

1500 So Union Avenue  
Bakersfield, California 93307  
Phone: (805) 835-7700  
FAX: (805) 835-7717

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


**WORKPLAN FOR SITE ASSESSMENT**  
July 15, 1992

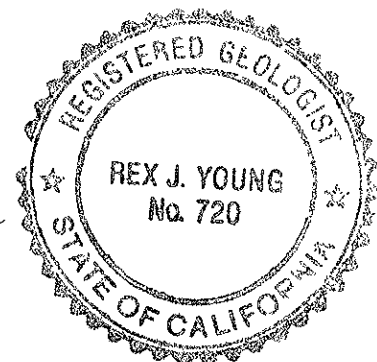
Report Prepared for

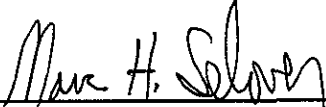
**MALIBU GRAND PRIX**  
7301 Topanga Canyon Boulevard  
Canoga Park, California 91303

Prepared by

**RESNA INDUSTRIES INC.**

  
Rex J. Young, R.G. #720  
Project Manager



  
Marc H. Selover  
Manager of Professional Services

**TABLE OF CONTENTS**

SECTION	DESCRIPTION	PAGE
1.0	INTRODUCTION .....	1
2.0	BACKGROUND .....	1
3.0	OBJECTIVES OF PROPOSED WORK .....	1
4.0	SCOPE OF WORK.....	2
5.0	PLANS AND RATIONALE .....	2
	5.1 Reduction of Ground Water Recharge .....	2
	5.2 Assessment of Soil Plumes at Former Tank Locations .....	3
	5.3 Remediation of the Soil Plumes.....	3
	5.4 Monitoring the Tidal Ditches .....	3
	5.5 Remediation of the Ground Water Plumes .....	3
6.0	HYDROGEOLOGIC SETTING .....	4
7.0	PROCEDURES .....	4
	7.1 Soil Borings and Soil Sampling .....	4
	7.2 Laboratory Analyses .....	5
	7.3 Boring Locations .....	5
	7.4 Backfilling of Boreholes .....	5
	7.5 Report of Soil Assessment.....	5
8.0	HEALTH AND SAFETY .....	5
9.0	PROPOSED WORK SCHEDULE .....	6

**ILLUSTRATIONS**

Plate 1	Location Map
Plate 2	Plot Plan
Plate 3	Plot Plan
Plate 4	Schedule Chart

**APPENDICES**

Appendix A	RESNA Site Specific Health and Safety Plan
Appendix B	RESNA Sampling Protocol - Quality Assurance and Quality Control Program

## **1.0 INTRODUCTION**

This Work Plan is submitted by RESNA Industries Inc. (RESNA) in response to your letter to Bill Patterson, Malibu Grand, Prix dated June 1, 1992. Objectives and tasks described herein will carry the project through remediation but, in fact, remediation is dependent on information which will be acquired from proposed assessment. Approval from the Alameda County Department of Environmental Health (ACDEH) is sought for the proposed assessment work and plans for subsequent work will follow. To this end, all that can be done now on site without ACDEH approval, or permits from other agencies, is being done.

The Malibu Grand Prix site is located at 8000 South Coliseum Way adjacent to the Nimitz Freeway (I-880) near the Hegenberger Road exit. The property is rectangular in shape and is occupied by paved parking lots, outdoor recreation facilities, and structures housing electronic-game rooms, food counters, rest rooms and offices. The business uses one above-ground fuel tank located at the race track facility. Malibu Grand Prix will continue to operate during the proposed work which should result in minimal interference with business.

## **2.0 BACKGROUND**

Malibu Grand Prix (MGP) maintained two 6000 gallon USTs containing marine mix gasoline. The tanks, located at the Castle and Race Track areas, were removed on March 29, 1989 and February 1, 1990, respectively. A verbal request for assessment at the Race Track was made at the time of the tank removal. On June 29, 1989 a letter from Alameda County was sent to MGP requiring an initial site investigation to determine the extent of soil and groundwater contamination present at the Castle area. 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 MW-1 through -10 were sampled July 17, 1991. Four additional monitoring wells at the Castle and four additional monitoring wells 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. Pump tests and slug tests were performed on selected wells October 8, 9, and 10, 1991. The Site Assessment Report dated January 13, 1992 describes well construction and monitoring in August, 1991 in addition to the October, 1991 monitoring and well tests.

## **3.0 OBJECTIVES OF PROPOSED WORK**

The objectives of the proposed work are as follows:

- Reduction of ground water recharge and lowering of the elevation of the water table in the areas of the former tank locations.
- Assessment of the extent of the gasoline impacted soil in the areas of the former tank locations in order to facilitate remediation.
- Remediation of the soil in the areas of the former tank locations.

- Assessment by laboratory analysis of the water quality in the adjacent tidal ditches and the quality of the mud and sludge on the ditch bottoms, analysis of the flow and tidal movement of water in the ditches, and evaluation of the impact of the ditch water and the tidal movement on the ground water at the site.
- Characterization of the ground water table and ground water plumes to facilitate the design of a plan for a remediation system and making application for a permit from the Water Quality Control Board or the East Bay Municipal Utility District for remediation of the ground water plumes at the two former tank locations and disposal of the treated effluent from the system.
- Remediation and disposal of the effluent from the two ground water plumes.

Some phases of work, both assessment and remediation, are dependent upon the completion of other phases of work, as is indicated in the work schedule.

#### 4.0 SCOPE OF WORK

The tasks proposed to accomplish the objectives stated are as follows:

- Drain the boat pond and control irrigation of the Race Track lawn area.
- Monitor and report the effect of draining the boat pond and reducing the volume of lawn irrigation.
- Make investigation borings to assess the volume of gasoline impacted soil at both former tank locations, logging the borings and collecting soil samples for analysis. At least four borings will be needed at each of the former tank locations. Interpret and assimilate the findings in a report and work plan for soil remediation.
- Implement a plan for excavation and remediation of the gasoline impacted soil from the areas of the former tank locations. *(what about the utility areas?)*
- Design and implement a plan for monitoring the tidal movement and the quality of the water in the ditches adjacent to the site. Research any readily available information about the ditches.
- Design and implement a plan for remediation and disposal of treated effluent from the ground water plumes associated with the former tank locations.

#### 5.0 PLANS AND RATIONALE

##### 5.1 Reduction of Ground Water Recharge

By July 8, 1992, MGP had already drained the water from the boat pond which should cause an observable drop in the water table. The results of eliminating the recharge at the boat pond is already being monitored and a clear indication of the effectiveness of the effort should be available before beginning the more difficult job of reducing the amount of lawn irrigation to prevent percolation of excess water down to the water table at the Race Track.

To observe the drop in the water table, water levels in the wells will be measured and recorded at frequent intervals. *specify frequency* As the water table recharge is reduced or stopped, the water table gradient will become less steep at the former tank sites. The rate of transport of gasoline impacted ground water in the plumes will be slowed in direct proportion with the gradient reduction.

**5.2 Assessment of Soil Plumes At Former Tank Locations**

*ok Borings to define area of soil contamination*

At least four borings at each location, as shown on Plates 2 and 3, will give added control to locating the perimeters of the plumes. Attention will be given to observing the first encounter of the top of the plume in each boring and to collecting soil samples near the capillary zone of the water table to locate the margin of the liquid product plume. A report of the assessment will be made with recommendations and plans for remediation of the soil.

**5.3 Remediation of the Soil Plumes**

The most efficient method for remediation of the soil plumes will depend on the depth, volume and concentration of the plumes, which can be evaluated after the water table has stabilized without the influence of nearby ground water recharge. A Soil Remediation Plan will be submitted to the ACDEH before beginning remediation.

**5.4 Monitoring the Tidal Ditches**

*ok. - sample ditch soil & H2O for TPHg, BTEX & salinity*

The quality of the water in the ditches adjacent to the site will be evaluated. This work involves the collection of soil and sludge samples from the bottom of the ditches and collection of water samples upstream and downstream (distances to be assessed) from the site and at the occurrence of high and low tide. Samples will be analyzed for salinity and for gasoline constituents using EPA methods 602, 8020 and 8015 modified. A current determination of the high and low tide levels will be measured and timed to supplement tidal movement data from ground water monitoring wells at the site. A current determination of the quality of gasoline impacted water in the monitoring wells will be described and compared with water quality in the ditches.

**5.5 Remediation of the Ground Water Plumes**

It is recommended that the design and construction of the ground water remediation system be deferred until after the following:

*would like to delay H2O treatment until after soil excavation*

- Excavation of the soil plumes. When the soil plumes are excavated, the ground water plumes should no longer be in contact with gasoline liquid phase-impacted soil and the geometry of the ground water plumes may change.
- Decrease and stabilization of the elevation of the water table following removal or reduction of ground water recharge sources. The elevation of the stabilized water table gradient will be a factor in the design of new ground water withdrawal wells.

*On if one of 1 ditch H2O > meets new results*

## **6.0 HYDROGEOLOGIC SETTING**

The site is situated south of Oakland on the west margin of San Francisco Bay in a previously estuarine environment in which the grade has been modified with imported fill material comprising soil of various textures and containing wood, plastic and rubber debris. A shallow, semi-confined aquifer beneath the site contributes water to drainage ditches adjacent to the north and west sides of the site (Plate 1). The ground water elevation beneath the site is as much as five feet higher than the average water elevation in the ditches which intersect at the northwest corner of the site. Water in the ditches is tidally influenced.

The hydrogeologic setting and the deep aquifer source of the municipal water supply are described in "Geohydrology and Ground Water Quality Overview of East Bay Plain Area, Alameda County, June 1988". Much of the industrial and domestic water is imported. Additional research and on-site investigation relevant to the objectives of this remediation plan are within the scope of work.

## **7.0 PROCEDURES**

### **7.1 Soil Borings and Soil Sampling**

Soil borings will be drilled vertically with a Mobile B-53 drill rig equipped with 8-inch diameter, hollow-stem augers. Auger flights and sampling equipment will be steam-cleaned before use (or re-use) to minimize the possibility of cross-hole contamination. In landscaped areas a hand auger will be used to advance the holes and a coring device driven by a slide-hammer will collect samples. Drilling will be observed by a field geologist under the supervision of a State of California Registered Geologist, and the earth materials in the borings will be logged accordingly to the Unified Soil Classification System as drilling progresses.

During drilling, soil samples will be collected at intervals of 5-feet or less, at the capillary fringe and at obvious changes in soil types with a California-modified, split-spoon sampler equipped with clean brass sleeves. Samples will be collected at each sampling point by driving the sampler into the soil 18 inches beyond the auger-bit with a standard 140-pound hammer repeatedly dropped 30 inches. The number of blows required to drive the sampler each successive 6-inch interval will be counted and recorded to give an indication of soil consistency.

A photo ionization detector (PID) or flame ionization detector (FID) will be used to screen the concentration of volatiles in the work space around the auger rig and also to measure hydrocarbon concentrations in soil samples described on the boring logs.

Soil samples selected for possible chemical analysis will be sealed in the brass or stainless steel sample sleeves using teflon lined plastic caps. The samples will be labeled and placed in iced storage for transport to the laboratory for analysis. Chain of Custody Records will be initiated by the geologist in the field and will

accompany the samples to the laboratory. Copies of these records will be presented in the soil assessment report. An expanded description of sampling procedures is described in Appendix A.

