



**RESNA/GROUNDWATER  
RESOURCES, INC.**  
*Working to Restore Nature*

1500 SO. UNION AVE.  
BAKERSFIELD, CALIFORNIA 93307

General Engineering Contractor  
Class A/Haz License No. 520768

**MALIBU GRAND PRIX  
8000 South Coliseum Way  
Oakland, California**

**SITE ASSESSMENT AND  
REMEDATION PLAN  
January 31, 1991**

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**1.0 INTRODUCTION**

Groundwater Resources Inc (GRI), a RESNA company, is conducting an assessment of soil and groundwater contamination at the Malibu Grand Prix property at 8000 South Coliseum Way, Oakland, California (Plate 1). Two distinct sites, each associated with a leaking underground gasoline fuel tank system, have been identified: one at the Malibu Grand Prix Castle, the other at the Racetrack. Shallow groundwater and soils are affected at each location. GRI has completed a number of soil borings and monitoring wells at each location to delineate the extent of the contamination. In this report the past history of the sites will be reviewed, recommendations for further assessment will be made and a concept for remediation will be presented.

**2.0 BACKGROUND**

**2.1 Castle**

**Assessment Activities**

One 6000 gallon underground tank which had been used to store a gasoline and oil fuel mixture was removed from the parking lot south of the Malibu Castle on March 29, 1989. Floating product was observed on the surface of the shallow groundwater encountered within the tank excavation. Chemical analyses of soil and water samples obtained from the pit confirmed the presence of gasoline constituents as follows:

**Preliminary Assessment Sampling - Malibu Grand Prix Castle**

	<u>Benzene</u>	<u>TPH (gasoline)</u>
Soil -north end of tank	7.3 ppm	50 ppm
Soil -south end of tank	33.0 ppm	150 ppm
Water from excavation	920.0 ppb	15000 ppb

A site assessment was required by the Alameda County Department of Environmental Health (letter dated June 29, 1989).

During September 21-22, 1989 four monitoring wells were constructed on the property (Plate 2). MW-1 was installed near the tank location and MW-2 and MW-3 were placed 161 feet south and 210 feet northwest of MW-1, respectively. The wells were used to calculate a local groundwater flow direction of 72 degrees west of south with a gradient of 2.88 feet per 100 feet. MW-4 was located 15 feet west and downgradient from the former tank. Significant concentrations of gasoline hydrocarbons were detected in samples from MW-1 and MW-4. No hydrocarbons

were reported from MW-2 while only benzene at a concentration of 1.2 ppb was detected in water from MW-3.

Five borings (B-1 through B-5) were drilled adjacent to the former tank location in an effort to define the extent of contamination in the soil (Plate 3). The holes were advanced to a depth of five feet, less than one foot above the water table. Soil contamination was indicated in B-4, B-5, MW-1 and MW-4.

Characterization of the site was continued during the period of June 12-14, 1990. MW-5, 6 and 7 were constructed and borings B-6 through B-9 were drilled south and west of the former tank in an effort to define the lateral edges and down gradient terminus of the groundwater plume. The borings were drilled to 10 feet. Groundwater was allowed to enter the borehole and after a sample was collected with a bailer, the holes were abandoned.

#### Site Assessment Results - Groundwater

Laboratory results for all water samples collected at the Malibu Castle site are presented in Table 1.

**TABLE 1**  
**GROUNDWATER SAMPLES (ppb)**

<u>Well</u>	<u>Sampling Date</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Ethyl-Benzene</u>	<u>Total Xylenes</u>	<u>TPH Gasoline</u>
MW-1	9-22-89	410	1800	1100	7100	35000
	6-14-90	0.66	ND	1.3	8.6	210
MW-2	9-22-89	ND	ND	ND	ND	ND
	6-14-90	ND	ND	ND	ND	ND
MW-3	9-22-89	1.2	ND	ND	ND	ND
	6-14-90	0.90	4	ND	ND	ND
MW-4	9-22-89	410	430	78	324	4000
	6-14-90	200	3.7	1.2	9.5	660
MW-5	6-14-90	ND	ND	ND	ND	ND
MW-6	6-14-90	73	ND	17	29.7	1800
MW-7	6-14-90	0.84	ND	1.2	1.8	58

**TABLE 1 (continued)**  
**GROUNDWATER SAMPLES (ppb)**

<u>Well</u>	<u>Sampling Date</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Ethyl-Benzene</u>	<u>Total Xylenes</u>	<u>TPH Gasoline</u>
B-6	6-12-90 *	15	0.55	3	5.24	160
B-7	6-12-90 *	0.76	ND	2.5	3.3	380
B-8	6-12-90 *	43	ND	130	48.6	7900
B-9	6-12-90 *	ND	ND	ND	ND	ND

\* Grab sample

The groundwater plume at the Malibu Castle remains partially defined. Concentrations of TPH (gasoline) found in water samples obtained from the wells during the latest sampling episode in June 1990 are contoured on the Plot Plan, Plate 2. They show the outline of the plume as it is now defined. Its axis trends southwestward. MW-5 was found to be "clean" and establishes the northwestern margin of the plume. A water sample from Boring B-9 was also found to be uncontaminated and it defines the southeastern edge of the plume. The down gradient extent remains to be determined. Significant hydrocarbon levels were present in the most down gradient well MW-6 and in Boring B-8. The plume likely extends off the property under South Coliseum Way and possibly beyond. The presence of the miniature golf and batting cage facilities precluded the placing of monitoring wells in the eastern upgradient direction.

Initially very high levels of gasoline contamination (410 ppb benzene and 4000-35000 ppb TPH) were reported from MW-1 and MW-4, the wells located closest to the former tank, however; the results of the June 14 sampling effort indicate that a marked decrease in levels have occurred in a nine month period (< 1-200 ppb benzene and 210-660) ppb TPH). This may reflect movement of the most highly affected water away from the site and replacement with untainted water from up gradient. Additional periodic sampling will be necessary to establish positive trends.

