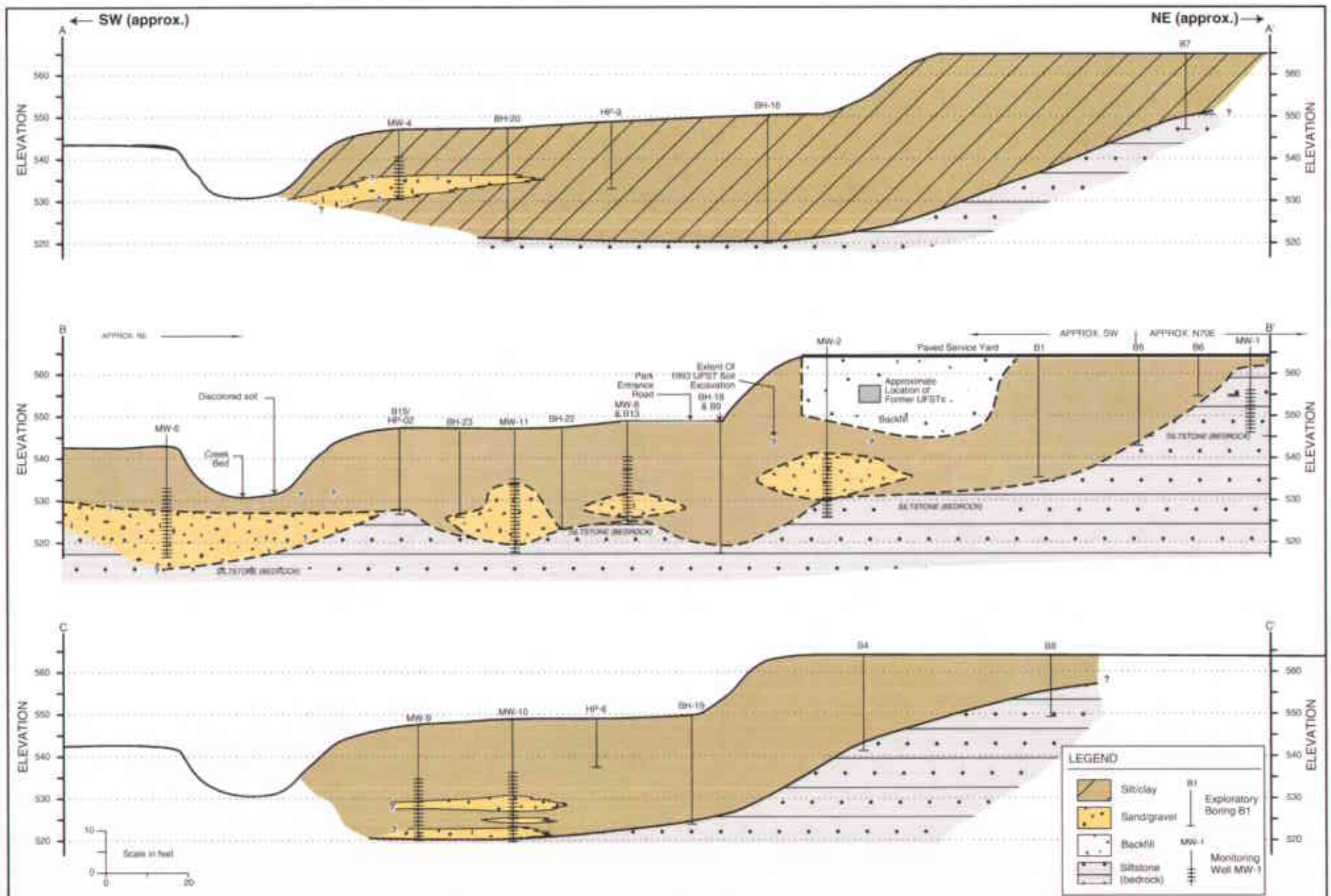
Groundwater at the site occurs under unconfined and semi-confined conditions, generally within the clayey, silty sand-gravel zone. The top of this zone varies between approximately 12 and 19 feet below ground surface (bgs), and the bottom of the water-bearing zone (approximately 25 to 28 feet bgs) corresponds to the top of the siltstone bedrock unit. Seasonal fluctuations in groundwater depth create a capillary fringe of several feet that is saturated in the rainy period (late fall through early spring) and unsaturated during the remainder of the year. The thickness of the saturated zone plus the capillary fringe varies between approximately 10 and 15 feet in the area of contamination. Local perched water zones have been observed above the top of the capillary fringe.

Figure 6 is a groundwater elevation map constructed from the current event monitoring well static water levels, and Table 1 (in Section 3.0) summarizes current event groundwater elevation data. The groundwater gradient is relatively steep—approximately 2 feet per foot—between well MW-1 and the former UFST source area, resulting from the steep topography immediately upgradient, and the highly disturbed nature of sediments in the landslide debris. Downgradient from (west of) the UFST source area (between MW-2 and Redwood Creek), the groundwater gradient is approximately 0.1 feet per foot. The direction of shallow groundwater flow during the current event was to the west-southwest (toward Redwood Creek), which is consistent with historical site groundwater flow direction (discussed in detail in Section 4.0).



- LEGEND**
- VW-1 Vapor Monitoring Point or Vent Well
 - BH-20 Exploratory borehole BH-20
 - MW-1 Groundwater monitoring well MW-1
 - SW-2 Area of discolored soil and creek soil and surface water sample location SW-2
 - A-A'** Geologic cross section
 - Tree

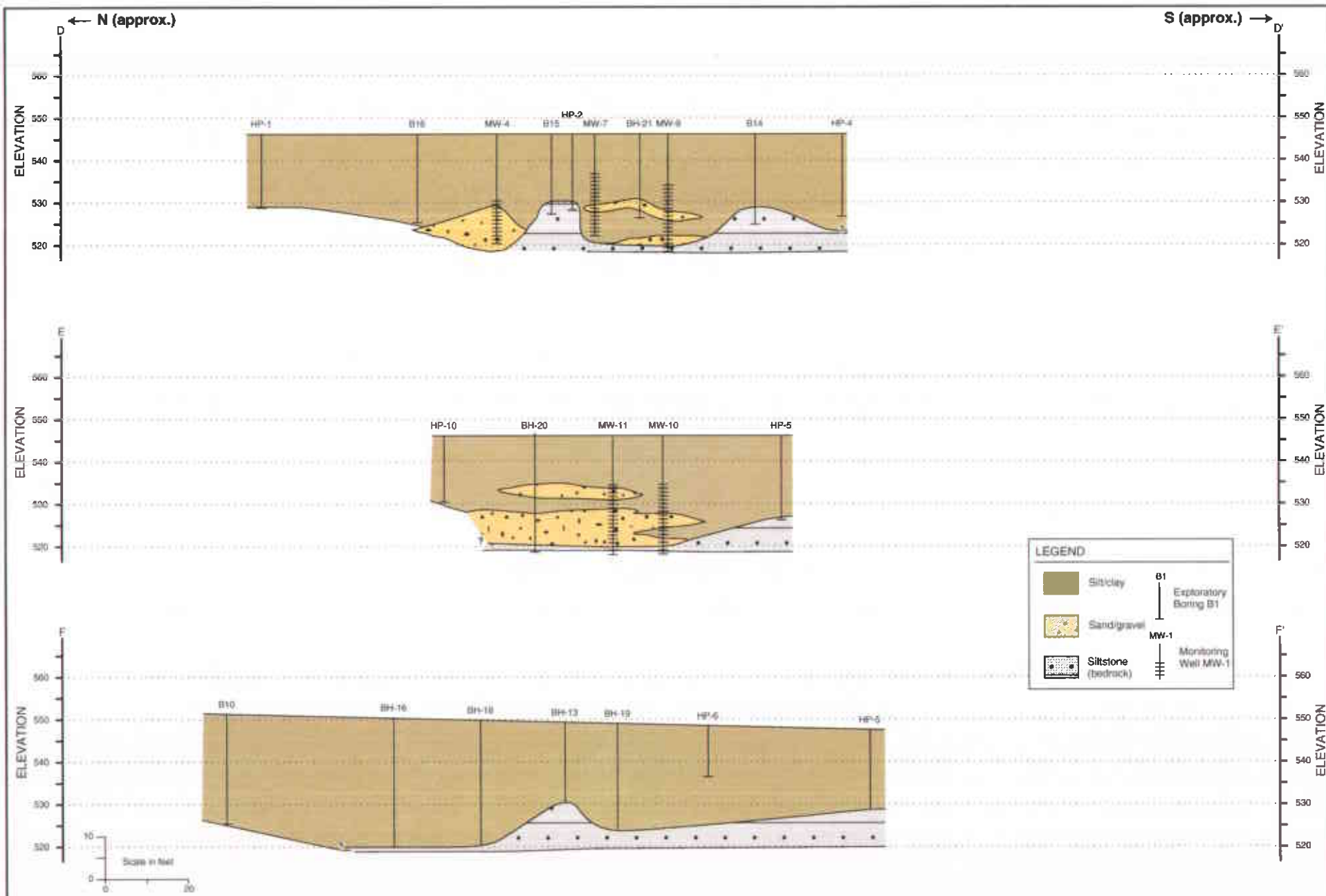
- NOTES**
- Locations and dimensions of roads, trails, creek, and parking lot are approximate
 - UFST = Underground fuel storage tank
- 0 20
Scale in feet

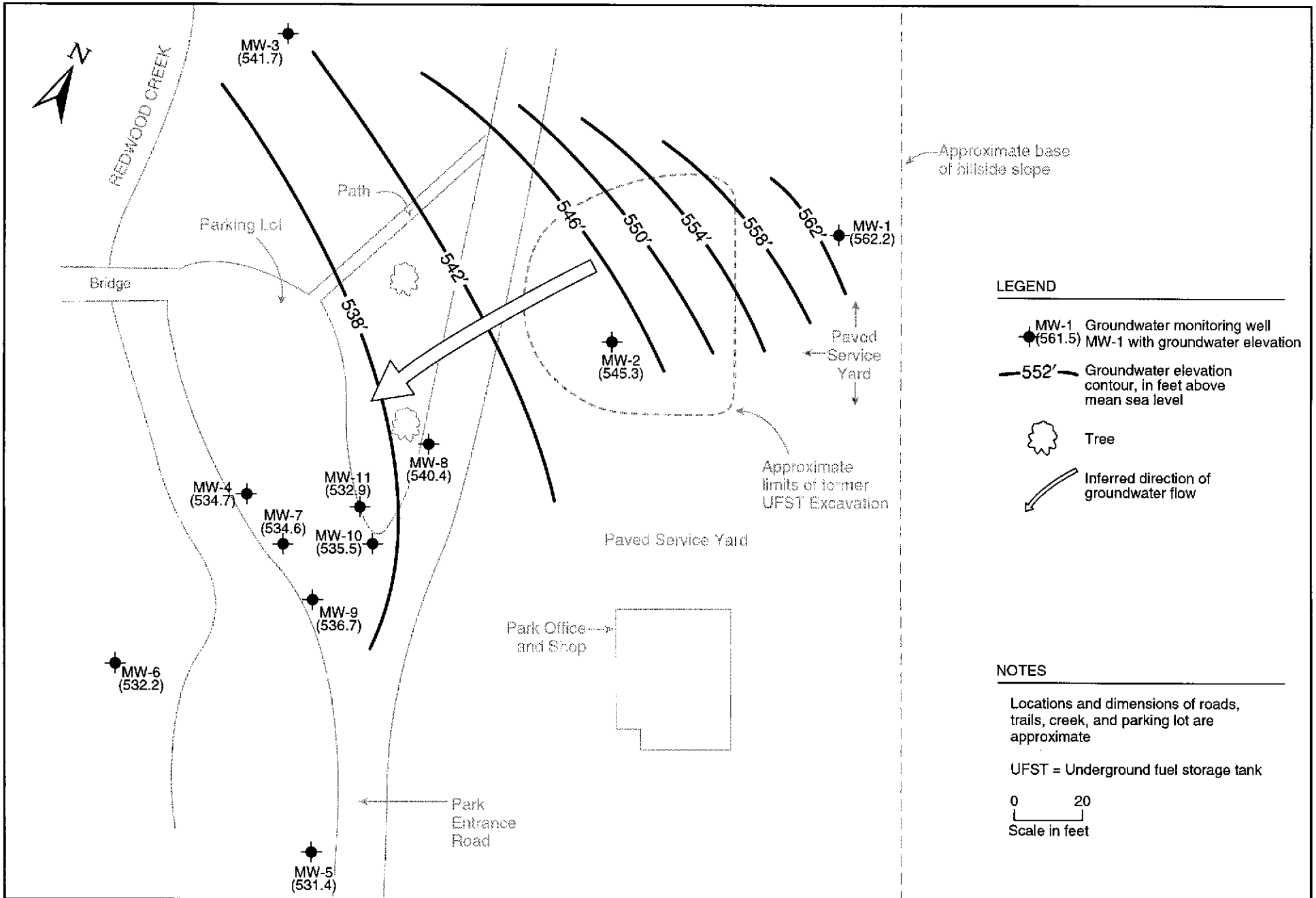


GEOLOGIC CROSS SECTIONS — A-A' through C-C'
Redwood Regional Park Service Yard, Oakland, CA

Figure 4

2000-02-45





2004-02-19

We estimate site groundwater velocity to be at least 7 to 10 feet per year using site-specific empirical data, from the date of UST installation (late 1970s) to the date when contamination was first observed in Redwood Creek (1993). Actual groundwater velocity could be variable and faster.

Redwood Creek, which borders the site to the west, is a seasonal creek known for the occurrence of rainbow trout. Creek flow in the vicinity of the site shows significant seasonal variation, with little to no flow during the summer and fall dry season, and vigorous flow with depths exceeding 1 foot during the winter and spring wet season. The creek is a gaining stream (i.e., it is recharged by groundwater) in the vicinity of the site, and discharges into Upper San Leandro Reservoir located approximately 1 mile southeast of the site.

3.0 DECEMBER 2004 CREEK AND GROUNDWATER SAMPLING

This section presents the creek surface water and groundwater sampling and analytical methods for the current event. Groundwater and surface water analytical results are summarized in Section 4.0. Monitoring and sampling protocols were in accordance with the Alameda County Health-approved SES technical workplan (SES, 1998a). Activities included:

- Measuring static water levels in all site wells (MW-1 through MW-11);
- Collecting post-purge groundwater samples for laboratory analysis of site contaminants from wells located within the groundwater plume (MW-2, MW-4, and MW-7 through MW-11); and
- Collecting Redwood Creek surface water samples for laboratory analysis from locations SW-2 and SW-3.

Creek sampling and groundwater monitoring/sampling was conducted on December 14, 2004. The locations of all site monitoring wells and creek water sampling locations are shown on Figure 2 (in Section 1.0). Well construction information and water level data are summarized in Table 1. Appendix B contains the groundwater monitoring field records.

GROUNDWATER LEVEL MONITORING AND SAMPLING

Groundwater monitoring well water level measurements, purging, sampling, and field analyses were conducted by Blaine Tech Services under the direct supervision of SES personnel. Groundwater sampling was conducted in accordance with State of California guidelines for sampling dissolved analytes in groundwater associated with leaking UFSTs (RWQCB, 1989), and followed the methods and protocols approved by the Alameda County Health in the SES 1998 workplan (SES, 1998a).

As the first task of the monitoring event, static water levels were measured using an electric water level indicator. The wells to be sampled for contaminant analyses were then purged (by bailing and/or pumping) of a minimum of three wetted casing volumes. Aquifer stability parameters (temperature, pH, and electrical conductivity) were measured after each purged casing volume to ensure that representative formation water would be sampled.

Table 1
Groundwater Monitoring Well Construction and Groundwater Elevation Data
Redwood Regional Park Corporation Yard, Oakland, California

Well	Well Depth	Screened Interval	TOC Elevation	Groundwater Elevation (12/14/04)
MW-1	18	7 to 17	565.9	562.2
MW-2	36	20 to 35	566.5	545.3
MW-3	42	7 to 41	560.9	541.7
MW-4	26	10 to 25	548.1	534.7
MW-5	26	10 to 25	547.5	531.4
MW-6	26	10 to 25	545.6	532.2
MW-7	24	9 to 24	547.7	534.6
MW-8	23	8 to 23	549.2	540.4
MW-9	26	11 to 26	549.4	536.7
MW-10	26	11 to 26	547.3	535.5
MW-11	26	11 to 26	547.9	532.9

Notes:

TOC = Top of casing.

Wells MW-1 through MW-6 are 4-inch diameter; all other wells are 2-inch diameter.

All elevations are feet above USGS mean sea level. Elevations of Wells MW-1 through MW-6 were surveyed by EBRPD relative to USGS Benchmark No. JHF-49. Wells MW-7 through MW-11 were surveyed by a licensed land surveyor using existing site wells as datum.

Approximately 100 gallons of well purge water and decontamination rinseate from the current event were containerized in the onsite plastic tank. Purge water from future events will continue to be accumulated in the onsite tank until it is full, at which time the water will be transported offsite for proper disposal.

CREEK SURFACE WATER SAMPLING

Surface water sampling was conducted by SES on December 14, 2004. Surface water samples were collected from Redwood Creek location SW-2 (immediately downgradient of the former UFST source area and within the area of documented creek bank soil contamination) and location SW-3 (approximately 500 feet downstream from SW-2) See Figure 2 for surface water sample locations.

In accordance with a previous Alameda County Health-approved SES recommendation, upstream sample location SW-1 was not sampled.

At the time of sampling, water in the creek was flowing briskly (between locations SW-2 and SW-3). Creek water depth was approximately 6 inches to 1 foot. Neither petroleum sheen nor odor were evident at either location. There was faint evidence of the orange algae on the eastern creekbank at SW-2, as has historically been observed.

4.0 CURRENT MONITORING EVENT ANALYTICAL RESULTS AND REGULATORY CONSIDERATIONS

This section presents the field and laboratory analytical results of the most recent monitoring event, preceded by a brief summary of regulatory considerations regarding surface water and groundwater contamination. Table 2 and Figure 7 summarize the contaminant analytical results of the current monitoring event; Appendix C contains the certified analytical laboratory report and chain-of-custody record. Section 5.0 contains a detailed discussion of hydrochemical trends, and Appendix A contains a tabular summary of historical groundwater and surface water analytical results and hydrochemical trend plots.

REGULATORY CONSIDERATIONS

Groundwater Contamination

As specified in the RWQCB's *San Francisco Bay Region Water Quality Control Plan*, all groundwaters are considered potential sources of drinking water unless approved by the RWQCB, and are also assumed to ultimately discharge to a surface water body and potentially impact aquatic organisms. While it is likely that site groundwater would satisfy geology-related criteria for exclusion as a drinking water source (excessive total dissolved solids and/or insufficient sustained yield), RWQCB approval for this exclusion has not been obtained for the site. As summarized in Table 2, site groundwater contaminant levels are compared to RWQCB Tier 1 Environmental Screening Levels (ESLs) for groundwater (using the criteria for residential sites where groundwater is a known or potential drinking water resource) and for surface water (freshwater environment). For these contaminants, the groundwater and surface water ESLs are identical.

As stipulated in the ESL document (RWQCB, 2003), the ESLs are not cleanup criteria; rather, they are conservative screening-level criteria designed to be protective of both drinking water resources and aquatic environments in general. The groundwater ESLs include one or more components, including ceiling value, human toxicity, indoor air impacts, and aquatic life protection. Exceedance of ESLs suggests that additional investigation and/or remediation is warranted. While drinking water standards (e.g., Maximum Contaminant Levels [MCLs]) are published for the site contaminants of concern, Alameda County Health has indicated that impacts to nearby

Table 2
Groundwater and Surface Water Sample
Analytical Results – December 2004
Redwood Regional Park Corporation Yard, Oakland, California

Compound	Concentrations in $\mu\text{g/L}$						
	TPHg	TPHd	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE
GROUNDWATER SAMPLES							
MW-2	80	<50	14	<0.5	2.9	0.72	20
MW-4	<50	<50	<0.5	<0.5	<0.5	<1.0	<2.0
MW-7	8,200	4,000	95	<0.5	290	124	<2.0
MW-8	15,000	4,000	840	21	1,200	1,520	<10
MW-9	4,700	2,800	160	<2.5	470	<0.5	<10
MW-10	64	<50	3.7	<0.5	3.7	0.7	10
MW-11	11,000	3,900	180	5.1	780	695	<10
Groundwater ESLs^(a)	100	100	1.0	40	30	13	5.0
REDWOOD CREEK SURFACE WATER SAMPLES							
SW-2	<50	<50	<0.5	<0.5	<0.5	<0.5	<2.0
SW-3	<50	<50	<0.5	<0.5	<0.5	<0.5	<2.0
Surface Water ESLs	100	100	1.0	40	30	13	5.0

Notes:

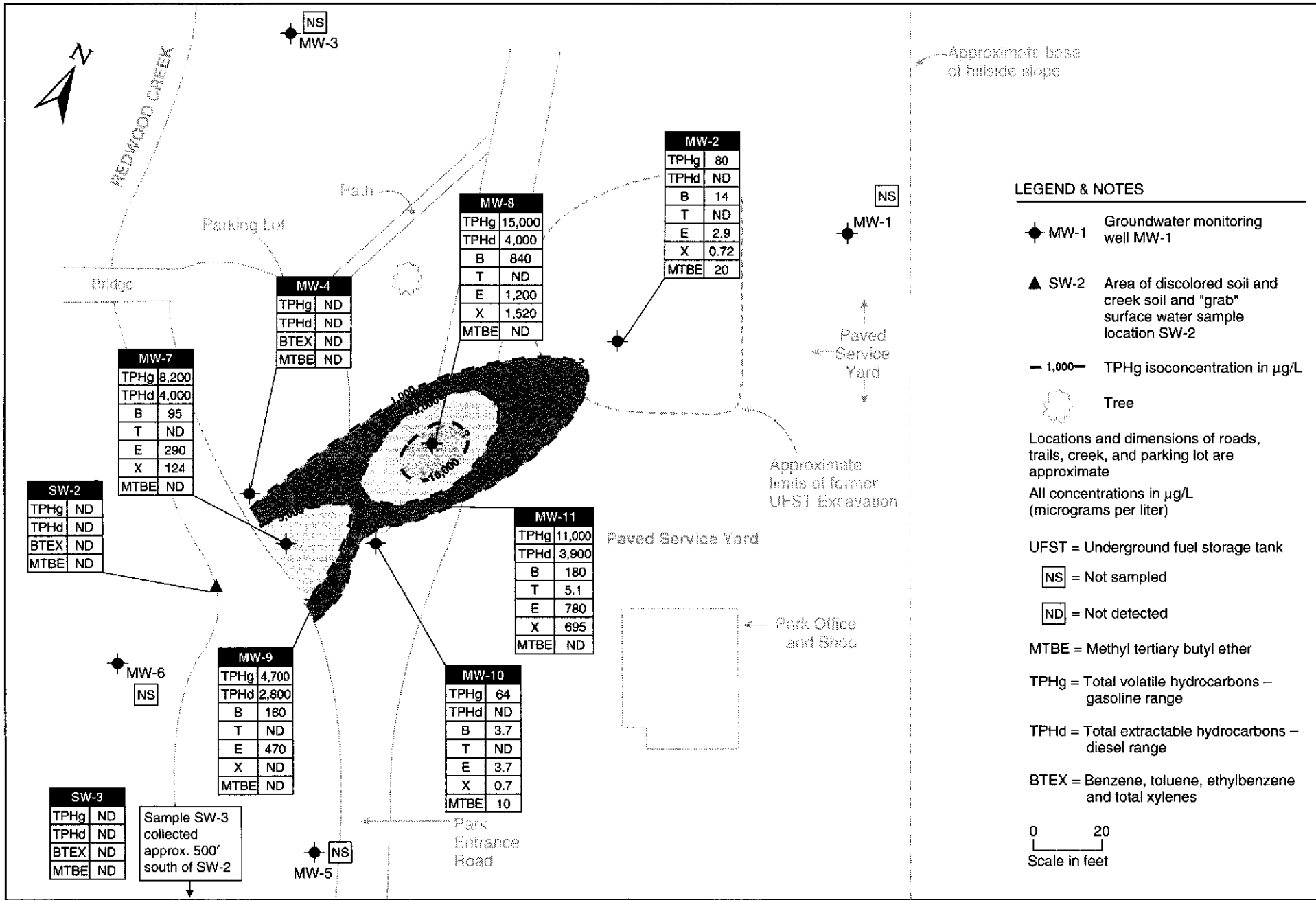
^(a) RWQCB Environmental Screening Levels (for residential sites where groundwater is a known or potential drinking water resource (RWQCB, 2004).

MTBE = Methyl *tertiary*-butyl ether.

TPHg = Total petroleum hydrocarbons - gasoline range (equivalent to total volatile hydrocarbons - gasoline range).

TPHd = Total petroleum hydrocarbons - diesel range (equivalent to total extractable hydrocarbons - diesel range).

$\mu\text{g/L}$ = Micrograms per liter, equivalent to parts per billion (ppb). Concentrations in **bold face** exceed one or more ESL criteria.



Redwood Creek are of primary importance, and that site target cleanup standards should be evaluated primarily within the context of surface water quality criteria.

Surface Water Contamination

As discussed in the RWQCB ESL document, benthic communities at the groundwater/surface water interface (e.g., at site groundwater discharge location SW-2) are assumed to be exposed to the full concentration of groundwater contamination prior to dilution/mixing with the surface water). This was also a fundamental assumption in the in-stream benthic macroinvertebrate bioassessment events, which documented no measurable impacts.

Historical surface water sampling in the immediate vicinity of contaminated groundwater discharge (SW-2) has sporadically documented petroleum contamination, usually in periods of low stream flow, and generally at concentrations several orders of magnitude less than adjacent (within 20 feet) groundwater monitoring well concentrations. It is likely that mixing/dilution between groundwater and surface water precludes obtaining an "instantaneous discharge" surface water sample that is wholly representative of groundwater contamination at the discharge location. Therefore, the most conservative assumption is that surface water contamination at the groundwater/surface water interface is equivalent to the upgradient groundwater contamination (e.g., site downgradient wells MW-4, MW-7, and MW-9).

While site target cleanup standards for groundwater have not been determined, it is likely that no further action will be required by regulatory agencies when groundwater (and surface water) contaminant concentrations are all below their respective screening level criteria. Residual contaminant concentrations in excess of screening level criteria might be acceptable to regulatory agencies if a more detailed risk assessment (e.g., Tier 2 and/or Tier 3) can demonstrate that no significant impacts are likely.

GROUNDWATER AND SURFACE WATER CONTAMINANT FINDINGS

Current event groundwater and surface water data indicate the following:

- Current site groundwater contaminant concentrations exceed their respective groundwater ESLs (for both cases, where drinking water resource *is* or *is not* threatened) and surface water screening levels for all site contaminants except toluene.
- Groundwater contaminant concentrations showed a strong correlation with distance from the source area: maximum contamination was detected in well MW-8 (approximately 80 feet upgradient of Redwood Creek), then MW-11 (50 feet from the creek), then wells MW-7 and MW-9 (both at the extreme downgradient edge of the site, immediately upgradient of

Redwood Creek). Trace to non-detectable groundwater contaminant concentrations were present in former source area well MW-2 (approximately 130 feet upgradient of Redwood Creek) and well MW-4 (northern boundary of the plume). Only MTBE was detected above screening level criteria in MW-10 (southern boundary of the plume).