#### 7.2 Laboratory Analyses

Soil samples selected for testing will be analyzed for total petroleum hydrocarbons (TPH) as gasoline using modified EPA 8015, and for benzene, toluene, ethylbenzene, and total xylenes (BTEX) using EPA method 5020/8020. RESNA Environmental Laboratories in Fremont, certified by the State of California, will perform the analyses.

#### 7.3 Boring Locations

Locations of the proposed borings and wells are shown on Plate 2. Additional boring locations will be selected by the Project Geologist on site in order to assure detection of the perimeter of the soil plume.

#### 7.4 Backfilling of Boreholes

All boreholes will be filled with bentonite chips to two feet above the water table and cement slurry to the surface. Subjectively impacted cuttings generated during drilling will be placed on and covered with plastic sheeting. The cuttings pile will be located away from traffic flow.

#### 7.5 Report of Soil Assessment

A report of findings, procedures, interpretations and recommendations will be prepared and submitted approximately six weeks following the site work.

### 8.0 HEALTH AND SAFETY

All RESNA employees that will work at the site have received the Health and Safety training required by OSHA for hazardous waste site operations (29 CFR 1910.120). Without excluding the relatively immobile outboard motor oil, the gasoline fuel constituents are the principle substances identified as hazardous at this site. The more volatile components, especially benzene, pose the greatest health hazard. Because of the outdoor location and the intermittent nature of drilling operations, it is not considered likely that personnel will be exposed to elevated levels of hydrocarbon vapors for any length of time. Under these conditions personnel will work under "Class D" protection. The PID or FID will be used to monitor ambient concentrations of organic vapors. Personnel will be equipped with air-purifying respirators (APR) with organic vapor canisters which can be donned if conditions warrant.

A detailed site specific Health and Safety Plan, to which all RESNA personnel and any/all site visitors will adhere, will be distributed at the site (Appendix B). A "tailgate" safety meeting will be held at the site prior to commencing operations during which all site hazards and Health and Safety Plan will be reviewed.

9.0 PROPOSED WORK SCHEDULE

The boat pond has been drained and the ground water level is now being monitored. Assessment of the water and tides in the ditches can begin approximately two weeks after approval of this plan by ACDEH. Following an estimated three days of data collecting and sampling and two weeks for laboratory reports, an assessment report with recommendations regarding ground water remediation will be submitted in approximately four weeks.

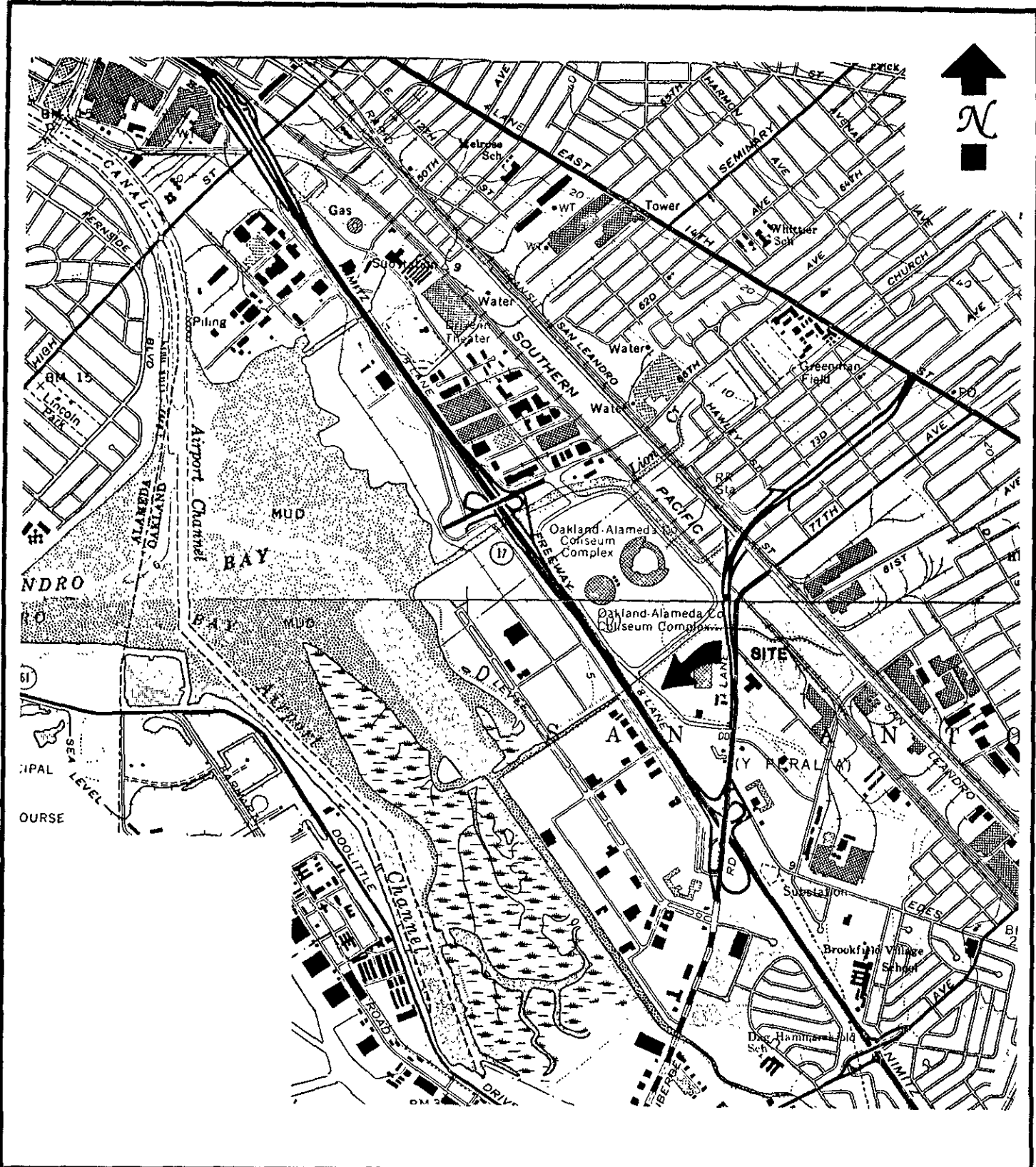
It is anticipated that drilling and soil sampling will commence within two weeks after receiving approval of this plan and that the borings can be completed in three working days. The analytical laboratory reports should be received two weeks after the field work. The report of findings and Plan for Remediation should be completed within the following four weeks.

Findings from the soil and ground water assessment work will be used in the design and planning of remediation systems for the soil and ground water. With the approval of ACDEH the design information will be incorporated into applications for Bay Area Air Quality Management District and Regional Water Quality Control Board NPDES permit applications. RESNA has been advised that those permits will require approximately 60 days (2.5 months) for processing.

A schedule chart showing tasks, tentative starting dates and task durations is on Plate 4.

Plan approval	_____	_____	
work initiated	2 wks	drilling	in 2 wks
data collection	2.5 wks	borings	0.5 wk
		analytical	2 wks
Report re: GW Remediation	_____	Plan for remed.	4 wks
	5 wks		_____
			~9 wks