#### **Site Assessment Results - Soil**

Levels of gasoline constituents found in the soil by the borings are presented in Table 2.

**TABLE 2**  
**SOIL SAMPLES -(ppm)**

<u>Well</u>	<u>Sampling Depth (ft)</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Ethyl- Benzene</u>	<u>Total Xylenes</u>	<u>TPH Gasoline</u>
MW-1	5	0.10	ND	ND	ND	2.7
	7	1.8	ND	ND	ND	16
MW-2	5	ND	ND	ND	ND	ND
	7	ND	ND	ND	ND	ND
MW-3	5	0.18	ND	ND	ND	ND
MW-4	5	47	5.5	2.9	100	1200
B-1	5	ND	ND	ND	ND	ND
B-2	5	ND	ND	ND	ND	ND
B-3	5	ND	ND	ND	ND	ND
B-4	5	660	31	260	45	3200
B-5	5	0.24	ND	ND	ND	2.2

TPH (gasoline) concentrations found in the borings at the tank site at the five foot horizon are contoured on Plate 3. Levels above 1000 ppm were reported from MW-4 located 15 feet northwest of the former tank and from B-4 which was situated adjacent to the tank at its east side. No hydrocarbons were detected in samples from B-1, B-2 and B-3 located at the south and west sides of the former tank, but petroleum odors in the soil were reported from most of the other downgradient borings at the site. The data are inconsistent. Diffuse soil contamination is believed to be present throughout the area overlying the groundwater plume due to the action of seasonal water table fluctuations, tidal effects and presence of a thick capillary fringe in the clayey substratum.

## 2.2 Racetrack Assessment Activities

On February 1, 1990 another 6000 gallon underground tank was removed from the Malibu Grand Prix facility. This unit was located in a parking area north of the

Castle adjacent to the miniature car racetrack. The tank had also been used to store a gasoline-oil mixture. Once again, floating product, primarily motor oil, was observed. Soil and water samples from the excavation were found to contain gasoline hydrocarbons, as follows:

**Preliminary Assessment Sampling - Malibu Grand Prix Racetrack**

	<u>Benzene</u>	<u>TPH (gasoline)</u>
Soil -north of tank	0.31 ppm	79 ppm
Soil -south of tank	0.07 ppm	26 ppm
Water from excavation	50.00 ppb	2100 ppb

A verbal request for further site assessment was made by the Alameda County health official on site.

During June 12-14, 1990, in conjunction with the ongoing characterization efforts at the Castle, a number of monitoring wells and borings were also completed at the Racetrack (Plate 4) for the purposes of delineating soil and groundwater contamination in this area.

MW-8 was installed at the north end of the former tank and MW-9 and MW-10 were constructed downgradient to the west. Subsequent chemical analysis proved the presence of gasoline in all three wells. In addition eight soil borings (B-10 through B-17) were located around the perimeter of the former tank, along the product line, under the dispenser and at downgradient points. Soil and water grab samples were collected before abandonment of these borings.

**Site Assessment Results - Groundwater**

Laboratory results for the groundwater samples from the Racetrack wells are listed in Table 3.

**TABLE 3  
GROUNDWATER SAMPLES (ppb)**

<u>Well</u>	<u>Sampling Date</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Ethyl-Benzene</u>	<u>Total Xylenes</u>	<u>TPH Gasoline</u>
MW-8	6-14-90	680	36	150	1060	13000
MW-9	6-14-90	12	0.78	4.5	2.54	320

**TABLE 3 (continued)**  
**GROUNDWATER SAMPLES (ppb)**

<u>Well</u>	<u>Sampling Date</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Ethyl-Benzene</u>	<u>Total Xylenes</u>	<u>TPH Gasoline</u>
MW-10	6-14-90	20	0.69	4.3	7.7	400
B-11	6-13-90 *	6100	6500	4900	14200	120000
B-12	6-13-90 *	2100	140	180	2830	19000
B-13	6-13-90 *	23000	24000	6800	40700	290000
B-14	6-13-90 *	12000	8400	7600	33500	230000
B-15	6-13-90 *	120	3.1	3.9	7.2	1300
B-16	6-13-90 *	240	28	180	259	4400
B-17	6-13-90 *	ND	ND	ND	ND	ND

\* Grab samples

The plume as it can now be defined is depicted on Plate 4. Gasoline constituents were detected in samples from all of the wells and borings with the exception of B-17 which provides a point of control in establishing the northwestern margin of the plume. The southeastern and down gradient extent of the plume remains undefined. This plume may also extend off the property under South Coliseum Way. Presumably contamination does not extend far to the north and east, the up gradient direction. No wells were constructed in this area due to the racetrack facilities.

Concentrations of the BTXE components and TPH detected in the grab samples taken from the borings near the former tank are very elevated. The results reported for MW-8 which was properly developed prior to sampling may more accurately reflect aquifer conditions near the source of the leak.

#### Site Assessment Results- Soil

Data from the Racetrack soil borings is listed in Table 4.



**TABLE 4**  
**SOIL SAMPLES -(ppm)**

<u>Well</u>	<u>Sampling Depth (ft)</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Ethyl- Benzene</u>	<u>Total Xylenes</u>	<u>TPH Gasoline</u>
MW-8	5	0.55	.15	.52	1.83	16
MW-10	5	ND	ND	ND	ND	ND
MW-3	5	0.18	ND	ND	ND	ND
B-10	3	20	10	6.4	8.7	550
B-11	3	85	26	61	202	2400
B-12	3	1.7	0.12	0.14	3.7	29
B-13	3	51	44	9.9	38.4	720
B-14	3	0.35	0.10	0.29	ND	5.3
B-15	3	0.41	ND	ND	0.12	9.4

TPH values for the soil samples are contoured on Plate 5. The reported concentrations range widely between borings and probably reflect a smearing of the contamination through the soil column due to fluctuations in the very shallow water table (< 5 feet) and capillary effects.