- Hydrocarbon concentration in the key groundwater wells MW-8, MW-9, and MW-11 increased relative to the previous quarterly monitoring, reflecting the seasonal desorption of residual contamination in the former source area and capillary fringe.
- The existing well layout adequately constrains the lateral extent of groundwater contamination. The vertical (lowest) limit of groundwater contamination is very likely the top of the siltstone bedrock, at a depth of approximately 25 to 28 feet. The saturated interval extends approximately 12 to 15 feet from top of bedrock upward through the capillary fringe.
- The plume of groundwater contamination above screening levels appears to be approximately 120 feet long and approximately 50 feet wide. The zone of greatest contamination (greater than 10,000 $\mu\text{g/L}$ TPH) is an approximately 20- to 30-foot-wide by 50-foot-long area extending from just downgradient of MW-8 to the most downgradient wells (MW-7 and MW-9).
- The groundwater contaminant plume has become disconnected from the former source, and the center of contaminant mass has migrated well beyond the former source area (represented by well MW-2) toward Redwood Creek.
- No contaminants were detected in either of the current event surface water samples, which has historically been the case during wet weather (high creek flow) periods.

QUALITY CONTROL SAMPLE ANALYTICAL RESULTS

Laboratory QC samples (e.g., method blanks, matrix spikes, surrogate spikes, etc.) were analyzed by the laboratory in accordance with requirements of each analytical method. All laboratory QC sample results and sample holding times were within the acceptance limits of the methods (see Appendix C).

5.0 EVALUATION OF HYDROCHEMICAL TRENDS AND PLUME STABILITY

This section evaluates the observed hydrochemical trends with regard to plume stability and migration of the center of contaminant mass toward Redwood Creek. An assessment is made of the nature of residual contaminated soil that acts as a continued source of groundwater contamination. A conceptual model (incorporating site lithology, hydrogeology, and hydrochemistry) is presented to explain the spatial extent and magnitude of the dissolved hydrocarbon plume.

CONTAMINANT SOURCE ASSESSMENT

Site UFSTs were removed (i.e., discharge was discontinued) in 1993, and some but not all of the source area excavation contaminated soil was removed. Borehole soil sampling has provided data on the extent and magnitude of soil contamination in the vicinity of the former UFSTs ("source area") and the outlying area (in the capillary fringe above the groundwater plume). Soil contamination is constrained to the unsaturated zone and the underlying saturated sediments on the weathered bedrock surface.

A large mass of residual TPH contamination in the unsaturated zone overlies the contaminant plume, primarily in the area between the former UFSTs and the park entrance roadway, with the contaminated zone thinning toward Redwood Creek. Seasonal desorption of contamination in this unsaturated zone occurs during the rainy season and during high-water periods, acting as a long-term source of dissolved contamination. Previous ORC™ injection programs, which resulted in permanent reductions at the peripheral plume margins but were followed by rebound (to pre-injection conditions) within the central portions of the plume, indicate that site conditions support aerobic biodegradation; however, biodegradation is limited by oxygen deficiency in the unsaturated zone.

Based on this conceptual model and using conservative assumptions for equilibrium partitioning, contaminant geometry, soil moisture, and previous laboratory analytical results for TPH in soil, estimates of TPH mass in soil were calculated. Residual TPH in vadose zone soil is estimated at 1,400 to 7,000 pounds (100 to 600 gallons of gasoline), compared to a mass of TPH in groundwater estimated at 1 to 10 pounds (0.1 to 1.0 gallon of gasoline).

Soil and groundwater contamination distribution and site lithologic and hydrogeologic conditions have shown that residual soil contamination will continue to be a source of long-term groundwater contamination via seasonal desorption and migration, unless abated.

WATER LEVEL TRENDS

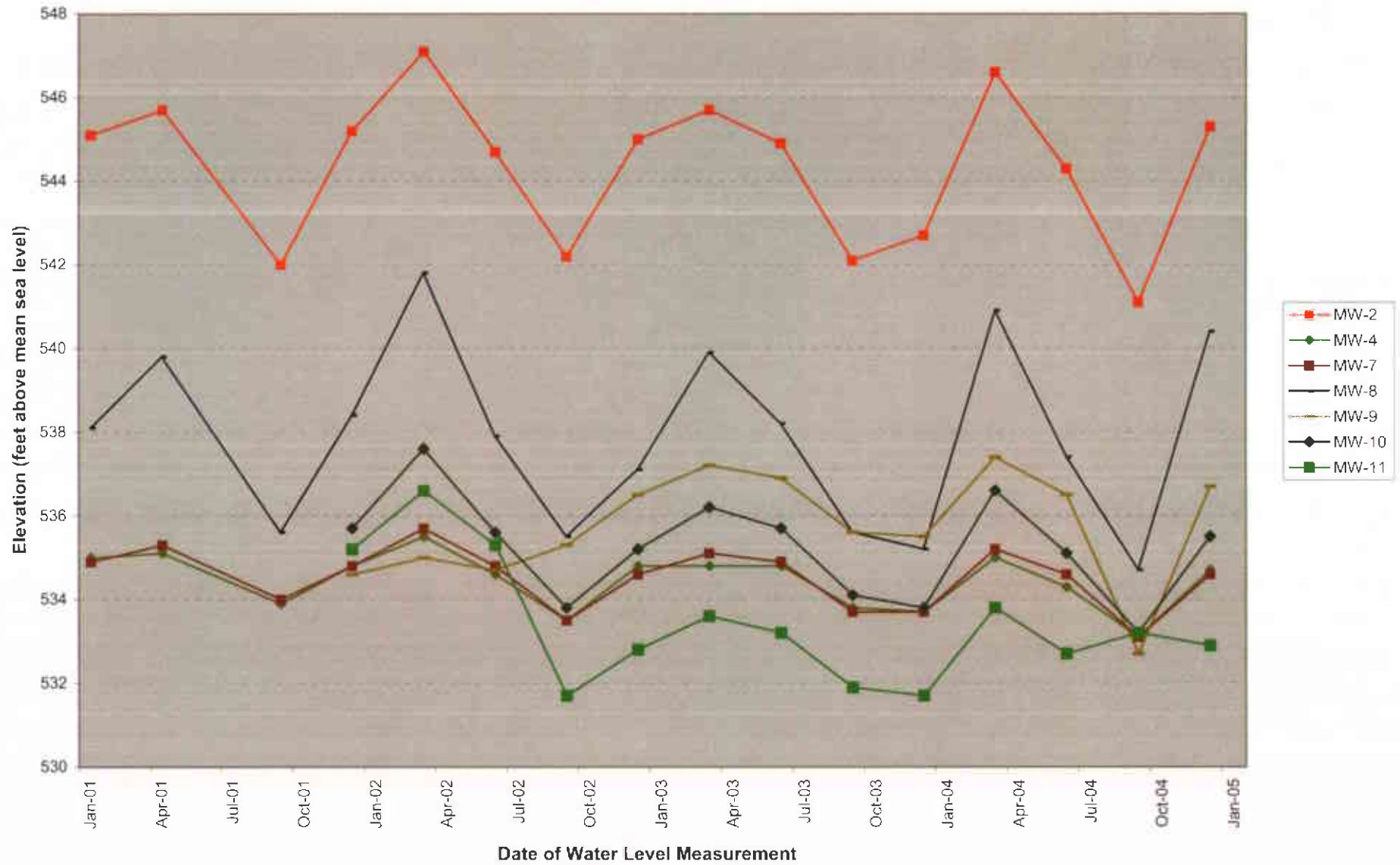
Appendix D contains historical groundwater elevation data and flow direction maps. Figure 8 shows a trendline of site groundwater elevations in key wells (those within the contaminant plume). The data support the following conclusions:

- Groundwater elevations of all site wells in the 20 historical events have shown a seasonal fluctuation of 1.7 feet to 6.6 feet, with an average elevation change in individual wells of 3.7 feet. Wells within the plume have shown a similar range, with an average elevation change of approximately 4.0 feet in individual wells.
- Wells nearest to Redwood Creek (MW-5, MW-6, MW-7 and MW-9) show a narrower range of water level elevations (average of approximately 1.9 feet) than wells in the mid-plume and upgradient areas of the site (average of approximately 4.7 feet). This finding correlates strongly with the thinning of the contaminated soil interval closer to Redwood Creek, and confirms the capillary fringe mechanism that has resulted in unsaturated zone soil contamination in the downgradient portion of the plume.
- In all wells, lowest elevations have generally been observed during the end of the dry season and highest elevations at the peak of the rainy season. This is a common seasonal trend observed in the upper water-bearing zone in the Bay Area region.
- Groundwater elevation trends and magnitudes are similar between wells.
- Overall groundwater flow direction is consistently to the west-southwest (toward Redwood Creek). Localized (on the scale of tens of feet) groundwater flow direction appears to vary within the general flow direction, likely controlled by bedrock surface topography.
- Historical groundwater gradient is consistently approximately 0.1 feet/foot in the area of the contaminant plume.

HYDROCHEMICAL TRENDS

Contaminant concentrations in an individual well can fluctuate over time for one or more reasons—contaminant migration; seasonal effects due to fluctuating groundwater levels (i.e., desorption from the unsaturated zone and/or dilution of saturated zone contamination); and/or natural attenuation (plus enhancement by active remediation such as ORC™ injection and bioventing). These hydrochemical trends can result in changes in the lateral extent and magnitude of a dissolved contaminant plume.

Figure 8: Historical Groundwater Elevations in Key Site Wells
 Redwood Regional Park Service Yard - Oakland, California



The most consistent trend over time in those wells within the centerline of the plume has been a seasonal influence of desorption following the winter rains with a resultant increase in concentration of the dissolved hydrocarbon in the groundwater.

Because the quarter to quarter comparisons can be unduly influenced by seasonal effects that mask longer trends, it is useful to compare same-season data over time to determine if concentrations are increasing, decreasing, or remaining stable. Our evaluation of hydrochemical trends focuses on gasoline and diesel, which, when combined, represent the majority of contaminant mass. To more closely evaluate plume stability differences, the following discussion focuses on four separate portions of the plume relative to the long axis (along the hydraulic gradient): “upgradient” (trailing edge of plume); “mid-plume”; “downgradient”; and “plume fringe.”

Important components of plume stability include: degree of contaminant fluctuations in individual wells over time; changes in the lateral extent of the plume; and changes in the location of the center of contaminant mass within the plume. Historical gasoline isoconcentration contour maps in Appendix A are presented to show temporal changes in plume lateral extent and center of contaminant mass, which are discussed below.

In general, the contaminant plume has disconnected from the source such that recent historical downgradient concentrations are higher than upgradient (near the source) concentrations. To evaluate plume stability with regard to changes in the center of contaminant mass, we evaluated concentrations of total petroleum hydrocarbons (gasoline and diesel combined) in individual wells over time. The data show no obvious correlation between maximum TPH concentrations and well location, suggesting high plume instability. Since January 2001, maximum TPH concentrations have been variously detected in upgradient, mid-plume, and downgradient wells. These variations are likely due in large part to differing contaminant mass in unsaturated zone soils at particular locations, resulting in variable amounts of desorbed mass to the plume during high water conditions. The following discusses hydrochemical trends in each of the upgradient, mid-plume, and downgradient portions of the site, as well as the fringes of the plume.

Upgradient Hydrochemical Trends

Well MW-2, installed in the area of the former UFSTs, has historically shown relatively low (sometimes non-detectable) contaminant levels. Well MW-8, located approximately 60 feet downgradient of MW-2, has historically shown much higher concentrations. These data suggest that the plume has become disconnected from the former source area near MW-2, and that the center of contaminant mass has moved downgradient, with significant contaminant mass entrained in the soil that continues to “feed” the dissolved concentration represented by MW-8 (the first well downgradient of MW-2 along the inferred centerline of the plume).

Figure 9 shows hydrochemical trends for gasoline and diesel in MW-8. Both gasoline and diesel concentrations have fluctuated widely. A strong seasonal effect is apparent, with annual maximum concentrations generally occurring in late winter/early spring, and annual minimum concentrations generally occurring in the fall. Neither contaminant has shown an overall reducing concentration trend (i.e., annual maxima and minima are approximately the same over the previous 3 years).

In the previous three March events (high water conditions), MW-8 has shown sitewide maxima (or near maxima) for gasoline, benzene, and MTBE. Maximum concentrations in other events have been in other wells.

Current (December 2004) TPH concentrations in MW-8 are at or near site historical maxima.

Mid-Plume Trends

Well MW-11 represents the high concentration centerline of the plume, approximately midway between upgradient well MW-8 and downgradient well MW-7. Figure 10 shows hydrochemical trends for gasoline and diesel for this well. Gasoline and diesel concentrations showed a large reduction in 2001, followed by an equally large increase by late 2002. Since that time, concentrations have fluctuated widely, with a strong seasonal effect. Overall, neither diesel nor gasoline concentrations in this well are showing a reducing or increasing trend.

Since March 2002 (twelve events), maximum or near maximum sitewide concentrations in MW-11 have been detected in six events for gasoline, four events for benzene, three events for diesel, and two events for MTBE. In nearly all cases, these maxima have not occurred in the high water season.

Current (December 2004) TPH concentrations in MW-11 are below their historical maxima, and have been between the historical maxima and minima over the last 2 years.

Downgradient Hydrochemical Trends

Well MW-7 represents the high-concentration centerline of the plume at the downgradient area approximately 20 feet from Redwood Creek. Figure 11 shows hydrochemical trends for gasoline and diesel for this well. Beginning in January 2002 (between the two ORC™ injection phases), both gasoline and diesel concentrations have been relatively stable, with no obvious seasonal effects.

Since March 2002 (twelve events), maximum or near maximum sitewide concentrations have been detected in MW-7 in nine events for diesel, two events for gasoline, one event for MTBE, and no events for benzene. With the exception of two events for diesel, these maxima have not occurred in the high-water season.

Current (December 2004) TPH concentrations in MW-7 are near their 3-year maxima.

Figure 9: Gasoline and Diesel Hydrochemical Trends: Well MW-8
 Redwood Regional Park Service Yard, Oakland, California

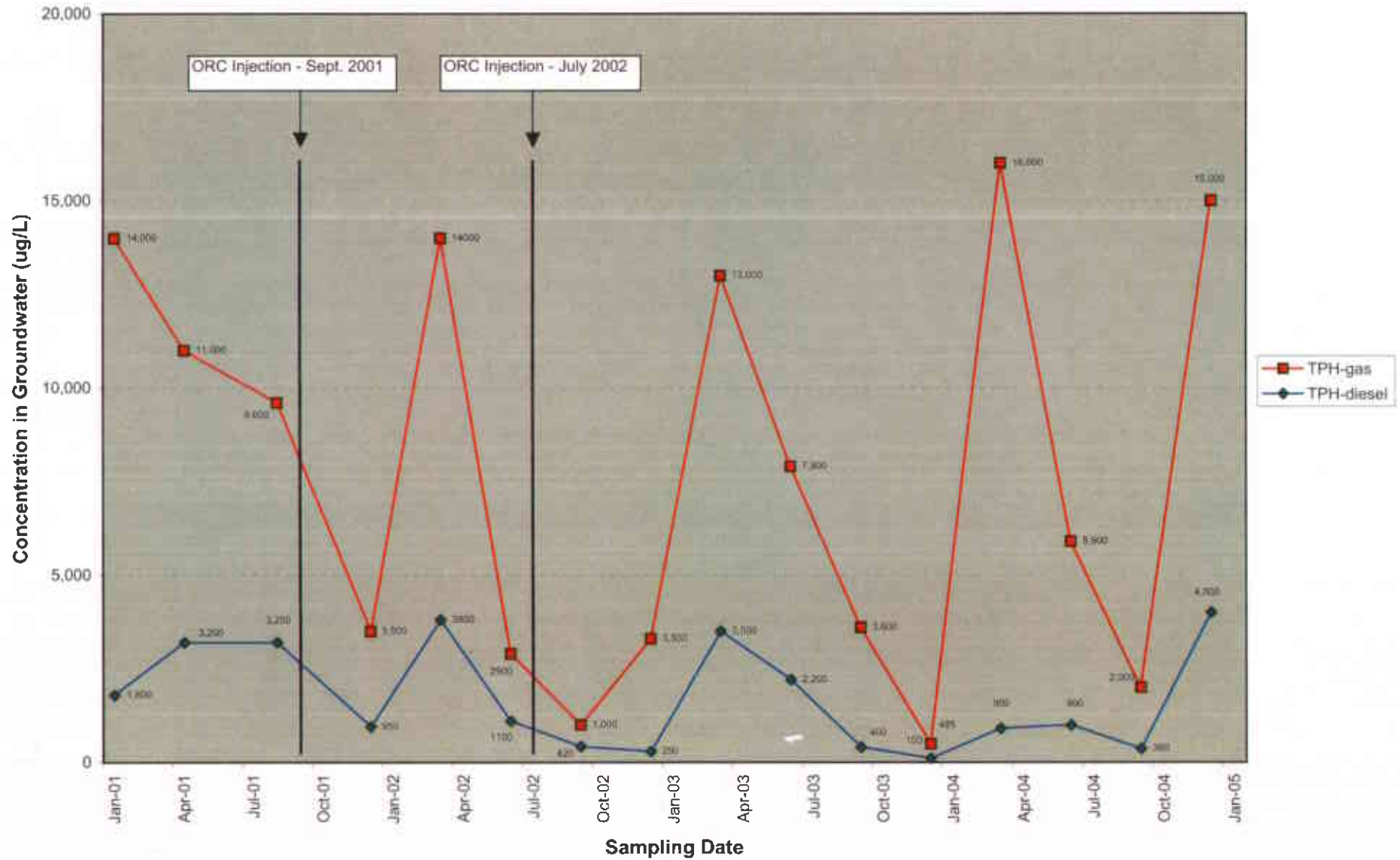


Figure 10: Gasoline and Diesel Hydrochemical Trends: Well MW-11
 Redwood Regional Park Service Yard, Oakland, California

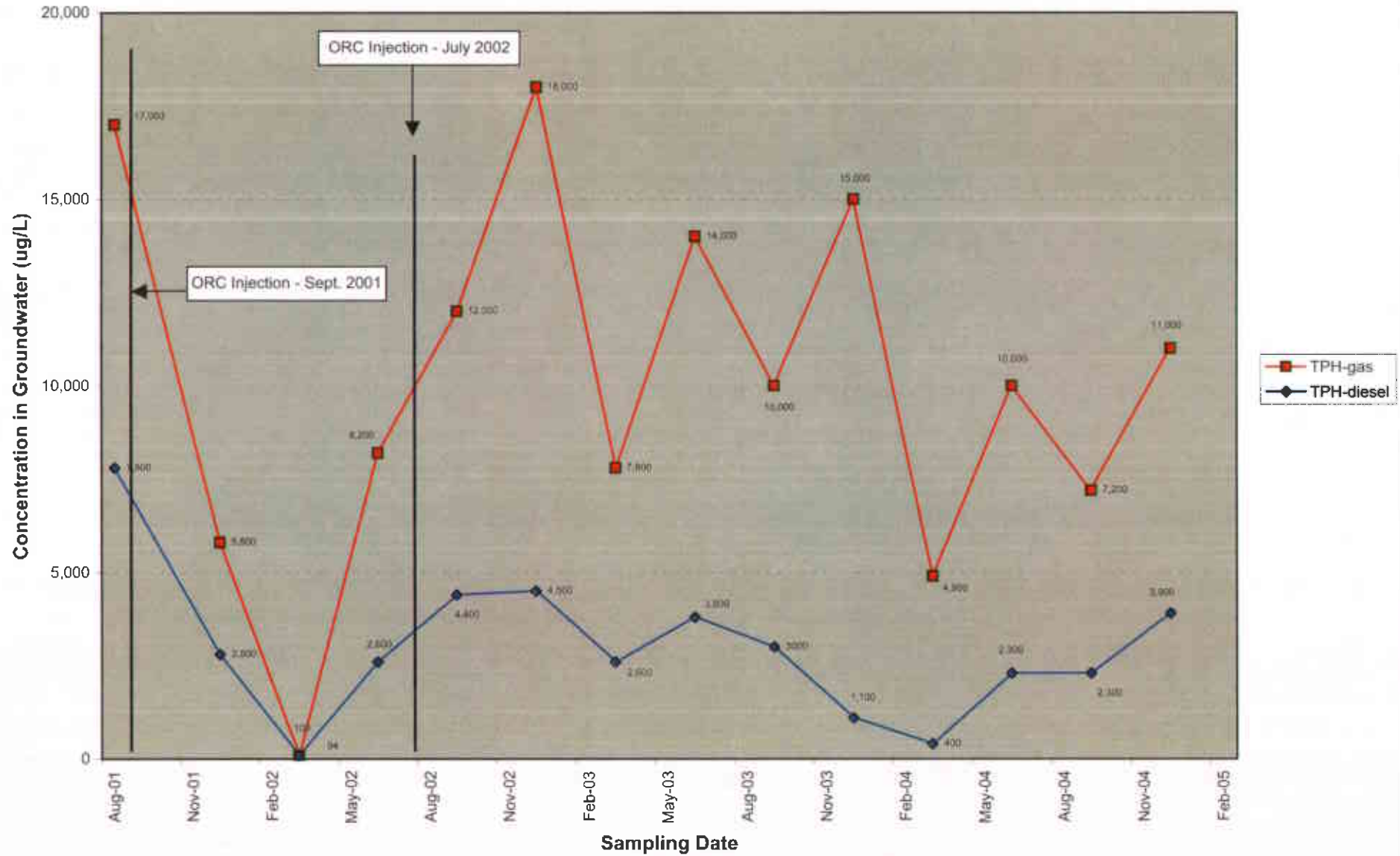
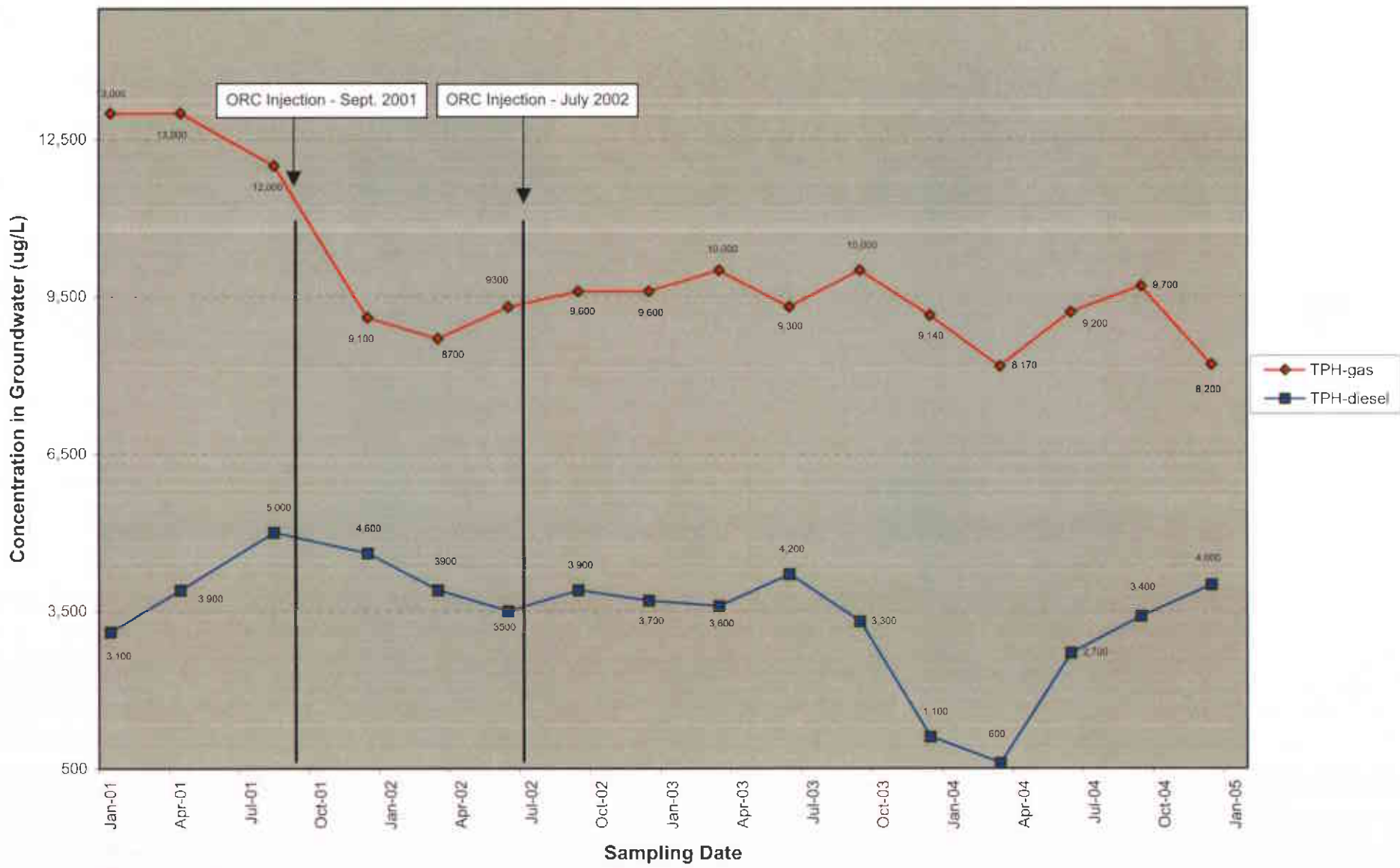


Figure 11: Gasoline and Diesel Hydrochemical Trends: Well MW-7
 Redwood Regional Park Service Yard, Oakland, California



Plume Fringe Trends

Well MW-4 is located on the northern edge of the plume, just upgradient of Redwood Creek. Figure 12 shows hydrochemical trends for gasoline and diesel for this well. Concentrations of both gasoline and diesel showed a sharp reduction beginning in April 2001. Other than an apparent anomalous diesel detection in June 2004, no contamination has been detected in this well since December 2001.

Well MW-10 is located on the southern edge of the plume, in the mid-plume portion relative to the longitudinal axis. Figure 13 shows hydrochemical trends for gasoline and diesel for this well. Concentrations of both gasoline and diesel showed a sharp reduction between the August and December 2001 events (following the first ORC™ injection phase). Since that time, gasoline has been detected at or below approximately 160 µg/L, and diesel has been detected above 100 µg/L only once.

These two plume fringe wells show the positive effect of ORC™ injection in areas with low to moderate contamination, on the lateral edge of the plume, where natural attenuation is not overwhelmed by continued contaminant input.

As of the most recent groundwater monitoring event, over 2½ years has passed since the second phase of ORC™ injection. This is well beyond the useful life of injected ORC™ (generally 6 to 9 months). Despite continued elevated DO in low dissolved-phase concentrations in fringe wells MW-4 and MW-10, we infer that the previously-injected ORC™ is no longer substantially contributing to contamination reduction.

PLUME GEOMETRY AND MIGRATION INDICATIONS

As discussed in detail in Section 4.0, the plume of groundwater contamination above screening levels appears to be approximately 120 feet long and approximately 50 feet wide. The zone of greatest contamination (greater than 10,000 µg/L TPH) is an approximately 20- to 30-foot-wide by 50-foot-long area extending from just downgradient of MW-8 to the most downgradient well MW-7.

As shown on the historical plume contour maps in Appendix A, the plume geometry has not varied substantially over the past 4 years of monitoring, although seasonal fluctuations in contaminant concentrations have been observed. This is exhibited by higher concentrations in downgradient wells in some events, and in mid-plume or upgradient wells in other events.