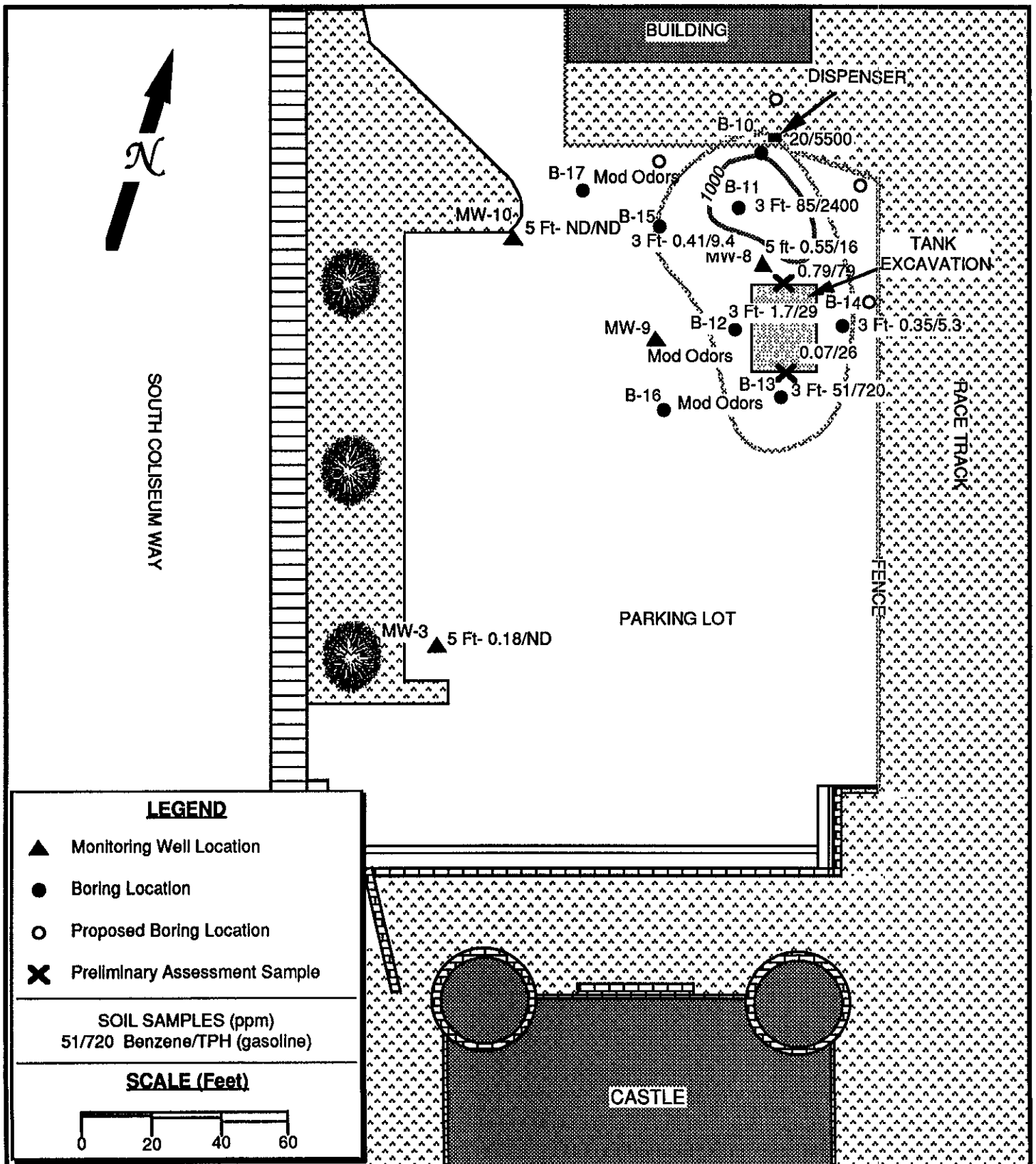
**RESNA**  
 Working to Restore Nature

DATE: 7/15/92  
 PROJECT NUMBER: 2481-4

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

**LOCATION MAP**

**PLATE**  
 1



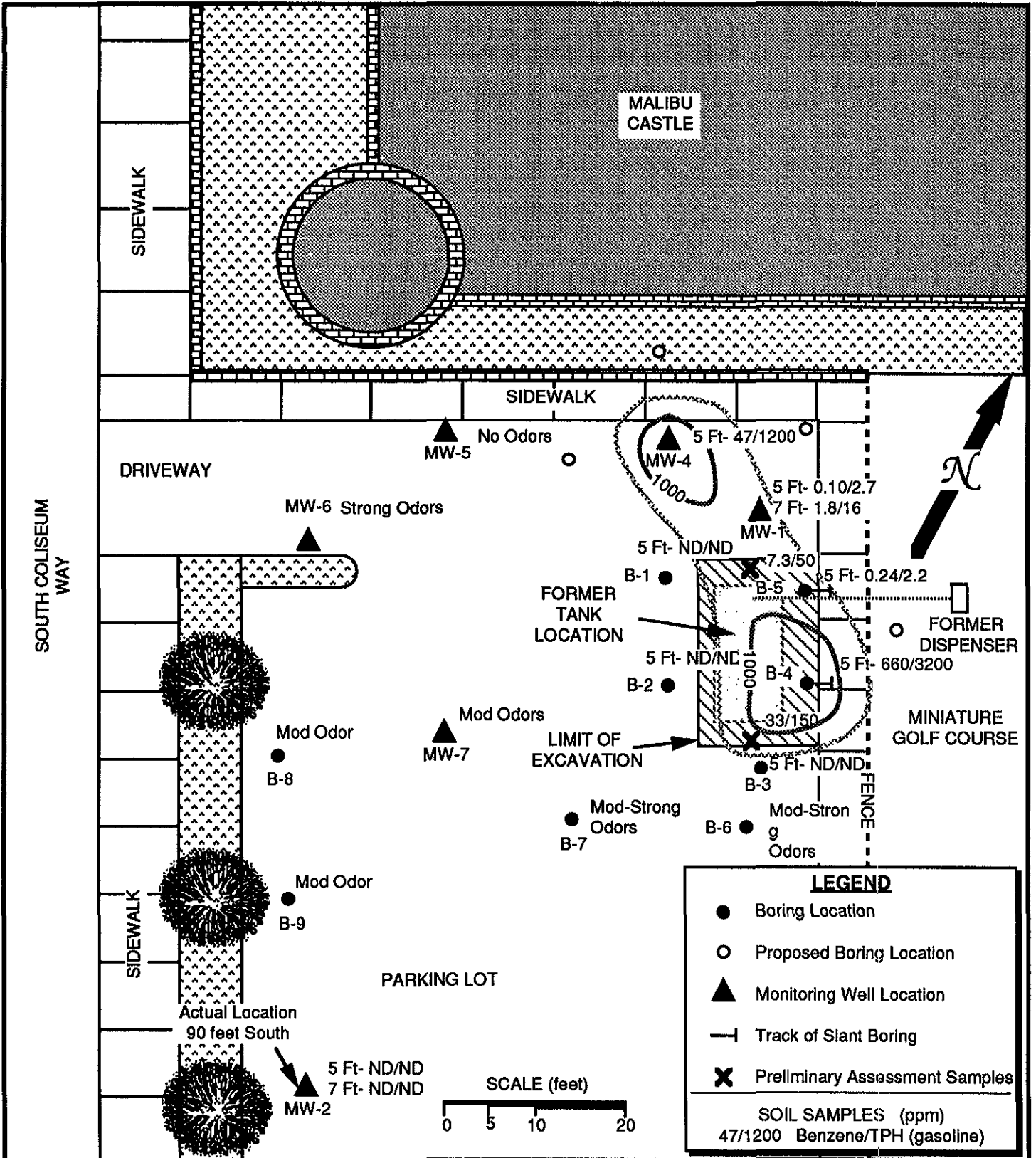
**RESNA**  
Working to Restore Nature

DATE: 07/15/92  
PROJECT NUMBER: 2481-4

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

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

PLATE  
**2**



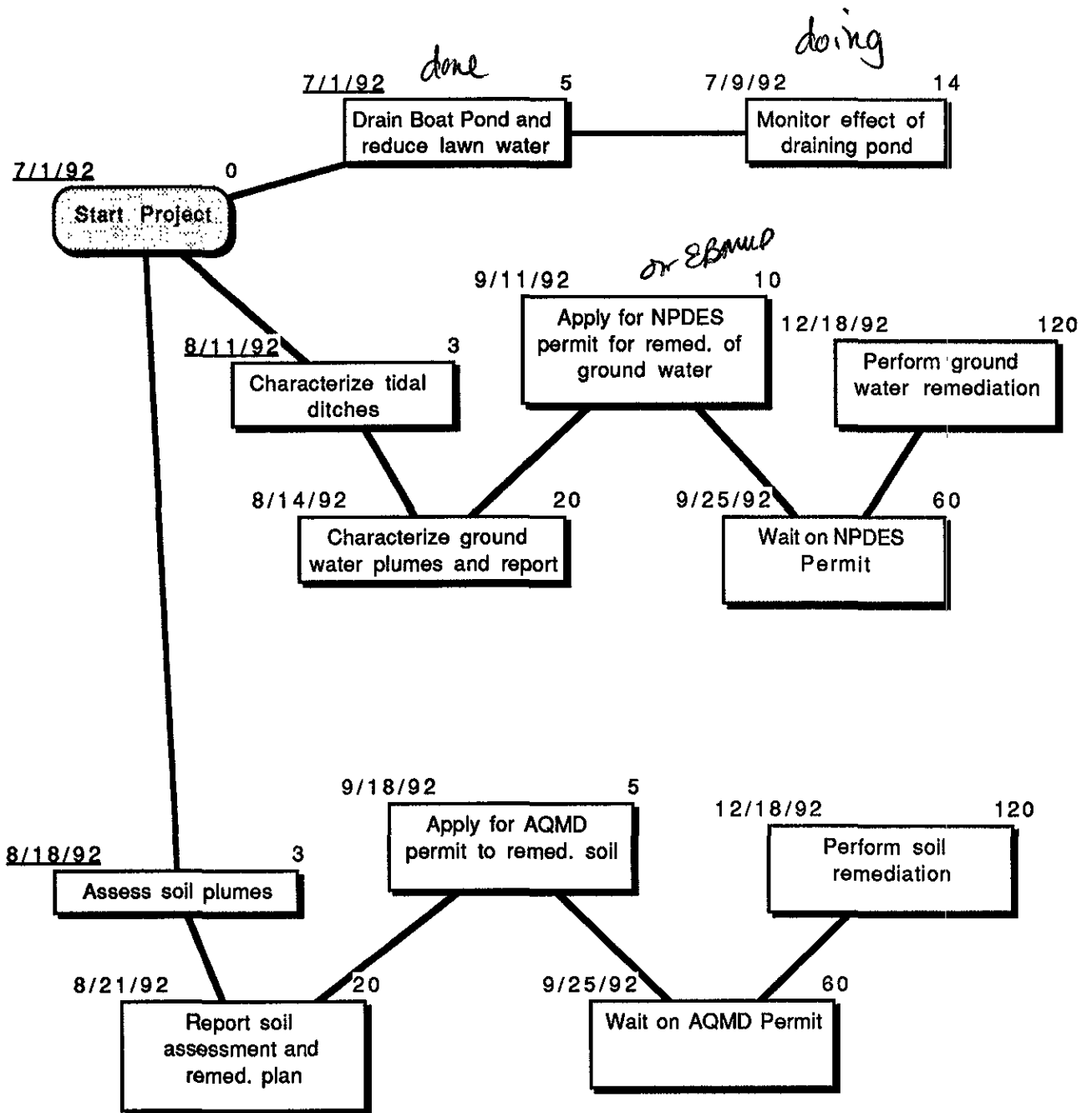
**RESNA**  
*Working to Restore Nature*

DATE: 07/15/92  
PROJECT NUMBER: 2481-4

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

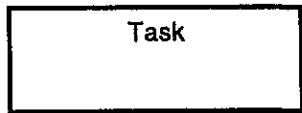
**CASTLE PLOT PLAN**  
WITH CONTOURS OF EQUAL TPH  
CONCENTRATIONS IN SOIL

**PLATE**  
**3**



Starting date      Duration  
 1/1/92                      0

LEGEND:



Malibu Grand Prix Remediation

SCHEDULE CHART

PLATE 4

7/15/92

**APPENDIX A**

**RESNA Site Specific Health and Safety Plan**

1500 So. Union Avenue  
Bakersfield, California 93307  
Phone: (805) 835-7700  
FAX: (805) 835-7717

**SITE-SPECIFIC  
HEALTH AND SAFETY PLAN**

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

**Prepared for:**

**MALIBU GRAND PRIX  
7301 Topanga Canyon Boulevard, Suite 300  
Canoga Park, California**

**Prepared by:**

**RESNA Industries Inc.  
1500 South Union Avenue  
Bakersfield, California**

**JULY 1992**

**HEALTH AND SAFETY PLAN**

**TABLE OF CONTENTS**

SECTION	SUBJECT	PAGE
1	Facility Background .....	1
2	Project Schedule and Work Plan .....	2
3	Key Personnel and Responsibilities .....	3
4	Job Hazard Analysis .....	5
5	Job Hazard Summary .....	7
6	Exposure Monitoring Plan .....	8
7	Personal Protective Equipment .....	9
8	Site Control .....	10
9	Decontamination Procedures.....	11
10	General Safe Work and Standard Operating Practices .....	13
11	Sanitation .....	15
12	Contingency Plans and Emergency Response Precedures .....	16
13	Training Requirements.....	18
14	Medical Surveillance Program .....	19
15	Documentation .....	20

**ILLUSTRATIONS**

PLATE 1	Site Location Map/Route to Hospital
PLATE 2	Race Track Plot Plan
PLATE 3	Castle Plot Plan
PLATE 4	Decontamination Layout

**ATTACHMENTS**

Attachment A	Material Safety Data Sheets (MSDS)
Attachment B	Foxboro OVA Calibration Protocol
Attachment C	Gastech LEL Calibration Protocol

**SECTION 1****FACILITY BACKGROUND****1.1 SITE DESCRIPTION**

The Malibu Grand Prix site is located at 8000 South Coliseum Way adjacent to the Nimitz Fwy (I-880) near the Hegenberger Road exit. The property is rectangular in shape and is occupied by paved parking lots, outdoor recreation facilities, and structures housing electronic game rooms, food counters, rest rooms and offices. The business uses one above-ground fuel tank located at the race track facility.

**1.2 SITE HISTORY**

Malibu Grand Prix (MGP) maintained two 6000 gallon USTs containing marine mix gasoline. The tanks, located at the Castle and Race Track areas, were removed on March 29, 1989 and February 1, 1990, respectively. A verbal request for assessment at the Race Track was made at the time of the tank removal. On June 29, 1989 a letter from Alameda County was sent to MGP requiring an initial site investigation to determine the extent of soil and groundwater contamination present at the Castle area. 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 MW-1 through -10 were sampled July 17, 1991. Four additional monitoring wells at the Castle and four additional monitoring wells at the Race Track were constructed on August 27-30, 1991. All monitoring wells, MW-1 through MW-18, were sampled October 9, 10, 11, 1991 for water analyses. Pump tests and slug tests were performed on selected wells October 8, 9, and 10, 1991. The Site Assessment Report dated January 13, 1992 describes well construction and monitoring in August, 1991 in addition to the October, 1991 monitoring and well tests.