### 3.0 RECOMMENDATIONS

#### 3.1 Groundwater Recovery System

In its July 16, 1990 Site Assessment Report GRI recommended the immediate start of remedial action at the Malibu sites. The proposal focused on the removal of free product and reduction of dissolved gasoline constituents in the groundwater. Due to the brackish character of the water, cleanup to drinking water standards was not considered necessary. The use of existing wells in a pump and treat system was envisioned. The Alameda County Department of Health Care Services by letter dated September 27, 1990 concurred with the need for initiation of remediation.

The circumstances at the Malibu Grand Prix sites present problems which will make mitigation more difficult to achieve. Chief among these is the impermeable clayey nature of the affected sediments. Contaminants will be more readily adsorbed and hydraulic conductivities will be low with consequent reduced well yields and lengthened cleanup time.

The close proximity of the water table to the ground surface has also resulted in widespread and diffuse distribution of the contaminants throughout the soil column as was discussed previously. Some indications of hydrocarbons were reported in most of the borings. There is no clear evidence of "hot spots" in the soil acting as a continuing source of contamination.

A third complicating factor is the nature of the contamination itself. Floating product, reportedly primarily the oily component of the fuel, is widely distributed. It was present in both tank excavations and was bailed from boring B-7 and B-8 at the Castle as well as borings B-11,12,13 and 14 at the Racetrack. These heavy insoluble hydrocarbons will be difficult to remove effectively.

A variation on the conventional pump and treat approach to groundwater treatment, the use of subsurface interceptor drains may offer a more cost effective and efficient remediation alternative in this instance. A buried, horizontal conduit encased in a filter pack of sand is placed down gradient and perpendicular to the groundwater flow direction. The drain functions as an infinite line of extraction wells which intercepts the contaminated flow. Contaminated water and free product are collected by gravity flow to a drainage sump from which they are pumped to separation and treatment facilities.

This approach is particularly suitable where contamination is shallow and unconsolidated sediments allow the use of conventional trenching machines or backhoes. At the Malibu sites the maximum trenching depth is expected to be 15 feet. Shoring will probably not be required considerably reducing construction costs.

The method also has advantages as compared to pumping systems where sediments are impermeable as is the case here. With lower hydraulic conductivity a larger number of wells are required to effectively drain the aquifer. In such situations the costs of well construction, equipment, operations and maintenance may be considerably more than costs to construct and operate a simple horizontal drain which collects water by gravity flow.

Use of subsurface interceptor drains to collect the free product and contaminated groundwater is recommended for the Oakland Malibu Grand Prix sites. Because of the clayey soils and oily nature of the free product, the system will operate more effectively if two drains are constructed at each site. One will be placed directly

down gradient from each of the former tanks to collect the most highly affected water and free product. The depression of the water table towards the drain as water is pumped from the system should allow the floating hydrocarbons concentrated in this area to flow into the drain. The other drains will be constructed adjacent to South Coliseum Way in order to intercept the plumes as they exit the property (See Plate 6 and 7 for a schematic representation of the system). Additional site assessment will be necessary to insure proper placement of the drains.

### **3.2 Remediation Systems**

The extracted water will be treated preferably through carbon filters or in an air stripper system followed by a combustion process to destroy the liberated hydrocarbon vapors. Another alternative which may be applicable given the shallow situation is the use of an in-situ bioremediation process to eliminate the hydrocarbons. In this approach, oxygen in the form of hydrogen peroxide and inorganic nutrients are dissolved in water. They are introduced into the soil up-gradient to the contaminated area to provide these essential elements for bacteria which degrade the hydrocarbons in place. Specially cultured hydrocarbon utilizing bacteria are commercially available which can also be introduced into the system enhancing the probability of success. The water is extracted in the down gradient drains, additional nutrients and oxygen are added as needed, and the water is continuously recycled through the system until sampling verifies reduction of the contaminants to below action levels.

Selection of a specific remediation system is premature at this stage of the project.

### **3.3 Further Site Assessment**

Additional monitoring wells will be required at both sites to completely define the margins of the plume on the property and permit placement of the drains so the entire plume is intercepted for treatment.

Four wells are proposed at the Castle site (Plate 6); one at mid-plume along its projected southern margin, one each at the north and south end of the proposed drain on South Coliseum Way and one down gradient to the southwest. The latter well will necessarily be off the Malibu property. The presence of the street, a water filled channel draining to San Francisco Bay and a major freeway may prevent any drilling offsite. If a location can be found, permission to drill will be obtained prior to entry.

Four wells to be placed at similar locations are also recommended at the Racetrack site (see Plate 7).

In addition to the monitoring wells one boring should be drilled at the center of each plume at the approximate location of the drains. The holes should be continuously

cored to obtain complete information on the stratigraphic section and a Hydropunch tool should be used to obtain water samples at various depths below the water table to define the plume's vertical dimension. This information will be required to properly design and install the drain and its filter pack envelope.

Following completion of the site assessment phase, slug tests and pump tests will be conducted on the existing wells to develop quantitative information on the aquifer's hydraulic characteristics.

#### 4.0 LIMITATIONS

This report was prepared for the exclusive use of Malibu Grand Prix as it relates to the property described. The discussion and conclusions presented in this report are based on:

- The test borings performed at this site.
- The observations of field personnel.
- The results of laboratory tests performed by SMC Laboratory, Bakersfield, California.
- Our understanding of the regulations of Alameda and the California Regional Water Quality Control Board.

Possible variations in the soil or groundwater conditions which may exist beyond the points explored in this investigation might effect the validity of this report unless those variations or conditions come to our attention and are reviewed and assimilated into the conclusions and recommendations of this report. Also, changes in the hydrologic conditions found could occur with time due to variations in rainfall, temperature, regional water usage, or other factors, any of which could effect this report.

