


1500 So. Union Avenue
Bakersfield, California 93307
Phone: (805) 835-7700
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**MALIBU GRAND PRIX
8000 South Coliseum Way
Oakland, California**

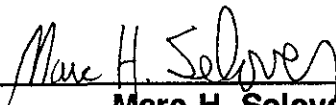
**GROUNDWATER MONITORING REPORT
THIRD QUARTER 1992**

Report Prepared for
Malibu Grand Prix
7301 Topanga Canyon Boulevard, Suite 300
Canoga Park, California 91303

by
RESNA Industries Inc.



Rex J. Young, R.G. #720



Marc H. Selover

Manager of Geosciences and Engineering



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-

EXECUTIVE SUMMARY

Ground water monitoring wells at the Race Track and at the Castle sites were sounded for depth to water on July 9-10, 1992, and were sounded again and sampled on August 5-6, 1992. Water table elevations in the monitoring wells have not responded to the removal of the water from the boat pond during the first week of July, 1992. Results of laboratory analyses of water samples show, as in previous reports, that not all of the monitoring wells down gradient from the former tank locations consistently show ground water impaction by gasoline.

1.0 INTRODUCTION

RESNA has performed additional monitoring and assessment of hydrocarbon plumes in the soil and groundwater at the Malibu Grand Prix Race Track and Castle areas, 8000 South Coliseum Way, Oakland, California (Plate 1). This report reviews the past history of the site, gives the results of the analysis of soil and water samples, interpretation of findings and revised recommendations based on the findings.

2.0 BACKGROUND

Malibu Grand Prix (MGP) operates two adjacent amusement park facilities, a Racetrack for midget cars and a Fun Center with miniature golf and batting cages on leased property at 8000 South Coliseum Way, Oakland (Plates 1 & 2). Prior to 1989 the MGP facility maintained two 6,000 gallon underground storage tanks containing marine mix gasoline. The tanks were located in the parking lots adjacent to the MGP Castle and Race Track. The tanks were removed on March 29, 1989 and February 1, 1990 respectively. Closure reports were submitted to the Alameda County Department of Environmental Health with all relevant waste manifests and analysis results. On June 29, 1989 a letter from Alameda County was sent to Malibu Grand Prix Corp. requiring an initial site investigation to determine the extent of soil and groundwater contamination present at the MGP Castle while a verbal request was issued for an assessment at the Race Track at the time of the removal. The site assessment at the Castle began on September 21, 1989 and a report was issued on November 15, 1989 recommending further work. The assessment work at the Race Track, and the continued assessment at the Castle began on June 12, 1990. Monitoring Wells 1 through 10 were sampled July 17, 1991. Four additional monitoring wells (MWs) at the Castle and four additional MWs at the Race Track were constructed on August 27-30, 1991. All monitoring wells, MW-1 through -18, were sampled October 9, 10, 11, 1991, for water analyses and pump tests and slug tests were performed on selected wells. A report of ground water monitoring was submitted in January, 1992, which included recommendations to eliminate two on-site ground water recharge areas, conduct further assessment of impacted soil, and perform ground water monitoring on a quarterly basis until a plan for remediation is developed. *provide results*

3.0 PROCEDURES

The stabilized water depth was measured in each well with an electrical measuring tape and the depths were recorded on site prior to sampling. During sampling, which followed depth measurement, the wells were purged of three well volumes of water with a bailer and samples were taken for laboratory analysis. A split sample (two simultaneous samples) was taken from the bailer following purging. The bailer was decontaminated before each purging and sampling event to prevent cross-contamination between wells. Samples were labeled and chilled for transporting to the laboratory under chain of custody. Purged water was stored on site in marked containers. Sampling procedures are described in Appendix B.

4.0 FINDINGS

4.1 Water Samples Analyses

Water samples collected from the ground water monitoring wells were analyzed for benzene, toluene, ethylbenzene and xylenes plus total petroleum hydrocarbons as gasoline (BTEX-TPHg). Lines of equal concentrations of TPHg are shown on Plate 2; benzene concentrations are contoured on Plate 3.

Three wells (MW-3, -6, and -15) which were previously clean are now reported to contain gasoline impacted water while one previously impacted well (MW-16) is now clean. These differences are considered to represent typical changes in the lateral extent of the plumes due to some of the wells alternating from clean, to impacted, to clean again.

Tidal influences from the ditches adjacent to the site and inhomogenities in the underlying fill material are possible reasons for the variations in the shape of the ground water plumes.

Analyses results are presented in Table 1. Laboratory reports are in Appendix A.

4.2 Contours on Top of Water Table

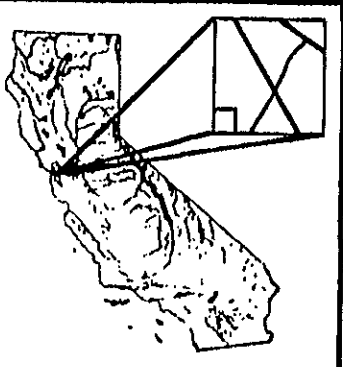
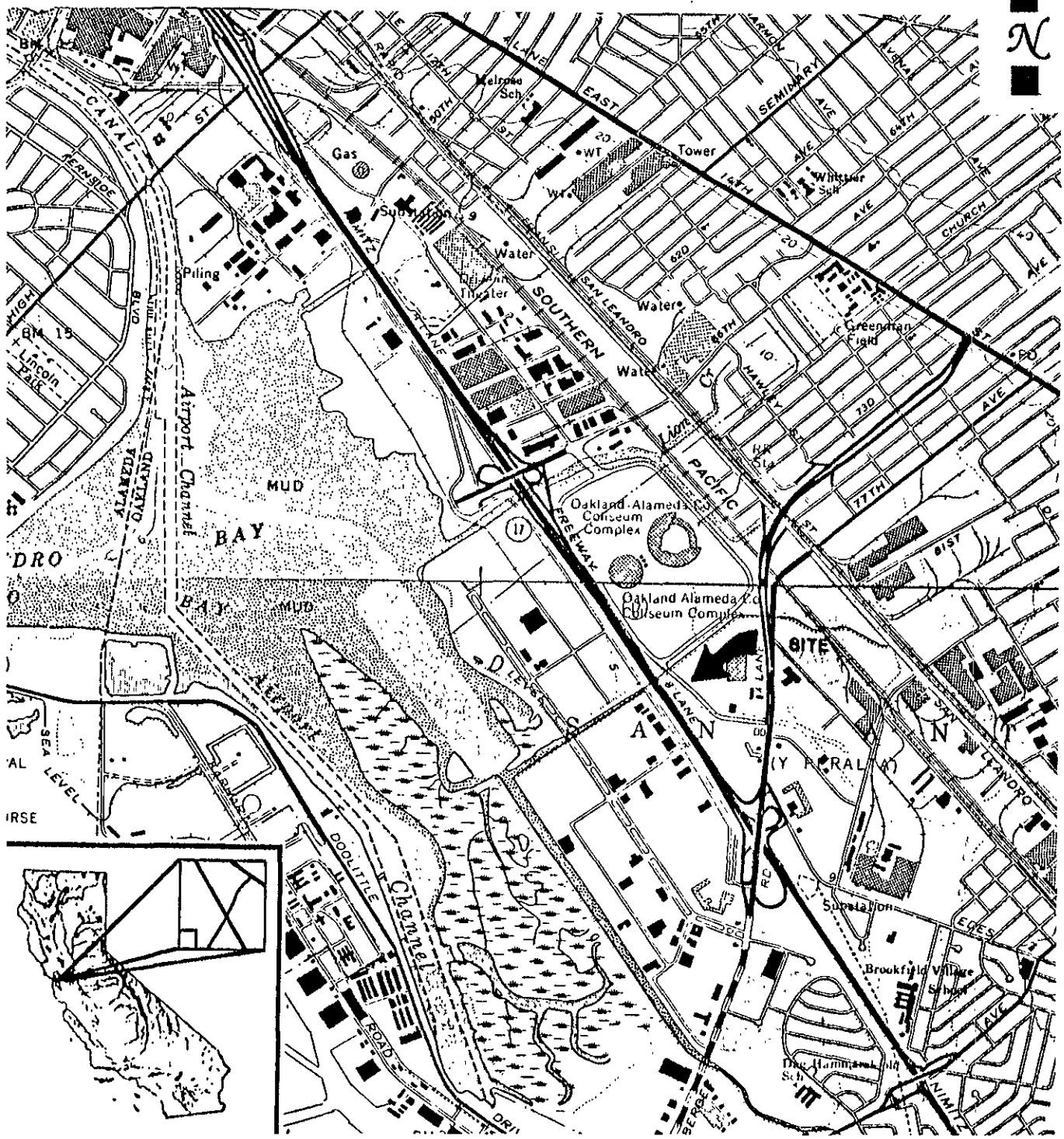
Contours on Top of Water Table and tables of elevation and depth to water in the wells at the Race Track and Castle areas, measured August 5-6, 1992, are presented in Plate 4. The boat pond was drained in late July, 1992, but the data and contours presented in this report show little change from the measurements recorded in October, 1991, and reported January 13, 1992.