**SECTION 2****PROJECT SCHEDULE AND WORK PLAN****2.1 PROJECT SCHEDULE**

It is anticipated that drilling and soil sampling will commence within two weeks after receiving approval of this plan for soil plume assessment and that the borings can be completed in three working days.

**2.2 WORK PLAN**

Assessment of soil plumes at former tank locations will involve at least four borings at each location, as shown on Plate 2. The borings will range between five feet and twelve feet in depth. Attention will be given to observing the first encounter of the top of the plume in each boring and to collecting soil samples near the capillary zone of the water table to locate the margin of the liquid product plume.

**SECTION 3**

**KEY PERSONNEL AND RESPONSIBILITIES**

**3.1 PERSONNEL**

Key personnel in charge of site activities for RESNA Industries Inc..

Project Manager .....Rex J. Young  
Project Safety Officer .....Marc Selover  
Site Safety Officer .....Rex J. Young  
Field Personnel..... To be designated

**3.2 RESPONSIBILITIES**

RESNA Industries Inc. (RESNA) has been given the responsibility for the preparation of this Health and Safety Plan, and is to monitor compliance of its personnel and those of its subcontractors. RESNA personnel responsible for the distribution and monitoring of this site health and safety plan will be the Project Safety Officer, and the Project Manager.

The Project Safety Officer is responsible for delivering the plan and any addenda to the Project Manager, and for advising the Project Manager and Site Safety Officer on health and safety issues. He has the authority to monitor compliance with the provisions of this plan, suspend work or modify work practices for safety reasons, and to dismiss individuals whose conduct on the site endangers the health and safety of others.

The Project Manager is responsible for distributing the plan to RESNA field personnel, and its subcontractors and each firm with personnel working on site. The Project Manager is also responsible for review of RESNA field personnel's compliance with its medical examination requirements, providing the appropriate safety equipment for personnel protection, and verify that all required health and safety documentation is submitted to the Project Safety Officer. The authority of the Project Manager is the same as the Project Safety Officer.

The Site Safety Officer is responsible for assisting the Project Manager with on-site implementation of the Site Health and Safety Plan. His responsibilities are as follows:

- 1) Maintain safety equipment supplies.
- 2) Perform air quality measurements as required or needed.
- 3) Direct decontamination operations and emergency response operations in accordance with the information provided in this document.

- 4) Establish the work zone markers and signs.
- 5) Report all accidents, incidents and infractions of safety rules and requirements to the Project Manager.

The Site Safety Officer has the authority to suspend work anytime he determines that the provisions of the Site Health and Safety Plan are inadequate to provide a safe working environment. He is to notify the Project Manager of individuals whose on-site presence jeopardizes their health and safety, and the health and safety of others.

## SECTION 4

## JOB HAZARD ANALYSIS

## 4.1 MAJOR CHEMICAL COMPOUNDS

The primary chemical hazard at this site is the presence of marine-mix gasoline fuel constituents in the subsurface soil. Specific compounds such as benzene, toluene, xylenes and ethylbenzene are known to be present in the fuel. Benzene is a known carcinogen and precautions are necessary to limit exposure to this compound. Material data sheets (MSDS) for these compounds are in Attachment A.

*NOTES*

- 1) Inh - Inhalation  
Ing - Ingestion  
Abs - Absorption through the skin
- 2) TLV-TWA - Threshold Limit Value-Time Weighted Average)
- 3) ACGIH - American Conference of Governmental Industrial Hygienists

## 4.2 INHALATION HAZARD

The vapor and dust concentrations that might be encountered during sampling procedures may exceed currently recommended exposure limits in which case respiratory protection must be used in the work area. Engineering and administrative controls will be employed if required to abate windborne dust. These will include items such as water spray and/or administrative controls such as reducing site activities that produce windborne dust.

## 4.3 DERMAL EXPOSURE HAZARD

Contact of sufficient duration to cause significant absorption of toxic components is highly unlikely. Repeated daily or prolonged contact over a period of time may however, lead to absorption through the skin, irritation and dermatitis. For this reason direct skin contact shall be avoided by wearing protective gloves and clothing. However, if contact does occur, the exposed areas shall be washed with soap and water and rinsed thoroughly.

## 4.3.1 Eye Contact

If eye contact is made with any chemical materials at the site, the eye shall be flooded with water for at least 15 minutes. Medical attention shall be obtained as soon as possible.

**4.3.2 Skin Contact**

Skin exposure shall be treated by washing with soap and water. Any contaminated clothing shall be removed and affected areas washed with soap and water.

**4.4 OTHER HAZARDS**

Attention must be paid to other possible hazards on the site including, but not limited to:

- improper use of hand tools
- rotating machinery such as pumps
- dehydration of the personnel
- tripping on objects or open ditches
- falling objects from the overhead work
- lack of oxygen through blockage of the mask
- overhead power lines
- automobile traffic

**4.5 HEAT STRESS PREVENTION**

The SSO shall monitor ambient temperature and use the following work/rest regimes as a guide.

For ambient temperature below 80°F, standard rest breaks (e.g. 15 minutes every 4 hours) should be used. For temperature above 80°F, the following regime should be followed.

<u>Temperature</u>	<u>Work</u>	<u>Rest</u>	<u>Comments (a)</u>
80 to 85°F	2 hr.	5 min.	Review heat stress in a safety meeting. Schedule a beverage break every 2 hrs., at a minimum.
80 to 90°F	2 hr.	15 min.	Seated rest. Drink at least 8 ounces at each break.
Above 90°F	1.5 hr	15 min.	As stated above. Rest area to be shaded.

**SECTION 5**

**JOB HAZARD SUMMARY**

Exposure to chemical hazards may occur when contaminated soils are brought to the surface during drilling, soil cuttings disposal, and during the sample preparation process. As each of task begins, the potential risk of exposure increases. Consequently, level C personal protective equipment shall be available at the site. If monitoring of the breathing zone establishes another action level, the personal protection level may be upgraded. Nearby residents or workers are at a sufficient distance that they shall be at no significant risk. The SSO shall determine if any further action is required.

**SECTION 6****EXPOSURE MONITORING PLAN****6.1 DRILLING**

The exposure monitoring activities shall be conducted or directed by the SSO during those activities that require such monitoring. At a minimum, the breathing zone shall be monitored for organic vapor during drilling and excavation activities. This shall be accomplished by use of a Foxboro OVA-FID, HNU or Photovac PID portable analyzer. A Gastech LEL explosive meter shall be used to warn of any explosive hazards during these activities.

**6.2 ACTION LEVELS**

Actions levels for explosive hazards are set at 25% of the lower explosive limit (LEL). In the event that enough combustible vapor is present to sustain readings at or near 25% of LEL work shall cease until an evaluation is perform by the SSO and a determination can be made.

Action levels for organic vapors in the breathing zone shall be based on readings obtained by the portable equipment mentioned. The FID instrument determines the total organic vapor present in the breathing zone. Readings of 0 to 300 ppm (TWA for gasoline is 300 ppm) shall be considered level D without respirators. Readings of 300 ppm or greater for 5 minutes or longer shall trigger an action level to upgrade to level C or modified level D with respirators.

**SECTION 7****PERSONAL PROTECTIVE EQUIPMENT**

The respiratory and skin protection requirement shall be initially set at level "D" without respirators. This indicates that inhalable airborne substances are known, and concentrations of chemicals in the atmosphere are not expected and are well below TLV-STEL levels. The use of the following personal protection equipment is mandatory.

**7.1 Equipment Required for Field Personnel**

- Hard hat
- Boots (with steel toes)
- Nitrile, or equivalent, work gloves
- Eye protection

**7.2 Level C Personal Protective Equipment**

- Half-mask air purifying respirator with organic vapor cartridge when necessary.
- Tyvek protective coveralls
- Gloves (latex and/or nitrile)

**7.3 Equipment to be used or available on site:**

- First-aid kit with eyewash
- Fire extinguisher
- Construction tape and barriers to delineate work zone
- A vehicle must be kept on site when personnel are working
- A cellular or public phone to be available on site for communication purposes with off site facilities
- Foxboro OVA portable analyzer or PID
- Gastech LEL meter
- Sanitation facilities portable or public



**SECTION 8****SITE CONTROL****8.1 WORK ZONE**

The site area shall be controlled to reduce the possibility of exposure to chemical and/or mechanical hazards present at the site.

Work areas shall be delineated to protect the general public from exposures and hazards. If level C protection becomes necessary then zones and access points shall be clearly indicated (see Plate 2). A restricted area for contamination reduction shall be maintained at the exit to the exclusion zone. Protective clothing and equipment as required by this health and safety plan shall be worn at all times in the exclusion zone and shall only be removed in the designated decontamination corridor at the exit. The areas outside the contamination reduction area, is considered a clean area.

## SECTION 9

## DECONTAMINATION PROCEDURES

Decontamination of equipment shall be conducted when necessary. However, if it becomes necessary to upgrade to a protect level greater than "D", then an Exclusion Zone shall be established and an area in the Contamination Reduction Corridor (CRC) shall be used as a decontamination area. The CRC controls access into and out of the Exclusion Zone and confines personnel and equipment decontamination activities to a limited area. The CRC boundaries shall be marked and all personnel entering and leaving the site must do so through this corridor (Plate 2).

**9.1 DECONTAMINATION OF PERSONNEL IN LEVEL C**

Exit from the exclusion zone through CRC shall include the following steps:

**9.1.1 While in the Exclusion Zone Near the CRC**

- Deposit equipment used on site.
- Outer boot and glove wash.
- Outer boot and glove rinse.
- Tape removal if used.
- Boot cover removal.
- Outer glove removal.

**9.1.2 Exit the Exclusion Zone to the Contamination Reduction Zone for Further Decontamination**

- Remove garment
- Wash inner glove
- Rinse inner glove
- Face piece removal
- Inner glove removal

**9.1.3 Exit the Contamination Reduction Zone to the Support Zone**

- Wash face and hands.

**9.2 DECONTAMINATION OF EQUIPMENT**

Insofar as possible, measures shall be taken to prevent contamination of equipment. Any delicate instrument, which cannot be decontaminated easily should be protected while it is being used. It

should be bagged and the bag taped and secured around the instrument. Openings are made in the bag for sample intake.

Larger equipment shall be decontaminated with water or steam under pressure. These activities shall be conducted on an impermeable surface such as plastic. The rinsate shall be collected and stored in fifty five (55) gallon drums. The drums shall be label as to its contents and staged for disposal or recycling.

**SECTION 10.0****GENERAL SAFE WORK AND  
STANDARD OPERATING PRACTICES**

Site health and safety plan implementation will be the responsibility of RESNA. If RESNA health and safety personnel find that the H&S plan is not being implemented by the subcontractors, the subcontractors will be instructed to suspend further work. A meeting to evaluate the noncompliance will be scheduled with the subcontractors Project Manager. During the meeting the personnel will reach an agreement to

- \* Revise the Health and Safety Plan,
- \* Modify the Health and Safety Plan,
- \* Request review by an Industrial Hygienist, or
- \* Leave the Plan unchanged.

The subcontractor will then implement the Plan as modified.

**10.1 SITE SAFETY ORIENTATION MEETING**

All field personnel from RESNA and the subcontractors must attend a safety orientation meeting before commencing the field work. The meeting will be scheduled and conducted by the Site Safety Officer and is to include an overview of the site history, the potentially hazardous compounds, their potential mode of ingress into the body, protective equipment requirements, and emergency response equipment. All individuals who do not have respirators and who may be required to wear them, will not be allowed on the site until they are provided with and fit tested for respirators by their respective employers.