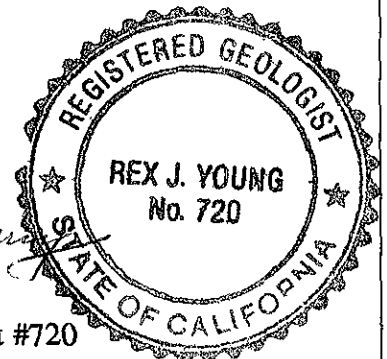
The services performed by GRI have been conducted in a manner consistent with the levels of care and skill ordinarily exercised by professionals currently practicing under similar conditions in California. The absence of contamination on or beneath the property cannot be guaranteed by this report. GRI is not responsible for any contamination or hazardous material found on the property. No other warranty expressed or implied, is made.

Respectfully submitted,

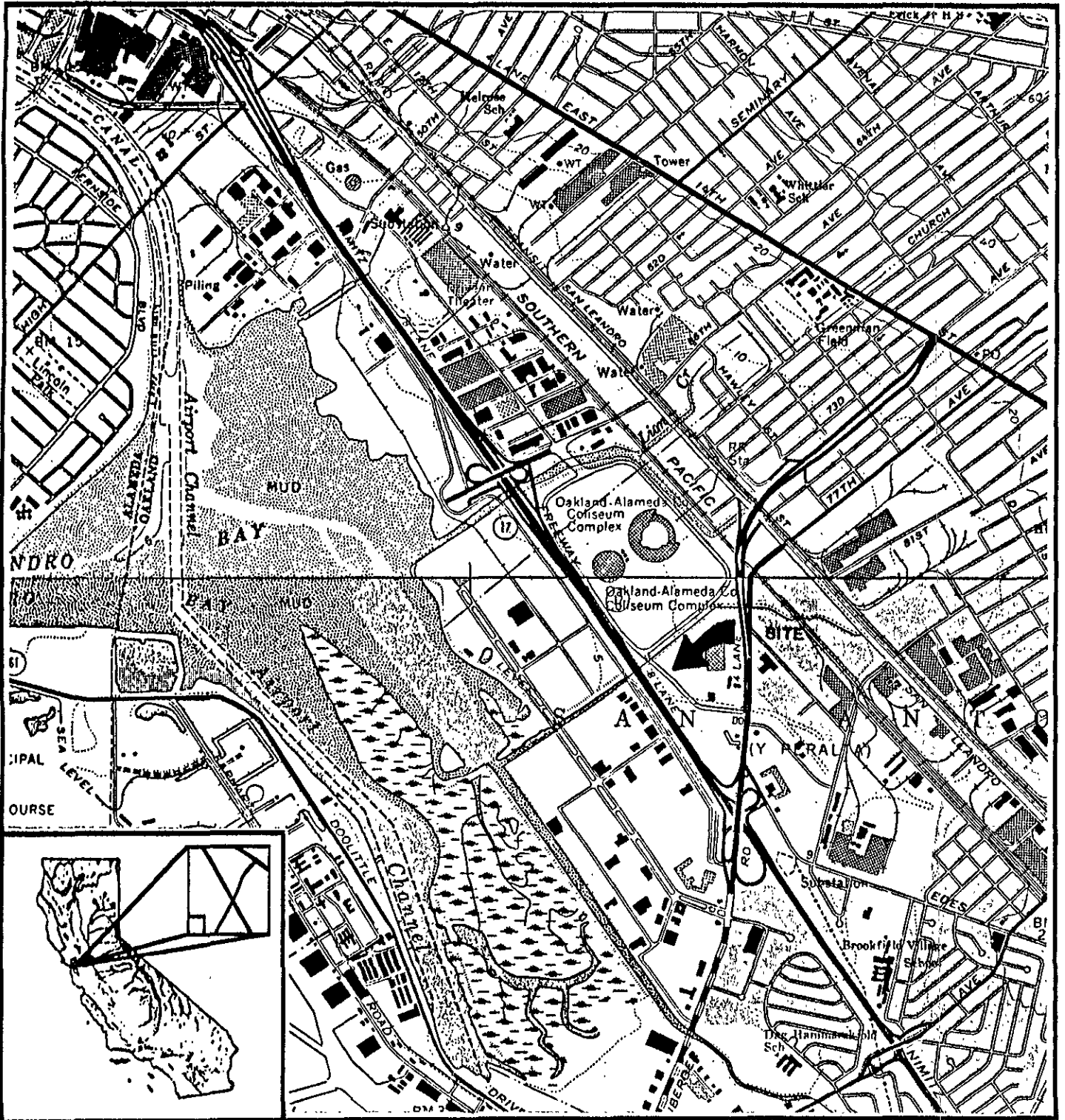
GROUNDWATER RESOURCES INC.