TABLE 1
MALIBU GRAND PRIX - OAKLAND, CALIFORNIA
WATER SAMPLE ANALYSIS RESULTS, ppb

Well #	Date	Benzene	Toluene	Ethyl- benzene	Total Xylenes	TPHg
MW-1	09/22/89	410	1800	1100	7100	35000
	06/14/90	.66	<.05	1.3	2.3	210
	07/17/91	<.05	.06	<.05	<.05	270
	10/09/91	<.05	<.05	<.05	<.05	370
	08-05-92	<0.5	<0.5	<0.5	<0.5	600
MW-2	09/22/89	<.05	<.05	<.05	<.05	<50
	06/14/90	<.05	<.05	<.05	<.05	<50
	07/17/91	<.05	<.05	<.05	<.05	<50
	10/09/91	<.05	<.05	<.05	<.05	<50
	08-05-92	<0.5	<0.5	<0.5	<0.5	<50
MW-3	09/22/89	1.2	<.05	<.05	<.05	<50
	06/14/90	0.90	4	<.05	<.05	<50
	07/17/91	3.8	<.05	<.05	<.05	<50
	10/10/91	<.05	<.05	<.05	<.05	<50
	08-05-92	9.7	1.4	1.0	0.9	110
MW-4	09/22/89	410	430	78	324	4000
	06/14/90	200	3.7	1.2	9.5	660
	07/17/91	49	4.3	1.5	38	1100
	duplicate 07/17/91	45	2.7	1.0	33	1000
	10/09/91	0.8	<.05	<.05	<.05	88
08-05-92	11	8.9	2.4	4.7	5800	
MW-5	06/14/90	<.05	<.05	<.05	<.05	<50
	07/17/91	<.05	<.05	<.05	<.05	<50
	10/09/91	<.05	<.05	<.05	<.05	110
	08-05-92	<0.5	<0.5	2.0	0.9	210
MW-6	06/14/90	73	<.05	17	29.7	1800
	07/17/91	7.4	<.05	<.05	5.6	1200
	10/09/91	<.05	<.05	<.05	<.05	<50
	08-05-92	1.4	<0.5	12	4.1	1900
MW-7	06/14/90	0.84	<.05	1.2	1.8	58
	07/17/91	12	1.7	4.7	3.8	120
	10/09/91	<.05	<.05	<.05	<.05	<50
	08-05-92	<0.5	<0.5	0.6	<0.5	<50

TABLE 1 (continued)
MALIBU GRAND PRIX - OAKLAND, CALIFORNIA
WATER SAMPLE ANALYSIS RESULTS, ppb

<i>Well #</i>	<i>Date</i>	<i>Benzene</i>	<i>Toluene</i>	<i>Ethly- benzene</i>	<i>Total Xylenes</i>	<i>TPHg</i>
MW-8	06/14/90	680	36	150	1060	13000
	07/17/91	330	1.8	1.7	3.6	1300
	10/10/91	3.1	0.6	0.7	<.05	76
	duplicate 10/10/91	3.2	0.6	0.7	<.05	72
	08-05-92	35	1.2	0.6	2.4	1700
MW-9	06/14/90	12	0.78	4.5	2.54	3200
	07/17/91	3.4	<.05	<.05	<.05	87
	10/10/91	1.8	<.05	<.05	<.05	100
	08-05-92	1.7	<0.5	<0.5	1.3	150
MW-10	06/14/90	20	.69	4.3	7.7	400
	07/17/91	4.2	<.05	<.05	<.05	290
	10/10/91	<.05	<.05	<.05	<.05	90
	08-05-92	<0.5	<0.5	<0.5	<0.5	790
MW-11	10/09/91	<.05	1.2	1.0	6.4	430
	08-05-92	<0.5	<0.5	3.2	3.2	580
MW-12	10/09/91	<.05	2.6	0.8	5.1	1500
	08-05-92	<0.5	<0.5	9.1	1.1	53
MW-13 duplicate	10/09/91	<.05	0.9	0.6	3.0	720
	08-05-92	<0.5	2.7	<0.5	0.69	1400
	08-05-92	<0.5	3.0	<0.5	0.7	1100
MW-14 hydropunch	08/27/91	<.05	<.05	<.05	<.05	<50
	10/09/91	<.05	<.05	<.05	0.9	<50
	08-05-92	.05	<0.5	<0.5	<0.5	<50
MW-15	10/10/91	<.05	<.05	<.05	<.05	<50
	08-05-92	0.8	<0.5	<0.5	<0.5	<50
MW-16	10/09/91	<.05	<.05	<.05	<.05	78
	08-05-92	<0.5	<0.5	<0.5	<0.5	<50
MW-17	10/09/91	<.05	<.05	<.05	<.05	<50
	08-05-92	<0.5	<0.5	<0.5	<0.5	<50
MW-18	10/09/91	<.05	<.05	<.05	<.05	<50
	08-05-92	<0.5	<0.5	<0.5	<0.5	<50