**10.2 ACCIDENT / PERSONNEL EXPOSURE REPORTS**

The Site Safety Officer must be informed of all exposures to potentially hazardous material and all accidents whether or not any injury was caused. After investigation of the cause of the accident, he will take all immediate possible steps for the mitigation of the repeat of the accident and proceed with the preparation of an accident report. In the event off a serious or fatal injury resulting from accidents on the site, the relevant CAL/OSHA requirements for accident reporting must be met. The Project Manager will also be informed at the earliest possible time.

**10.3 PROHIBITED ACTIVITIES**

No eating, drinking, or smoking is allowed in the restricted zone, and only allowed outside of the contamination reduction zone after personal decontamination has taken place. Removal of personal protection equipment and respirator, required by articles of this plan, inside the contamination zone is prohibited. Under special circumstances, and after consultation with the Project Manager and/or the Project Safety Officer, the Site Safety Officer may lower the level of protection required and allow the disuse of specific items of personnel protection.

Movements on the site singly and out of the sight of the rest of the personnel is prohibited.

**10.4 TAIL GATE MEETING**

A Tail Gate Meeting will be held every morning before the start of work and is to be attended by all personnel on-site. The purpose of the meeting is to discuss the days work, potential hazards, and specific health and safety procedures to utilized during the day. The minutes of the meeting will be prepared by the Site Safety Officer.

**10.5 VISITOR CLEARANCE**

Visitors to the site must inform the Site Safety Officer or the Project Manager upon their arrival on the site and must be informed of the contents of this report and fully equipped before entry is permitted. Visitors will be required to be escorted in the exclusion zone and must comply with escort directions at all times. Non-compliance with escort directions will not be tolerated, and violators will be required to leave the restricted access zones immediately.

**SECTION 11**

**SANITATION**

Sanitation facilities for site personnel will include the following:

1. Accessible, near-by restrooms
2. Washing facilities
3. Potable water
4. Electrolyte drink (Gator Aid)

**SECTION 12**

**CONTINGENCY PLANS AND  
EMERGENCY RESPONSE PROCEDURES**

RESNA requires the utmost care and safety for all of its employees and therefore attempts to maintain all employees in a current status of emergency training.

**12.1 PHYSICAL INJURY**

In the event of an accident resulting in a physical injury, apply first aid and call paramedics. Severely injured personnel are to be transported only by paramedics and/or ambulance personnel. At the hospital, a physician's attention is mandatory regardless of how serious the injury appears.

The Project Safety Officer and the Project Manager are to be notified by the Site Safety Officer, as soon after the injury as practical, regarding the nature of the accident. A written report is also to be prepared and submitted by the Site Safety Officer.

**12.2 FIRE, EXPLOSION, AND PROPERTY DAMAGE**

In the event of a fire or explosion notify the fire department immediately by dialing: 911

The Project Safety Officer and the Project Manager are to be notified by the Site Safety Officer as soon as practical and a written report prepared.

**12.3 EMERGENCY TELEPHONE NUMBERS**

- Fire Department .....911
- Police Department.....911
- Paramedics .....911
- RESNA Industries Inc. ....(805) 835-7700
- RESNA Toll Free .....(800) 289-3252

**12.4 WORK SITE ADDRESS**

8000 South Coliseum Way  
Oakland, California

**12.5 HOSPITAL ADDRESSES AND ROUTES****Hospital Address:**

Humana Hospital  
13855 E. 14th Street  
San Leandro, California  
Phone: (510) 357-6500

Plate 1 is a local map showing the route to the hospital.

**Hospital Route:**

Freeway (I-880) south toward San Leandro and Hayward. Proceed 1.5 miles on I-880 to Davis Street exit. East (left) on Davis one mile toward hills, away from the Bay, to East 14th Street. South (right) on 14th St. one mile to Humana Hospital, on the right.



**SECTION 13****TRAINING REQUIREMENTS**

Training on the hazards at the site will be conducted at the start of the project and as conditions and personnel change. This plan will be reviewed with project personnel prior to their entry onto the site. In addition, RESNA provides and encourages training opportunities such as CPR, First Aid, and 1910.120 annual refresher and supervisory training.

The initial training will include the following subjects at a minimum:

1. Nature of the hazards, including the location of the site Material Safety Data Sheets for chemicals at the site.
2. A description of the levels of personal protection at the site, and the condition for selection of each level.
3. Emergency procedures.
4. Demonstration of respiratory protective equipment.
5. Review of safe work practices at the site, and identification of forbidden practices.

Safety Meetings will be conducted daily at the site to review work plans and safety practices associated with them. These meetings will be conducted by the SSO, attendance by all RESNA employees, subcontractors, and visitors to the site will be mandatory.

**SECTION 14**

**MEDICAL SURVEILLANCE PROGRAM**

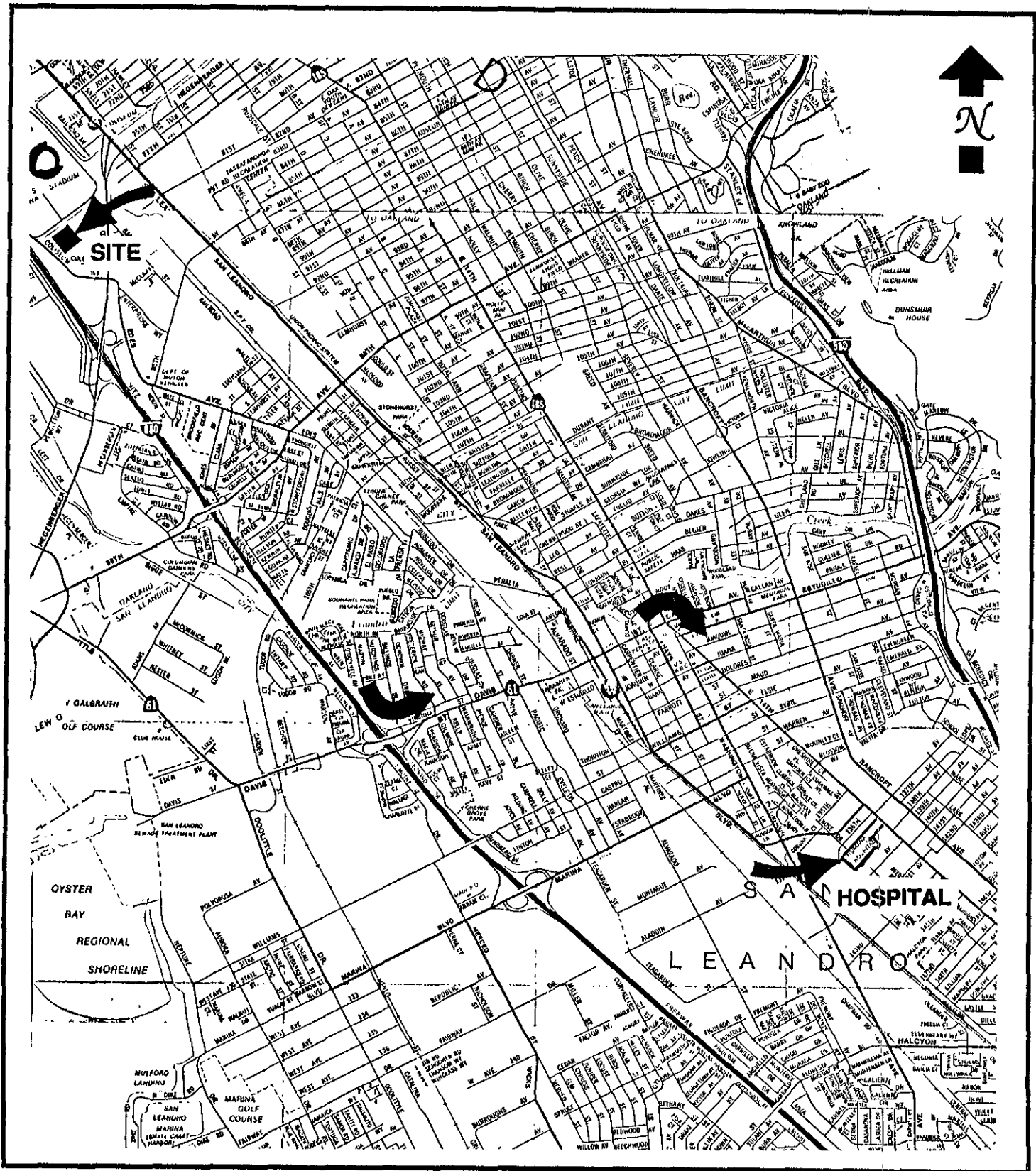
To meet with the criteria set forth in 29 CFR 1910.120 RESNA has implemented a medical surveillance program which includes all employees that work at or visit hazardous waste sites.

**SECTION 15**  
**DOCUMENTATION**

All required records of individual employees are maintained at RESNA's central location in Bakersfield, California. The records include but are not limited to: medical surveillance, training, and respiratory testing.

This Site Safety Plan Is Hereby Approved and Acknowledge by RESNA's Acting Health and Safety Officer.