Over the past 2 years, maximum sitewide contaminant concentrations have remained approximately the same, including at downgradient wells, suggesting that “worst-case” groundwater contaminant concentrations have been reached across the lateral extent of the plume.

Figure 12: Gasoline and Diesel Hydrochemical Trends: Well MW-4
 Redwood Regional Park Service Yard, Oakland, California

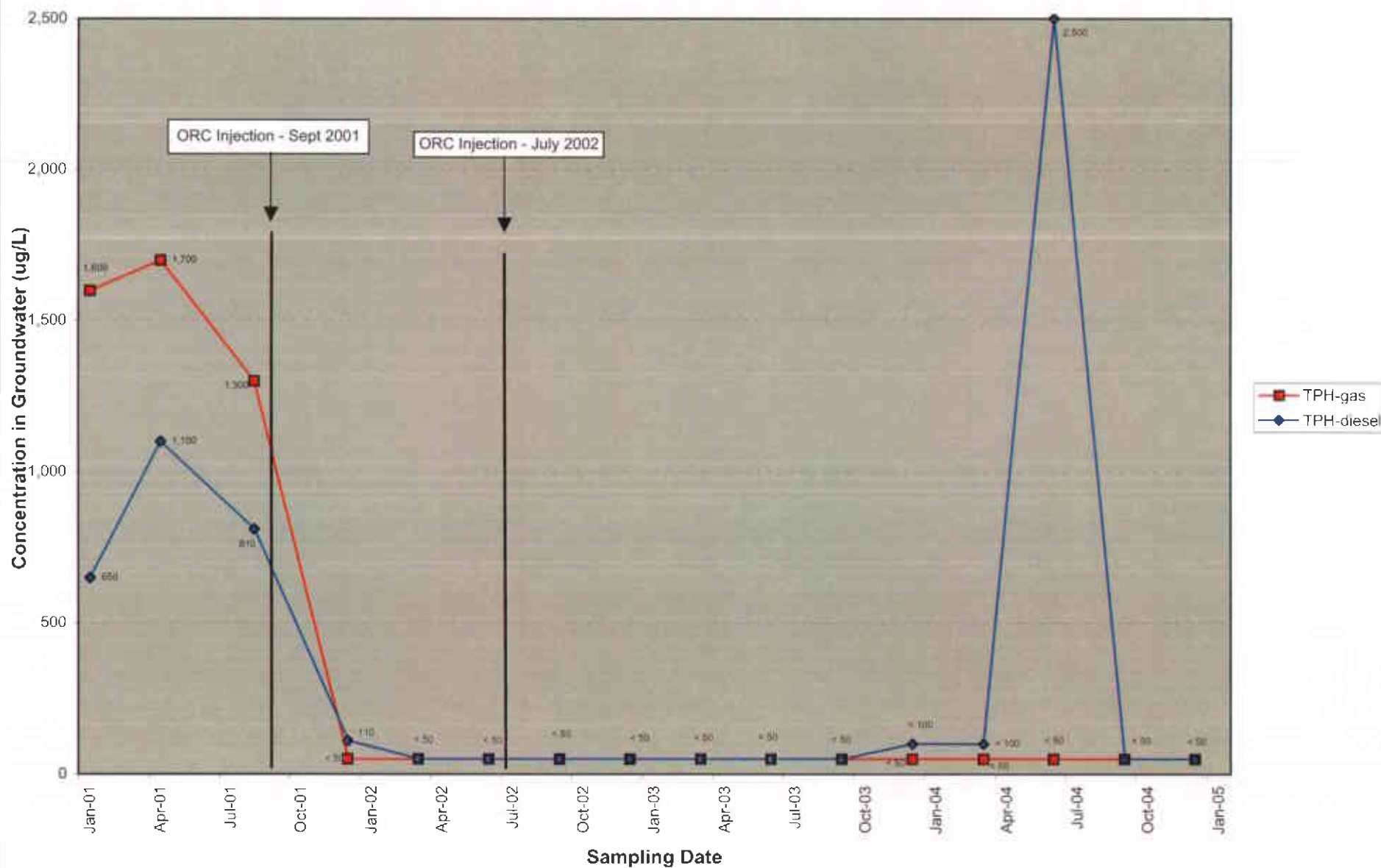
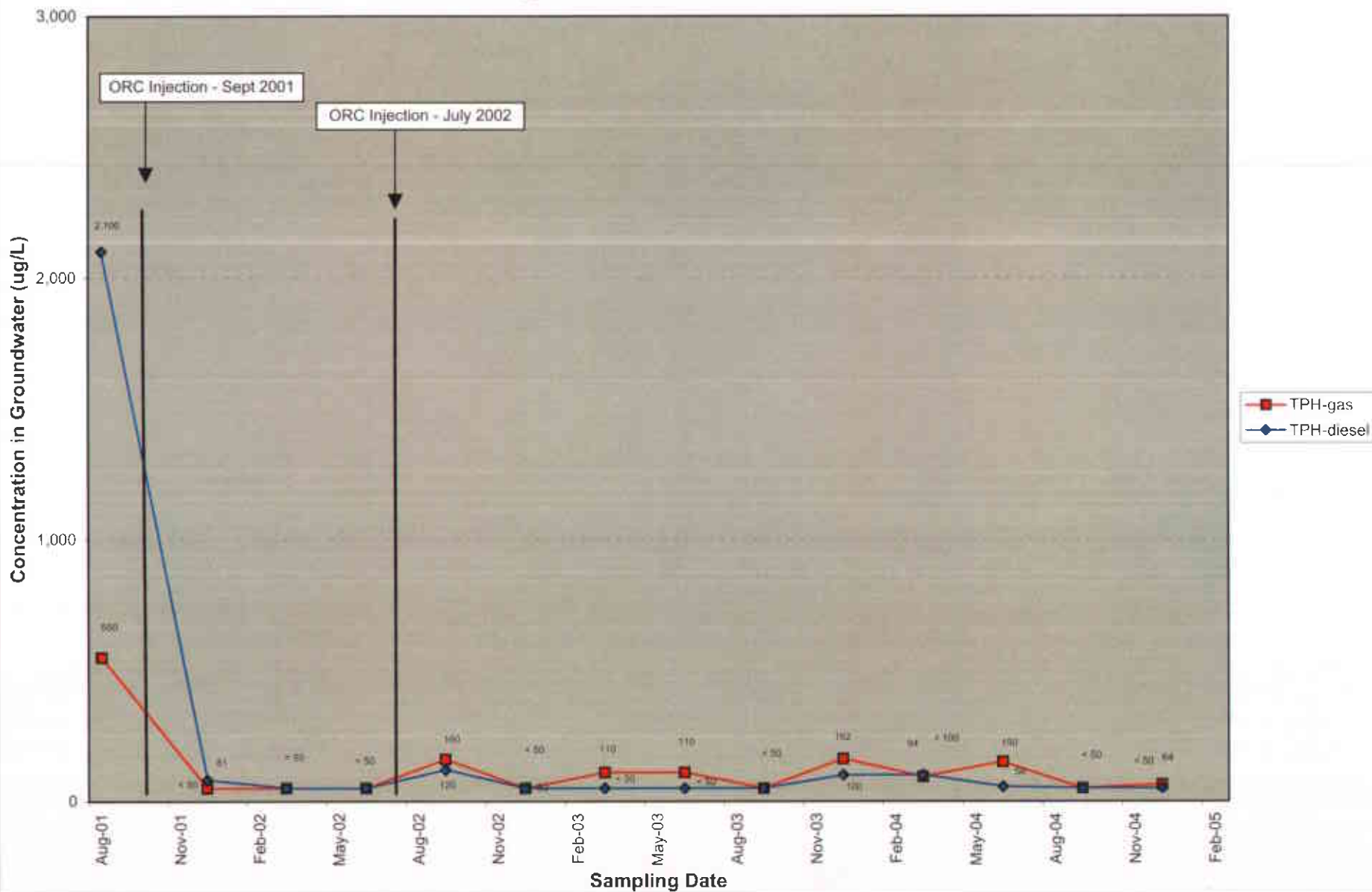


Figure 13: Gasoline and Diesel Hydrochemical Trends: Well MW-10
 Redwood Regional Park Service Yard, Oakland, California



CLOSURE CRITERIA ASSESSMENT AND PROPOSED ACTIONS

The RWQCB and Alameda County Health generally require that the following criteria be met before issuing regulatory closure of contaminant cases:

1. ***The contaminant source has been removed (i.e., the source of the discharge and obviously-contaminated soil).*** This criterion has not been fully met. While the UFSTs have been removed, borehole soil sampling has shown a substantial mass of residual source area soil contamination that will act as an ongoing source of groundwater contamination. As discussed below, the property owner has proposed to Alameda County Health to implement a soil bioventing system as a corrective action to reduce contaminant mass.
2. ***The groundwater contaminant plume is well characterized, and is stable or reducing in magnitude and extent.*** As discussed above, in our professional opinion, this criterion has not been met, and continued groundwater monitoring will be needed to demonstrate plume stability.
3. ***If residual contamination (soil or groundwater) exists, there is no reasonable risk to sensitive receptors (i.e., contaminant discharge to surface water or water supply wells) or to site occupants.*** This criterion is generally met by conducting a Risk-Based Corrective Action (RBCA) assessment that models the fate and transport of residual contamination in the context of potential impacts to sensitive receptors (e.g., water wells, residential land use). For this site, Redwood Creek is considered the primary sensitive receptor. The proposed corrective action is designed specifically to reduce the magnitude and duration of future contaminated groundwater discharge to Redwood Creek.

A bioventing pilot test was conducted at the site in September and October 2004, which was discussed in detail in our Bioventing Pilot Tests Result Report (SES, 2004f). The findings indicated that bioventing is an appropriate technology to mitigate the residual unsaturated zone soil contamination, the primary source of ongoing groundwater contamination. The pilot test report included a full-scale system design and installation/operation procedures that East Bay Regional Park District has elected to implement. Alameda County Health has not yet responded to the report.

6.0 SUMMARY CONCLUSIONS AND PROPOSED ACTIONS

SUMMARY AND CONCLUSIONS

- Groundwater sampling has been conducted on an approximately quarterly basis since November 1994 (32 events in the initial site wells). A total of 11 site wells are available for monitoring; 7 of the available wells are currently monitored for contamination.
- Site contaminants of concern include gasoline, diesel, BTEX, and MTBE. Current groundwater concentrations exceed applicable regulatory agency screening levels for all constituents except toluene.
- The primary environmental risk is discharge of contaminated groundwater to the adjacent Redwood Creek. A stream bioassessment concluded that there were no direct impacts to the surface water benthic community; however, groundwater contamination is sporadically detected in surface water samples, and there is historical visual evidence of plume discharge at the creek/groundwater interface. Surface water samples have sporadically exceeded surface water ESL criteria for gasoline, diesel, and benzene, and generally only in low creek flow conditions. An in-stream bioassessment evaluation in 1999-2000 determined no impacts to the benthic macroinvertebrate community.
- The existing well layout adequately constrains the lateral extent of groundwater contamination, and the vertical limit is very likely the top of the near-surface (25 to 28 feet) siltstone bedrock. The saturated interval extends approximately 12 to 15 feet from top of bedrock through the capillary fringe. Groundwater elevations fluctuate seasonally, creating a capillary fringe that varies seasonally in thickness.
- The groundwater contaminant plume has become disconnected from the former source, and has migrated well beyond the former source area (represented by well MW-2) toward Redwood Creek. The plume of groundwater contamination above screening levels appears to be approximately 120 feet long and approximately 50 feet wide. The zone of greatest contamination (greater than 10,000 $\mu\text{g/L}$ TPH) is an approximately 20- to 30-foot-wide by 50-foot-long area extending from just downgradient of MW-8 to the most downgradient well MW-7.
- The contaminant plume is neither stable nor reducing, as groundwater contaminant concentrations fluctuate seasonally, and the center of mass of the contaminant plume (represented by maximum concentrations) has alternated between mid-plume and downgradient wells in recent history. While recent groundwater contaminant concentrations

are at or near sitewide historical maxima, there is no indication that maximum site groundwater concentrations are increasing, suggesting that "worst-case" contaminant concentrations have been reached.

- A two-phase ORC™ injection corrective action program was implemented at the site. In September 2001, approximately 3,000 pounds of ORC™ was injected into 44 boreholes over a 4,400-square foot area of the maximum groundwater contamination. In June 2002, approximately 1,000 pounds of ORC™ was injected in 30 boreholes over a smaller area that showed residual high contaminant concentrations following the initial injection phase. The ORC™ was injected over the full saturated interval (including the capillary fringe). The findings indicate that the corrective action was partially effective in reducing the lateral extent of the groundwater contaminant plume; however, initial contaminant reductions were followed by rebounding to pre-injection concentrations. The data suggest that site conditions support aerobic biodegradation when not limited by oxygen concentrations, notably on the plume margins and upgradient former source area, but not along the centerline of the contaminant plume.
- A September 2003 exploratory borehole program confirmed that sorbed-phase contamination in the seasonally-unsaturated zone is a primary source of long-term contaminant contribution to the groundwater plume. Reduction/removal of this contamination will be necessary to eliminate continued discharge of contaminated groundwater to Redwood Creek and ultimately obtain site closure.
- Soil bioventing is a proven technology for contaminant mass removal in the unsaturated zone, under conditions similar to the site, and appears to be the most appropriate corrective action strategy giving consideration to technical, cost, safety, and aesthetic issues. A 2- to 3-year program of bioventing will likely reduce unsaturated zone contamination such that it will no longer be a long-term source of contamination to groundwater. A full-scale bioventing system design was presented to Alameda County Health in October 2004.

PROPOSED ACTIONS

The EBRPD proposes to implement the following actions to address regulatory concerns:

- Continue the quarterly program of creek and groundwater sampling and reporting.
- Continue to inform regulators of site progress and seek their concurrence with proposed actions.
- Install the proposed bioventing system as a corrective action to move the site toward closure.
- Continue to evaluate analytical results (and bioventing contaminant removal data) in the context of hydrochemical trends, impacts of groundwater contamination on Redwood Creek, and the effectiveness of the corrective action.

7.0 LIMITATIONS

This report has been prepared for the exclusive use of the East Bay Regional Park District, its authorized representatives, and the regulatory agencies. No reliance on this report shall be made by anyone other than those for whom it was prepared.

The findings and conclusions presented in this report are based on the review of previous investigators' findings at the site, as well as onsite activities conducted by SES since September 1998. This report provides neither a certification nor guarantee that the property is free of hazardous substance contamination. This report has been prepared in accordance with generally accepted methodologies and standards of practice. The SES personnel who performed these activities are qualified to perform such investigations and have accurately reported the information available, but cannot attest to the validity of that information. No warranty, expressed or implied, is made as to the findings, conclusions, and recommendations included in the report.

The findings of this report are valid as of the present. Site conditions may change with the passage of time, natural processes, or human intervention, which can invalidate the findings and conclusions presented in this report. As such, this report should be considered a reflection of the current site conditions as based on the investigation and remediation completed.

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APPENDIX A

Historical Analytical Results and Plume Maps

HISTORICAL GROUNDWATER MONITORING WELLS ANALYTICAL RESULTS
REDWOOD REGIONAL PARK SERVICE YARD, OAKLAND, CALIFORNIA
(all concentrations in ug/L, equivalent to parts per billion [ppb])

Well MW-2									
Event	Date	TVHg	TEHd	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX	MTBE
1	Nov-94	66	< 50	3.4	< 0.5	< 0.5	0.9	4.3	NA
2	Feb-95	89	< 50	18	2.4	1.7	7.5	30	NA
3	May-95	< 50	< 50	3.9	< 0.5	1.6	2.5	8	NA
4	Aug-95	< 50	< 50	5.7	< 0.5	< 0.5	< 0.5	5.7	NA
5	May-96	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
6	Aug-96	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
7	Dec-96	< 50	< 50	6.3	< 0.5	1.6	< 0.5	7.9	NA
8	Feb-97	< 50	< 50	0.69	< 0.5	0.55	< 0.5	1.2	NA
9	May-97	67	< 50	8.9	< 0.5	5.1	< 1.0	14	NA
10	Aug-97	< 50	< 50	4.5	< 0.5	1.1	< 0.5	5.6	NA
11	Dec-97	61	< 50	21	< 0.5	6.5	3.9	31	NA
12	Feb-98	2,000	200	270	92	150	600	1,112	NA
13	Sep-98	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	7.0
14	Apr-99	82	710	4.2	< 0.5	3.4	4	12	7.5
15	Dec-99	57	< 50	20	0.6	5.9	< 0.5	27	4.5
16	Sep-00	< 50	< 50	0.72	< 0.5	< 0.5	< 0.5	0.7	7.9
17	Jan-01	51	< 50	8.3	< 0.5	1.5	< 0.5	9.8	8.0
18	Apr-01	110	< 50	10	< 0.5	11	6.4	27	10
19	Aug-01	260	120	30	6.7	1.6	6.4	45	27
20	Dec-01	74	69	14	0.8	3.7	3.5	22	6.6

Well MW-2 (continued)									
Event	Date	TVHg	TEHd	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX	MTBE
21	Mar-02	< 50	< 50	2.3	0.51	1.9	1.3	8.3	8.2
22	Jun-02	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	7.7
23	Sep-02	98	< 50	5.0	< 0.5	< 0.5	< 0.5	—	13
24	Dec-02	< 50	< 50	4.3	< 0.5	< 0.5	< 0.5	—	< 2.0
25	Mar-03	130	82	39	< 0.5	20	4.1	63	16
26	Jun-03	< 50	< 50	1.9	< 0.5	< 0.5	< 0.5	1.9	8.7
27	Sep-03	120	< 50	8.6	0.51	0.53	< 0.5	9.6	23
28	Dec-03	282	< 100	4.3	1.6	1.3	1.2	8.4	9.4
29	Mar-04	374	< 100	81.0	1.2	36	7.3	126	18
30	Jun-04	< 50	< 50	0.75	< 0.5	< 0.5	< 0.5	< 0.5	15
31	Sep-04	200	< 50	23	< 0.5	< 0.5	0.70	24	16
32	Dec-04	80	< 50	14	< 0.5	2.9	0.72	18	20

Well MW-4									
Event	Date	TVHg	TEHd	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX	MTBE
1	Nov-94	2,600	230	120	4.8	150	88	363	NA
2	Feb-95	11,000	330	420	17	440	460	1,337	NA
3	May-95	7,200	440	300	13	390	330	1,033	NA
4	Aug-95	1,800	240	65	6.8	89	67	227	NA
5	May-96	1,100	140	51	< 0.5	< 0.5	47	98	NA
6	Aug-96	3,700	120	63	2.0	200	144	409	NA
7	Dec-96	2,700	240	19	< 0.5	130	93	242	NA
8	Feb-97	3,300	< 50	120	1.0	150	103	374	NA
9	May-97	490	< 50	2.6	6.7	6.4	6.7	22	NA
10	Aug-97	1,900	150	8.6	3.5	78	53	143	NA
11	Dec-97	1,000	84	4.6	2.7	61	54	123	NA
12	Feb-98	5,300	340	110	24	320	402	856	NA
13	Sep-98	1,800	< 50	8.9	< 0.5	68	27	104	23
14	Apr-99	2,900	710	61	1.2	120	80	263	32
15	Dec-99	1,000	430	4.0	2.0	26	14	46	< 2.0

Well MW-4 (continued)									
Event	Date	TVHg	TEHd	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX	MTBE
16	Sep-00	570	380	< 0.5	< 0.5	16	4.1	20	2.4
17	Jan-01	1,600	650	4.2	0.89	46	13.8	65	8.4
18	Apr-01	1,700	1,100	4.5	2.8	48	10.7	66	5.0
19	Aug-01	1,300	810	3.2	4.0	29	9.7	46	< 2.0
20	Dec-01	< 50	110	< 0.5	< 0.5	< 0.5	1.2	1.2	< 2.0
21	Mar-02	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	< 2.0
22	Jun-02	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	< 2.0
23	Sep-02	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	< 2.0
24	Dec-02	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	< 2.0
25	Mar-03	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	< 2.0
26	Jun-03	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	< 2.0
27	Sep-03	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	< 2.0
28	Dec-03	< 50	< 100	< 0.3	< 0.3	< 0.3	< 0.6	—	< 5.0
29	Mar-04	< 50	< 100	< 0.3	< 0.3	< 0.3	< 0.6	—	< 5.0
30	Jun-04	< 50	2,500	< 0.3	< 0.3	< 0.3	< 0.6	—	< 5.0
31	Sep-04	< 50	< 50	< 0.5	< 0.5	< 0.5	< 1.0	—	< 2.0
32	Dec-04	< 50	< 50	< 0.5	< 0.5	< 0.5	< 1.0	—	< 2.0

Well MW-5									
Event	Date	TVHg	TEHd	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX	MTBE
1	Nov-94	50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
2	Feb-95	70	< 50	0.6	< 0.5	< 0.5	< 0.5	0.6	NA
3	May-95	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
4	Aug-95	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
5	May-96	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
6	Aug-96	80	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
7	Dec-96	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
8	Feb-97	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
9	May-97	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
10	Aug-97	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
11	Dec-97	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
12	Feb-98	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
13	Sep-98	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	< 2
Groundwater monitoring in this well discontinued in 1998 with Alameda County Health Care Services Agency approval.									
Subsequent groundwater monitoring conducted to confirm plume's southern limit									
14	Jun-04	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	5.9
15	Sep-04	< 50	< 50	< 0.5	< 0.5	< 0.5	< 1.0	—	< 2.0

Well MW-7									
Event	Date	TVHg	TEHd	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX	MTBE
1	Jan-01	13,000	3,100	95	4	500	289	888	95
2	Apr-01	13,000	3,900	140	< 0.5	530	278	948	52
3	Aug-01	12,000	5,000	55	25	440	198	718	19
4	Dec-01	9,100	4,600	89	< 2.5	460	228	777	< 10
5	Mar-02	8,700	3,900	220	6.2	450	191	867	200
6	Jun-02	9,300	3,500	210	6.3	380	155	751	18
7	Sep-02	9,600	3,900	180	< 0.5	380	160	720	< 2.0
8	Dec-02	9,600	3,700	110	< 0.5	400	188.9	699	< 2.0
9	Mar-03	10,000	3,600	210	12	360	143	725	45
10	Jun-03	9,300	4,200	190	< 10	250	130	570	200
11	Sep-03	10,000	3,300	150	11	300	136	597	< 2.0
12	Dec-03	9,140	1,100	62	45	295	184	586	89
13	Mar-04	8,170	600	104	41	306	129	580	84
14	Jun-04	9,200	2,700	150	< 0.5	290	91	531	< 2.0
15	Sep-04	9,700	3,400	98	< 0.5	300	125	523	< 2.0
16	Dec-04	8200	4,000	95	< 0.5	290	124	509	< 2.0

Well MW-8									
Event	Date	TVHg	TEHd	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX	MTBE
1	Jan-01	14,000	1,800	430	17	360	1230	2,037	96
2	Apr-01	11,000	3,200	320	13	560	1,163	2,056	42
3	Aug-01	9,600	3,200	130	14	470	463	1,077	14
4	Dec-01	3,500	950	69	2.4	310	431	812	< 4.0
5	Mar-02	14,000	3,800	650	17	1,200	1,510	3,377	240
6	Jun-02	2,900	1,100	70	2.0	170	148	390	19
7	Sep-02	1,000	420	22	< 0.5	64	50	136	< 2.0
8	Dec-02	3,300	290	67	< 0.5	190	203	460	< 2.0
9	Mar-03	13,000	3,500	610	12	1,100	958	2,680	< 10
10	Jun-03	7,900	2,200	370	7.4	620	562	1,559	< 4.0
11	Sep-03	3,600	400	120	3.3	300	221	644	< 2.0
12	Dec-03	485	100	19	1.5	26	36	83	< 5.0

Well MW-8 (continued)

Event	Date	TVHg	TEHd	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX	MTBE
13	Mar-04	16,000	900	592	24	1,060	1,870	3,546	90
14	Jun-04	5,900	990	260	9.9	460	390	1,120	< 10
15	Sep-04	2,000	360	100	< 2.5	180	102	382	< 10
16	Dec-04	15,000	4,000	840	21	1,200	1,520	3,581	< 10

Well MW-9

Event	Date	TVHg	TEHd	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX	MTBE
1	Aug-01	11,000	170	340	13	720	616	1,689	48
2	Dec-01	9,400	2,700	250	5.1	520	317	1,092	< 10
3	Mar-02	1,700	300	53	4.2	120	67	244	20
4	Jun-02	11,000	2,500	200	16	600	509	1,325	85
5	Sep-02	3,600	2,800	440	11	260	39	750	< 4.0
6	Dec-02	7,000	3,500	380	9.5	730	147	1,266	< 10
7	Mar-03	4,400	1,400	320	6.9	400	93	820	< 2.0
8	Jun-03	7,600	1,600	490	10	620	167	1,287	< 4.0
9	Sep-03	8,300	2,900	420	14	870	200	1,504	< 10
10	Dec-03	7,080	700	287	31	901	255	1,474	< 10
11	Mar-04	3,550	600	122	15	313	84	534	35
12	Jun-04	6,800	1,700	350	< 2.5	620	99	1,069	< 10
13	Sep-04	7,100	1,900	160	8.1	600	406	1,174	< 10
14	Dec-04	4700	2800	160	< 2.5	470	< 0.5	630	< 10

Well MW-10									
Event	Date	TVHg	TEHd	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX	MTBE
1	Aug-01	550	2,100	17	< 0.5	31	44	92	40
2	Dec-01	< 50	81	< 0.5	< 0.5	< 0.5	< 0.5	—	25
3	Mar-02	< 50	< 50	0.61	< 0.5	< 0.5	< 0.5	0.61	6.0
4	Jun-02	< 50	< 50	0.59	< 0.5	0.58	< 0.5	1.2	9.0
5	Sep-02	160	120	10	< 0.5	6.7	3.6	20	26
6	Dec-02	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	16
7	Mar-03	110	< 50	11	< 0.5	12	1.3	24	15
8	Jun-03	110	< 50	9.6	< 0.5	6.8	< 0.5	16	9.0
9	Sep-03	< 50	< 50	1.1	< 0.5	1.5	< 0.5	2.6	7.0
10	Dec-03	162	< 100	6.9	< 0.3	8	< 0.6	15	9.9
11	Mar-04	94	< 100	2.8	< 0.3	5.7	7.0	16	< 5.0
12	Jun-04	150	56	11	< 0.5	12	< 0.5	23	15
13	Sep-04	< 50	< 50	1.6	< 0.5	1.9	< 1.0	3.5	5.8
14	Dec-04	64	< 50	3.7	< 0.5	3.7	0.7	8.1	10