RESNA
Working to Restore Nature

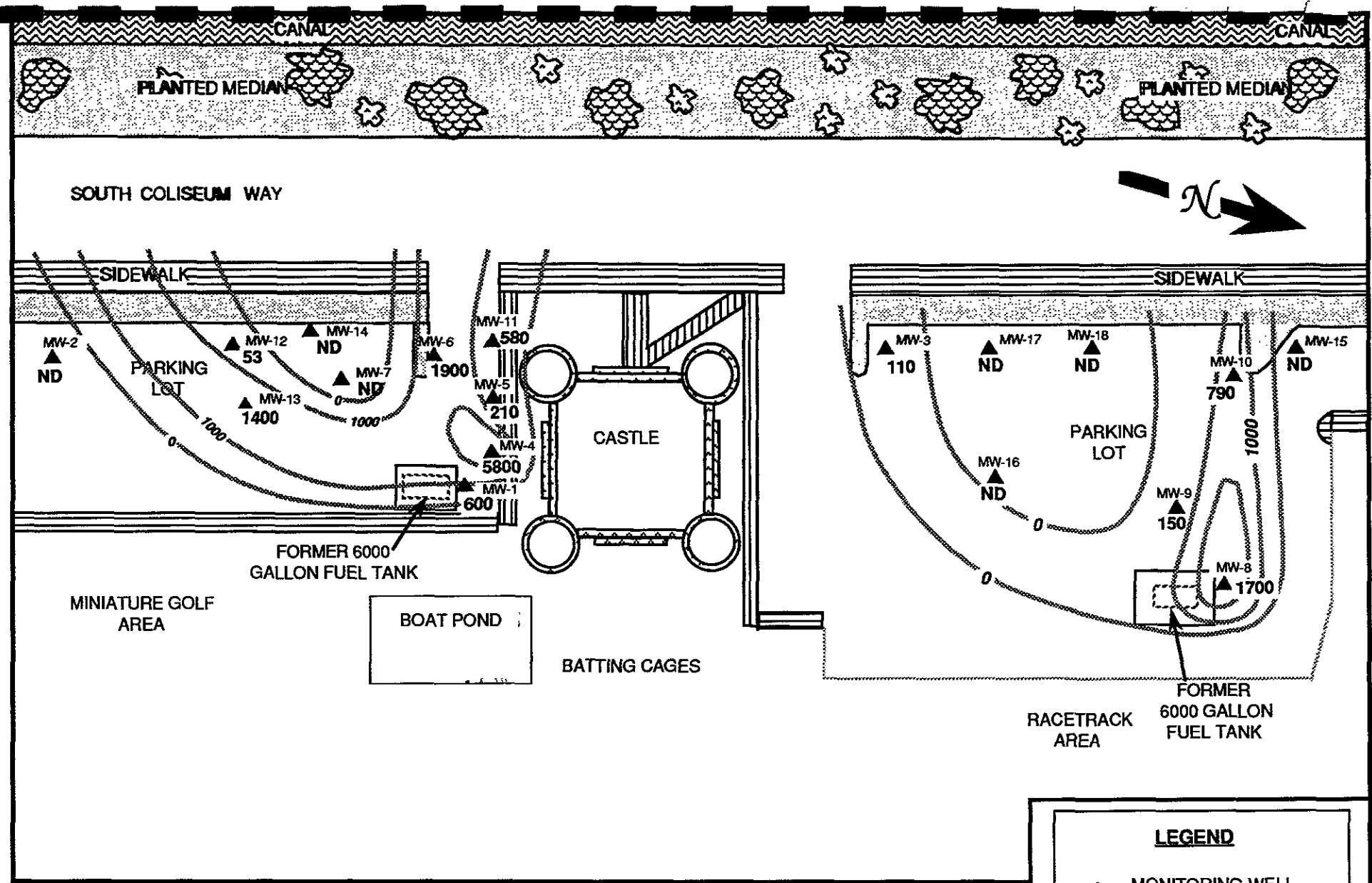
MALIBU GRAND PRIX
8000 SOUTH COLISEUM WAY
OAKLAND, CALIFORNIA

PLATE

1

LOCATION MAP

DATE: 10/12/92
PROJECT NUMBER: 2481-42



RESNA
Working to Restore Nature

DATE: 9/21/92
PROJECT NUMBER: 2481-4

MALIBU GRAND PRIX
8000 SOUTH COLISEUM WAY
OAKLAND, CALIFORNIA

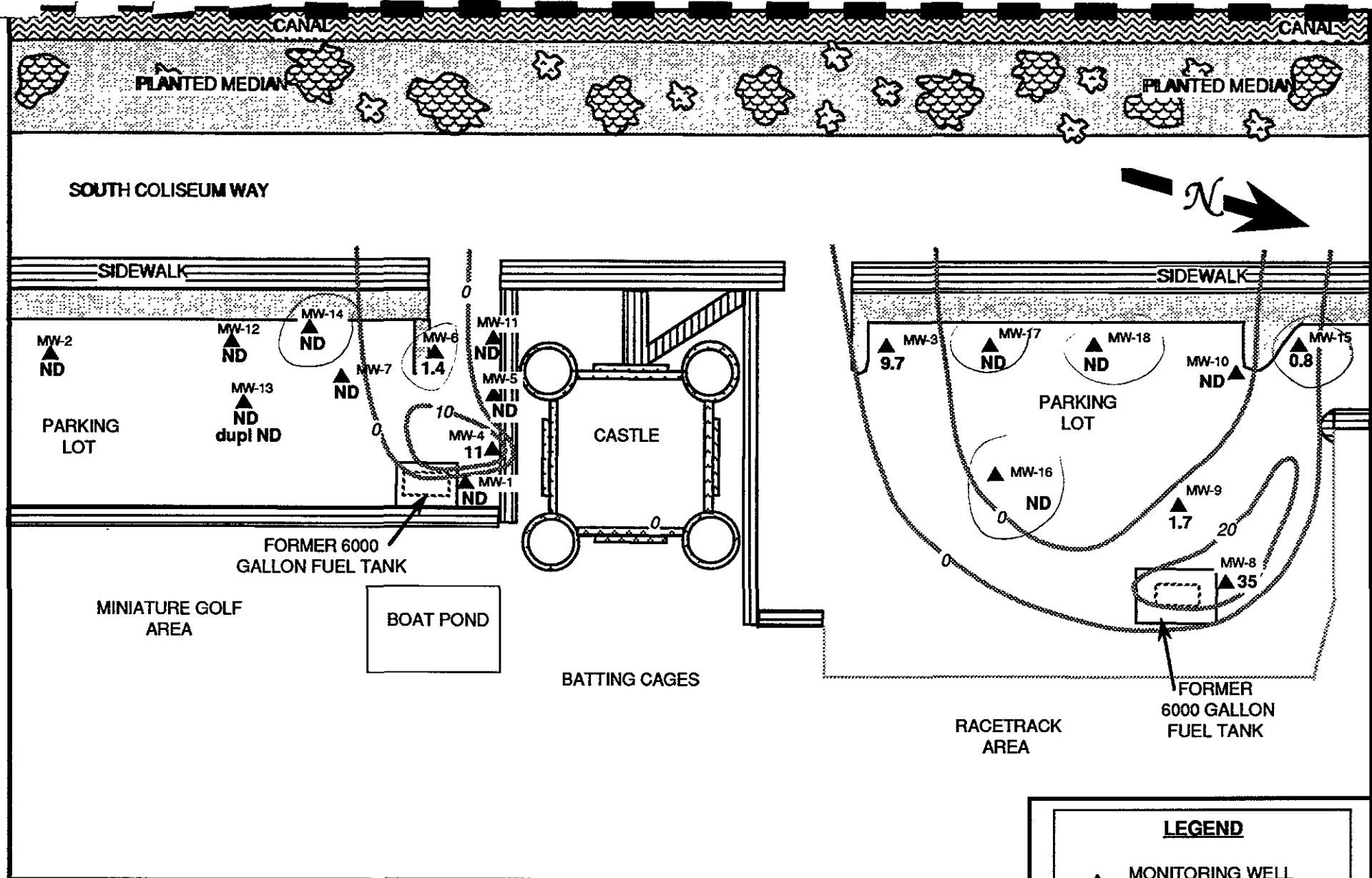
GROUNDWATER PLUME CONCENTRATIONS
TPHg, ppb 8/5/92