\_\_\_\_\_  
Marc Selover



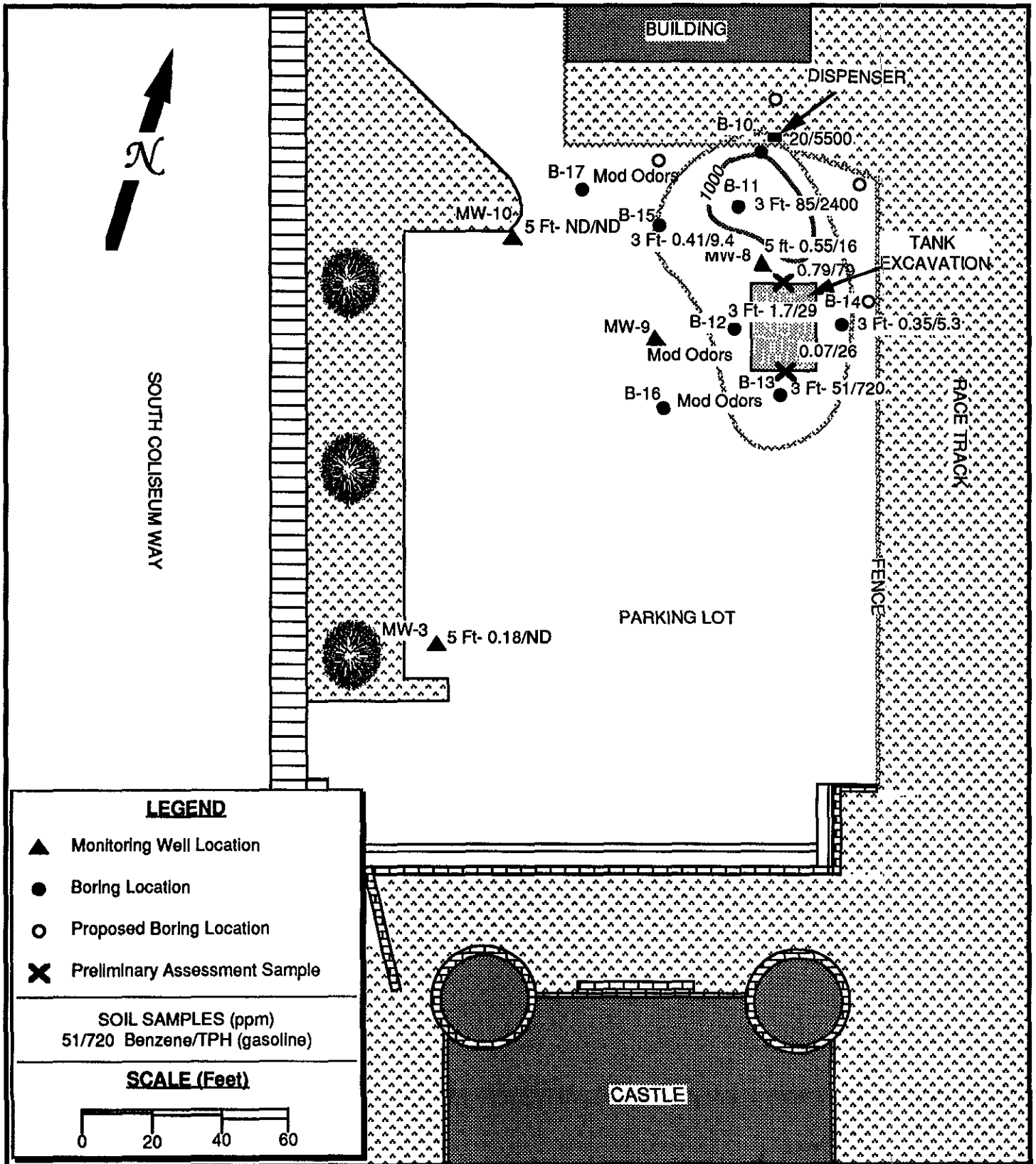
**RESNA**  
 Working to Restore Nature

DATE: 7/15/92  
 PROJECT NUMBER: 2481-4

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

**SITE LOCATION MAP  
 AND ROUTE TO HOSPITAL**

**PLATE**  
 1



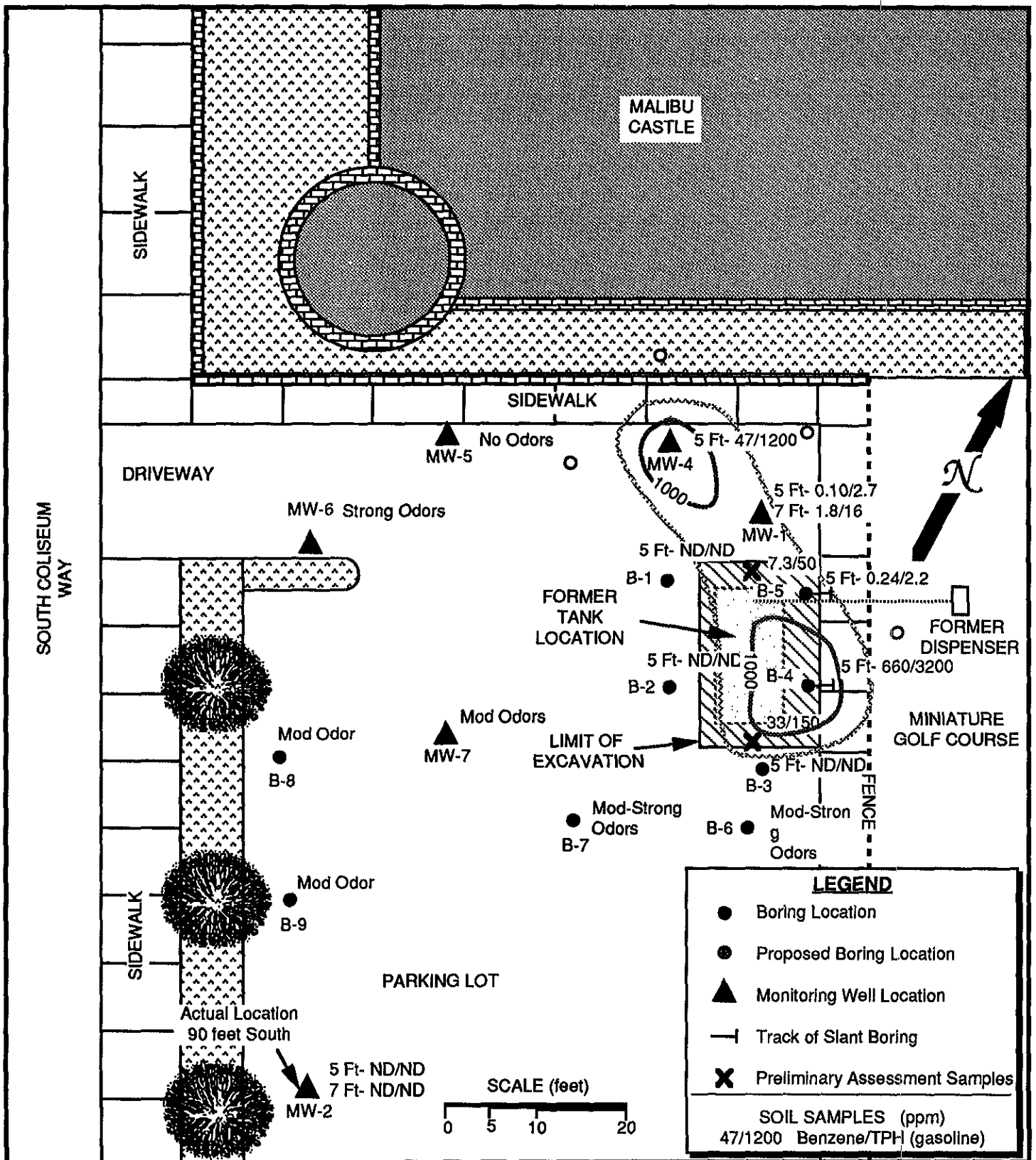
**RESNA**  
Working to Restore Nature

DATE: 07/15/92  
PROJECT NUMBER: 2481-4

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

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

PLATE  
**2**



**RESNA**  
Working to Restore Nature

DATE: 07/15/92  
PROJECT NUMBER: 2481-4

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

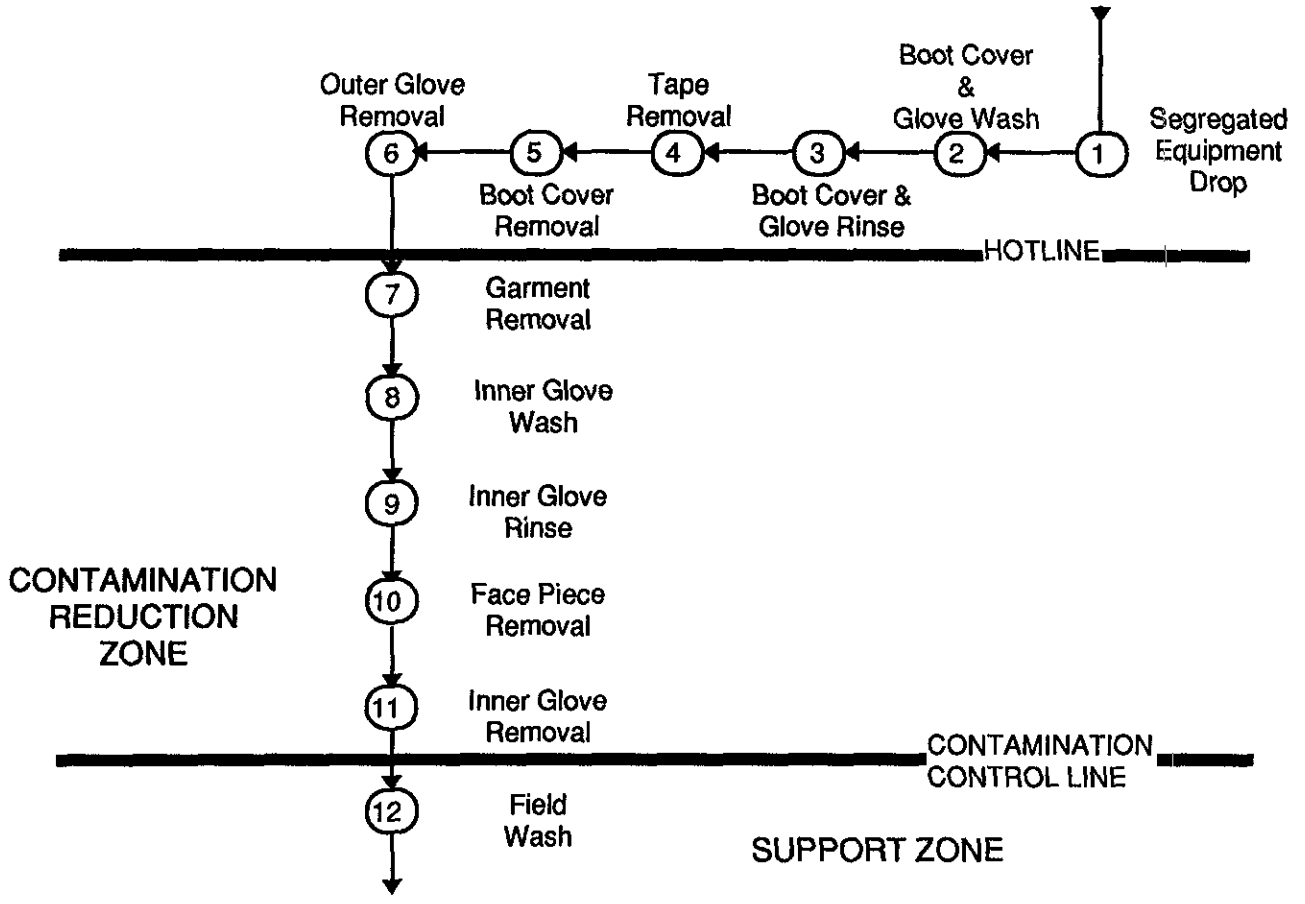
**CASTLE PLOT PLAN**  
WITH CONTOURS OF EQUAL TPH  
CONCENTRATIONS IN SOIL

PLATE

**3**

PROCESS DECON PROCEDURES

**EXCLUSION ZONE**



DATE: 07/15/92  
PROJECT NUMBER: 2481-4

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

**DECONTAMINATION LAYOUT**  
**LEVEL C PROTECTION**

PLATE  
**4**

**ATTACHMENT A**

**Material Safety Data Sheets**



# MATERIAL SAFETY DATA SHEET

GENIUM PUBLISHING CORPORATION  
1145 CATALYN STREET  
SCHENECTADY, NY 12303-1836 USA  
(518) 377-8855



No. 316  
BENZENE  
Revision C  
Date November 1978

SECTION I. MATERIAL IDENTIFICATION				
<p>MATERIAL NAME: BENZENE OTHER DESIGNATIONS: Benzol, Phenylhydride, Phene, C<sub>6</sub>H<sub>6</sub>, GE Material D5B53, ASTM D835, D836, D2359, CAS #000 071 432 MANUFACTURER: Available from many sources.</p>				
SECTION II. INGREDIENTS AND HAZARDS		%	HAZARD DATA	
Benzene		ca 100	8-hr TWA 10 ppm (skin) <sup>*</sup> with 25 ppm ceiling level and 50 ppm 10 minute peak	
<p>*Current OSHA and ACGIH (1978) permissible exposure level. Note that the OSHA standard on benzene which would reduce the TLV to 1 ppm with a 5 ppm ceiling, forbid contact with liquid with over 0.5% benzene, and legally classify benzene as a human carcinogen has been struck down by U.S. Court of Appeals. ACGIH (1978) lists benzene as a <u>suspected carcinogen</u> for humans.</p>				
SECTION III. PHYSICAL DATA				
Boiling point, 1 atm, deg F (C) -- 176 (80)		Specific gravity, 20/4 C -- 0.879		
Vapor pressure at 20 C, mm Hg --- 74.6		Volatiles, % ----- ca 100		
Vapor density (Air=1) ----- 2.77		Evaporation rate (CCl <sub>4</sub> =1) - 1.0		
Solubility in water, wt. % ----- 0.06		Molecular weight ----- 78.12		
Melting point, deg F (C) -- 42 (5.5)				
Appearance & Odor: Clear, colorless liquid having a characteristic aromatic odor. The odor recognition threshold (100% of panel) is 4.68 ppm (unfatigued) in air. Odor is <u>not</u> an adequate warning of hazard.				
SECTION IV. FIRE AND EXPLOSION DATA			LOWER	UPPER
Flash Point and Method	Autoignition Temp.	Flammability Limits In Air		
120°F (-11C) (TCC)	1044°F (562°C)	Volume %	1.3	7.1
<p>Extinguishing Media: Water fog, CO<sub>2</sub>, dry chemical or foam. Use a blanketing effect to smother fire. A water stream will scatter the fire. A water spray can be used to cool fire exposed containers. Firefighters should wear approved self-contained breathing apparatus. This material can form explosive and flammable mixtures with air at room temperature. It is a <u>severe explosion hazard</u> and <u>toxic hazard</u> in a fire situation. Vapors can flow along surfaces to distant ignition sources and flash back.</p>				
SECTION V. REACTIVITY DATA				
<p>Benzene is a stable compound under normal storage and use conditions; it does not polymerize. Benzene will react vigorously with strong oxidizers such as ozone, permanganate, sulfuric or nitric acids, potassium peroxide, sodium peroxide, et al. It is a flammable liquid. OSHA Class IB. Heating greatly increases the fire and explosion hazards. Oxidation in air will produce oxides of carbon and nitrogen.</p>				

**SECTION VI. HEALTH HAZARD INFORMATION**

TLV 10 ppm or 30 mg/m<sup>3</sup> (skin)

Excessive inhalation or prolonged skin exposure may cause headache, weariness, loss of appetite and lassitude with incipient blood effects including decreased cell counts, mild lymphotosis and eosinopenia. The most significant toxic effect of benzene is insidious and often irreversible injury to the blood forming tissue from chronic low level exposures. Development of leukemia may occur from chronic excessive exposure! Eye contact yields irritation from liquid or high vapor concentrations. Skin contact will also yield a defatting effect. Inhalation may result in collapse, bronchitis and pneumonia.

**FIRST AID:**

Eye contact: Wash eyes well with water for 15 minutes. Contact physician.

Skin contact: Wash skin well with water. Contaminated clothing should be removed at once.

Inhalation: Remove victim to fresh air. Restore breathing if required and administer oxygen for labored breathing. Contact physician.

Ingestion: Give edible fats or oils to swallow. Do not induce vomiting (aspiration hazard). Contact a physician immediately.

**SECTION VII. SPILL, LEAK, AND DISPOSAL PROCEDURES**

If a significant spill occurs, notify safety personnel and evacuate the area. Remove all ignition sources. Provide maximum, explosion-proof ventilation. Clean-up personnel must use approved self-contained breathing apparatus and other protective equipment to avoid contact with benzene.

Remove free liquid. Pick up residue with an inert absorbant, such as vermiculite, and placed in a closed metal container for disposal, using non-sparking tools. When necessary, benzene may be flushed away from a critical area with water, but flush to open area only, not to sewer or to surface waters.

DISPOSAL: Incinerate waste benzene or dispose of via a licensed solvent disposal company. Do not send (or allow run off) to the sewer!

**SECTION VIII. SPECIAL PROTECTION INFORMATION**

Provide general ventilation and local exhaust ventilation where benzene is used, handled, or stored to meet TLV requirements. Self-contained breathing apparatus should be available for emergencies and non-routine situations. Approved cartridge or canister type respirators can be used for benzene concentrations up to 50 ppm for short periods. A full facepiece is required above 10 ppm

To prevent skin contact, gloves, aprons, boots, etc of neoprene or other benzene-resistant materials should be used. Chemical goggles or face shields should be used if splashing is possible. Eyewash station should be available where splashing is probable.

**SECTION IX. SPECIAL PRECAUTIONS AND COMMENTS**

Whenever possible, less toxic solvents should be substituted for benzene. Consult health and safety services before benzene is used in plant operations. Do not breathe vapors. Prevent contact with liquid. It is a suspected cancer causing agent!