Well MW-11									
Event	Date	TVHg	TEHd	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX	MTBE
1	Aug-01	17,000	7,800	390	17	820	344	1,571	< 10
2	Dec-01	5,800	2,800	280	7.8	500	213	1,001	< 10
3	Mar-02	100	94	< 0.5	< 0.5	0.64	< 0.5	0.64	2.4
4	Jun-02	8,200	2,600	570	13	560	170	1,313	< 4
5	Sep-02	12,000	4,400	330	13	880	654	1,877	< 10
6	Dec-02	18,000	4,500	420	< 2.5	1,100	912	2,432	< 10
7	Mar-03	7,800	2,600	170	4.7	530	337	1,042	53
8	Jun-03	14,000	3,800	250	< 2.5	870	693	1,813	< 10
9	Sep-03	10,000	3,000	250	9.9	700	527	1,487	< 4
10	Dec-03	15,000	1,100	314	60	1,070	802	2,246	173
11	Mar-04	4,900	400	72	17	342	233	664	61
12	Jun-04	10,000	2,300	210	2.8	690	514	1,417	< 10
13	Sep-04	7,200	2,300	340	< 2.5	840	75	1,255	< 10
14	Dec-04	11,000	3,900	180	5.1	780	695	1,660	< 10

**HISTORICAL SURFACE WATER ANALYTICAL RESULTS
REDWOOD REGIONAL PARK SERVICE YARD, OAKLAND, CALIFORNIA**

(all concentrations in ug/L, equivalent to parts per billion [ppb])

Sampling Location SW-1 (Upstream of Contaminated Groundwater Discharge Location SW-2)									
Event	Date	TVHg	TEHd	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX	MTBE
1	Feb-94	50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
2	May-95	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
3	May-96	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
4	Aug-96	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
5	Dec-96	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
6	Feb-97	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
7	Aug-97	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
8	Dec-97	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
9	Feb-98	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
10	Sep-98	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	< 2.0
11	Apr-99	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	< 2.0

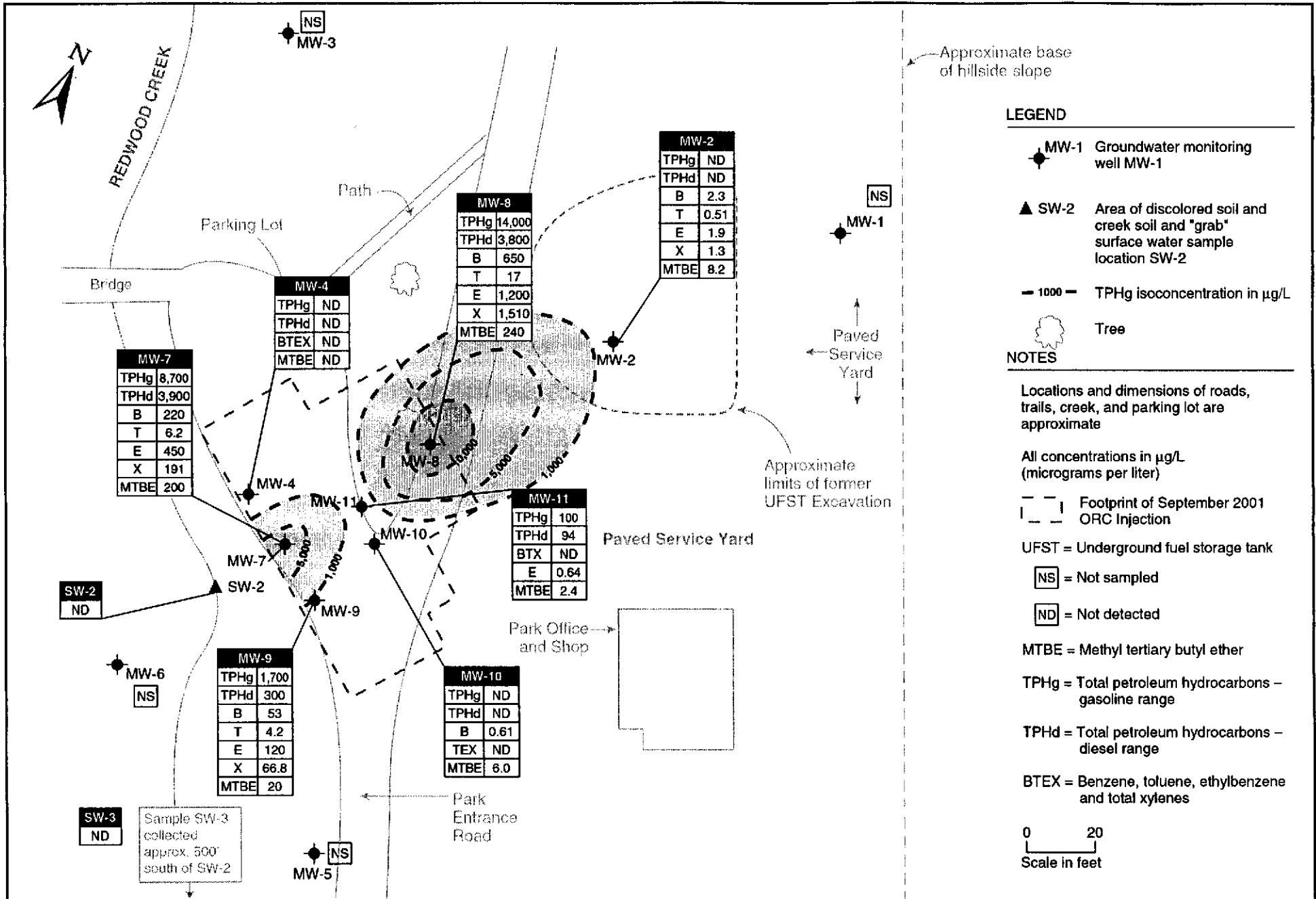
Sampling at this location discontinued after April 1999 with Alameda County Health Services Agency approval.

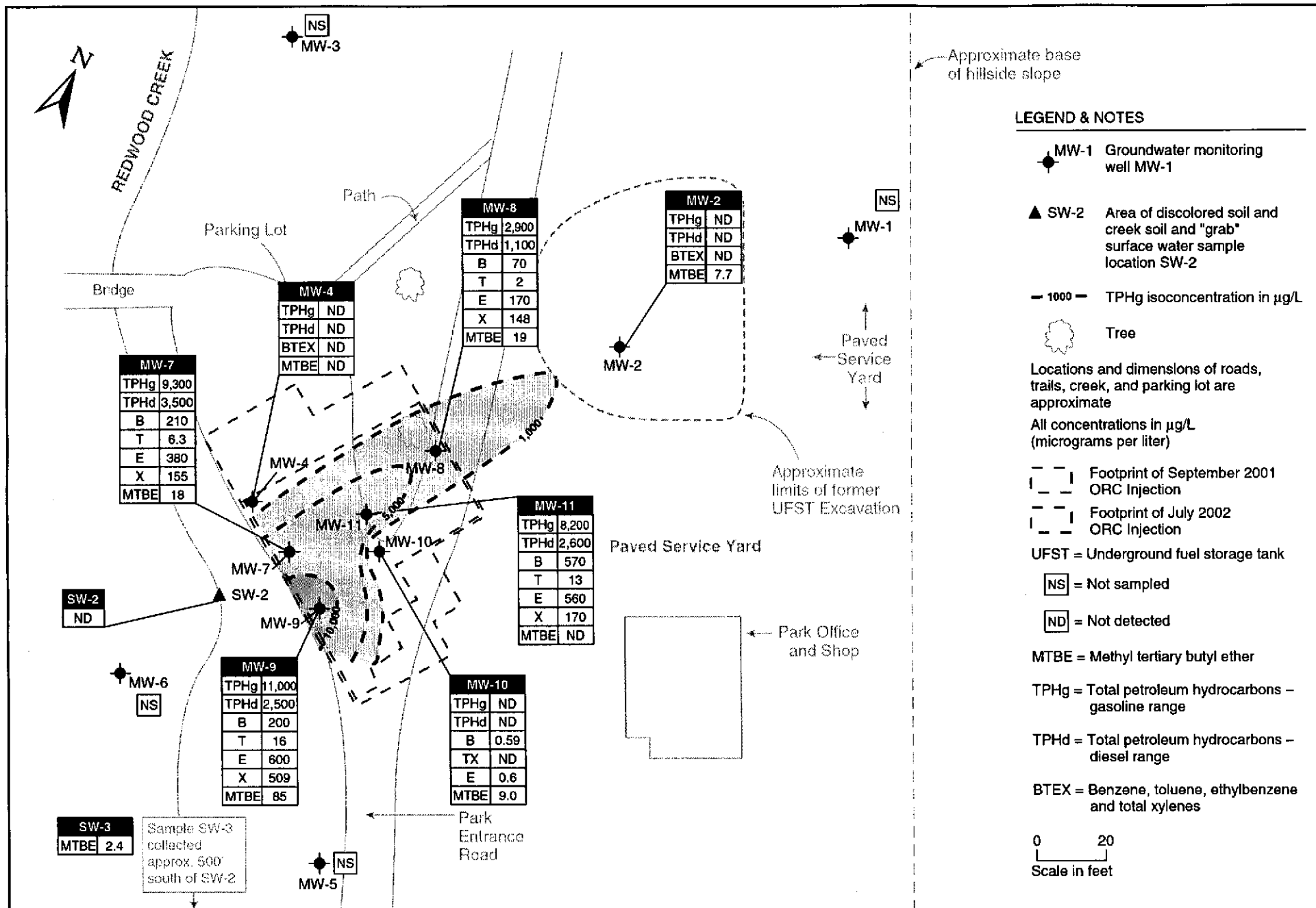
Sampling Location SW-2 (Area of Historical Contaminated Groundwater Discharge)									
Event	Date	TVHg	TEHd	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX	MTBE
1	Feb-94	130	< 50	1.9	< 0.5	4.4	3.2	9.5	NA
2	May-95	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
3	Aug-95	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
4	May-96	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
5	Aug-96	200	< 50	7.5	< 0.5	5.4	< 0.5	13	NA
6	Dec-96	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
7	Feb-97	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
8	Aug-97	350	130	13	0.89	19	11	44	NA
9	Dec-97	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
10	Feb-98	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
11	Sep-98	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	< 2.0
12	Apr-99	81	< 50	2.0	< 0.5	2.5	1.3	5.8	2.3
13	Dec-99	1,300	250	10	1.0	47	27	85	2.2
14	Sep-00	160	100	2.1	< 0.5	5.2	1.9	9.2	3.4
15	Jan-01	< 50	< 50	< 0.5	< 0.5	0.53	< 0.5	0.5	< 2.0
16	Apr-01	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	< 2.0
17	Sep-01	440	200	2.1	< 0.5	17	1.3	20	10
18	Dec-01	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	-	< 2.0
19	Mar-02	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	-	< 2.0
20	Jun-02	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	-	< 2.0
21	Sep-02	220	590	10	< 0.5	13	< 0.5	23	< 2.0
22	Dec-02	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	-	< 2.0
23	Mar-03	< 50	< 50	< 0.5	< 0.5	0.56	< 0.5	0.56	2.8
24	Jun-03	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	-	< 2.0
25	Sep-03	190	92	2.1	< 0.5	4.2	< 0.5	6.3	< 2.0
26	Dec-03	86	< 100	< 0.3	< 0.3	< 0.3	< 0.6	-	< 5.0
27	Mar-04	< 50	< 100	< 0.3	< 0.3	1.1	< 0.6	1.1	< 5.0
28	Jun-04	< 50	< 50	< 0.5	< 0.5	0.83	< 0.5	0.83	< 2.0
29	Sep-04	260	370	4.4	< 0.5	6.3	< 1.0	11	< 2.0
30	Dec-04	< 50	< 50	< 0.5	< 0.5	< 0.5	< 1.0	-	< 2.0

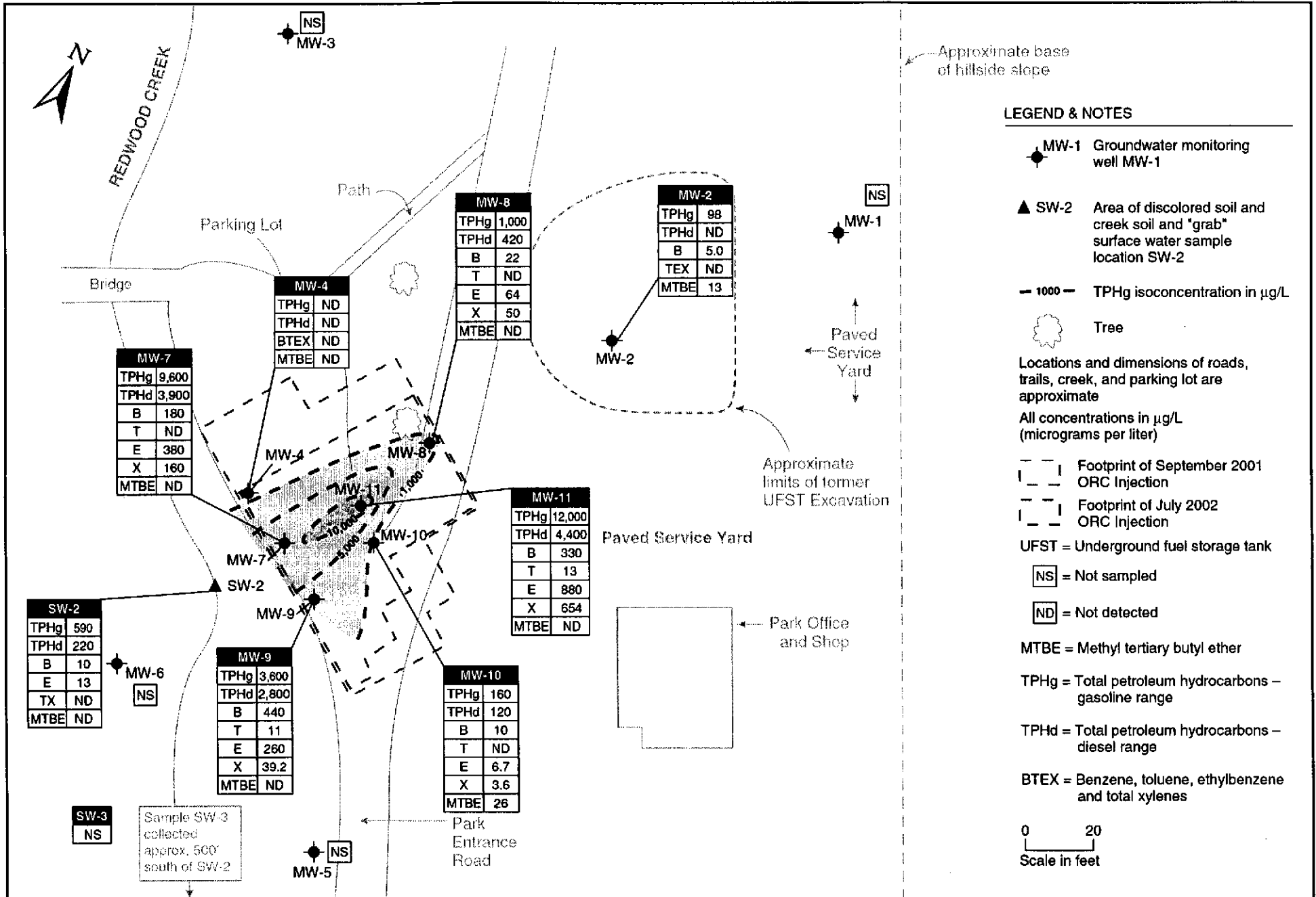
Sampling Location SW-3 (Downstream of Contaminated Groundwater Discharge Location SW-2)									
Event	Date	TVHg	TEHd	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX	MTBE
1	May-95	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
2	Aug-95	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
3	May-96	< 50	74	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
4	Aug-96	69	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
5	Dec-96	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
6	Feb-97	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
7	Aug-97	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
8	Dec-97	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
9	Feb-98	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
10	Sep-98	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	< 2.0
11	Apr-99	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	< 2.0
12	Dec-99	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	< 2.0
13	Sep-00	NS	NS	NS	NS	NS	NS	—	NS
14	Jan-01	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	< 2.0
15	Apr-01	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	< 2.0
16	Sep-01	NS	NS	NS	NS	NS	NS	—	NS
17	Dec-01	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	< 2.0
18	Mar-02	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	< 2.0
19	Jun-02	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	2.4
20	Sep-02	NS	NS	NS	NS	NS	NS	—	NS
21	Dec-02	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	-	< 2.0
22	Mar-03	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	-	< 2.0
23	Jun-03	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	-	< 2.0
24	Sep-03	NS	NS	NS	NS	NS	NS	—	NS
25	Dec-03	60	< 100	< 0.3	< 0.3	< 0.3	< 0.6	-	< 5.0
26	Mar-04	< 50	< 100	< 0.3	< 0.3	< 0.6	< 0.6	-	< 5.0
27	Jun-04	NS	NS	NS	NS	NS	NS	—	NS
28	Sep-04	NS	NS	NS	NS	NS	NS	—	NS
29	Dec-04	< 50	< 50	< 0.5	< 0.5	< 0.5	< 1.0	-	< 2.0

NA = Not Analyzed for this constituent

NS = Not Sampled (no surface water present during sampling event)







MW-3	
TPHg	NS

MW-4	
TPHg	ND
TPHd	ND
BTEX	ND
MTBE	ND

MW-8	
TPHg	1,000
TPHd	420
B	22
T	ND
E	64
X	50
MTBE	ND

MW-2	
TPHg	98
TPHd	ND
B	5.0
TEX	ND
MTBE	13

MW-7	
TPHg	9,600
TPHd	3,900
B	180
T	ND
E	380
X	160
MTBE	ND

MW-4	
TPHg	ND
TPHd	ND
BTEX	ND
MTBE	ND

MW-8	
TPHg	1,000
TPHd	420
B	22
T	ND
E	64
X	50
MTBE	ND

MW-2	
TPHg	98
TPHd	ND
B	5.0
TEX	ND
MTBE	13

SW-2	
TPHg	590
TPHd	220
B	10
E	13
TX	ND
MTBE	ND

MW-9	
TPHg	3,600
TPHd	2,800
B	440
T	11
E	260
X	39.2
MTBE	ND

MW-11	
TPHg	12,000
TPHd	4,400
B	330
T	13
E	880
X	654
MTBE	ND

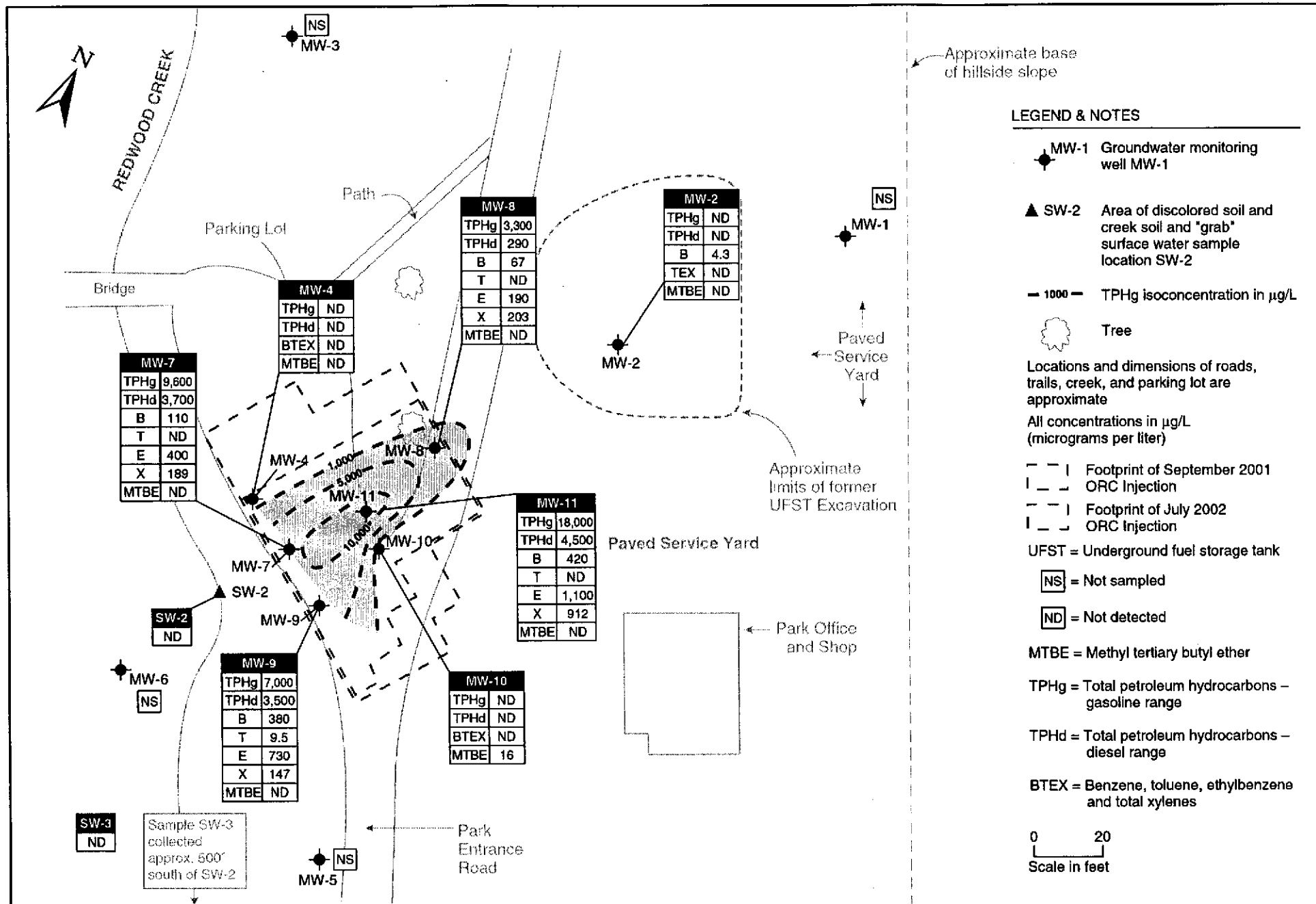
SW-3	
TPHg	NS

Sample SW-3 collected approx. 500' south of SW-2

MW-9	
TPHg	3,600
TPHd	2,800
B	440
T	11
E	260
X	39.2
MTBE	ND

MW-10	
TPHg	160
TPHd	120
B	10
T	ND
E	6.7
X	3.6
MTBE	26

MW-5	
TPHg	NS



LEGEND & NOTES

- MW-1 Groundwater monitoring well MW-1
- ▲ SW-2 Area of discolored soil and creek soil and "grab" surface water sample location SW-2
- 1000 — TPHg isoconcentration in µg/L
- Tree

Locations and dimensions of roads, trails, creek, and parking lot are approximate

All concentrations in µg/L (micrograms per liter)

- Footprint of September 2001
- ORC Injection
- Footprint of July 2002
- ORC Injection

UFST = Underground fuel storage tank

NS = Not sampled

ND = Not detected

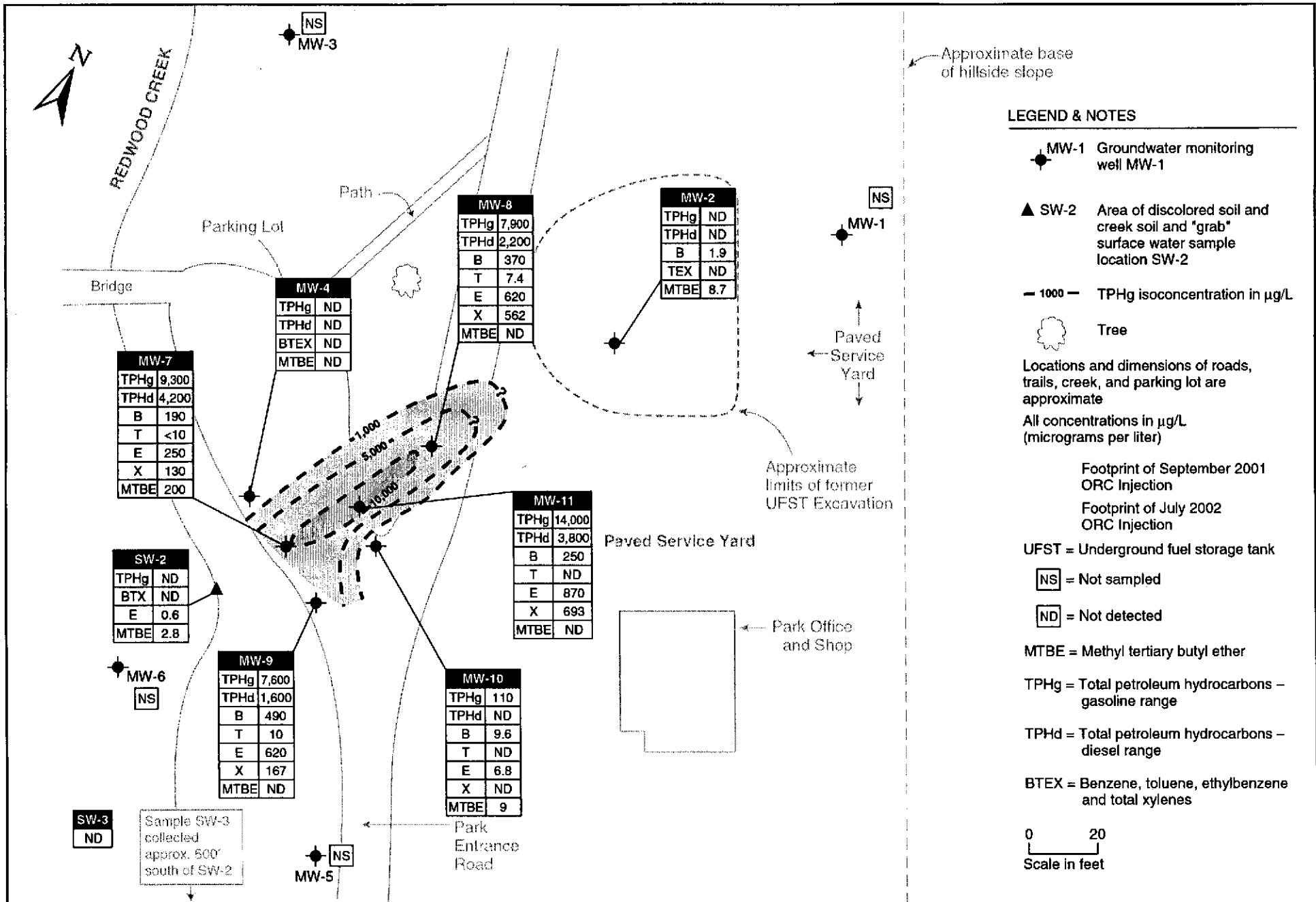
MTBE = Methyl tertiary butyl ether

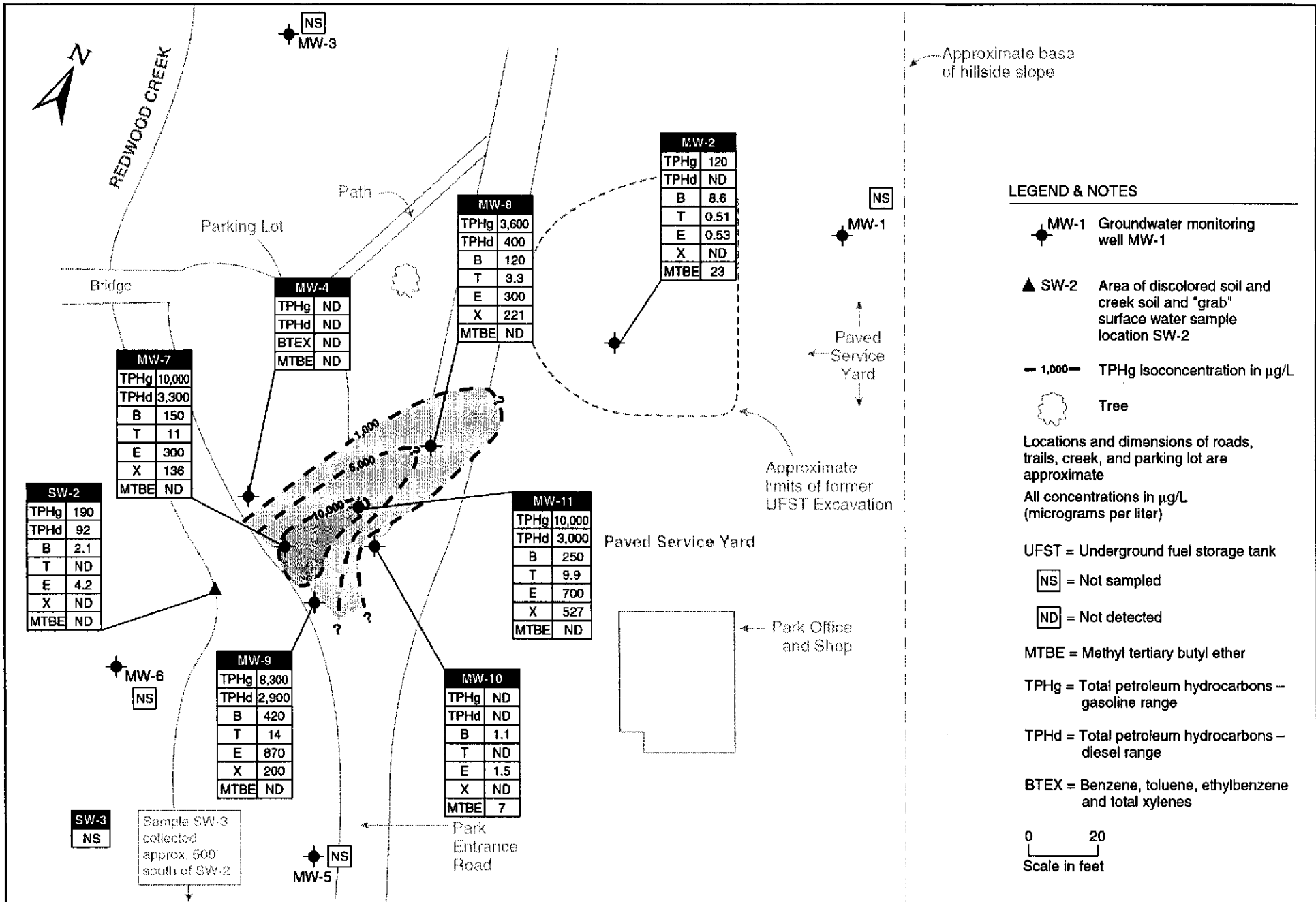
TPHg = Total petroleum hydrocarbons – gasoline range