PLATE
2

LEGEND

▲ MONITORING WELL LOCATION

SCALE
ONE INCH = 50 FEET



RESNA
Working to Restore Nature

DATE: 9/21/92
PROJECT NUMBER: 2481-4

MALIBU GRAND PRIX
8000 SOUTH COLISEUM WAY
OAKLAND, CALIFORNIA

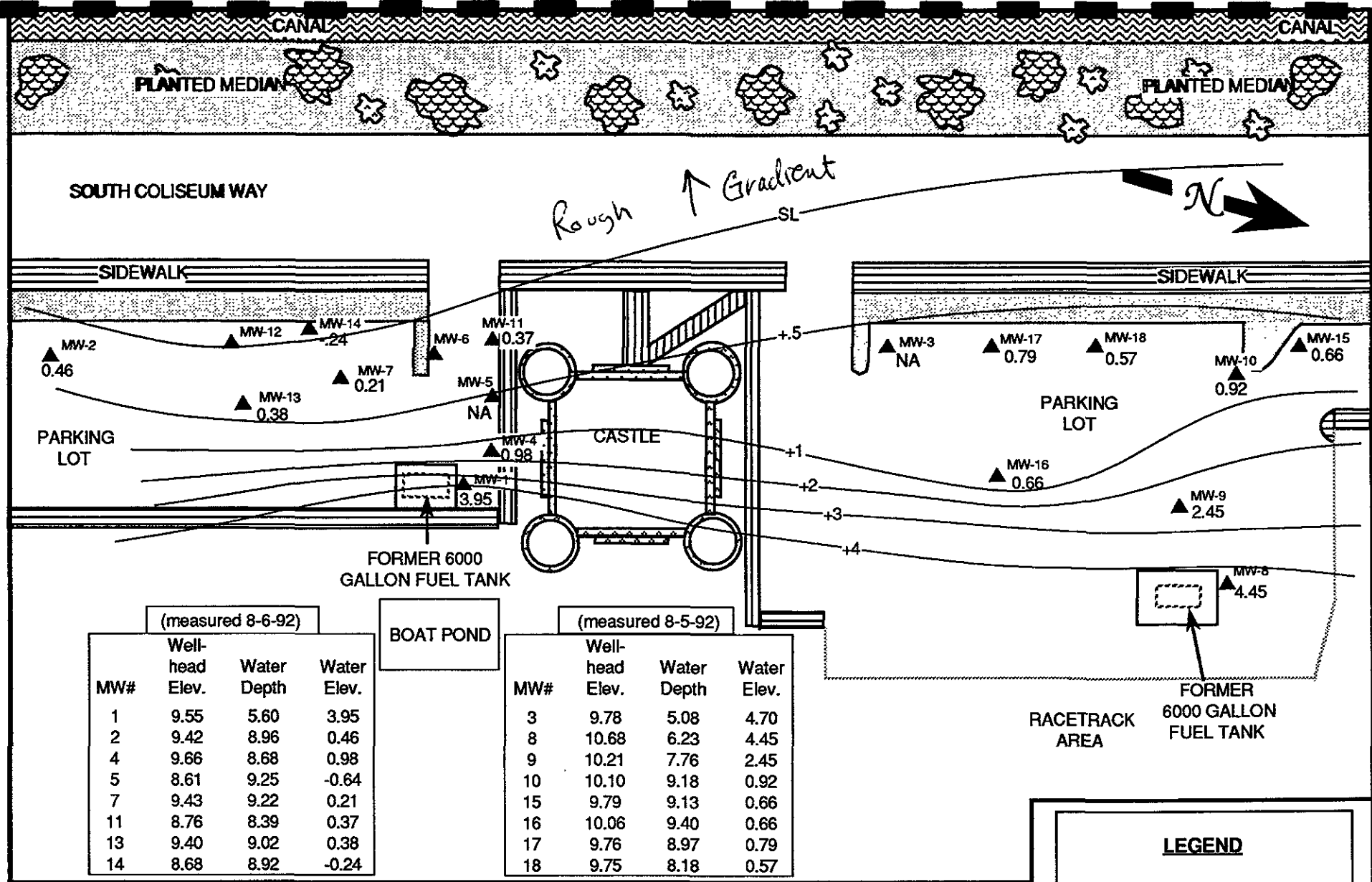
GROUNDWATER PLUME CONCENTRATIONS
BENZENE, ppb 8/5/92

PLATE
3

LEGEND

▲ MONITORING WELL LOCATION

SCALE
ONE INCH = 50 FEET



(measured 8-6-92)

MW#	Well-head Elev.	Water Depth	Water Elev.
1	9.55	5.60	3.95
2	9.42	8.96	0.46
4	9.66	8.68	0.98
5	8.61	9.25	-0.64
7	9.43	9.22	0.21
11	8.76	8.39	0.37
13	9.40	9.02	0.38
14	8.68	8.92	-0.24

(measured 8-5-92)

MW#	Well-head Elev.	Water Depth	Water Elev.
3	9.78	5.08	4.70
8	10.68	6.23	4.45
9	10.21	7.76	2.45
10	10.10	9.18	0.92
15	9.79	9.13	0.66
16	10.06	9.40	0.66
17	9.76	8.97	0.79
18	9.75	8.18	0.57

LEGEND

▲ MONITORING WELL LOCATIONS

SCALE
ONE INCH = 50 FEET

RESNA
Working to Restore Nature

DATE: 9-24-92
PROJECT NUMBER: 2481-42

MALIBU GRAND PRIX
8000 SOUTH COLISEUM WAY
OAKLAND, CALIFORNIA

**TOP OF WATER TABLE
CONTOURS OF COMPOSITE DATA**

PLATE

4

A P P E N D I X A

Laboratory Analyses and Chain of Custody

ANALYSIS REPORT

1020lab.frm

Attention: Mr. Rex Young
RESNA
1500 South Union Ave.
Bakersfield, CA 93307
Project: 19514-L, Project #2481-42
Malibu Grand Prix, Oakland

Date Sampled: 08-05-92
Date Received: 08-07-92
BTEX Analyzed: 08-11/12-92
TPHg Analyzed: 08-11/12-92
TPHd Analyzed: NR
Matrix: Water

	Benzene ppb	Toluene ppb	Ethyl- benzene ppb	Total Xylenes ppb	TPHg ppb	TPHd ppb
Detection Limit:	0.5	0.5	0.5	0.5	50	50

SAMPLE
Laboratory Identification

MW-1 W1208090	ND	ND	ND	ND	600*	NR
MW-2 W1208091	ND	ND	ND	ND	ND	NR
MW-4 W1208092	11	8.9	2.4	4.7	5800*	NR
MW-5 W1208093	ND	ND	2.0	0.9	210*	NR
MW-6 W1208094	1.4	ND	12	4.1	1900	NR

ppb = parts per billion = $\mu\text{g/L}$ = micrograms per liter.
 ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
 NR = Analysis not requested.
 * = Several early-eluting peaks are also present.

ANALYTICAL PROCEDURES

BTEX-- Benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction using EPA Method 5030 followed by analysis using EPA Method 8020/602, which utilizes a gas chromatograph (GC) equipped with a photoionization detector (PID) and a flame-ionization detector (FID) in series.
TPHg--Total petroleum hydrocarbons as gasoline (low-to-medium boiling points) are measured by extraction using EPA Method 5030, followed by analysis using modified EPA Method 8015, which utilizes a GC equipped with an FID.
TPHd--Total petroleum hydrocarbons as diesel (high boiling points) are measured by extraction using EPA Method 3550 for soils and EPA Method 3510 for water, followed by modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

MTague
Laboratory Representative

August 17, 1992
Date Reported

RESNA ENVIRONMENTAL LABORATORY IS CERTIFIED BY THE STATE OF CALIFORNIA
 DEPARTMENT OF HEALTH SERVICES AS A HAZARDOUS WASTE TESTING LABORATORY
 (Certification No. 1211)

ANALYSIS REPORT

1020lab.frm

Attention:	Mr. Rex Young RESNA 1500 South Union Ave. Bakersfield, CA 93307	Date Sampled:	08-05-92
Project:	19514-L, Project #2481-42 Malibu Grand Prix, Oakland	Date Received:	08-07-92
		BTEX Analyzed:	08-11/12-92
		TPHg Analyzed:	08-11/12-92
		TPHd Analyzed:	NR
		Matrix:	Water

	Benzene ppb	Toluene ppb	Ethyl- benzene ppb	Total Xylenes ppb	TPHg ppb	TPHd ppb
Detection Limit:	0.5	0.5	0.5	0.5	50	50

SAMPLE
Laboratory Identification

MW-7 W1208095	ND	ND	0.6	ND	ND	NR
MW-11 W1208096	ND	ND	3.2	1.4	580	NR
MW-12 W1208097	ND	ND	9.1	1.1	53**	NR
MW-13 W1208098	ND	2.7	ND	0.69	1400*	NR
MW-14 W1208099	ND	ND	ND	ND	ND	NR

ppb = parts per billion = µg/L = micrograms per liter.