*Claus L. Engelhardt*  
Claus L. Engelhardt  
Project Geologist

*Rex J. Young*  
Rex J. Young  
Registered Geologist #720



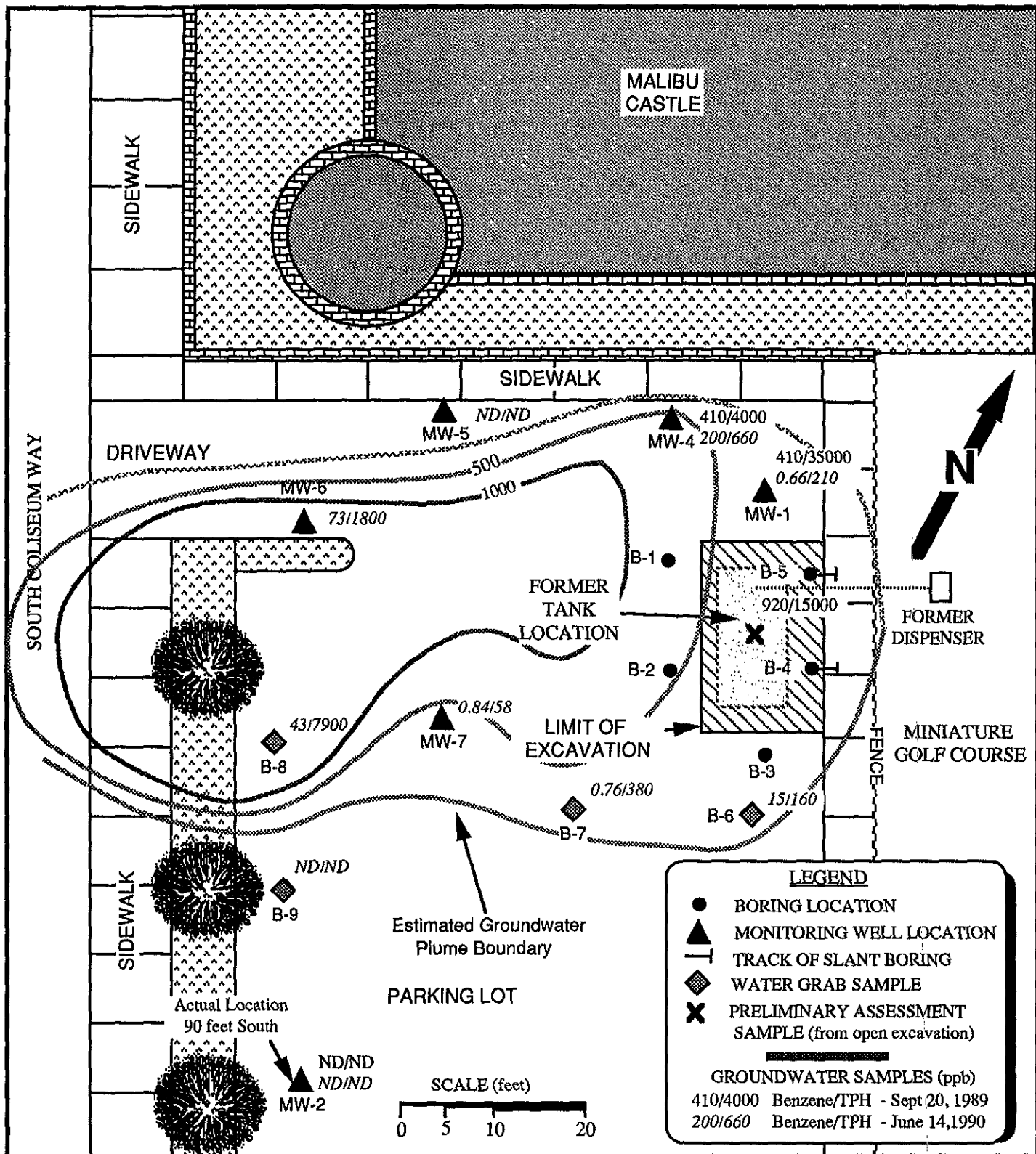
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**MALIBU GRAND PRIX**  
**8000 SOUTH COLISEUM WAY**  
OAKLAND, CALIFORNIA  
**LOCATION MAP**

PLATE  
**1**

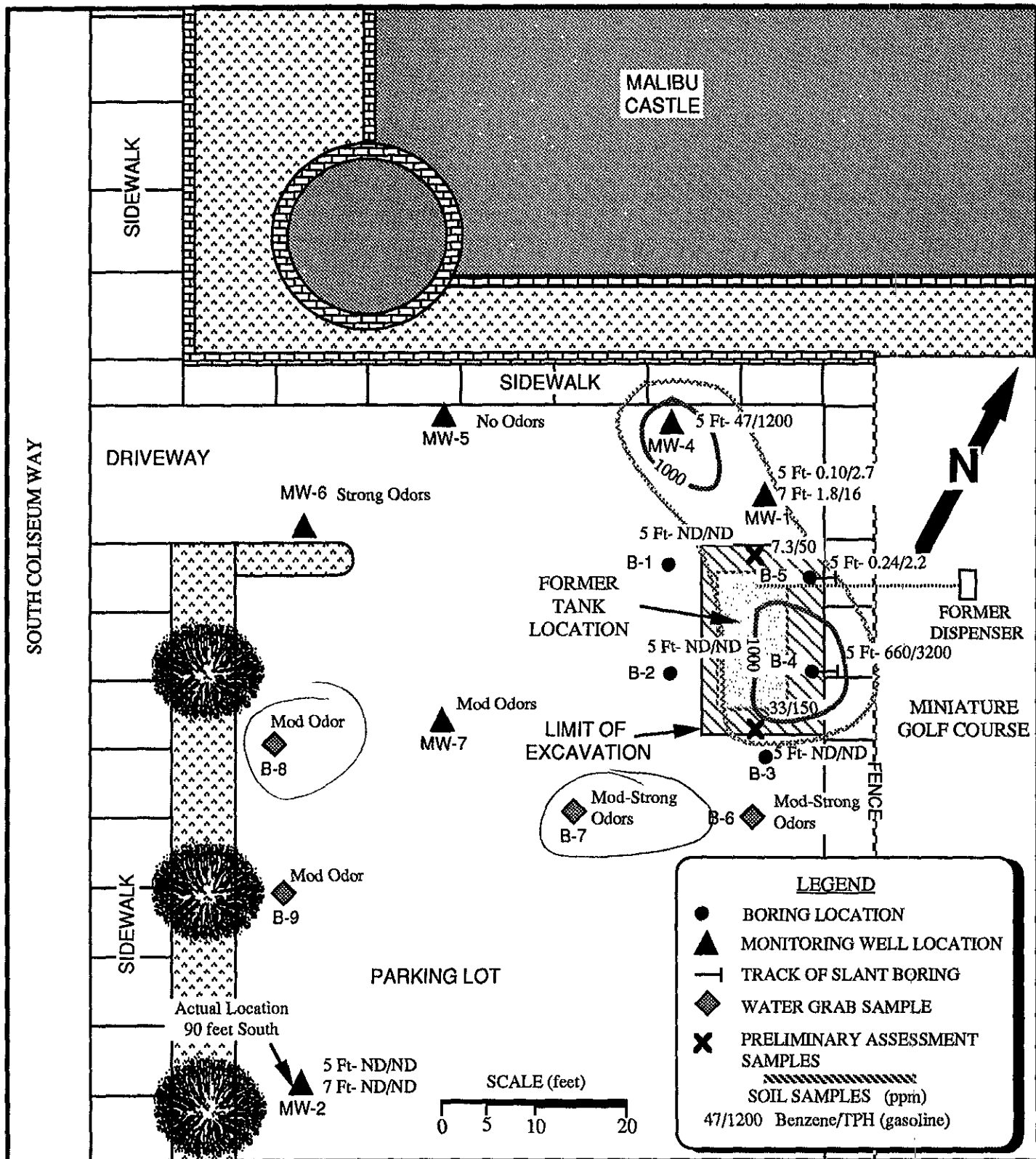



  
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**MALIBU GRAND PRIX**  
**8000 SOUTH COLISEUM WAY**  
**OAKLAND, CALIFORNIA**