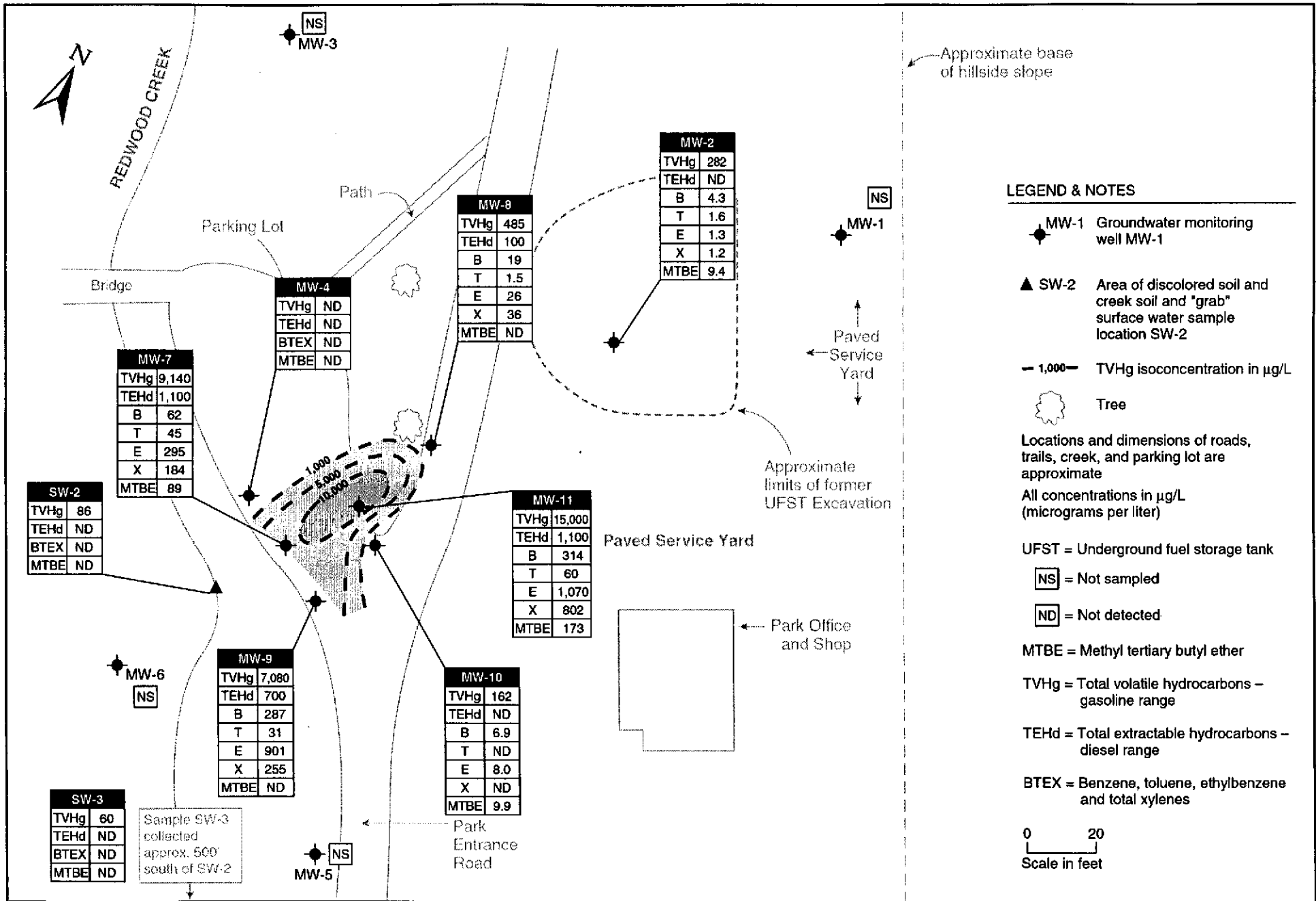
TPHd = Total petroleum hydrocarbons – diesel range

BTEX = Benzene, toluene, ethylbenzene and total xylenes

0 20
Scale in feet

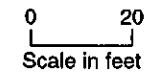




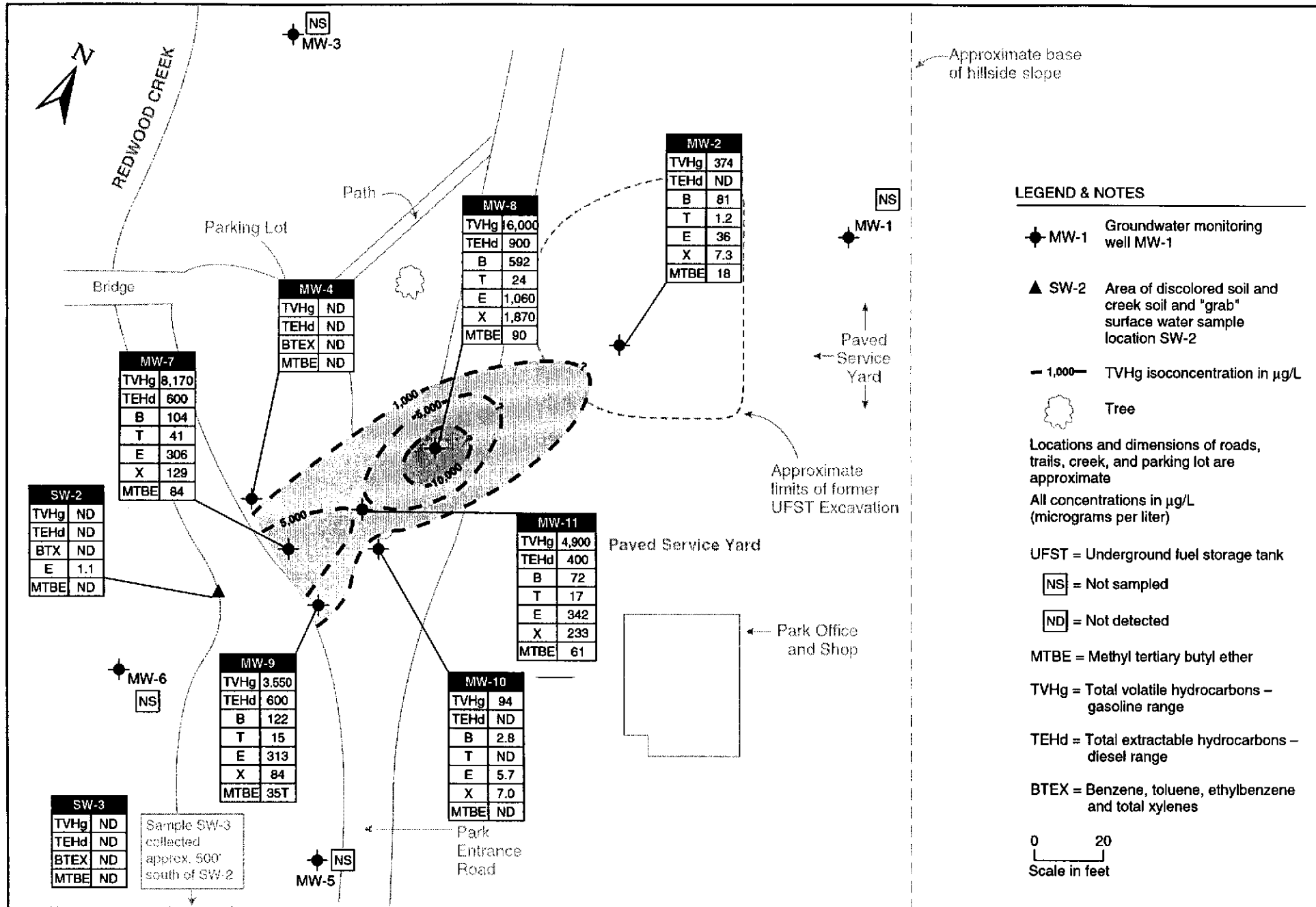


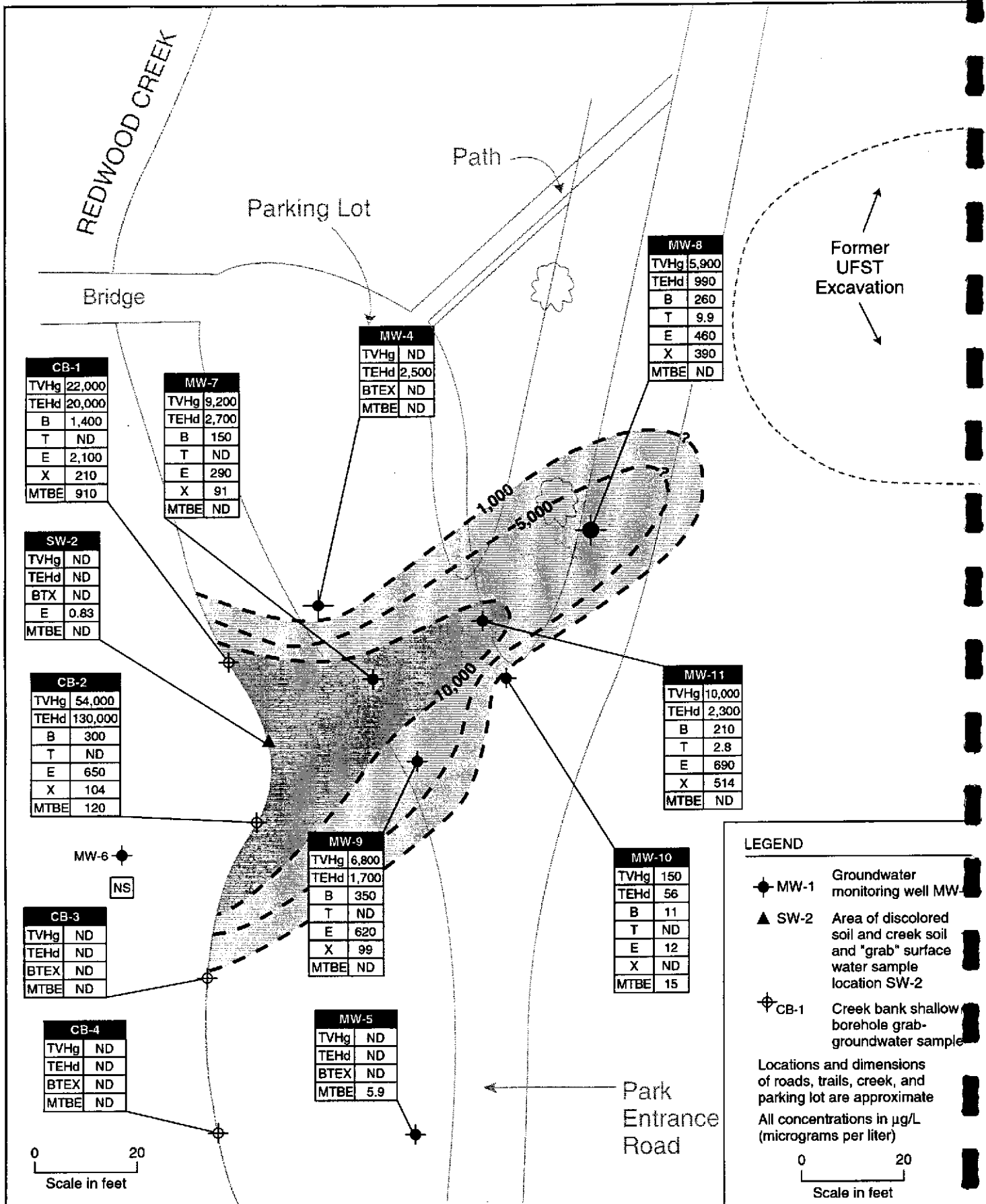
LEGEND & NOTES

- ◆ MW-1 Groundwater monitoring well MW-1
- ▲ SW-2 Area of discolored soil and creek soil and "grab" surface water sample location SW-2
- 1,000 — TVHg isoconcentration in µg/L
- ☼ Tree
- Locations and dimensions of roads, trails, creek, and parking lot are approximate
- All concentrations in µg/L (micrograms per liter)
- UFST = Underground fuel storage tank
- NS = Not sampled
- ND = Not detected
- MTBE = Methyl tertiary butyl ether
- TVHg = Total volatile hydrocarbons – gasoline range
- TEHd = Total extractable hydrocarbons – diesel range
- BTEX = Benzene, toluene, ethylbenzene and total xylenes



03-02-32





CB-1	
TVHg	22,000
TEHd	20,000
B	1,400
T	ND
E	2,100
X	210
MTBE	910

MW-7	
TVHg	9,200
TEHd	2,700
B	150
T	ND
E	290
X	91
MTBE	ND

MW-4	
TVHg	ND
TEHd	2,500
BTEX	ND
MTBE	ND

MW-8	
TVHg	5,900
TEHd	990
B	260
T	9.9
E	460
X	390
MTBE	ND

SW-2	
TVHg	ND
TEHd	ND
BTX	ND
E	0.83
MTBE	ND

CB-2	
TVHg	54,000
TEHd	130,000
B	300
T	ND
E	650
X	104
MTBE	120

MW-11	
TVHg	10,000
TEHd	2,300
B	210
T	2.8
E	690
X	514
MTBE	ND

MW-6
NS

CB-3	
TVHg	ND
TEHd	ND
BTEX	ND
MTBE	ND

MW-9	
TVHg	6,800
TEHd	1,700
B	350
T	ND
E	620
X	99
MTBE	ND

MW-10	
TVHg	150
TEHd	56
B	11
T	ND
E	12
X	ND
MTBE	15

CB-4	
TVHg	ND
TEHd	ND
BTEX	ND
MTBE	ND

MW-5	
TVHg	ND
TEHd	ND
BTEX	ND
MTBE	5.9

LEGEND

- ◆ MW-1 Groundwater monitoring well MW-
- ▲ SW-2 Area of discolored soil and creek soil and "grab" surface water sample location SW-2
- ⊕ CB-1 Creek bank shallow borehole grab-groundwater sample

Locations and dimensions of roads, trails, creek, and parking lot are approximate
All concentrations in µg/L (micrograms per liter)

0 20
Scale in feet

0 20
Scale in feet

MAY-JUNE 2004 GROUNDWATER RESULTS AND GASOLINE CONTOURS

Redwood Regional Park
Oakland, CA

By: MJC

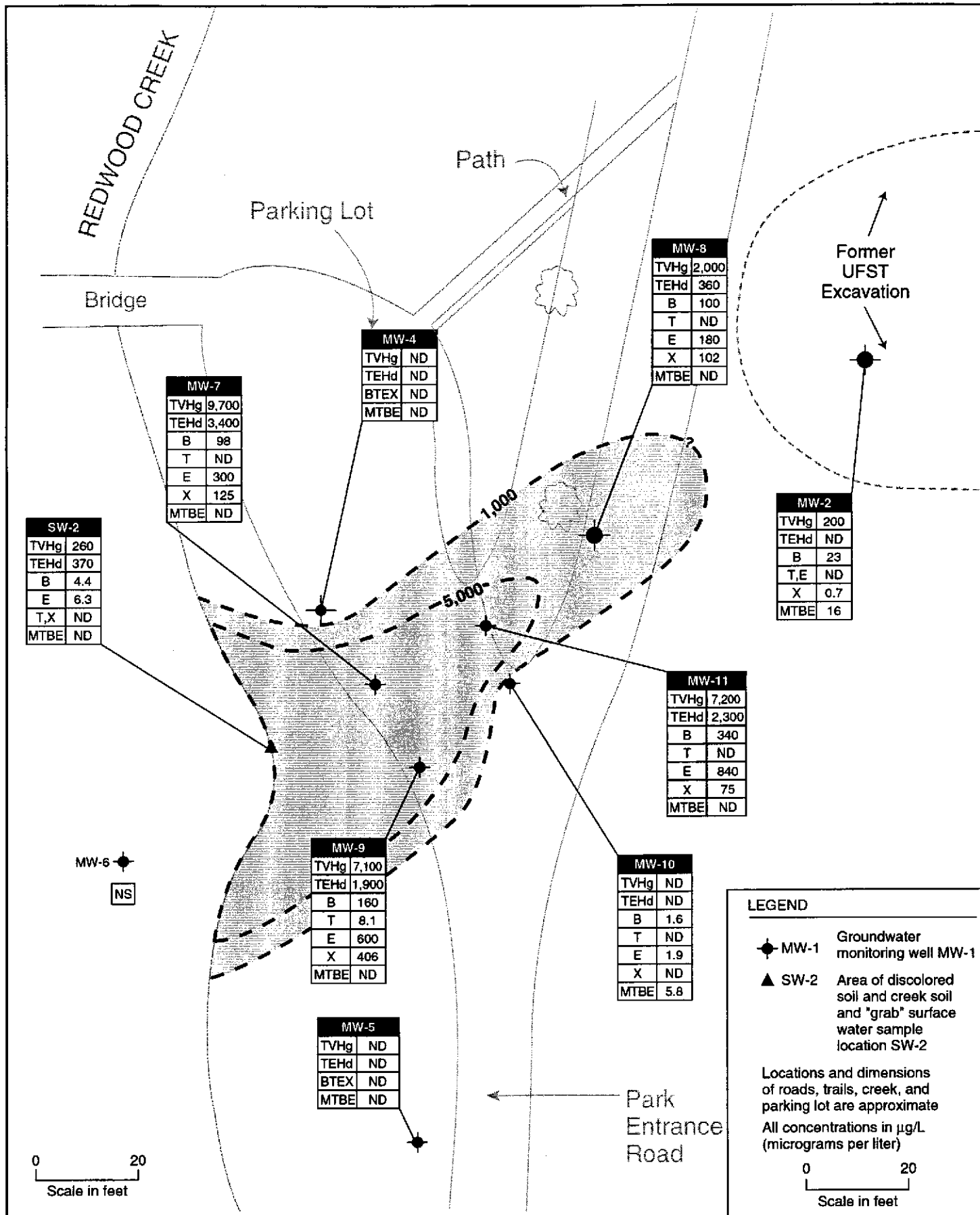
JULY 2004

Figure 8

★ Stellar Environmental Solutions, Inc.
Geoscience & Engineering Consulting

2004-02-10





SEPTEMBER 2004 GROUNDWATER RESULTS AND GASOLINE CONTOURS

Redwood Regional Park
Oakland, CA

By: MJC

OCTOBER 2004

Figure 7

★ Stellar Environmental Solutions, Inc.
Geoscience & Engineering Consulting

2004-02-12

WELLHEAD INSPECTION CHECKLIST

Client STELLAR Date 12/14/04

Site Address Redwood Regional Park, Oakland

Job Number 041214-PC1 Technician P. Lovvick

Well ID	Well Inspected - No Corrective Action Required	Water Bailed From Wellbox	Wellbox Components Cleaned	Cap Replaced	Lock Replaced	Other Action Taken (explain below)	Well Not Inspected (explain below)	Repair Order Submitted
MW-1	^							
MW-2	^							
MW-3	^							
MW-4	^							
MW-5	^							
MW-6	^							
MW-7	^							
MW-8	^	^	^					
MW-9	^							
MW-10	^		^					
MW-11	^							

NOTES: _____

WELL GAUGING DATA

Project # 041214-PC1

Date 12/14/04

Client STELLAR

Site Redwood Regional Park, Oakland

Well ID	Well Size (in.)	Sheen / Odor	Depth to Immiscible Liquid (ft.)	Thickness of Immiscible Liquid (ft.)	Volume of Immiscibles Removed (ml)	Depth to water (ft.)	Depth to well bottom (ft.)	Survey Point: TOB or TOC		
MW-1	4					3.70	19.14	TOC	67.0	
MW-2	4					21.16	38.84			
MW-3	4					19.23	45.05		67.0	
MW-4	4					13.43	26.43			
MW-5	4					16.09	26.90		67.0	
MW-6	4					13.37	27.50		67.0	
MW-7	2					13.06	25.40			
MW-8	2					8.82	22.28			
MW-9	2					12.68	26.75			
MW-10	2					11.82	26.33			
MW-11	2					14.97	30.29		↓	

WELL MONITORING DATA SHEET

Project #: <u>041214PEL</u>	Client: <u>STELLAR</u>
Sampler: <u>PC</u>	Date: <u>12/14/04</u>
Well I.D.: <u>MW-2</u>	Well Diameter: 2 3 <u>4</u> 6 8
Total Well Depth (TD): <u>30.84</u>	Depth to Water (DTW): <u>21.16</u>
Depth to Free Product:	Thickness of Free Product (feet):
Referenced to: <u>PVC</u> Grade	D.O. Meter (if req'd): <u>YSI</u> <u>HACH</u>
DTW with 80% Recharge [(Height of Water Column x 0.20) + DTW]:	

Purge Method: <input type="checkbox"/> Bailor <input type="checkbox"/> Disposable Bailor <input type="checkbox"/> Positive Air Displacement <input checked="" type="checkbox"/> Electric Submersible	Water: <input type="checkbox"/> Peristaltic <input type="checkbox"/> Extraction Pump Other: _____	Sampling Method: <input type="checkbox"/> Bailor <input checked="" type="checkbox"/> Disposable Bailor <input type="checkbox"/> Extraction Port <input type="checkbox"/> Dedicated Tubing Other: _____
---	---	--

<u>11.5</u> (Gals.) X	<u>3</u>	=	<u>34.5</u> Gals.
Case Volume	Specified Volumes		Calculated Volume

Well Diameter	Multiplier	Well Diameter	Multiplier
1"	0.04	4"	0.65
2"	0.16	6"	1.47
3"	0.37	Other:	radius ² * 0.163

Time	Temp (°F or °C)	pH	Cond. (mS or µS)	Turbidity (NTUs)	Gals. Removed	Observations
915	15.0	6.14	897.4	67	11.5	cloudy
920	15.1	6.92	838.5	243	23	↓
924	15.2	7.00	809.6	217	34.5	

Did well dewater? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Gallons actually evacuated: <u>34.5</u>	
Sampling Date: <u>12/14/04</u>	Sampling Time: <u>935</u>	Depth to Water: <u>30.19</u>
Sample I.D.: <u>MW-2</u>	Laboratory: <u>Kiff CalScience</u>	Other: <u>C&D</u>
Analyzed for: <u>TPH-G</u> <u>BTEX</u> <u>MTBE</u> <u>TPH-D</u>	Oxygenates (5)	Other: _____
EB I.D. (if applicable): _____ @ _____ Time	Duplicate I.D. (if applicable): _____	
Analyzed for: <u>TPH-G</u> <u>BTEX</u> <u>MTBE</u> <u>TPH-D</u> Oxygenates (5) Other: _____		
D.O. (if req'd): Pre-purge: _____ mg/L	Post-purge: _____ mg/L	
O.R.P. (if req'd): Pre-purge: _____ mV	Post-purge: _____ mV	

WELL MONITORING DATA SHEET

Project #: 041214-PC1	Client: STELLAR
Sampler: PC	Date: 12/14/04
Well I.D.: MU-4	Well Diameter: 2 3 4 6 8
Total Well Depth (TD): 26-43	Depth to Water (DTW): 13-43
Depth to Free Product:	Thickness of Free Product (feet):
Referenced to: (VC) Grade	D.O. Meter (if req'd): YSI HACH
DTW with 80% Recharge [(Height of Water Column x 0.20) + DTW]:	

Purge Method: Bailor Watera Sampling Method: Bailor
 Disposable Bailor Peristaltic Disposable Bailor
 Positive Air Displacement Extraction Pump Extraction Port
 Electric Submersible Other: _____ Dedicated Tubing

8.5 (Gals.) X 3 = 25.5 Gals. Case Volume Specified Volumes Calculated Volume	<table border="1" style="width: 100%; border-collapse: collapse; font-size: small;"> <thead> <tr> <th>Well Diameter</th> <th>Multiplier</th> <th>Well Diameter</th> <th>Multiplier</th> </tr> </thead> <tbody> <tr> <td>1"</td> <td>0.04</td> <td>4"</td> <td>0.65</td> </tr> <tr> <td>2"</td> <td>0.16</td> <td>6"</td> <td>1.47</td> </tr> <tr> <td>3"</td> <td>0.37</td> <td>Other</td> <td>radius² * 0.163</td> </tr> </tbody> </table>	Well Diameter	Multiplier	Well Diameter	Multiplier	1"	0.04	4"	0.65	2"	0.16	6"	1.47	3"	0.37	Other	radius ² * 0.163
Well Diameter	Multiplier	Well Diameter	Multiplier														
1"	0.04	4"	0.65														
2"	0.16	6"	1.47														
3"	0.37	Other	radius ² * 0.163														

Time	Temp (°F or °C)	pH	Cond. (mS or µS)	Turbidity (NTUs)	Gals. Removed	Observations
945	14.2	8.12	807	68	8.5	
	Well dewatered @ 15 gal				IFR	
				16.03 = 78% recharge		24.35 @ 1005
						22.77 @ 1220
1320	13.5	9.39	854.1	744		site departure