ND = Not detected. Compound(s) may be present at concentrations below the detection limit.

NR = Analysis not requested.

* = Several early-eluting peaks are also present.

** = A Single early-eluting peak is present.

ANALYTICAL PROCEDURES

BTEX-- Benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction using EPA Method 5030 followed by analysis using EPA Method 8020/602, which utilizes a gas chromatograph (GC) equipped with a photoionization detector (PID) and a flame-ionization detector (FID) in series.

TPHg--Total petroleum hydrocarbons as gasoline (low-to-medium boiling points) are measured by extraction using EPA Method 5030, followed by analysis using modified EPA Method 8015, which utilizes a GC equipped with an FID.

TPHd--Total petroleum hydrocarbons as diesel (high boiling points) are measured by extraction using EPA Method 3550 for soils and EPA Method 3510 for water, followed by modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.



Laboratory Representative

August 17, 1992
Date Reported

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(Certification No. I211)

42501 Albrae Street • Fremont, CA 94538 • Phone: (510) 623-0775 • (800) 247-5223 • FAX: (510) 651-8754

ANALYSIS REPORT

1020lab.frm

Attention:	Mr. Rex Young RESNA 1500 South Union Ave. Bakersfield, CA 93307	Date Sampled:	08-05-92
		Date Received:	08-07-92
		BTEX Analyzed:	08-11/12-92
Project:	19514-L, Project #2481-42 Malibu Grand Prix, Oakland	TPHg Analyzed:	08-11/12-92
		TPHd Analyzed:	NR
		Matrix:	Water

	Benzene ppb	Toluene ppb	Ethyl- benzene ppb	Total Xylenes ppb	TPHg ppb	TPHd ppb
Detection Limit:	0.5	0.5	0.5	0.5	50	50

SAMPLE
Laboratory Identification

MW-19 W1208100	ND	3.0	ND	0.7	1100*	NR
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ppb = parts per billion = $\mu\text{g/L}$ = micrograms per liter.
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 NR = Analysis not requested.
 * = Several early-eluting peaks are also present.

ANALYTICAL PROCEDURES

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TPHd--Total petroleum hydrocarbons as diesel (high boiling points) are measured by extraction using EPA Method 3550 for soils and EPA Method 3510 for water, followed by modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

MTagan
Laboratory Representative

August 17, 1992
Date Reported



CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

1195374

PROJECT NO. 2491-42		PROJECT NAME/SITE Malibu Grand Prix 8000 S Coleseum Way, Oakland, CA.						ANALYSIS REQUESTED										P.O. #.		
SAMPLERS (SIGN) Robin A. Adair		(PRINT) Robin A. Adair						NO. CONTAINERS	SAMPLE TYPE	/										REMARKS
SAMPLE IDENTIFICATION		DATE	TIME	COMP	GRAB	PRES. USED	ICED			BTEX (602/8020)	TPHg (8015)	TPHg (8015)	TOG 418 1/5520	601/8010	624/8240	625/8270				
BBI		8-5-92	1:00			HCL	Y	3	X	X						W/208078	Hold.			
TRIP Blank			1:00			HCL	Y	2	X	X						079	Hold			
MW-3			1:15					2	X	X						080				
MW-8			5:30					2	X	X						081				
MW-9			5:00					2	X	X						082				
MW-10			4:15					2	X	X						083				
MW-15			2:45					2	X	X						084				
MW-16			3:30					2	X	X						085				
MW-17			1:45					2	X	X						086				
MW-18			2:15					2	X	X						087				

RELINQUISHED BY: Robin A. Adair	DATE 8-7-92	TIME 9:20	RECEIVED BY:	LABORATORY: Resna	PLEASE SEND RESULTS TO: Cyndi Virostko
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	REQUESTED TURNAROUND TIME Normal	
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	RECEIPT CONDITION good	PROJECT MANAGER
RELINQUISHED BY:	DATE 8-7-92	TIME 9:20	RECEIVED BY LABORATORY Anthony Green		

ANALYSIS REPORT

1020lab.frm

Attention: Mr. Rex Young
RESNA
1500 South Union Ave.
Bakersfield, CA 93307
Project: 19514-L, Project #2481-42
Malibu Grand Prix, Oakland

Date Sampled: 08-05-92
Date Received: 08-07-92
BTEX Analyzed: 08-11/12-92
TPHg Analyzed: 08-11/12-92
TPHd Analyzed: NR
Matrix: Water

	Benzene ppb	Toluene ppb	Ethyl- benzene ppb	Total Xylenes ppb	TPHg ppb	TPHd ppb
Detection Limit:	0.5	0.5	0.5	0.5	50	50

SAMPLE
Laboratory Identification

MW-3 W1208080	9.7	1.4	1.0	0.9	110	NR
MW-8 W1208081	35	1.2	0.6	2.4	1700	NR
MW-9 W1208082	1.7	ND	ND	1.3	150*	NR
MW-10 W1208083	ND	ND	ND	ND	790*	NR
MW-15 W1208084	0.80	ND	ND	ND	ND*	NR

ppb = parts per billion = $\mu\text{g/L}$ = micrograms per liter.
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NR = Analysis not requested.
* = Early-eluting peaks are also present.

ANALYTICAL PROCEDURES

BTEX-- Benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction using EPA Method 5030 followed by analysis using EPA Method 8020/602, which utilizes a gas chromatograph (GC) equipped with a photoionization detector (PID) and a flame-ionization detector (FID) in series.
TPHg--Total petroleum hydrocarbons as gasoline (low-to-medium boiling points) are measured by extraction using EPA Method 5030, followed by analysis using modified EPA Method 8015, which utilizes a GC equipped with an FID.
TPHd--Total petroleum hydrocarbons as diesel (high boiling points) are measured by extraction using EPA Method 3550 for soils and EPA Method 3510 for water, followed by modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.



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ANALYSIS REPORT

1020lab.frm

Attention:	Mr. Rex Young RESNA 1500 South Union Ave. Bakersfield, CA 93307	Date Sampled:	08-05-92
Project:	19514-L, Project #2481-42 Malibu Grand Prix, Oakland	Date Received:	08-07-92
		BTEX Analyzed:	08-11/12-92
		TPHg Analyzed:	08-11/12-92
		TPHd Analyzed:	NR
		Matrix:	Water

	Benzene ppb	Toluene ppb	Ethyl- benzene ppb	Total Xylenes ppb	TPHg ppb	TPHd ppb
Detection Limit:	0.5	0.5	0.5	0.5	50	50


SAMPLE
Laboratory Identification

MW-16 W1208085	ND	ND	ND	ND	ND	NR
MW-17 W1208086	ND	ND	ND	ND	ND	NR
MW-18 W1208087	ND	ND	ND	ND	ND	NR

ppb = parts per billion = $\mu\text{g/L}$ = micrograms per liter.
 ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
 NR = Analysis not requested.

ANALYTICAL PROCEDURES

BTEX- Benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction using EPA Method 5030 followed by analysis using EPA Method 8020/602, which utilizes a gas chromatograph (GC) equipped with a photoionization detector (PID) and a flame-ionization detector (FID) in series.
TPHg-Total petroleum hydrocarbons as gasoline (low-to-medium boiling points) are measured by extraction using EPA Method 5030, followed by analysis using modified EPA Method 8015, which utilizes a GC equipped with an FID.
TPHd-Total petroleum hydrocarbons as diesel (high boiling points) are measured by extraction using EPA Method 3550 for soils and EPA Method 3510 for water, followed by modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.