**CASTLE PLOT PLAN**  
 WITH  
 CONTOURS OF EQUAL TPH CONCENTRATIONS  
 IN GROUNDWATER as of JUNE 14, 1990

**PLATE**  
**2**

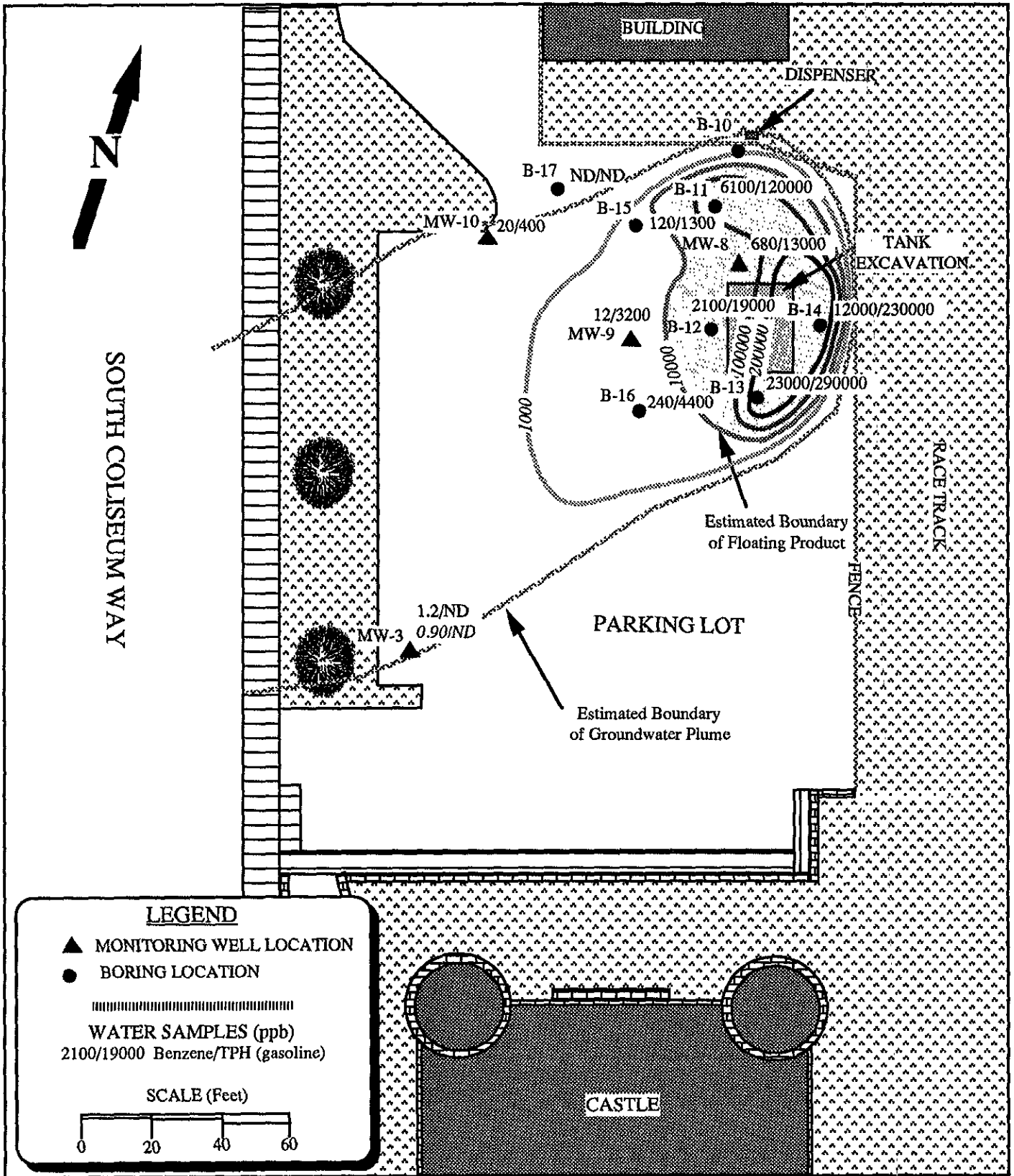


  
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**MALIBU GRAND PRIX**  
**8000 SOUTH COLISEUM WAY**  
**OAKLAND, CALIFORNIA**