Did well dewater? Yes No Gallons actually evacuated: **15**

Sampling Date: **12/14/04** Sampling Time: **1320** Depth to Water: **22.57**

Sample I.D.: **MU-4** Laboratory: Kiff CalScience Other: **(C&T)**

Analyzed for: ~~TPH-G BTEX MTBE TPH-D~~ Oxygenates (5) Other:

EB I.D. (if applicable): @ Time Duplicate I.D. (if applicable):

Analyzed for: TPH-G BTEX MTBE TPH-D Oxygenates (5) Other:

D.O. (if req'd):	Pre-purge:	mg/L	Post-purge:	mg/L
O.R.P. (if req'd):	Pre-purge:	mV	Post-purge:	mV

WELL MONITORING DATA SHEET

Project #: <u>041214-PC1</u>	Client: <u>STELLAR</u>
Sampler: <u>pc</u>	Date: <u>12/14/04</u>
Well I.D.: <u>MW-7</u>	Well Diameter: <u>2</u> 3 4 6 8
Total Well Depth (TD): <u>25.40</u>	Depth to Water (DTW): <u>13.06</u>
Depth to Free Product:	Thickness of Free Product (feet):
Referenced to: <u>EVO</u> Grade	D.O. Meter (if req'd): YSI HACH
DTW with 80% Recharge [(Height of Water Column x 0.20) + DTW]:	

Purge Method: <input type="checkbox"/> Bailor <input type="checkbox"/> Disposable Bailor <input checked="" type="checkbox"/> Positive Air Displacement <input type="checkbox"/> Electric Submersible	Wattera <input type="checkbox"/> Peristaltic <input type="checkbox"/> Extraction Pump Other: _____	Sampling Method: <input type="checkbox"/> Bailor <input checked="" type="checkbox"/> Disposable Bailor <input type="checkbox"/> Extraction Port <input type="checkbox"/> Dedicated Tubing Other: _____
---	---	--

$\frac{2.0 \text{ (Gals.)} \times 3}{\text{Specified Volumes}} = 6 \text{ Gals.}$ Calculated Volume	<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Well Diameter</th> <th>Multiplier</th> <th>Well Diameter</th> <th>Multiplier</th> </tr> </thead> <tbody> <tr> <td>1"</td> <td>0.04</td> <td>4"</td> <td>0.65</td> </tr> <tr> <td>2"</td> <td>0.16</td> <td>6"</td> <td>1.47</td> </tr> <tr> <td>3"</td> <td>0.37</td> <td>Other</td> <td>radius² * 0.163</td> </tr> </tbody> </table>	Well Diameter	Multiplier	Well Diameter	Multiplier	1"	0.04	4"	0.65	2"	0.16	6"	1.47	3"	0.37	Other	radius ² * 0.163
Well Diameter	Multiplier	Well Diameter	Multiplier														
1"	0.04	4"	0.65														
2"	0.16	6"	1.47														
3"	0.37	Other	radius ² * 0.163														

Time	Temp (°F or °C)	pH	Cond. (mS or µS)	Turbidity (NTUs)	Gals. Removed	Observations
1230	14.1	6.88	777.6	21000	2	grey ↓
1235	14.0	6.83	770.3	71000	4	
1240	13.9	6.86	772.	21000	6	

Did well dewater? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Gallons actually evacuated: <u>6</u>	
Sampling Date: <u>12/14/04</u>	Sampling Time: <u>1254</u>	Depth to Water: <u>22.91</u>
Sample I.D.: <u>MW-7</u>	Laboratory: Kiff CalScience	Other: <u>CET</u>
Analyzed for: <u>TPH-G BTEX MTBE TPH-D</u>	Oxygenates (5)	Other:
EB I.D. (if applicable): @ Time	Duplicate I.D. (if applicable):	
Analyzed for: TPH-G BTEX MTBE TPH-D	Oxygenates (5)	Other:
D.O. (if req'd): Pre-purge: _____ mg/L	Post-purge: _____ mg/L	
O.R.P. (if req'd): Pre-purge: _____ mV	Post-purge: _____ mV	

WELL MONITORING DATA SHEET

Project #: <u>041214-PC1</u>	Client: <u>STELLAR</u>
Sampler: <u>PC</u>	Date: <u>12/14/04</u>
Well I.D.: <u>MW-9</u>	Well Diameter: <u>3</u> 3 4 6 8 _____
Total Well Depth (TD): <u>26.75</u>	Depth to Water (DTW): <u>12.68</u>
Depth to Free Product:	Thickness of Free Product (feet):
Referenced to: <u>NO</u> Grade	D.O. Meter (if req'd): YSI HACH
DTW with 80% Recharge [(Height of Water Column x 0.20) + DTW]:	

Purge Method: Bailer Disposable Bailer Positive Air Displacement Electric Submersible	Water: Peristaltic Extraction Pump Other _____	Sampling Method: Bailer Disposable Bailer Extraction Port Dedicated Tubing Other: _____
--	--	---

<u>2.3</u> (Gals.) X <u>3</u> = <u>6.9</u> Gals. I Case Volume Specified Volumes Calculated Volume	<table border="1"> <thead> <tr> <th>Well Diameter</th> <th>Multiplier</th> <th>Well Diameter</th> <th>Multiplier</th> </tr> </thead> <tbody> <tr> <td>1"</td> <td>0.04</td> <td>4"</td> <td>0.65</td> </tr> <tr> <td>2"</td> <td>0.16</td> <td>6"</td> <td>1.47</td> </tr> <tr> <td>3"</td> <td>0.37</td> <td>Other</td> <td>radius² * 0.163</td> </tr> </tbody> </table>	Well Diameter	Multiplier	Well Diameter	Multiplier	1"	0.04	4"	0.65	2"	0.16	6"	1.47	3"	0.37	Other	radius ² * 0.163
Well Diameter	Multiplier	Well Diameter	Multiplier														
1"	0.04	4"	0.65														
2"	0.16	6"	1.47														
3"	0.37	Other	radius ² * 0.163														

Time	Temp (°F or °C)	pH	Cond. (mS or µS)	Turbidity (NTUs)	Gals. Removed	Observations
1110	14.3	8.88	751.9	7000	2.3	brown
1114	14.6	8.38	744.5	7000	4.6	↓
1118	14.2	8.07	803.5	7000	6.9	

Did well dewater? Yes <u>NO</u>	Gallons actually evacuated: <u>6.9</u>	
Sampling Date: <u>12/14/04</u>	Sampling Time: <u>1130</u>	Depth to Water: <u>21.15</u>
Sample I.D.: <u>MW-9</u>	Laboratory: Kiff CalScience	Other: <u>CET</u>
Analyzed for: <u>TPH-G BTEX MTBE TPH-D</u>	Oxygenates (5)	Other:
EB I.D. (if applicable): @ Time	Duplicate I.D. (if applicable):	
Analyzed for: TPH-G BTEX MTBE TPH-D	Oxygenates (5)	Other:
D.O. (if req'd): Pre-purge: _____ mg/L	Post-purge: _____ mg/L	
O.R.P. (if req'd): Pre-purge: _____ mV	Post-purge: _____ mV	

WELL MONITORING DATA SHEET

Project #: <u>041214-PC1</u>	Client: <u>STELLAR</u>
Sampler: <u>PC</u>	Date: <u>12/14/04</u>
Well I.D.: <u>MW-11</u>	Well Diameter: <u>Ø</u> 3 4 6 8 _____
Total Well Depth (TD): <u>30.29</u>	Depth to Water (DTW): <u>14.97</u>
Depth to Free Product:	Thickness of Free Product (feet):
Referenced to: <u>PVC</u> Grade	D.O. Meter (if req'd): YSI HACH
DTW with 80% Recharge [(Height of Water Column x 0.20) + DTW]:	

Purge Method: Bailer Disposible Bailer <input checked="" type="checkbox"/> Positive Air Displacement Electric Submersible	Waterma Peristaltic Extraction Pump Other _____	Sampling Method: Bailer <input checked="" type="checkbox"/> Disposible Bailer Extraction Port Dedicated Tubing Other: _____
--	--	---

$2.5 \text{ (Gals.)} \times 3 = 7.5 \text{ Gals.}$ <p>I Case Volume Specified Volumes Calculated Volume</p>	<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Well Diameter</th> <th>Multiplier</th> <th>Well Diameter</th> <th>Multiplier</th> </tr> </thead> <tbody> <tr> <td>1"</td> <td>0.04</td> <td>4"</td> <td>0.65</td> </tr> <tr> <td>2"</td> <td>0.16</td> <td>6"</td> <td>1.47</td> </tr> <tr> <td>3"</td> <td>0.37</td> <td>Other</td> <td>radius² * 0.163</td> </tr> </tbody> </table>	Well Diameter	Multiplier	Well Diameter	Multiplier	1"	0.04	4"	0.65	2"	0.16	6"	1.47	3"	0.37	Other	radius ² * 0.163
Well Diameter	Multiplier	Well Diameter	Multiplier														
1"	0.04	4"	0.65														
2"	0.16	6"	1.47														
3"	0.37	Other	radius ² * 0.163														

Time	Temp (°F or °C)	pH	Cond. (mS or µS)	Turbidity (NTUs)	Gals. Removed	Observations
1148	14.1	7.05	973.1	870	2.5	grey
1154	13.9	6.83	1006	443	5	clearing
1159	14.0	6.88	946.9	420	7.5	↓

Did well dewater? Yes <input checked="" type="checkbox"/> No	Gallons actually evacuated: <u>7.5</u>	
Sampling Date: <u>12/14/04</u>	Sampling Time: <u>1210</u>	Depth to Water: <u>27.19</u>
Sample I.D.: <u>MW-11</u>	Laboratory: Kiff CalScience Other: <u>C&T</u>	
Analyzed for: <u>TPH-G BTEX MTBE TPH-D</u>	Oxygenates (5) Other:	
EB I.D. (if applicable): @ _____	Duplicate I.D. (if applicable):	
Analyzed for: TPH-G BTEX MTBE TPH-D	Oxygenates (5) Other:	
D.O. (if req'd): Pre-purge: _____ mg/L	Post-purge: _____ mg/L	
O.R.P. (if req'd): Pre-purge: _____ mV	Post-purge: _____ mV	



Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878

2323 Fifth Street, Berkeley, CA 94710. Phone (510) 486-0900

A N A L Y T I C A L R E P O R T

Prepared for:

Stellar Environmental Solutions
2198 6th Street
Suite 201
Berkeley, CA 94710

Date: 21-DEC-04

Lab Job Number: 176632

Project ID: STANDARD

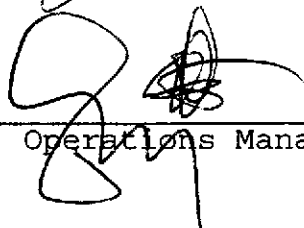
Location: Redwood Regional Park

This data package has been reviewed for technical correctness and completeness. Release of this data has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signatures. The results contained in this report meet all requirements of NELAC and pertain only to those samples which were submitted for analysis.

Reviewed by:


Project Manager

Reviewed by:


Operations Manager

This package may be reproduced only in its entirety.

CASE NARRATIVE

Laboratory number: 176632
Client: Stellar Environmental Solutions
Location: Redwood Regional Park
Request Date: 12/14/04
Samples Received: 12/14/04

This hardcopy data package contains sample and QC results for nine water samples, requested for the above referenced project on 12/14/04. The samples were received cold and intact.

TPH-Purgeables and/or BTXE by GC (EPA 8015B and EPA 8021B):

High surrogate recoveries were observed for trifluorotoluene (FID) in the LCS/MS/MSD for batch 97432 and the LCS for batch 97486; the corresponding bromofluorobenzene (FID) surrogate recoveries were within limits. No other analytical problems were encountered.

TPH-Extractables by GC (EPA 8015B):

No analytical problems were encountered.

Chain of Custody Record

Lab job no. _____
Date _____
Page 1 of 1

Laboratory Cuans & Tompkins Method of Shipment DELIVER TO LAB
Address 2323 FIFTH ST Shipment No. _____
BERKELEY, CA Airbill No. _____
Project Owner STEARZ ENV. SOLUTIONS Cooler No. _____
Site Address _____ Project Manager Bruce Rucker
Telephone No. (510) 644-3123
Project Name Redwood Regional Park Fax No. (510) 644-3859
Project Number Service Yard 041214-PC1 Samplers: (Signature) Patricia

Field Sample Number	Location Depth	Date	Time	Sample Type	Type/Size of Container	Preservation		Filtered	No. of Containers	Analysis Required	Remarks
						Cooler	Chemical				
1 SW-2	B20	12/14/04		W	240A/1 Amber	HCl		X	1		Sampled by Bruce R. of Stellar
2 SW-3	B05				" "			X	1		
3 MW-2	935				3 VOLS/1 Amber			X	1		
4 MW-4	1320							X	1		
5 MW-7	1254							X	1		
6 MW-8	1052							X	1		
7 MW-9	1130							X	1		
8 MW-10	1022							X	1		
9 MW-11	1210							X	1		

1
2
3
4
5
6
7
8
9

Relinquished by: Signature <u>Patricia</u> Printed <u>D. Cornish</u> Company <u>Blaine Tech</u>	Date <u>12/14/04</u> Time <u>2:20</u>	Received by: Signature <u>Joel Ingram</u> Printed <u>Joel Ingram</u> Company <u>C&T</u>	Date <u>12/14/04</u> Time <u>2:20 pm</u>	Relinquished by: Signature _____ Printed _____ Company _____	Date _____ Time _____	Received by: Signature _____ Printed _____ Company _____	Date _____ Time _____		
Turnaround Time: _____ Comments: Standard Turn <u>Standard Turn</u>				Relinquished by: Signature _____ Printed _____ Company _____				Received by: Signature _____ Printed _____ Company _____	

2000-00-01

Standard Turn



Total Volatile Hydrocarbons

Lab #:	176632	Location:	Redwood Regional Park
Client:	Stellar Environmental Solutions	Prep:	EPA 5030B
Project#:	STANDARD		
Matrix:	Water	Sampled:	12/14/04
Units:	ug/L	Received:	12/14/04

Field ID:	SW-2	Diln Fac:	1.000
Type:	SAMPLE	Batch#:	97432
Lab ID:	176632-001	Analyzed:	12/14/04

Analyte	Result	RL	Analysis
Gasoline C7-C12	ND	50	EPA 8015B
MTBE	ND	2.0	EPA 8021B
Benzene	ND	0.50	EPA 8021B
Toluene	ND	0.50	EPA 8021B
Ethylbenzene	ND	0.50	EPA 8021B
m,p-Xylenes	ND	0.50	EPA 8021B
o-Xylene	ND	0.50	EPA 8021B

Surrogate	%REC	Limits	Analysis
Trifluorotoluene (FID)	108	70-141	EPA 8015B
Bromofluorobenzene (FID)	127	80-143	EPA 8015B
Trifluorotoluene (PID)	89	59-133	EPA 8021B
Bromofluorobenzene (PID)	109	76-128	EPA 8021B

Field ID:	SW-3	Diln Fac:	1.000
Type:	SAMPLE	Batch#:	97432
Lab ID:	176632-002	Analyzed:	12/14/04

Analyte	Result	RL	Analysis
Gasoline C7-C12	ND	50	EPA 8015B
MTBE	ND	2.0	EPA 8021B
Benzene	ND	0.50	EPA 8021B
Toluene	ND	0.50	EPA 8021B
Ethylbenzene	ND	0.50	EPA 8021B
m,p-Xylenes	ND	0.50	EPA 8021B
o-Xylene	ND	0.50	EPA 8021B

Surrogate	%REC	Limits	Analysis
Trifluorotoluene (FID)	107	70-141	EPA 8015B
Bromofluorobenzene (FID)	127	80-143	EPA 8015B
Trifluorotoluene (PID)	85	59-133	EPA 8021B
Bromofluorobenzene (PID)	105	76-128	EPA 8021B

C= Presence confirmed, but RPD between columns exceeds 40%
 ND= Not Detected
 RL= Reporting Limit
 Page 1 of 6

Total Volatile Hydrocarbons

Lab #: 176632	Location: Redwood Regional Park
Client: Stellar Environmental Solutions	Prep: EPA 5030B
Project#: STANDARD	
Matrix: Water	Sampled: 12/14/04
Units: ug/L	Received: 12/14/04

Field ID: MW-2	Diln Fac: 1.000
Type: SAMPLE	Batch#: 97432
Lab ID: 176632-003	Analyzed: 12/14/04

Analyte	Result	RL	Analysis
Gasoline C7-C12	80	50	EPA 8015B
MTBE	20	2.0	EPA 8021B
Benzene	14	0.50	EPA 8021B
Toluene	ND	0.50	EPA 8021B
Ethylbenzene	2.9 C	0.50	EPA 8021B
m,p-Xylenes	0.72 C	0.50	EPA 8021B
o-Xylene	ND	0.50	EPA 8021B

Surrogate	%REC	Limits	Analysis
Trifluorotoluene (FID)	111	70-141	EPA 8015B
Bromofluorobenzene (FID)	130	80-143	EPA 8015B
Trifluorotoluene (PID)	88	59-133	EPA 8021B
Bromofluorobenzene (PID)	108	76-128	EPA 8021B

Field ID: MW-4	Diln Fac: 1.000
Type: SAMPLE	Batch#: 97432
Lab ID: 176632-004	Analyzed: 12/14/04

Analyte	Result	RL	Analysis
Gasoline C7-C12	ND	50	EPA 8015B
MTBE	ND	2.0	EPA 8021B
Benzene	ND	0.50	EPA 8021B
Toluene	ND	0.50	EPA 8021B
Ethylbenzene	ND	0.50	EPA 8021B
m,p-Xylenes	ND	0.50	EPA 8021B
o-Xylene	ND	0.50	EPA 8021B

Surrogate	%REC	Limits	Analysis
Trifluorotoluene (FID)	107	70-141	EPA 8015B
Bromofluorobenzene (FID)	125	80-143	EPA 8015B
Trifluorotoluene (PID)	93	59-133	EPA 8021B
Bromofluorobenzene (PID)	111	76-128	EPA 8021B

C= Presence confirmed, but RPD between columns exceeds 40%
 ND= Not Detected
 RL= Reporting Limit
 Page 2 of 6

Total Volatile Hydrocarbons

Lab #: 176632	Location: Redwood Regional Park	EPA 5030B
Client: Stellar Environmental Solutions	Prep:	
Project#: STANDARD		
Matrix: Water	Sampled: 12/14/04	
Units: ug/L	Received: 12/14/04	

Field ID: MW-7	Diln Fac: 1.000	
Type: SAMPLE	Batch#: 97432	
Lab ID: 176632-005	Analyzed: 12/14/04	

Analyte	Result	RL	Analysis
Gasoline C7-C12	8,200	50	EPA 8015B
MTBE	ND	2.0	EPA 8021B
Benzene	95	0.50	EPA 8021B
Toluene	ND	0.50	EPA 8021B
Ethylbenzene	290	0.50	EPA 8021B
m,p-Xylenes	120	0.50	EPA 8021B
o-Xylene	4.2	0.50	EPA 8021B

Surrogate	%REC	Limits	Analysis
Trifluorotoluene (FID)	99	70-141	EPA 8015B
Bromofluorobenzene (FID)	141	80-143	EPA 8015B
Trifluorotoluene (PID)	105	59-133	EPA 8021B
Bromofluorobenzene (PID)	112	76-128	EPA 8021B

Field ID: MW-8	Diln Fac: 5.000	
Type: SAMPLE	Batch#: 97432	
Lab ID: 176632-006	Analyzed: 12/14/04	

Analyte	Result	RL	Analysis
Gasoline C7-C12	15,000	250	EPA 8015B
MTBE	ND	10	EPA 8021B
Benzene	840	2.5	EPA 8021B
Toluene	21	2.5	EPA 8021B
Ethylbenzene	1,200	2.5	EPA 8021B
m,p-Xylenes	1,400	2.5	EPA 8021B
o-Xylene	120	2.5	EPA 8021B

Surrogate	%REC	Limits	Analysis
Trifluorotoluene (FID)	121	70-141	EPA 8015B
Bromofluorobenzene (FID)	125	80-143	EPA 8015B
Trifluorotoluene (PID)	99	59-133	EPA 8021B
Bromofluorobenzene (PID)	111	76-128	EPA 8021B

C= Presence confirmed, but RPD between columns exceeds 40%
 ND= Not Detected
 RL= Reporting Limit
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GC04 TVH 'J' Data File FID

Sample Name : 176632-005,97432

Sample #: a1.0

Page 1 of 1

FileName : G:\GC04\DATA\349J022.raw

Date : 12/15/04 09:47 AM

Method : TVHBTXE

Time of Injection: 12/14/04 10:13 PM

Start Time : 0.00 min

End Time : 26.00 min

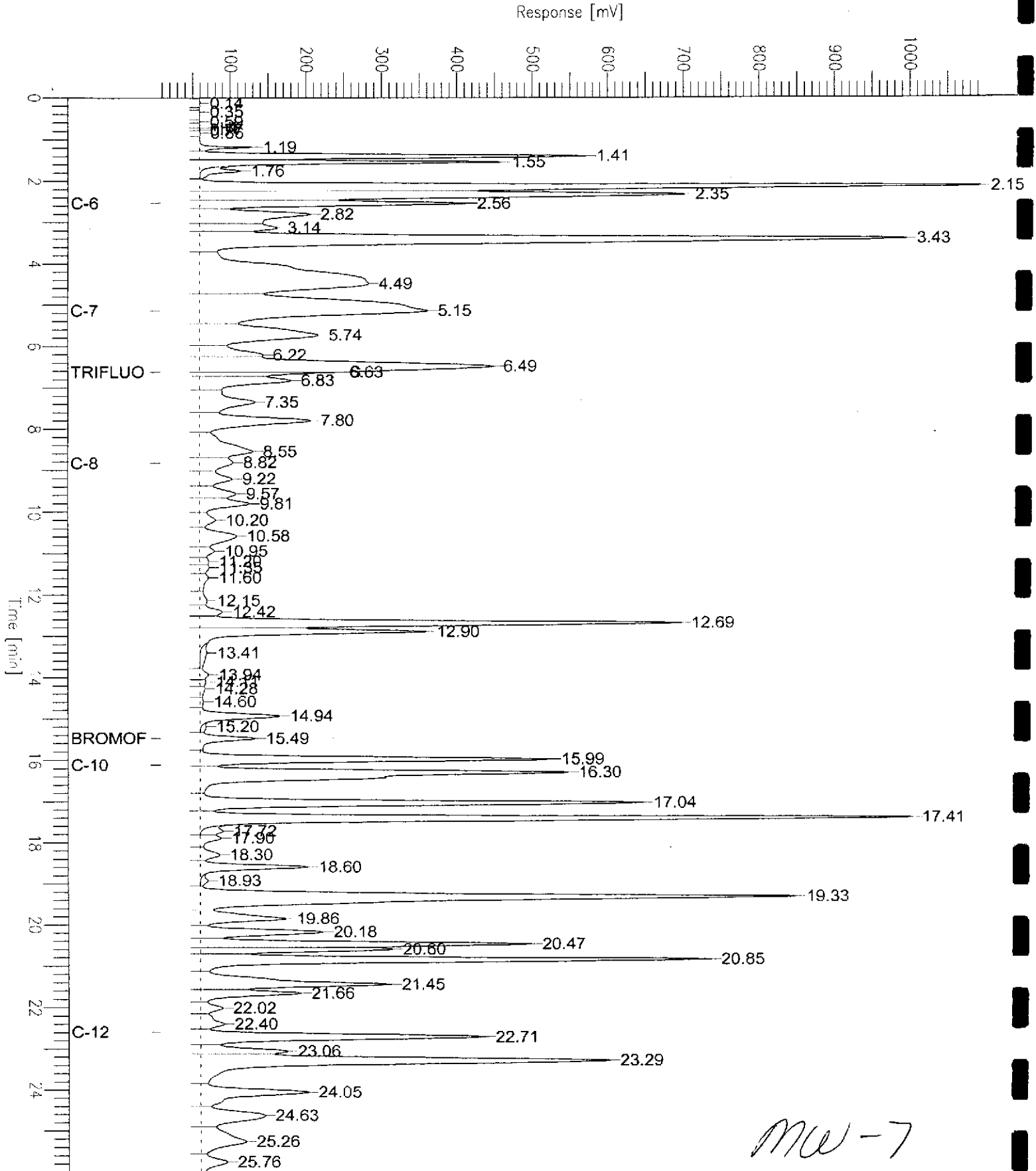
Low Point : 7.57 mV

High Point : 1093.70 mV

Scale Factor: 1.0

Plot Offset: 8 mV

Plot Scale: 1086.1 mV



MW-7

GC04 TVH 'J' Data File FID

Sample Name : 176632-006,97432

Sample #: a1.0

Page 1 of 1

FileName : G:\GC04\DATA\349J012.raw

Date : 12/15/04 09:47 AM

Method : TVHBTXE

Time of Injection: 12/14/04 04:16 PM

Start Time : 0.00 min End Time : 26.00 min

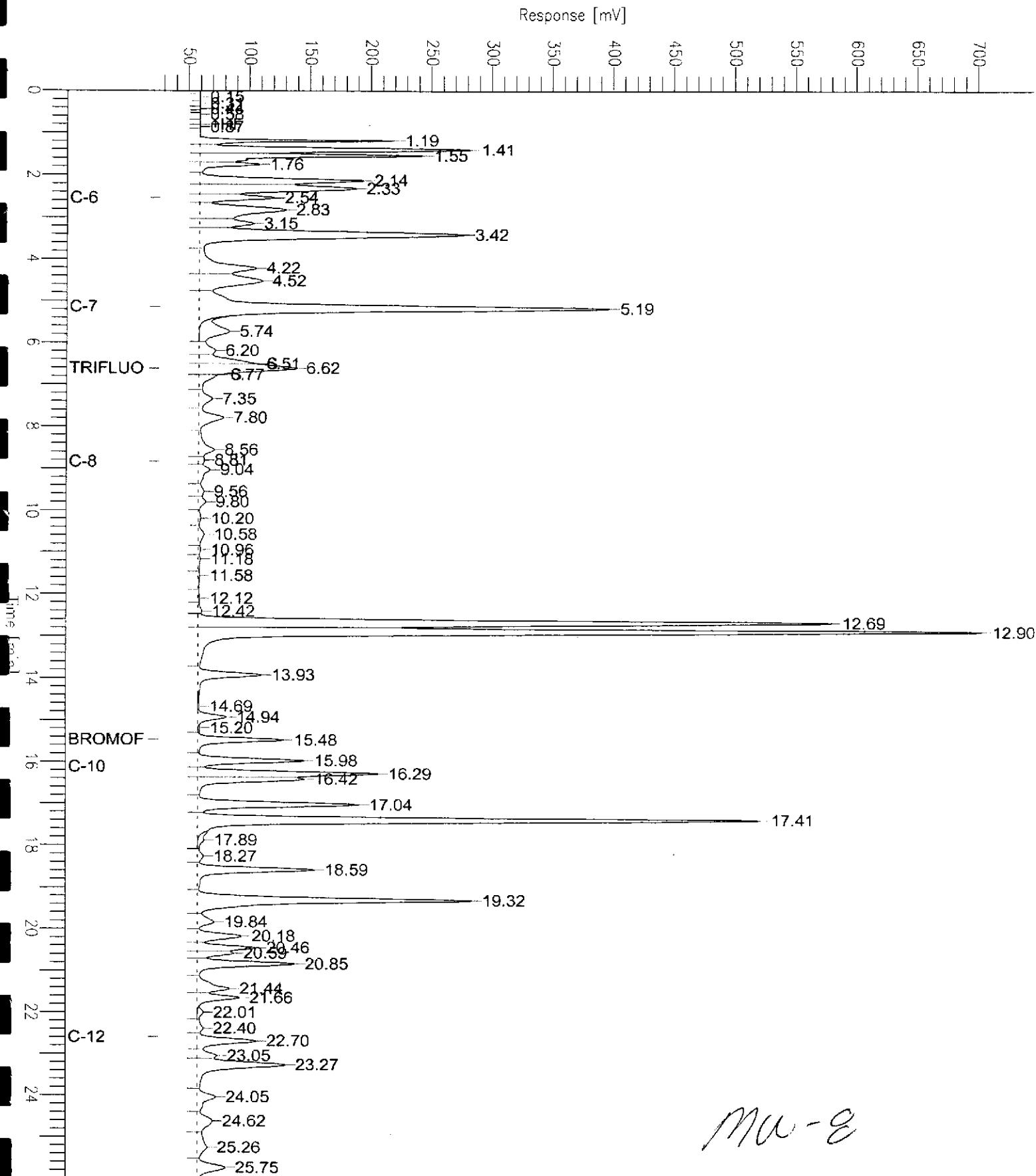
Low Point : 26.66 mV

High Point : 705.24 mV

Scale Factor: 1.0

Plot Offset: 27 mV

Plot Scale: 678.6 mV



MA-8



Total Volatile Hydrocarbons

Lab #: 176632	Location: Redwood Regional Park
Client: Stellar Environmental Solutions	Prep: EPA 5030B
Project#: STANDARD	
Matrix: Water	Sampled: 12/14/04
Units: ug/L	Received: 12/14/04