 Laboratory Representative

August 17, 1992
 Date Reported

RESNA ENVIRONMENTAL LABORATORY IS CERTIFIED BY THE STATE OF CALIFORNIA
 DEPARTMENT OF HEALTH SERVICES AS A HAZARDOUS WASTE TESTING LABORATORY
 (Certification No. 1211)

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APPENDIX B

Sampling Protocol

**RESNA INDUSTRIES INC.
1500 SOUTH UNION AVENUE
BAKERSFIELD, CALIFORNIA 93307**

**SAMPLING PROTOCOL
QUALITY ASSURANCE & QUALITY CONTROL**

(QAQC)

Revised April 1991

SAMPLING PROTOCOL - QUALITY ASSURANCE AND QUALITY CONTROL

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SAMPLING PROTOCOL-QUALITY ASSURANCE AND QUALITY CONTROL

RESNA Industries Inc. (RESNA) has adopted the following Site Investigation Quality Assurance/Quality Control (QA/QC) program intended to facilitate the acquisition of accurate and reliable data. Environmental data gathered during the investigation shall be collected and analyzed following procedures prescribed in the Quality Control Program. A Quality Assurance Program has been established to assure that the Quality Control Program is effective. Both programs are necessary to provide accurate data and documentation for investigations and laboratory analyses. The following field and laboratory procedures shall be implemented to ensure that QA/QC objectives are met.

1.0 RECORDING OF FIELD DATA

All information pertinent to the field investigation shall be kept in a field log book. In addition, boring log and chain-of-custody comprise the field documents in which all of the pertinent information about bore hole soil samples are recorded. Information to be documented includes at least the following:

- Sample number.
- Locations of sample collection.
- Soil boring or well numbers, as applicable.
- Depths at which samples were obtained.
- Names of collectors.
- Dates and times of collection.
- Purpose of sample.
- Sample distribution (e.g., laboratory, archive, etc.).
- Field observations.
- Field measurements (e.g., PID readings, pH, conductivity, water levels).
- Other data records (e.g., development log, soil sampling report, well log, etc.).

2.0 SAMPLE CONTAINERS

Groundwater samples shall be placed in containers supplied by RESNA or an analytical laboratory. Table 1 summarizes the required sample containers.

Soil samples shall be collected in either 8-ounce widemouth glass jars with screw-on caps lined with teflon or in brass or stainless steel tubes (Table 1). Screw-on caps for the tubes shall be fitted with teflon liners. Tubes shall be tightly capped and sealed with integrity tape.

3.0 QUALITY CONTROL OF WATER SAMPLES

A QC program independent from the laboratory's program shall be maintained. The program entails submittals of travel blanks, duplicates, and field blanks to a certified laboratory. No spiked samples shall be supplied from the field; the laboratory in-house QC program shall include analysis of spiked samples. Field blanks shall be assigned independent sample numbers and made indistinguishable from non quality control samples.

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3.1 Travel Blanks

When sampling groundwater, travel blanks shall be used to detect the introduction of contaminants during transportation from the field to the laboratory. The travel blanks shall be provided by RESNA or the analytical laboratory. They shall be taken to the field and accompany the collected groundwater samples to the laboratory for analysis. The blanks shall consist of deionized water or analytically confirmed organic-free water. The blank is numbered, packaged, and sealed in the same manner as the other samples.

3.2 Duplicates

Five percent (1 in 20) or one (1) per sampling set, whichever is more, shall be submitted to the laboratory for analysis as duplicates. Therefore, if a job site has one (1) and up to twenty (20) wells to be sampled, one (1) duplicate shall be analyzed. If twenty-one (21) wells are to be sampled then two (2) duplicates shall be analyzed. The duplicate is acquired by filling two sample bottles from the same well bailer. If more than one bailer volume is required, each bailer volume shall be split between containers. The duplicates shall be labeled as duplicate without identifying the actual well location either on the chain-of-custody or on the actual sample. The actual well location of the duplicate shall be noted in the field log book.

3.3 Field Blanks

Field blanks shall be prepared and submitted to the analytical laboratory for analysis on the same frequency stated for duplicates. A field blank shall be acquired by sampling the deionized water used to rinse the sampling bailer in between sample points.

3.4 Sample Preservation

Sample containers shall be pre-cooled and transported to the site in coolers. All samples shall be preserved as indicated on Table 1 and placed in coolers immediately after collection. Sealed chemical ice shall be used in the coolers to maintain samples at a temperature of 4 degrees celsius. A high level recording thermometer shall accompany the samples during transport conditions.

4.0 GROUNDWATER SAMPLING PROTOCOL

Immediately prior to sampling, the depth to water (DTW) in the well shall be recorded. If there is free product in the well, the thickness of product on top of the groundwater shall be measured using an interface probe.

If free product is detected, analysis of groundwater at the interface for dissolved product shall not be conducted. A product sample shall be collected for source identification. If all free product cannot be removed, an interval-specific sampling device may be utilized to collect a sample from below the

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zone of free product. The well shall be purged until indicator parameters (temperature, conductivity and pH) are stabilized. This shall entail the removal of at least four well-casing volumes by bailing or pumping. The criteria for determining well-casing volumes and temporary storage of purged water is outlined in Section 9.0, (Well Development Protocol). The indicator parameter measurements shall be taken both before and after purging of each well-casing volume. Once the well is purged and indicator parameters have stabilized, a sample may be collected after the water level has reached 80 percent of its initial elevation. Where water level recovery is slow, the sample may be collected after stabilization is achieved and enough water is present to fill sample containers.

Cross contamination from transferring pumps (or bailers) from well to well shall be avoided by utilizing dedicated equipment. Where this is not feasible, thorough cleaning of equipment shall be performed between sampling rounds. Sampling shall proceed from the least contaminated to the most contaminated well, if that information is available before sample collection, or if it is indicated by field evidence. Where several types of analysis shall be performed for a given well, individual samples shall be collected in the following order:

1. Volatile organics
2. Purgeable organics
3. Purgeable organic halogens
4. Total organics
5. Total organic halogens
6. Extractable organics
7. Total metals
8. Dissolved metals
9. Phenols
10. Cyanide

The specific analytical methods to be utilized for the common volatile/semi-volatile analyses are shown on Table 2.

Duplicate samples shall be transferred to vials or containers that meet Regional Board specifications (Table 1). Groundwater from the bailer shall be transferred to the sample container by allowing the fluid to flow slowly along the sides of the vessel. All containers shall be filled above the top of the opening to form a positive meniscus. No head space should be present in the sample container once it is sealed. After the vial is capped it should be inverted to check for air bubbles. If bubbles are present the sample should be discarded and replaced. If it is not possible to collect a sample without air bubbles, the problem shall be noted in the field log book.

5.0 CHAIN-OF-CUSTODY PROCEDURES

5.1 Sample Labels

Each sample container shall be labeled prior to filling to prevent misidentification. The label shall contain at least the following information:

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- Sample number which uniquely identifies the sample
- Project title or number
- Location of sample collection
- Soil boring or well number, as applicable
- Name of collector
- Date and time of collection

5.2 Chain-of-Custody Record and Sample Analysis Request Form

A chain-of-custody record for each container or sample shall be used to track possession of the samples from the time they were collected in the field until the time they are analyzed in the laboratory.

The chain-of-custody record shall contain the following information:

1. Site name or project number
2. Signature of collector
3. Date and time of collection
4. Sample identification number(s)
5. Number of containers in sample set
6. Description of sample and container(s)
7. Name and signature of persons, and the companies or agencies they represent, who are involved in the chain-of-custody
8. Inclusive dates and times of possession
9. Type of analysis requested

5.3 Delivery of Samples to Laboratory

Samples shall be delivered to the laboratory on a daily basis. Samples shall be maintained at approximately 4 degrees celsius for shipping. Shipping containers shall be sealed with security tape to assure sample integrity during shipping. Delivered samples shall be accompanied by a chain-of-custody record. The laboratory shall note on the chain-of-custody that samples were properly preserved and security tape was intact upon arrival.