**CASTLE PLOT PLAN**  
 WITH CONTOURS OF EQUAL TPH  
 CONCENTRATIONS IN SOIL

**PLATE**  
**3**



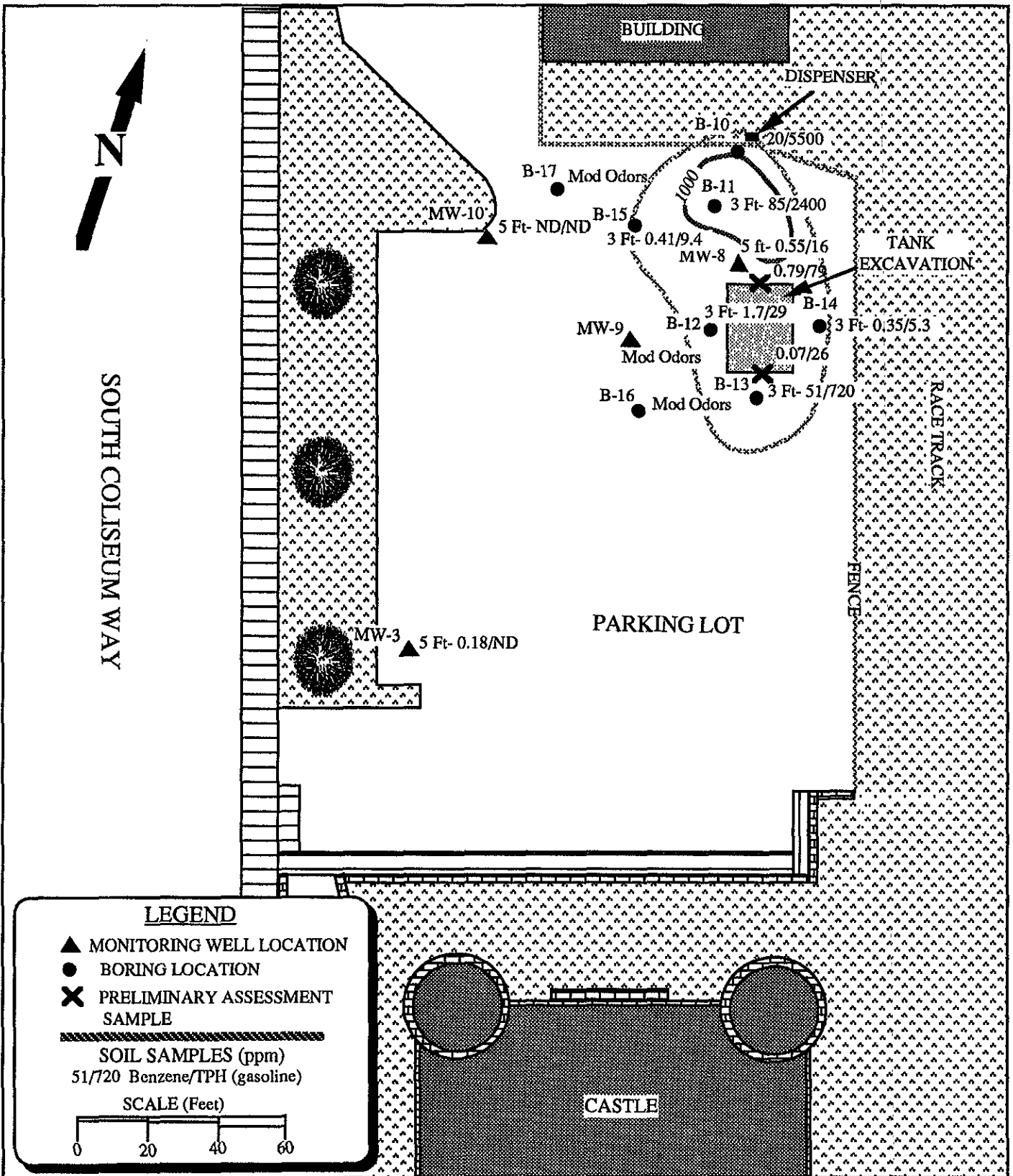
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**RACETRACK PLOT PLAN**  
WITH CONTOURS OF EQUAL TPH  
CONCENTRATIONS IN GROUNDWATER