Field ID: MW-9	Diln Fac: 5.000
Type: SAMPLE	Batch#: 97432
Lab ID: 176632-007	Analyzed: 12/14/04

Analyte	Result	RL	Analysis
Gasoline C7-C12	4,700	250	EPA 8015B
MTBE	ND	10	EPA 8021B
Benzene	160	2.5	EPA 8021B
Toluene	ND	2.5	EPA 8021B
Ethylbenzene	470	2.5	EPA 8021B
m,p-Xylenes	50	2.5	EPA 8021B
o-Xylene	ND	2.5	EPA 8021B

Surrogate	%REC	Limits	Analysis
Trifluorotoluene (FID)	125	70-141	EPA 8015B
Bromofluorobenzene (FID)	125	80-143	EPA 8015B
Trifluorotoluene (PID)	108	59-133	EPA 8021B
Bromofluorobenzene (PID)	106	76-128	EPA 8021B

Field ID: MW-10	Diln Fac: 1.000
Type: SAMPLE	Batch#: 97486
Lab ID: 176632-008	Analyzed: 12/15/04

Analyte	Result	RL	Analysis
Gasoline C7-C12	64	50	EPA 8015B
MTBE	10	2.0	EPA 8021B
Benzene	3.7	0.50	EPA 8021B
Toluene	ND	0.50	EPA 8021B
Ethylbenzene	3.7	0.50	EPA 8021B
m,p-Xylenes	0.70 C	0.50	EPA 8021B
o-Xylene	ND	0.50	EPA 8021B

Surrogate	%REC	Limits	Analysis
Trifluorotoluene (FID)	111	70-141	EPA 8015B
Bromofluorobenzene (FID)	129	80-143	EPA 8015B
Trifluorotoluene (PID)	91	59-133	EPA 8021B
Bromofluorobenzene (PID)	113	76-128	EPA 8021B

C= Presence confirmed, but RPD between columns exceeds 40%
 ND= Not Detected
 RL= Reporting Limit
 Page 4 of 6

GC04 TVH 'J' Data File FID

Sample Name : 176632-007,97432

Sample #: a1.0

Page 1 of 1

FileName : G:\GC04\DATA\349J023.raw

Date : 12/15/04 09:47 AM

Method : TVHBTXE

Time of Injection: 12/14/04 10:49 PM

Start Time : 0.00 min

End Time : 26.00 min

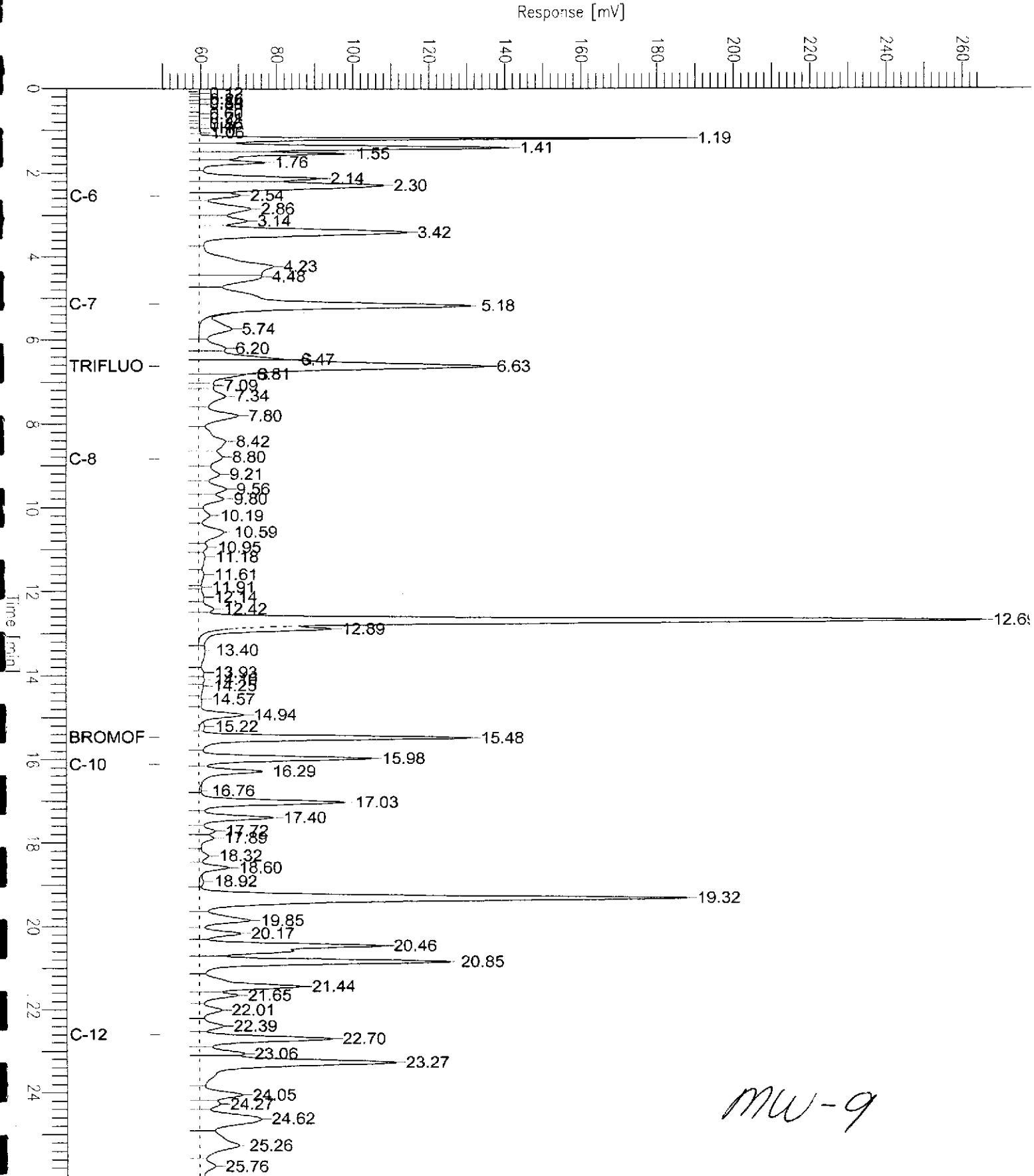
Low Point : 49.38 mV

High Point : 265.70 mV

Scale Factor: 1.0

Plot Offset: 49 mV

Plot Scale: 216.3 mV



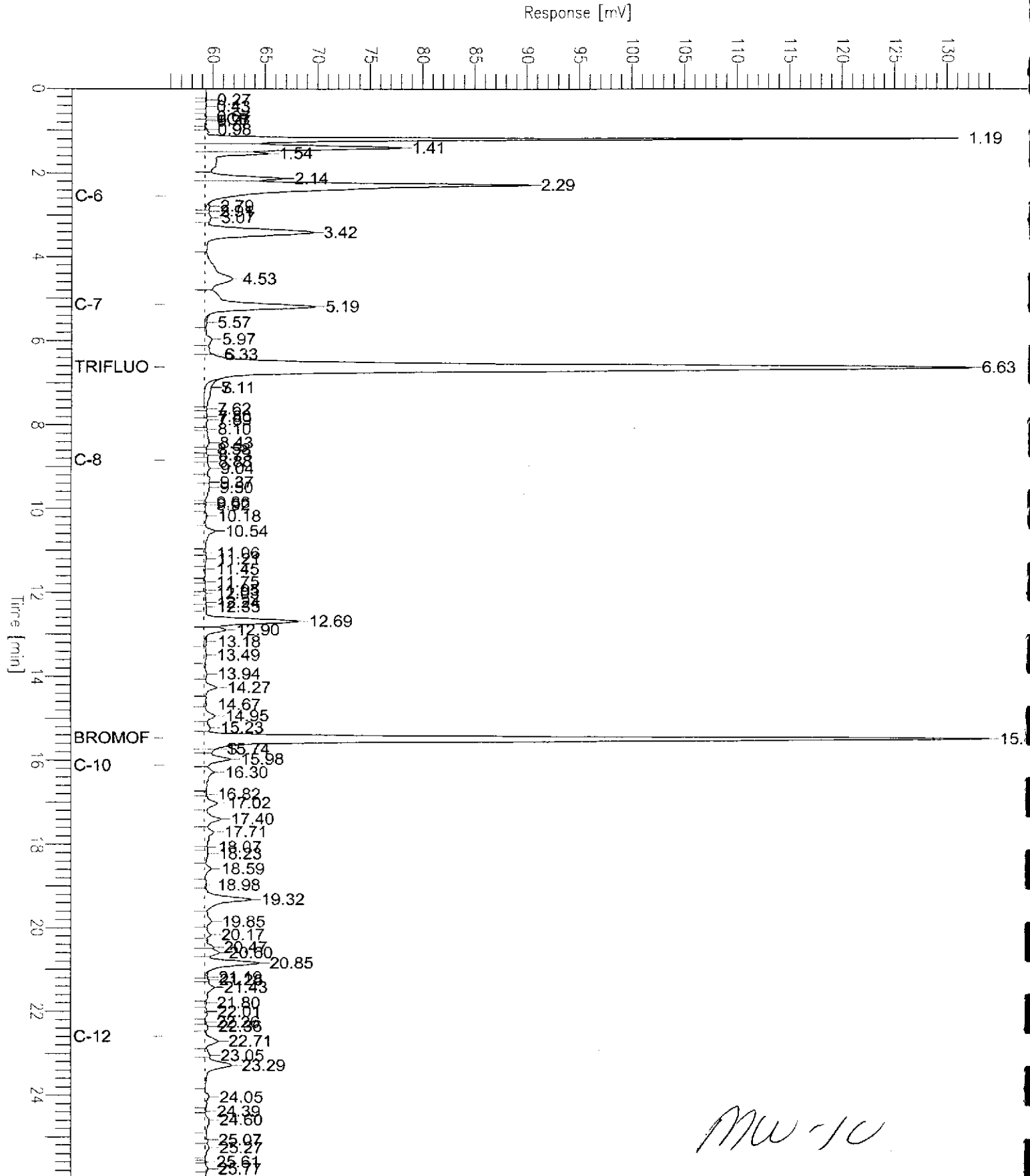
MW-9

GC04 TVH 'J' Data File FID

Sample Name : 176632-008,97486
 FileName : G:\GC04\DATA\350J010.raw
 Method : TVHBTXE
 Start Time : 0.00 min
 Scale Factor : 1.0

End Time : 26.00 min
 Plot Offset : 55 mV

Sample #: b1.0
 Date : 12/16/04 12:12 PM
 Time of Injection: 12/15/04 02:53 PM
 Low Point : 55.49 mV
 High Point : 134.20 mV
 Plot Scale: 78.7 mV



MW-10

Total Volatile Hydrocarbons

Lab #: 176632	Location: Redwood Regional Park
Client: Stellar Environmental Solutions	Prep: EPA 5030B
Project#: STANDARD	
Matrix: Water	Sampled: 12/14/04
Units: ug/L	Received: 12/14/04

Field ID: MW-11	Diln Fac: 5.000
Type: SAMPLE	Batch#: 97486
Lab ID: 176632-009	Analyzed: 12/15/04

Analyte	Result	RL	Analysis
Gasoline C7-C12	11,000	250	EPA 8015B
MTBE	ND	10	EPA 8021B
Benzene	180	2.5	EPA 8021B
Toluene	5.1	2.5	EPA 8021B
Ethylbenzene	780	2.5	EPA 8021B
m, p-Xylenes	670	2.5	EPA 8021B
o-Xylene	25	2.5	EPA 8021B

Surrogate	%REC	Limits	Analysis
Trifluorotoluene (FID)	141	70-141	EPA 8015B
Bromofluorobenzene (FID)	128	80-143	EPA 8015B
Trifluorotoluene (PID)	100	59-133	EPA 8021B
Bromofluorobenzene (PID)	115	76-128	EPA 8021B

Type: BLANK	Batch#: 97432
Lab ID: QC276093	Analyzed: 12/14/04
Diln Fac: 1.000	

Analyte	Result	RL	Analysis
Gasoline C7-C12	ND	50	EPA 8015B
MTBE	ND	2.0	EPA 8021B
Benzene	ND	0.50	EPA 8021B
Toluene	ND	0.50	EPA 8021B
Ethylbenzene	ND	0.50	EPA 8021B
m, p-Xylenes	ND	0.50	EPA 8021B
o-Xylene	ND	0.50	EPA 8021B

Surrogate	%REC	Limits	Analysis
Trifluorotoluene (FID)	111	70-141	EPA 8015B
Bromofluorobenzene (FID)	124	80-143	EPA 8015B
Trifluorotoluene (PID)	97	59-133	EPA 8021B
Bromofluorobenzene (PID)	111	76-128	EPA 8021B

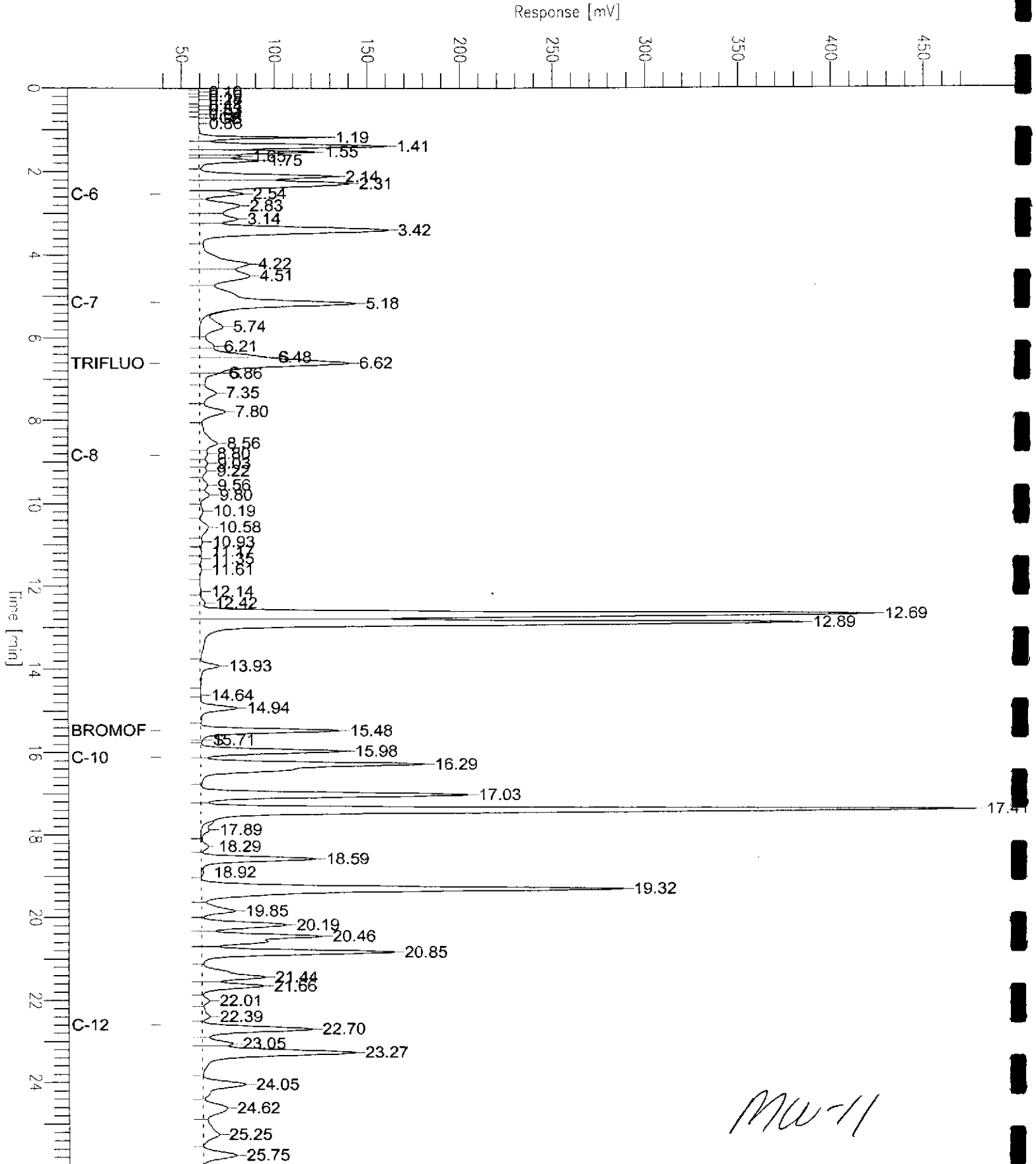
C= Presence confirmed, but RPD between columns exceeds 40%
 ND= Not Detected
 RL= Reporting Limit
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GC04 TVH 'J' Data File FID

Sample Name : 176632-009,97486
FileName : G:\GC04\DATA\350J009.raw
Method : TVHBTXE
Start Time : 0.00 min
Scale Factor : 1.0

End Time : 26.00 min
Plot Offset : 38 mV

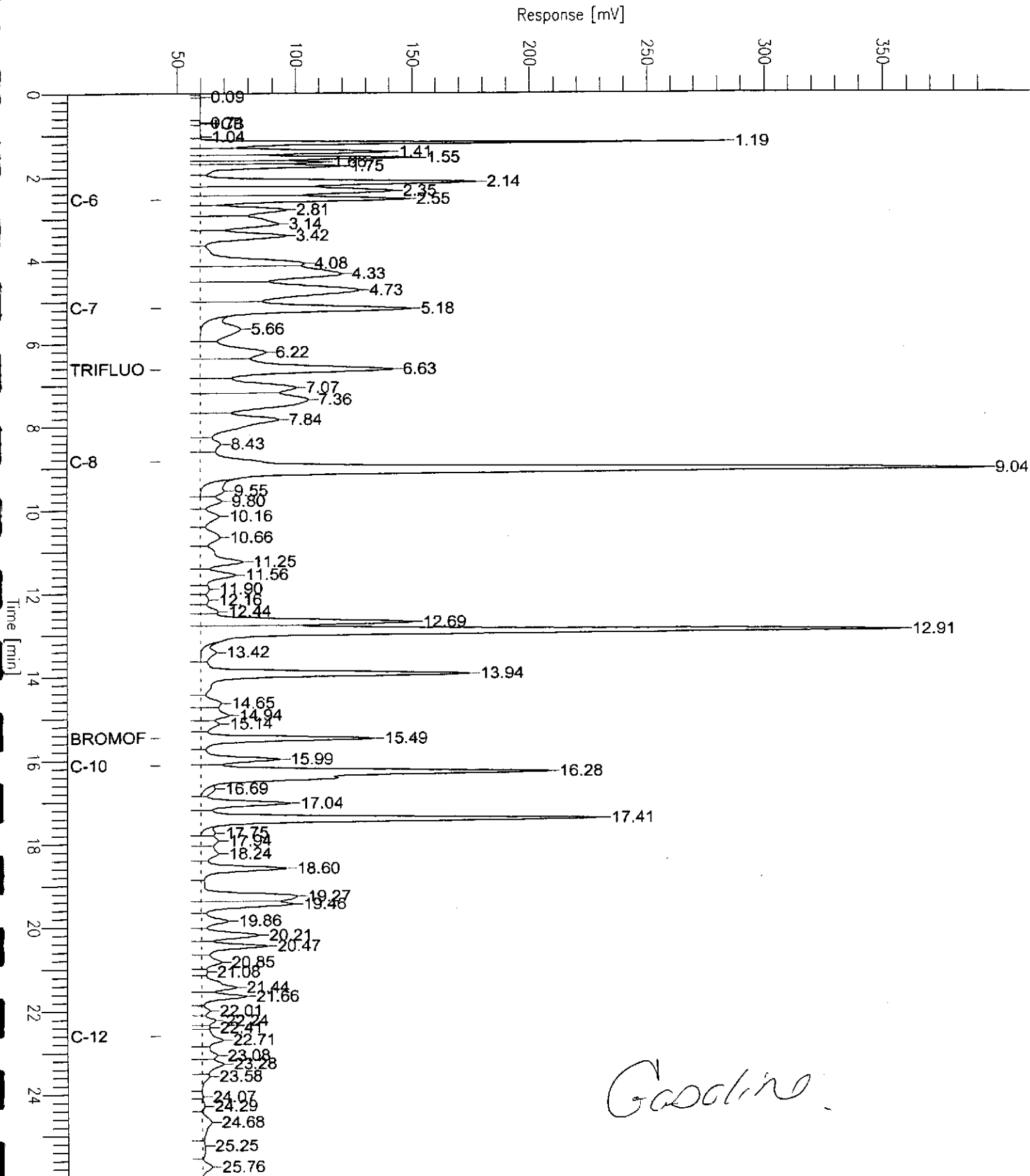
Sample #: b1.0
Date : 12/16/04 12:12 PM
Time of Injection: 12/15/04 02:18 PM
Low Point : 38.41 mV
Plot Scale: 440.1 mV
High Point : 478.56 mV



GC04 TVH 'J' Data File FID

Sample Name : ccv/lcs.qc276095,97432,04ws2235,5/5000
FileName : G:\GC04\DATA\349J003.raw
Method : TVHBTXE
Start Time : 0.00 min End Time : 26.00 min
Scale Factor : 1.0 Plot Offset : 43 mV

Sample # :
Date : 12/14/04 09:57 AM Page 1 of 1
Time of Injection: 12/14/04 09:31 AM
Low Point : 43.01 mV High Point : 392.94 mV
Plot Scale : 349.9 mV



Gasoline

**Total Volatile Hydrocarbons**

Lab #: 176632	Location: Redwood Regional Park
Client: Stellar Environmental Solutions	Prep: EPA 5030B
Project#: STANDARD	
Matrix: Water	Sampled: 12/14/04
Units: ug/L	Received: 12/14/04

Type: BLANK	Batch#: 97486
Lab ID: QC276305	Analyzed: 12/15/04
Diln Fac: 1.000	

Analyte	Result	RL	Analysis
Gasoline C7-C12	ND	50	EPA 8015B
MTBE	ND	2.0	EPA 8021B
Benzene	ND	0.50	EPA 8021B
Toluene	ND	0.50	EPA 8021B
Ethylbenzene	ND	0.50	EPA 8021B
m,p-Xylenes	ND	0.50	EPA 8021B
o-Xylene	ND	0.50	EPA 8021B

Surrogate	%REC	Limits	Analysis
Trifluorotoluene (FID)	108	70-141	EPA 8015B
Bromofluorobenzene (FID)	126	80-143	EPA 8015B
Trifluorotoluene (PID)	92	59-133	EPA 8021B
Bromofluorobenzene (PID)	111	76-128	EPA 8021B

Batch QC Report

Total Volatile Hydrocarbons

Lab #:	176632	Location:	Redwood Regional Park
Client:	Stellar Environmental Solutions	Prep:	EPA 5030B
Project#:	STANDARD	Analysis:	EPA 8021B
Type:	BS	Diln Fac:	1.000
Lab ID:	QC276094	Batch#:	97432
Matrix:	Water	Analyzed:	12/14/04
Units:	ug/L		

Analyte	Spiked	Result	%REC	Limits
MTBE	20.00	18.51	93	67-124
Benzene	20.00	18.44	92	80-120
Toluene	20.00	18.90	95	80-120
Ethylbenzene	20.00	18.52	93	80-120
m,p-Xylenes	20.00	18.81	94	80-120
o-Xylene	20.00	19.47	97	80-120

Surrogate	%REC	Limits
Trifluorotoluene (PID)	91	59-133
Bromofluorobenzene (PID)	106	76-128

Batch QC Report

Total Volatile Hydrocarbons

Lab #:	176632	Location:	Redwood Regional Park
Client:	Stellar Environmental Solutions	Prep:	EPA 5030B
Project#:	STANDARD	Analysis:	EPA 8021B
Type:	BSD	Diln Fac:	1.000
Lab ID:	QC276216	Batch#:	97432
Matrix:	Water	Analyzed:	12/14/04
Units:	ug/L		

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
MTBE	20.00	22.48	112	67-124	19	27
Benzene	20.00	20.61	103	80-120	11	20
Toluene	20.00	21.07	105	80-120	11	20
Ethylbenzene	20.00	20.89	104	80-120	12	20
m,p-Xylenes	20.00	21.12	106	80-120	12	20
o-Xylene	20.00	21.77	109	80-120	11	20

Surrogate	%REC	Limits
Trifluorotoluene (PID)	99	59-133
Bromofluorobenzene (PID)	117	76-128

Batch QC Report

Total Volatile Hydrocarbons

Lab #:	176632	Location:	Redwood Regional Park
Client:	Stellar Environmental Solutions	Prep:	EPA 5030B
Project#:	STANDARD	Analysis:	EPA 8015B
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC276095	Batch#:	97432
Matrix:	Water	Analyzed:	12/14/04
Units:	ug/L		

Analyte	Spiked	Result	%REC	Limits
Gasoline C7-C12	2,000	2,045	102	80-120

Surrogate	%REC	Limits
Trifluorotoluene (FID)	159 *	70-141
Bromofluorobenzene (FID)	134	80-143

Batch QC Report

Total Volatile Hydrocarbons

Lab #:	176632	Location:	Redwood Regional Park
Client:	Stellar Environmental Solutions	Prep:	EPA 5030B
Project#:	STANDARD	Analysis:	EPA 8021B
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC276306	Batch#:	97486
Matrix:	Water	Analyzed:	12/15/04
Units:	ug/L		

Analyte	Spiked	Result	%REC	Limits
MTBE	20.00	18.87	94	67-124
Benzene	20.00	18.73	94	80-120
Toluene	20.00	19.30	97	80-120
Ethylbenzene	20.00	18.75	94	80-120
m,p-Xylenes	20.00	18.79	94	80-120
o-Xylene	20.00	19.55	98	80-120