6.0 SAMPLING AND DRILLING EQUIPMENT DECONTAMINATION

Prior to arriving at the sampling site, all sampling equipment shall be cleaned with laboratory grade detergent (Alconox or equivalent) and rinsed twice with tap water. This procedure shall also be carried out on-site before sampling of any additional monitoring wells.

All decontamination shall be conducted on an impermeable surface and all decontamination effluent shall be contained. All surfaces of the equipment shall be thoroughly decontaminated using a steam cleaner. The equipment shall be placed on a drying rack for air drying. The water used for decontamination shall be stored in containers certified for hazardous materials storage and disposed of in an approved manner.

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7.0 FIELD EQUIPMENT CALIBRATION AND MAINTENANCE

The following measuring equipment may be used during the Site Investigation and/or sample collection. Calibration procedures and frequency are listed for each piece.

Soil Borings and Well Dimensions - Steel and coated cloth tape. Calibration: none.

Water Level Measurements in Wells - Water Sensing tape. Calibration: Manufacturer supplied temperature correction shall be applied as applicable for field conditions. Electrical well sounders.

Total Organic Vapors - Foxboro OVA, flame ionization detector (FID). Calibration: Daily field calibration using manufacturer recommended procedures.

Organic Vapors - Photovac, photoionization detector (PID). Calibration: Daily field calibration using an isobutylene standard as per manufacturer instructions.

Groundwater pH Measurement - Digital pH meter. Calibration: Standard pH solutions of 4, 7, and 10 shall be utilized for daily field calibration according to manufacturer instructions.

Electrical Conductivity - Electrical conductivity meter. Calibration: Factory-calibrated annually and periodically calibrated against laboratory prepared standard calibration solution.

Water Temperature - Alcohol or digital thermometers. Calibration: Factory-calibrated once.

Combustible Gas/Oxygen - Gastech LEL, combustible gas/oxygen meter calibration: Factory calibrated, field calibrated monthly, zeroed daily according to manufacturer's instructions.

Miscellaneous Measuring Devices - Calibration procedures for any other measuring device used shall be documented at the request of the regulatory authority.

All equipment shall be checked before use and replaced as necessary. Instrument manuals and an instrument log book shall accompany equipment into the field. Any calibrations, repairs or related information shall be recorded in the log book.

8.0 GROUNDWATER MONITORING PROTOCOL

Monitoring of depth to water and free product thickness within wells at the site shall be conducted using an interface probe or conductivity meter. For consistency, all measurements shall be taken from

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the north side of the wellhead at the survey mark. To assess potential infiltration of fine-grained sediments, total well depth shall also be sounded.

Newly installed wells shall be allowed to stabilize for 24 hours after development prior to free product inspection. A clean bailer or sampler shall be used for visual inspection of the groundwater in order to note sheens (difficult to detect with the interface probe), odors, microbial action and sediments.

To reduce the potential for cross contamination between wells, the monitoring shall take place in order from the least to the most contaminated, if known. Wells containing free product shall be monitored last. Between each well monitoring, the equipment shall be decontaminated.

Water level data collected from the wells shall be used to develop a groundwater contour map for the project site. Groundwater flow shall be estimated to be perpendicular to equipotential lines drawn on the map.

9.0 WELL DEVELOPMENT PROTOCOL

Groundwater monitoring wells shall be surged and developed prior to setting the surface seal. Approximately 3 to 5 times the volume of water in the casing shall be withdrawn if possible. Casing volumes shall be calculated in the following manner:

Volume of Schedule 40 PVC Pipe

Diameter (inches)	I.D. (inches)	Volume (gal/linear ft.)
2	2.067	0.17
4	4.026	0.66

If the aquifer is slow to recharge, development shall continue until recharge is too slow to practically continue. The volume of water produced, versus time, shall be recorded.

All withdrawn groundwater shall be stored on-site in 55-gallon waste drums unless permission is granted by the appropriate regulatory agency to discharge the water to the ground surface or sanitary sewer. Drummed water shall be labeled with the source of the water to help ensure appropriate disposal based on contamination levels.

10.0 QUALITY CONTROL OF SOIL SAMPLES

10.1 Travel Blanks

Travel blanks shall not be used for soil sample transportation due to problems associated with obtaining a blank material.

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10.2 Duplicates

The effort to collect duplicate soil samples from a bore hole may be compromised by variations of soil texture. This shall be minimized by selecting a duplicate sample location as near as possible to the actual sample. In a split-spoon sampler the lowest tube shall be a duplicate when needed. The middle tube shall be the actual sample. All soil sample tubes shall be marked to show from which end the tube is to be sampled. The ends, where the two sample tubes joined shall be marked. The laboratory shall be instructed to sample the marked end. The upper tube shall be used for soil characterization.

The frequency with which soil duplicates are taken shall be at a minimum five (5) percent (1 in 20). In bore-holes the samples are best collected below the five foot depth in zones of either low or no transition.

When sampling soil piles or tank pits the top inch or two shall be removed before sampling. Efforts shall be made to avoid areas where soil texture changes. Fill the sample jar completely full avoiding any unnecessary head space in the sample jar.

Duplicate soil samples shall be labeled as duplicate without any other identification. A record of its actual sampling point shall be kept in the field log book.

10.3 Field Blanks

A soil field-blank from a bore hole would be best sampled from the top of the bore hole i.e. the first sample depth (not to be greater than five feet) and only if there is no indication of contaminants. The blank should be labeled as to the boring number, depth, and B for blank. For example, a blank obtained from soil boring number two (2), at a depth of five feet would be labeled as SB2-5B. The frequency of blanks may differ than that of duplicates, but when possible they shall be of the same frequency, five (5) percent (1 in 20).

A blank from a soil pile or tank pit shall be taken from the surface material only. It shall be taken in a zone where no contamination is indicated.

11.0 SOIL SAMPLING PROTOCOL

11.1 Sample Collection During Drilling Activities

A proposal shall be submitted to the lead Regulatory Authority with proposed boring/sampling locations. The exact location and number of borings at each site shall be determined in the field by the Project Geologist/Engineer.

Prior to arriving at the sample site, the drill rig/augers shall be steam cleaned and all sample equipment shall be cleaned. Cleaning between samples shall be conducted on-site on all sampling equipment.

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Soil samples shall be obtained using a California modified split-spoon sampler containing three, six inch long, two inch diameter brass tubes. The sampler shall be driven 18 inches ahead of the hollow stem auger by a 140-pound hammer with a 30-inch drop in accordance with American Society for Testing and Materials (ASTM Method D 1586-84) for split-barrel sampling of soil and (ASTM Method D 1587-83) for thin-walled tube sampling of soils. The blows required to drive the sampler each six-inch interval shall be recorded on the boring log. The sampler shall be removed from the boring and opened to reveal the brass tubes. The middle tube shall be covered with teflon and plastic end caps, taped, labeled, and placed into a cooler containing frozen chemical. A high level temperature recording thermometer shall accompany sample shipments to ensure proper temperature maintenance. The samples shall be delivered to a state certified laboratory, with a chain-of-custody, following all protocols, within 48 hours of sampling.

Soil in the uppermost brass tube shall be described according to ASTM standard practice for physical description and identification of soils (ASTM Method D 2488-84). Stratigraphic, genetic and other data/interpretations shall also be recorded on a log prepared for each boring/well. The second sample tube may be used with the lowermost tube for preparation of duplicates.