PLATE  
**4**



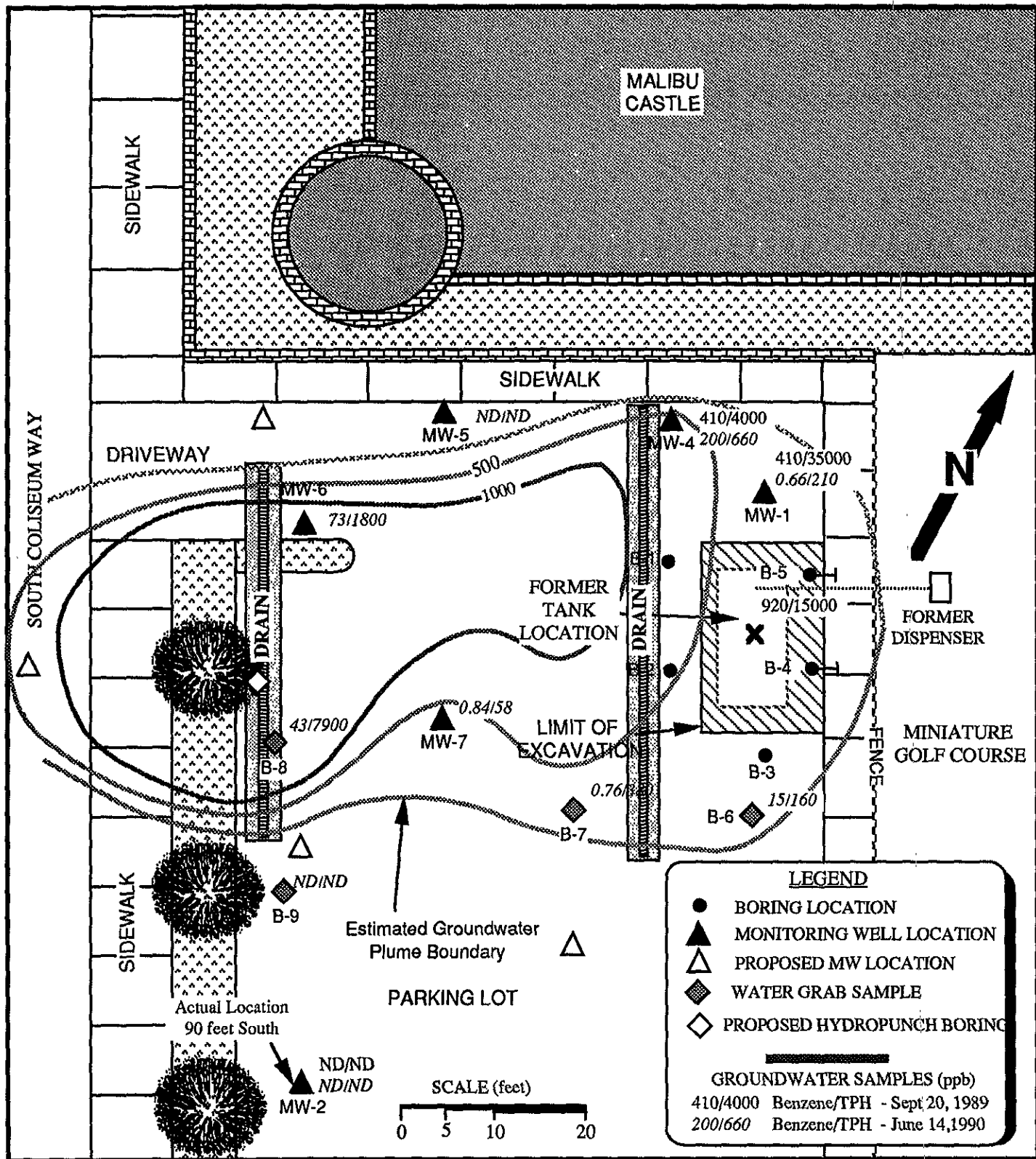



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**MALIBU GRAND PRIX**  
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**RACE TRACK PLOT PLAN**  
WITH CONTOURS OF EQUAL TPH  
CONCENTRATIONS IN SOIL

PLATE  
**5**



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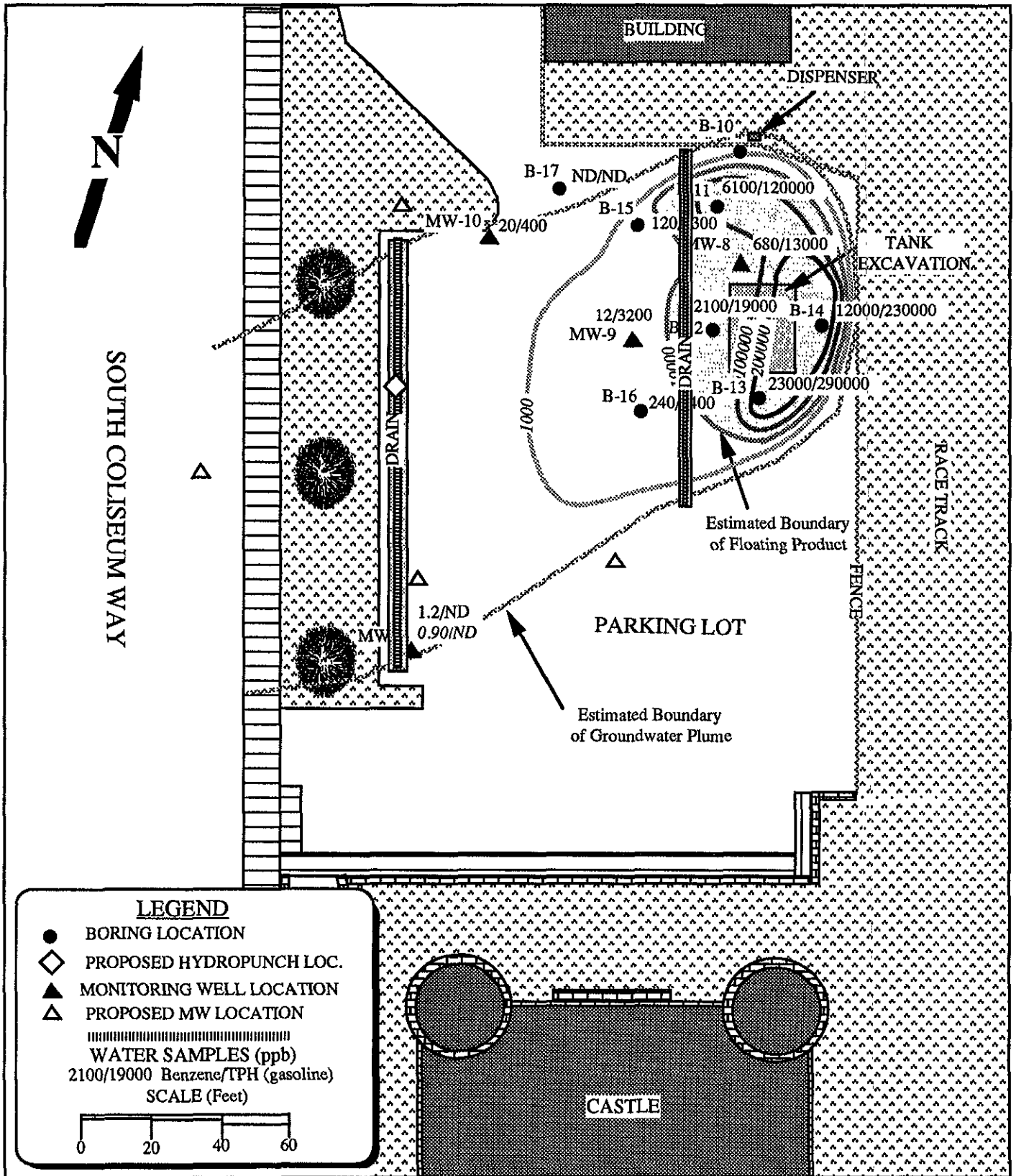
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**MALIBU GRAND PRIX**  
**8000 SOUTH COLISEUM WAY**  
**OAKLAND, CALIFORNIA**

**CASTLE PLOT PLAN**  
 WITH  
 CONTOURS OF EQUAL TPH CONCENTRATIONS  
 IN GROUNDWATER as of JUNE 14, 1990

**PLATE**

**6**



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**MALIBU GRAND PRIX**  
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**RACETRACK PLOT PLAN**  
 WITH CONTOURS OF EQUAL TPH  
 CONCENTRATIONS IN GROUNDWATER

**PLATE**  
 7