Surrogate	%REC	Limits
Trifluorotoluene (PID)	89	59-133
Bromofluorobenzene (PID)	108	76-128

Batch QC Report

Total Volatile Hydrocarbons

Lab #:	176632	Location:	Redwood Regional Park
Client:	Stellar Environmental Solutions	Prep:	EPA 5030B
Project#:	STANDARD	Analysis:	EPA 8015B
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC276307	Batch#:	97486
Matrix:	Water	Analyzed:	12/15/04
Units:	ug/L		

Analyte	Spiked	Result	%REC	Limits
Gasoline C7-C12	2,000	2,128	106	80-120

Surrogate	%REC	Limits
Trifluorotoluene (FID)	142 *	70-141
Bromofluorobenzene (FID)	135	80-143

*= Value outside of QC limits; see narrative

Batch QC Report

Total Volatile Hydrocarbons

Lab #:	176632	Location:	Redwood Regional Park
Client:	Stellar Environmental Solutions	Prep:	EPA 5030B
Project#:	STANDARD	Analysis:	EPA 8015B
Field ID:	ZZZZZZZZZZ	Batch#:	97432
MSS Lab ID:	176623-004	Sampled:	12/13/04
Matrix:	Water	Received:	12/14/04
Units:	ug/L	Analyzed:	12/15/04
Diln Fac:	1.000		

Type: MS Lab ID: QC276189

Analyte	MSS Result	Spiked	Result	%REC	Limits
Gasoline C7-C12	21.47	2,000	1,791	88	80-120

Surrogate	%REC	Limits
Trifluorotoluene (FID)	146 *	70-141
Bromofluorobenzene (FID)	138	80-143

Type: MSD Lab ID: QC276190

Analyte	Spiked	Result	%REC	Limits	RPD	Li
Gasoline C7-C12	2,000	1,796	89	80-120	0	20

Surrogate	%REC	Limits
Trifluorotoluene (FID)	146 *	70-141
Bromofluorobenzene (FID)	136	80-143

*= Value outside of QC limits; see narrative
 RPD= Relative Percent Difference
 Page 1 of 1

Batch QC Report

Total Volatile Hydrocarbons

Lab #:	176632	Location:	Redwood Regional Park
Client:	Stellar Environmental Solutions	Prep:	EPA 5030B
Project#:	STANDARD	Analysis:	EPA 8015B
Field ID:	ZZZZZZZZZZ	Batch#:	97486
MSS Lab ID:	176648-006	Sampled:	12/14/04
Matrix:	Water	Received:	12/15/04
Units:	ug/L	Analyzed:	12/16/04
Diln Fac:	1.000		

Type: MS Lab ID: QC276365

Analyte	MSS Result	Spiked	Result	%REC	Limits
Gasoline C7-C12	43.19	2,000	2,097	103	80-120

Surrogate	%REC	Limits
Trifluorotoluene (FID)	137	70-141
Bromofluorobenzene (FID)	143	80-143

Type: MSD Lab ID: QC276366

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Gasoline C7-C12	2,000	2,108	103	80-120	1	20

Surrogate	%REC	Limits
Trifluorotoluene (FID)	130	70-141
Bromofluorobenzene (FID)	138	80-143

RPD= Relative Percent Difference

**Total Extractable Hydrocarbons**

Lab #:	176632	Location:	Redwood Regional Park
Client:	Stellar Environmental Solutions	Prep:	EPA 3520C
Project#:	STANDARD	Analysis:	EPA 8015B
Matrix:	Water	Sampled:	12/14/04
Units:	ug/L	Received:	12/14/04
Diln Fac:	1.000	Prepared:	12/16/04
Batch#:	97558		

Field ID:	SW-2	Lab ID:	176632-001
Type:	SAMPLE	Analyzed:	12/18/04

Analyte	Result	RL
Diesel C10-C24	ND	50

Surrogate	%REC	Limits
Hexacosane	102	53-143

Field ID:	SW-3	Lab ID:	176632-002
Type:	SAMPLE	Analyzed:	12/18/04

Analyte	Result	RL
Diesel C10-C24	ND	50

Surrogate	%REC	Limits
Hexacosane	114	53-143

Field ID:	MW-2	Lab ID:	176632-003
Type:	SAMPLE	Analyzed:	12/18/04

Analyte	Result	RL
Diesel C10-C24	ND	50

Surrogate	%REC	Limits
Hexacosane	119	53-143

Field ID:	MW-4	Lab ID:	176632-004
Type:	SAMPLE	Analyzed:	12/18/04

Analyte	Result	RL
Diesel C10-C24	ND	50

Surrogate	%REC	Limits
Hexacosane	96	53-143

Field ID:	MW-7	Lab ID:	176632-005
Type:	SAMPLE	Analyzed:	12/20/04

Analyte	Result	RL
Diesel C10-C24	4,000 L Y	50

Surrogate	%REC	Limits
Hexacosane	98	53-143

L= Lighter hydrocarbons contributed to the quantitation

Y= Sample exhibits chromatographic pattern which does not resemble standard

ND= Not Detected

RL= Reporting Limit

Page 1 of 2

Chromatogram

Sample Name : 176632-005,97558

Sample #: 97558

Page 1 of 1

FileName : G:\GC15\CHB\355B005.RAW

Date : 12/20/04 12:07 PM

Method : BTEH335S.MTH

Time of Injection: 12/20/04 12:05 PM

Start Time : 0.01 min

End Time : 19.99 min

Low Point : 21.18 mV

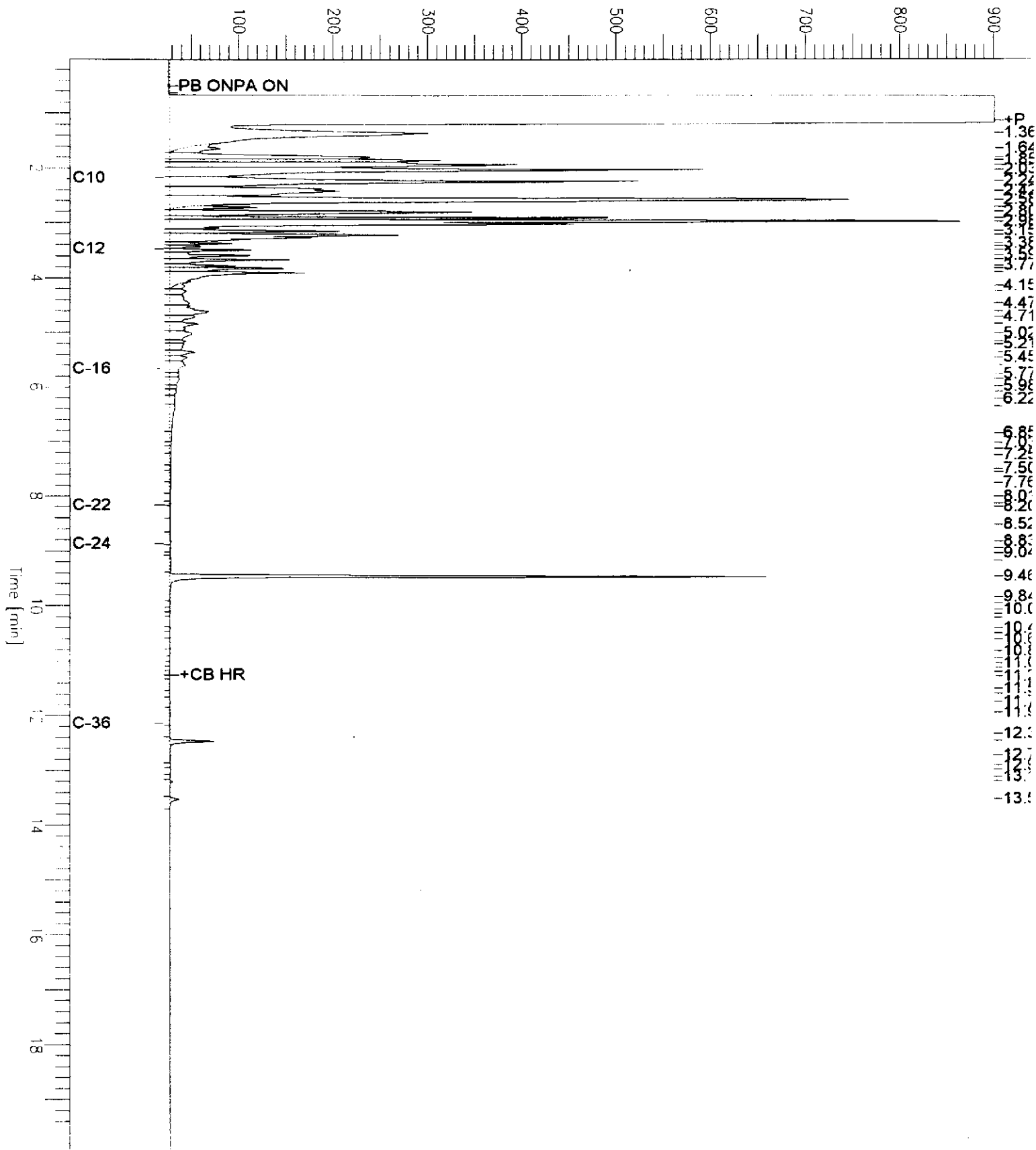
High Point : 901.08 mV

Scale Factor: 0.0

Plot Offset: 21 mV

Plot Scale: 879.9 mV

Response [mV]



**Total Extractable Hydrocarbons**

Lab #:	176632	Location:	Redwood Regional Park
Client:	Stellar Environmental Solutions	Prep:	EPA 3520C
Project#:	STANDARD	Analysis:	EPA 8015B
Matrix:	Water	Sampled:	12/14/04
Units:	ug/L	Received:	12/14/04
Diln Fac:	1.000	Prepared:	12/16/04
Batch#:	97558		

Field ID:	MW-8	Lab ID:	176632-006
Type:	SAMPLE	Analyzed:	12/20/04

Analyte	Result	RL
Diesel C10-C24	4,000 L Y	50

Surrogate	%REC	Limits
Hexacosane	96	53-143

Field ID:	MW-9	Lab ID:	176632-007
Type:	SAMPLE	Analyzed:	12/20/04

Analyte	Result	RL
Diesel C10-C24	2,800 L Y	50

Surrogate	%REC	Limits
Hexacosane	100	53-143

Field ID:	MW-10	Lab ID:	176632-008
Type:	SAMPLE	Analyzed:	12/17/04

Analyte	Result	RL
Diesel C10-C24	ND	50

Surrogate	%REC	Limits
Hexacosane	98	53-143

Field ID:	MW-11	Lab ID:	176632-009
Type:	SAMPLE	Analyzed:	12/20/04

Analyte	Result	RL
Diesel C10-C24	3,900 L Y	50

Surrogate	%REC	Limits
Hexacosane	117	53-143

Type:	BLANK	Analyzed:	12/17/04
Lab ID:	QC276600		

Analyte	Result	RL
Diesel C10-C24	ND	50

Surrogate	%REC	Limits
Hexacosane	119	53-143

L= Lighter hydrocarbons contributed to the quantitation

Y= Sample exhibits chromatographic pattern which does not resemble standard

ND= Not Detected

RL= Reporting Limit

Page 2 of 2

Chromatogram

Sample Name : 176632-007,97558

Sample #: 97558

Page 1 of 1

FileName : G:\GC15\CHB\355B007.RAW

Date : 12/20/04 01:51 PM

Method : BTEH335S.MTH

Time of Injection: 12/20/04 01:03 PM

Start Time : 0.01 min End Time : 19.99 min

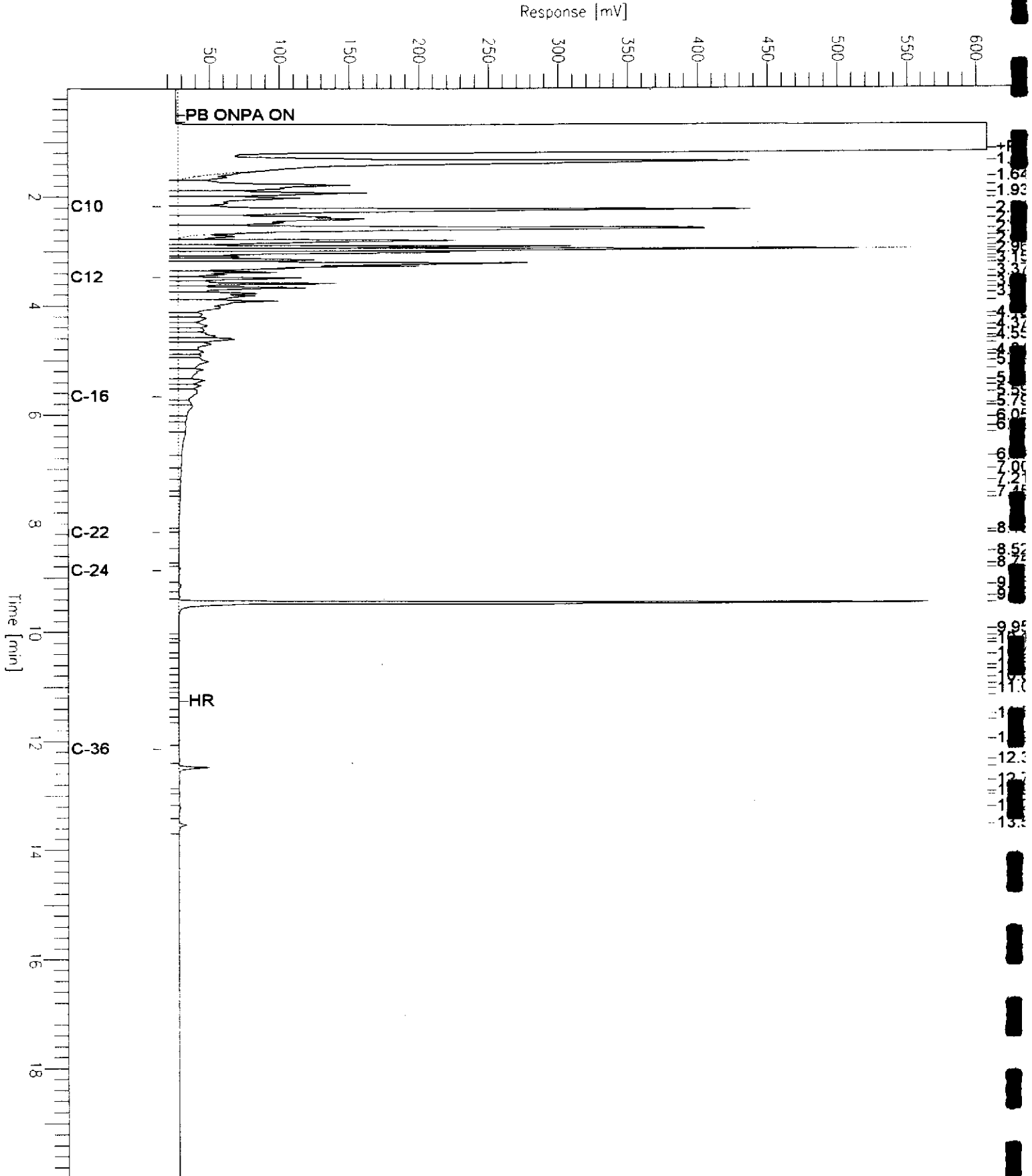
Low Point : 15.51 mV

High Point : 607.67 mV

Scale Factor: 0.0

Plot Offset: 16 mV

Plot Scale: 592.2 mV



Chromatogram

Sample Name : 176632-009,97558

Sample #: 97558

Page 1 of 1

FileName : G:\GC15\CHB\355B008.RAW

Date : 12/20/04 02:07 PM

Method : BTEH335S.MTH

Time of Injection: 12/20/04 01:32 PM

Start Time : 0.01 min

End Time : 19.99 min

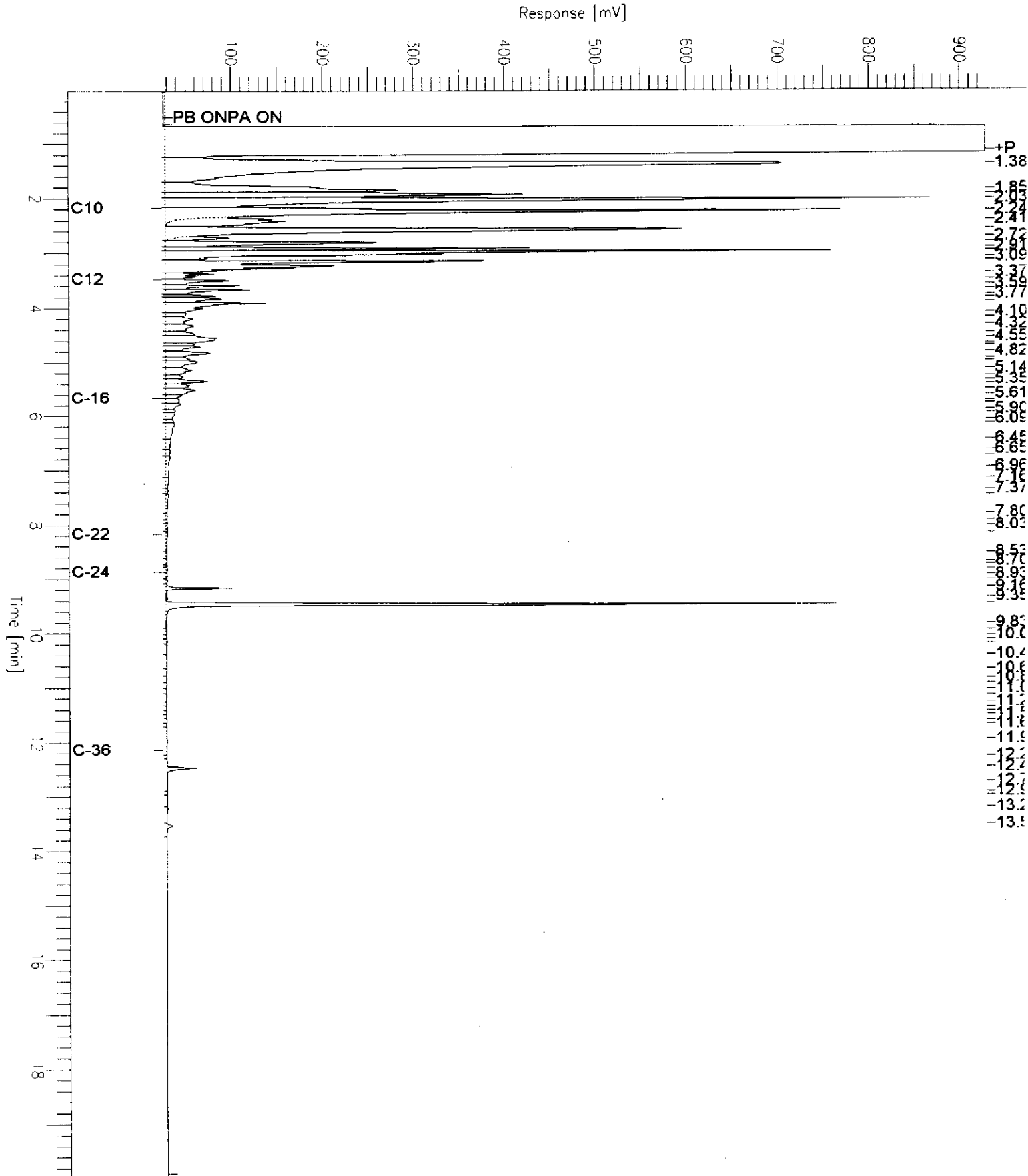
Low Point : 23.68 mV

High Point : 928.98 mV

Scale Factor: 0.0

Plot Offset: 24 mV

Plot Scale: 905.3 mV

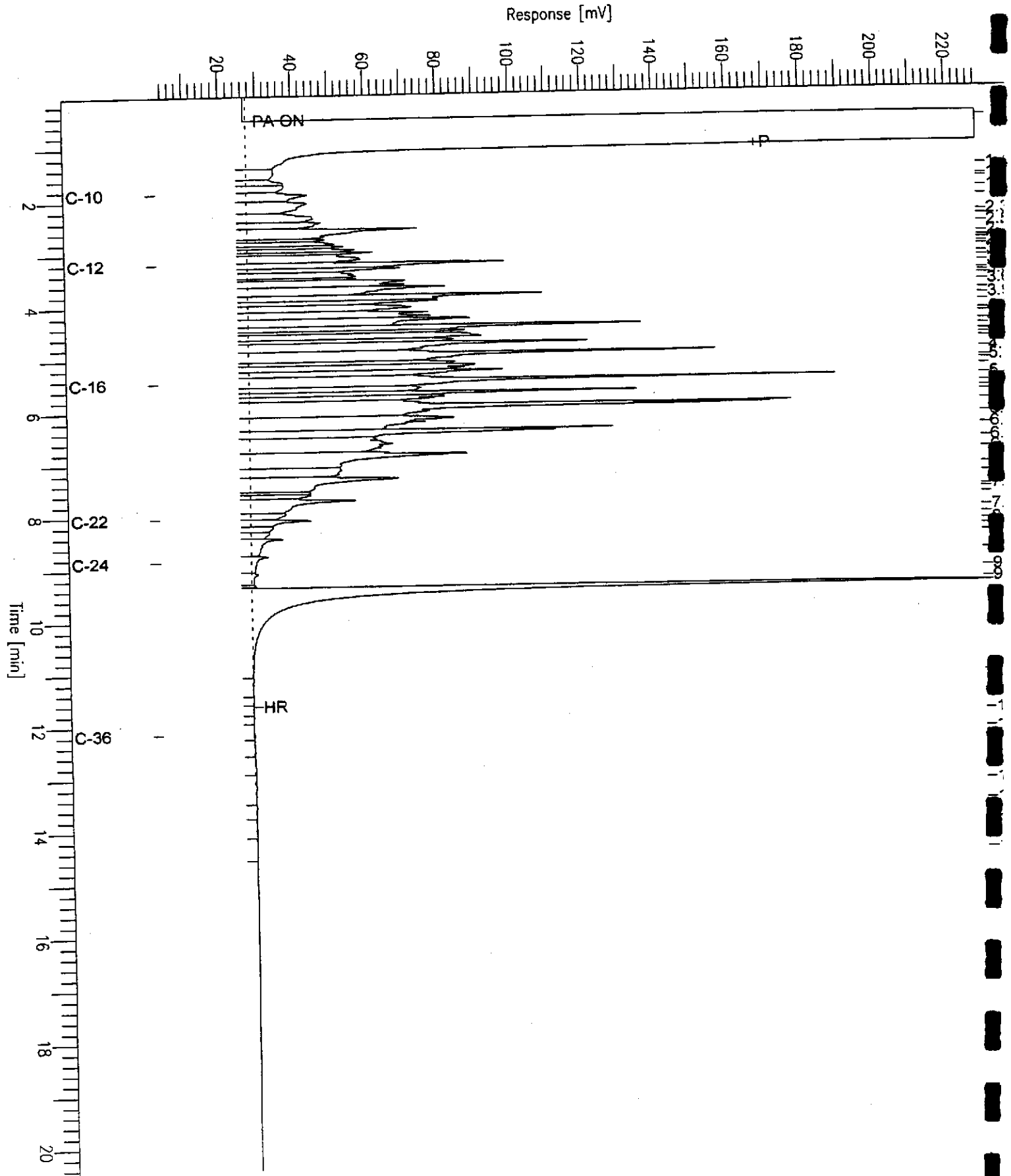


Sample Name : ccv_04ws2215.dsl
FileName : G:\GC11\CHA\352A003.RAW
Method : ATEH349S.MTH
Start Time : 0.04 min
Scale Factor: 0.0

End Time : 20.45 min
Plot Offset: 2 mV

Sample #: 500mg/L
Date : 12/17/04 11:00 AM
Time of Injection: 12/17/04 10:30 AM
Low Point : 2.36 mV
Plot Scale: 225.9 mV

Page 1 of 1
High Point : 228.32 mV



Batch QC Report

Total Extractable Hydrocarbons

Lab #:	176632	Location:	Redwood Regional Park
Client:	Stellar Environmental Solutions	Prep:	EPA 3520C
Project#:	STANDARD	Analysis:	EPA 8015B
Matrix:	Water	Batch#:	97558
Units:	ug/L	Prepared:	12/16/04
Diln Fac:	1.000	Analyzed:	12/17/04

Type: BS Lab ID: QC276601

Analyte	Spiked	Result	%REC	Limits
Diesel C10-C24	2,500	2,691	108	51-131

Surrogate	%REC	Limits
Hexacosane	118	53-143

Type: BSD Lab ID: QC276602

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Diesel C10-C24	2,500	2,719	109	51-131	1	42

Surrogate	%REC	Limits
Hexacosane	117	53-143

**HISTORICAL GROUNDWATER ELEVATIONS IN MONITORING WELLS
REDWOOD REGIONAL PARK SERVICE YARD
7867 REDWOOD ROAD, OAKLAND, CALIFORNIA**

Well I.D.	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	MW-11
TOC Elevation	565.90	566.50	560.90	548.10	547.50	545.60	547.70	549.20	549.40	547.30	547.90
Date Monitored	Groundwater Elevations (feet above mean sea level)										
September 18, 1998	563.7	544.2	540.8	534.5	531.1	545.6					
April 6, 1999	565.2	546.9	542.3	535.6	532.3	532.9					
December 20, 1999	562.9	544.7	541.5	534.9	531.2	532.2					
September 28, 2000	562.8	542.7	538.3	532.2	530.9	532.0					
January 11, 2001	562.9	545.1	541.7	535.0	531.2	532.3	534.9	538.1			
April 13, 2001	562.1	545.7	541.7	535.1	531.5	532.4	535.3	539.8			
September 1, 2001	560.9	542.0	537.7	533.9	530.7	531.8	534.0	535.6			
December 17, 2001	562.2	545.2	542.2	534.8	531.4	532.4	534.8	538.4	534.6	535.7	535.2
March 14, 2002	563.0	547.1	542.2	535.5	532.4	533.3	535.7	541.8	535.0	537.6	536.6
June 18, 2002	562.1	544.7	541.1	534.6	531.2	532.2	534.8	537.9	534.7	535.6	535.3
September 24, 2002	561.4	542.2	537.3	533.5	530.6	531.8	533.5	535.5	535.3	533.8	531.7
December 18, 2002	562.4	545.0	542.0	534.8	531.5	532.5	534.6	537.1	536.5	535.2	532.8
March 27, 2003	562.6	545.7	541.7	534.8	531.6	532.4	535.1	539.9	537.2	536.2	533.6
June 19, 2003	562.3	544.9	541.5	534.8	531.3	532.3	534.9	538.2	536.9	535.7	533.2
September 10, 2003	561.6	542.1	537.9	533.8	530.8	531.9	533.7	535.6	535.6	534.1	531.9
December 10, 2003	562.4	542.7	537.6	533.7	530.9	531.9	533.7	535.2	535.5	533.8	531.7
March 18, 2004	563.1	546.6	541.9	535.0	531.7	532.4	535.2	540.9	537.4	536.6	533.8
June 17, 2004	562.1	544.3	540.7	534.3	531.0	532.1	534.6	537.4	536.5	535.1	532.7
September 21, 2004	561.5	541.1	536.5	533.1	530.5	531.6	533.1	534.7	532.7	533.2	533.2
December 14, 2004	562.2	545.3	541.7	534.7	531.4	532.2	534.6	540.4	536.7	535.5	532.9

TOC = Top of well Casing