Soil samples shall be collected at five foot intervals, at significant changes in lithology and intervals of obvious contamination in order to develop a complete profile of soil contamination.

11.2 Sample Collection During Tank Removal

Soil samples shall be collected as soon as possible after removal of the tank. Where feasible, all preparations for soil sampling shall be made prior to tank removal. Soil samples collected from a backhoe bucket or directly from the excavation floor shall be collected in glass sampling jar with a Teflon lined screw cap. When sampling, the jar should be filled with soil as completely as possible.

11.3 Sampling from Soil Piles or Shallow Soil Pits

Soil samples shall be collected and transported from excavated material in the manner described in the previous section, however, a backhoe shall not be utilized. If composite samples are collected, four sample jars shall be collected for every 50 cubic yards of material to be sampled unless otherwise specified by the lead regulatory agency. The samples shall be composited by the state certified analytical laboratory personnel prior to testing.

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TABLE 1
Sample Containers, Holding Times and Preservation

Parameter	Matrix	Container	Holding Time	Preservation
Total Petroleum Hydrocarbons	Soil	3" stainless steel or brass cylinder	14 days ¹ 40 days ³	4°C
	Water	(2) 40ml glass vial teflon-faced silicon septum	7 days ¹ 14 days ²	4°C, HCl to pH 2
Benzene Toluene Xylene Ethylbenzene	Soil	3" stainless steel or brass cylinder	14 days ¹	4°C
	Water	(2) 40ml glass vial teflon-faced silicon septum	7 days ¹ 14 days ²	4°C, HCl to pH 2
Purgeable Hydrocarbon	Soil	3" stainless steel or brass cylinder	14 days ¹	4°C
	Water	(2) 40ml glass vial teflon-faced silicon septum	7 days ¹ 14 days ²	4°C, HCl to pH 2
Organiclead	Soil	3" stainless steel or brass cylinder	14 days ¹	4°C
	Water	(2) 40ml glass vial teflon-faced silicon septum	14 days ¹	4°C
Ethylene Dibromide	Soil	3" stainless steel or brass cylinder	14 days ³	4°C
	Water	(2) 40ml glass vial teflon-faced silicon septum	14 days ¹	4°C
Polynuclear Aromatic Hydrocarbons	Soil	8 oz. wide mouth glass with teflon seal	14 days ² 40 days ³	4°C
	Water	1000 ml amber glass with teflon seal	7 days ¹ 40 days ³	4°C

Notes:

- ¹ Maximum holding time for sample (sample must be extracted within this time or analyze if extraction is not required).
- ² Maximum holding time for sample if preserved with HCl,
Caution: HCl is a strong acid, avoid eye and skin contact
- ³ Maximum holding time for extract (sample must be analyzed within this time)

SAMPLING PROTOCOL-QUALITY ASSURANCE AND QUALITY CONTROL

TABLE 1
Sample Containers, Holding Times and Preservation

Parameter	Matrix	Container	Holding Time	Preservation
Poly-Chlorinated Biphenyls	Soil	8 oz. wide mouth glass with teflon seal	7 days ¹ 40 days ³	4°C
	Water	1000 ml amber glass with teflon seal	7 days ¹ 40 days ³	4°C
Total Metals	Soil	3" stainless steel or brass cylinder	6 months	
	Water	1000 ml plastic	6 months	pH < 2 HNO ₃
Dissolved Metals	Water	1000 ml plastic .45 Micron Filtration	6 months	pH < 2 HNO ₃
Pesticides	Soil	3" stainless steel or brass cylinder	14 days ³	4°C
	Water	1000 ml amber glass	7 days ¹ 40 days ³	4°C

Notes:

- 1 Maximum holding time for sample (sample must be extracted within this time or analyze if extraction is not required).
- 2 Maximum holding time for sample if preserved with HCl,
Caution: HCl is a strong acid, avoid eye and skin contact
- 3 Maximum holding time for extract (sample must be analyzed within this time)

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TABLE 2

Laboratory Test Methodology Underground Tank Sites

Type Hydrocarbon	Soil Analysis		Water Analysis	
Unknown Fuel	TPH-G	GCFID(5030)	TPH-G	GCFID(5030)
	TPH-D	GCFID(3550)	TPH-D	GCFID(3510)
	BTX&E	8020 or 8240	BTX&E	602 or 624
Leaded Gas	TPH-G	GCFID(5030)	TPH-G	GCFID(5030)
	BTX&E	8020 or 8240	BTX&E	602 or 624
	-----Optional-----			
	TEL	DHS-LUFT	TEL	DHS-LUFT
	EDB	DHS-AB1803	EDB	DHS-AB1803
Unleaded Gas	TPH-G	GCFID(5030)	TPH-G	GCFID(5030)
	BTX&E	8020 or 8240	BTX&E	602 or 624
Diesel	TPH-D	GCFID(3550)	TPH-D	GCFID(3510)
	BTX&E	8020 or 8240	BTX&E	602 or 624
Jet Fuel	TPH-D	GCFID(3550)	TPH-D	GCFID(3510)
	BTX&E	8020 or 8240	BTX&E	602 or 624
Kerosene	TPH-D	GCFID(3550)	TPH-D	GCFID(3510)
	BTX&E	8020 or 8240	BTX&E	602 or 624
Fuel Oil	TPH-D	GCFID(3550)	TPH-D	GCFID(3510)
	BTX&E	8020 or 8240	BTX&E	602 or 624
Chlorinated Solvents	Cl HC	8010 or 8240	Cl HC	601 or 624
	BTX&E	8020 or 8240	BTX&E	602 or 624
Non Chlorinated Solvents	TPH-D	GCFID(3550)	TPH-D	GCFID(3510)
	BTX&E	8020 or 8240	TX&E	602 or 624
Waste Oil or Unknown	TPH-G	GCFID(5030)	TPH-G	GCFID(5030)
	TPH-D	GCFID(3550)	TPH-D	GCFID(3510)
	BTX&E	8020 or 8240	BTX&E	602 or 624
	O & G	418.1	O & G	418.1
	Cl HC	8010 or 8240	Cl HC	601 or 624
Metals:	Cadmium (Cd) Cromimum (Cr) Lead (Pb) Zinc (Zn)		ICAP or AA	
Polychlorinated Biphenyls (PCB)	8270		8270	
Poly Nuclear Aromatic (PNA) (PCP)				

SAMPLING PROTOCOL-QUALITY ASSURANCE AND QUALITY CONTROL

TABLE 3
ABBREVIATIONS

TPH-G	=	Total Petroleum Hydrocarbon as Gasoline
TPH-D	=	Total Petroleum Hydrocarbon as Diesel
BTX&E	=	Benzene, Toluene, Xylenes, & Ethylbenzene
GCFID	=	Gas Chromatograph with a Flame Ionization Detector
Cl HC	=	Chlorinated Hydrocarbons
ICAP	=	Inductively Coupled Argon Plasma
AA	=	Atomic Absorption
O&G	=	Oil & Grease
DHS	=	Department of Health Services
AB1803	=	Assembly Bill 1803
418.1	=	EPA Method for Total Recoverable Petroleum Hydrocarbons
601	=	EPA Method for Volatile Halogenated Organics
602	=	EPA Method for Volatile Aromatics
624	=	EPA Method for Purgeables Halogenated & Aromatics
3510	=	EPA Method Extraction by Liquid-Liquid Separatory Funnel
3550	=	EPA Method Extraction by Sonication
5030	=	EPA Method Extraction by Purge and Trap
8010	=	EPA Method for Halogenated Volatile Organics
8015	=	EPA Method for Nonhalogenated Volatile Organics
8020	=	EPA Method for Aromatic Volatile Organics
8240	=	EPA Method for Volatile Organics/Mass Spectrometry
8270	=	EPA Method for Semivolatile Organic/Capillary Column