Keep away from heat, sources of ignition, and oxidizing agents. No smoking in areas of use. Store and handle as OSHA Class IB liquid.

Pre-placement detailed medical examination is needed. Workers who show heart, lung, kidney, liver, nervous disease, or any blood abnormality should not be assigned. Periodic physical examinations and area monitoring is required.

DATA SOURCE(S) CODE: 2-9, 12, 21

Judgments as to the suitability of information herein for purchaser's purposes are necessarily purchaser's responsibility. Therefore, although reasonable care has been taken in the preparation of such information, Genium Publishing Corporation extends no warranties, makes no representations and assumes no responsibility as to the accuracy or suitability of such information for application to purchaser's intended purposes or for consequences of its use.

APPROVALS: MIS, CRD *J. W. ...*

Industrial Hygiene and Safety *[Signature]*

Corporate Medical Staff *George F. Mart...*



**SECTION 1. MATERIAL IDENTIFICATION**

20

**MATERIAL NAME:** TOLUENE

**OTHER DESIGNATIONS:** Methyl Benzene, Methyl Benzol, Phenylmethane, Toluol, C<sub>7</sub>H<sub>8</sub>, CAS #0108-88-3

**MANUFACTURER/SUPPLIER:** Available from many suppliers, including:  
 Allied Corp., PO Box 2064R, Morristown, NJ 07960; Telephone: (201) 455-4400  
 Ashland Chemical Co., Industrial Chemicals & Solvents Div., PO Box 2219,  
 Columbus, OH; Telephone: (614) 889-3844

HMIS

H: 2

F: 3

R: 0

PPE\*

\*See sect. 8



R 1

I 3

S 2

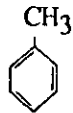
K 4

**SECTION 2. INGREDIENTS AND HAZARDS**

%

**HAZARD DATA**

Toluene



ca 100

8-hr TLV: 100 ppm, or  
 375 mg/m<sup>3</sup>\* (Skin)\*\*

Man, Inhalation, TClO:  
 100 ppm: Psychotropic\*\*\*

- \* Current (1985-86) ACGIH TLV. The OSHA PEL is 200 ppm with an acceptable ceiling concentration of 300 ppm and an acceptable maximum peak of 500 ppm/10 minutes.
- \*\* Skin designation indicates that toluene can be absorbed through intact skin and contribute to overall exposure.
- \*\*\* Affects the mind.

Rat, Oral, LD<sub>50</sub>: 5000 mg/kg

Rat, Inhalation, LCLo:  
 4000 ppm/4 hrs.

Rabbit, Skin, LD<sub>50</sub>: 14 gm/kg

Human, Eye: 300 ppm

**SECTION 3. PHYSICAL DATA**

Boiling Point ... 231°F (111°C)

Vapor Pressure @ 20°C, mm Hg ... 22

Water Solubility @ 20°C, wt. % ... 0.05

Vapor Density (Air = 1) ... 3.14

Evaporation Rate (BuAc = 1) ... 2.24

Specific Gravity (H<sub>2</sub>O = 1) ... 0.866

Melting Point ... -139°F (-95°C)

Percent Volatile by Volume ... ca 100

Molecular Weight ... 92.15

**Appearance and odor:** Clear, colorless liquid with a characteristic aromatic odor. The odor is detectable to most individuals in the range of 10 to 15 ppm. Because olfactory fatigue occurs rapidly upon exposure to toluene, odor is not a good warning property.

**SECTION 4. FIRE AND EXPLOSION DATA**

**LOWER**

**UPPER**

Flash Point and Method

Autoignition Temp.

Flammability Limits In Air

40°F (4°C) CC

896°F (480°C)

% by Volume

1.27

7.1

**EXTINGUISHING MEDIA:** Carbon dioxide, dry chemical, alcohol foam. Do not use a solid stream of water because the stream will scatter and spread the fire. Use water spray to cool tanks/containers that are exposed to fire and to disperse vapors.

**UNUSUAL FIRE/EXPLOSION HAZARDS:** This OSHA class IB flammable liquid is a dangerous fire hazard. It is a moderate fire hazard when exposed to oxidizers, heat, sparks, or open flame. Vapors are heavier than air and may travel a considerable distance to an ignition source and flash back.

**SPECIAL FIRE-FIGHTING PROCEDURES:** Fire fighters should wear self-contained breathing apparatus with full facepiece operated in a positive-pressure mode when fighting fires involving toluene.

**SECTION 5. REACTIVITY DATA**

**CHEMICAL INCOMPATIBILITIES:** Toluene is stable in closed containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization. This material is incompatible with strong oxidizing agents, dinitrogen tetroxide, silver perchlorate, tetranitromethane, and uranium hexafluoride. Contact with these materials may cause fire or explosion. Nitric acid and toluene, especially in the presence of sulfuric acid, will produce nitrated compounds that are dangerously explosive.

**CONDITIONS TO AVOID:** Avoid exposure to sparks, open flame, hot surfaces, and all sources of heat and ignition. Toluene will attack some forms of plastics, rubber, and coatings. Thermal decomposition or burning produces carbon dioxide and/or carbon monoxide.

**SECTION 6. HEALTH HAZARD INFORMATION | TLV**

Toluene is not considered a carcinogen by the NTP, IARC, or OSHA. **SUMMARY OF RISKS:** Vapors of toluene may cause irritation of the eyes, nose, upper respiratory tract, and skin. Exposure to 200 ppm for 8 hours causes mild fatigue, weakness, confusion, lacrimation (tearing) and paresthesia (a sensation of prickling, tingling, or creeping on the skin that has no objective cause). Exposure to higher concentrations may cause headache, nausea, dizziness, dilated pupils, and euphoria, and, in severe cases, may cause unconsciousness and death. The liquid is irritating to the eyes and skin. Contact with the eyes may cause transient corneal damage, conjunctival irritation, and burns if not promptly removed. Repeated and/or prolonged contact with the skin may cause drying and cracking. It may be absorbed through the skin in toxic amounts. Ingestion causes irritation of the gastrointestinal tract and may cause effects resembling those from inhalation of the vapor. Chronic overexposure to toluene may cause reversible kidney and liver injury. **FIRST AID: EYE CONTACT:** Immediately flush eyes, including under eyelids, with running water for at least 15 minutes. Get medical attention if irritation persists.\* **SKIN CONTACT:** Immediately flush skin (for at least 15 minutes) while removing contaminated shoes and clothing. Wash exposed area with soap and water. Get medical attention if irritation persists or if a large area has been exposed.\* **INHALATION:** Remove victim to fresh air. Restore and/or support breathing as required. Keep victim warm and quiet. Get medical help.\* **INGESTION:** Give victim 1 to 2 glasses of water or milk. Contact a poison control center. Do not induce vomiting unless directed to do so. Transport victim to a medical facility. Never give anything by mouth to a person who is unconscious or convulsing. \* **GET MEDICAL ASSISTANCE =** In plant, paramedic, community. Get medical help for further treatment, observation, and support after first aid, if indicated.

**SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES**

**SPILL/LEAK:** Notify safety personnel of large spills or leaks. Remove all sources of heat and ignition. Provide maximum explosion-proof ventilation. Limit access to spill area to necessary personnel only. Remove leaking containers to safe place if feasible. Cleanup personnel need protection against contact with liquid and inhalation of vapor (see sect. 8). **WASTE DISPOSAL:** Absorb small spills with paper towel or vermiculite. Contain large spills and collect if feasible, or absorb with vermiculite or sand. Place waste solvent or absorbent into closed containers for disposal using nonsparking tools. Liquid can be flushed with water to an open holding area for handling. Do not flush to sewer, watershed, or waterway. **COMMENTS:** Place in suitable container for disposal by a licensed contractor or burn in an approved incinerator. Consider reclaiming by distillation. Contaminated absorbent can be buried in a sanitary landfill. Follow all Federal, state, and local regulations. TLM 96: 100-10 ppm. Toluene is designated as a hazardous waste by the EPA. The EPA (RCRA) HW No. is U220 (40 CFR 261). The reportable quantity (RQ) is 1000 lbs/454 kg (40 CFR 117).

**SECTION 8. SPECIAL PROTECTION INFORMATION**

Provide general and local exhaust ventilation to meet TLV requirements. Ventilation fans and other electrical service must be nonsparking and have an explosion-proof design. Exhaust hoods should have a face velocity of at least 100 lfpm (linear feet per minute) and be designed to capture heavy vapor. For emergency or nonroutine exposures where the TLV may be exceeded, use an organic chemical cartridge respirator if concentration is less than 200 ppm and an approved canister gas mask or self-contained breathing apparatus with full facepiece if concentration is greater than 200 ppm. Safety glasses or splash goggles should be worn in all work areas. Neoprene gloves, apron, face shield, boots, and other appropriate protective clothing and equipment should be available and worn as necessary to prevent skin and eye contact. Remove contaminated clothing immediately and do not wear it until it has been properly laundered.

Eyewash stations and safety showers should be readily available in use and handling areas.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

**SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS**

**STORAGE SEGREGATION:** Store in a cool, dry, well-ventilated area away from oxidizing agents, heat, sparks, or open flame. Storage areas must meet OSHA requirements for class IB flammable liquids. Use metal safety cans for handling small amounts. Protect containers from physical damage. Use only with adequate ventilation. Avoid contact with eyes, skin, or clothing. Do not inhale or ingest. Use caution when handling this compound because it can be absorbed through intact skin in toxic amounts. **SPECIAL HANDLING/STORAGE:** Ground and bond metal containers and equipment to prevent static sparks when making transfers. Do not smoke in use or storage areas. Use nonsparking tools. **ENGINEERING CONTROLS:** Preplacement and periodic medical exams emphasizing the liver, kidneys, nervous system, lungs, heart, and blood should be provided. Workers exposed to concentrations greater than the action level (50 ppm) should be examined at least once a year. Use of alcohol can aggravate the toxic effects of toluene.

**COMMENTS:** Emptied containers contain product residues. Handle accordingly!

Toluene is designated as a hazardous substance by the EPA (40 CFR 116). DOT Classification: Flammable liquid. UN1294. Data Source(s) Code: 1-9, 12, 16, 20, 21, 24, 26, 34, 81, 82. CR

Judgements as to the suitability of information herein for purchaser's purposes are necessarily purchaser's responsibility. Therefore, although reasonable care has been taken in the preparation of such information, Genium Publishing Corp. extends no warranties, makes no representations and assumes no responsibility as to the accuracy or suitability of such information for application to purchaser's intended purposes or for consequences of its use.

Approvals *J.P. Accioppo, 11/86.*

Indust. Hygiene/Safety *JW 12-86*

Medical Review *SED Oct 86*

# MATERIAL SAFETY DATA SHEET

GENIUM PUBLISHING CORPORATION  
1145 CATALYN STREET  
SCHENECTADY, NY 12303-1836 USA  
(518) 377-8855



No. 318

XYLENE  
(mixed isomers)

Revision C

Date November 1980

SECTION I. MATERIAL IDENTIFICATION				
<p>MATERIAL NAME: XYLENE (mixed isomers)                      OTHER DESIGNATIONS: Xylol, Dimethylbenzene, C<sub>6</sub>H<sub>4</sub>(CH<sub>3</sub>)<sub>2</sub>; ASTM D843, D845 and D846;                      GE Material D5B9, CAS #001 330 207.                      MANUFACTURER: Available from many suppliers, including EXXON Company USA and Shell Chemical Company.</p>				
SECTION II. INGREDIENTS AND HAZARDS		%	HAZARD DATA	
<p>Xylene (o, m, p-isomers)                      Other C<sub>7</sub> to C<sub>9</sub> Hydrocarbons*</p> <p>*Material may contain ethylbenzene (8-hr TWA 100 ppm) and traces of toluene and C<sub>9</sub> aromatic and aliphatic hydrocarbons. Some commercial products may contain over 10% non-xylene hydrocarbons, mostly ethylbenzene.                      **Current OSHA standard and ACGIH (1980) TLV. NIOSH has proposed a 10-hr TWA of 100 ppm with a 200 ppm ceiling level (10 min. sample).                      STATUS: NCI bioassay for carcinogenesis study 9/78. TLV set to prevent irritant effects and CNS depression.</p>		<p>&gt;90                      &lt;10</p>	<p>8-hr TWA 100 ppm (skin)**                      or 435 mg/m<sup>3</sup>  <u>Xylene Typical</u>                      Human, inhalation                      TCl<sub>o</sub> 200 ppm                      (Irritation Effects)                      Rat, oral                      LD<sub>50</sub> 4.3 g/kg                      Human, oral                      LDLo 50 mg/kg</p>	
SECTION III. PHYSICAL DATA				
Boiling range, 1 atm, deg C	135-145*	Specific gravity (H <sub>2</sub> O=1)	0.86-0.87	
Vapor pressure at 20 C, mm Hg	ca 6	Volatiles, %	ca 100	
Vapor density (Air=1)	3.7	Evaporation rate (BuAc=1)	0.6	
Solubility in water	Negligible	Molecular weight	106.18	
<p>Appearance &amp; Odor: Light colored or colorless, mobile liquid with an aromatic odor. The recognition threshold (100% of test panel) is about 0.3 ppm in air (unfatigued) for xylene.                      *Wider and narrower boiling range materials are commercially available.</p>				
SECTION IV. FIRE AND EXPLOSION DATA			LOWER	UPPER
Flash Point and Method	Autoignition Temp.	Flammability Limits In Air		
>77 F (TCC)	867 F	Volume %	1	7
<p>Extinguishing Media: Use dry chemical, foam, CO<sub>2</sub>, and water fog or steam to provide a smothering effect on fire. A water stream can scatter flames. A spray of water may be used to cool fire-exposed containers.                      This flammable liquid is a dangerous fire hazard and a moderate explosion hazard when exposed to heat or flame. Heavier-than-air vapors can flow along surfaces to distant ignition sources and flash back.                      Firefighters should use self-contained breathing apparatus.</p>				
SECTION V. REACTIVITY DATA				
<p>This material is stable in closed containers at room temperature. It does not polymerize.                      It is flammable (OSHA Class IC liquid) and can form explosive mixtures with air. Keep away from sources of heat, sources of ignition and strong oxidizing agents. Thermal-oxidative degradation in air can produce toxic vapors and gases, including carbon monoxide and oxides of nitrogen.</p>				

## SECTION VI. HEALTH HAZARD INFORMATION

TLV 100 ppm or 435 mg/m<sup>3</sup>

Inhalation of xylene at the TLV may cause mild irritation and dizziness in sensitive persons. Concentrations from 100-200 ppm may cause nausea, headache and depression. Vapor levels >200 ppm can have an anesthetic effect. Skin contact may produce mild irritation and skin defatting. Eye contact may cause burning and irritation. Ingestion of xylene may cause poisoning. One ounce or more may be fatal. Aspiration can be a hazard if this material is swallowed.

FIRST AID:

Eye Contact: Irrigate with water for 15 minutes. Get medical attention!

Skin Contact: Wash with soap and water. Remove contaminated clothing promptly. Replace lost skin oils with approved lotions or creams.

Inhalation: Remove victim to fresh air. Restore breathing if required. Get medical attention if symptoms persist or if nausea or collapse has occurred.

Ingestion: Get medical attention immediately! Give white mineral oil demulcent and saline cathartic, but do not induce vomiting unless directed by a physician.

Maintain observation of patient for possible delayed onset of pulmonary edema.

## SECTION VII. SPILL, LEAK, AND DISPOSAL PROCEDURES

Notify safety personnel. Remove all ignition sources. Provide adequate ventilation. Use vermiculite or sand to absorb spill; scrape up with nonsparking tools and place in a covered metal container. The absorbed material may be burned in an open pit, or placed in cardboard boxes and burned in an incinerator. Spilled liquid can be flushed away from sensitive locations with a water stream; flush to open area not to sewer!

DISPOSAL: Scrap liquid may be atomized into an approved incinerator, or it may be disposed of via a licensed solvent disposal company. When large amounts are involved reclamation procedures may prove economical. Follow Federal, State, and Local regulations.

Aquatic toxicity rating TLm 96: 100-10 ppm.

## SECTION VIII. SPECIAL PROTECTION INFORMATION

Provide general ventilation and efficient exhaust ventilation (explosion-proof equipment to meet TLV requirements and to control heavier-than-air vapors. Use >100 fpm face velocity for exhaust hoods. Use approved organic vapor canister respirators for short periods of nonroutine work or emergency situations at up to 1000-2000 ppm and approved self-contained respirators for higher and unknown vapor levels. Full facepiece required. Buna-N rubber gloves and aprons should be worn to prevent contact of xylene with the skin. Safety glasses or goggles should be used for eye protection and eyewash stations should be readily accessible to use areas.

Comprehensive preplacement and biennial medical examinations to be directed toward, but not limited to, liver, kidney, gastrointestinal disorders, skin irritation, and the central nervous system.

## SECTION IX. SPECIAL PRECAUTIONS AND COMMENTS

Store in closed containers in a clean, cool, well-ventilated area, away from sources of heat, sources of ignition and strong oxidizing agents. Protect containers from physical damage. Bond and ground metal containers when transferring liquid. Use metal safety cans for small amounts. Use nonsparking tools for work in solvent areas. No Smoking in areas of use or storage.

Prevent skin contact and remove contaminated clothing promptly. Avoid repeated or prolonged breathing of vapor. Do not ingest!

DATA SOURCE(S) CODE: 1-12, 19-21, 23, 26, 31, 34, 37-39

Judgments as to the suitability of information herein for purchaser's purposes are necessarily purchaser's responsibility. Therefore, although reasonable care has been taken in the preparation of such information, Genium Publishing Corporation extends no warranties, makes no representations and assumes no responsibility as to the accuracy or suitability of such information for application to purchaser's intended purposes or for consequences of its use.

APPROVALS: MIS  
CRDIndustrial Hygiene  
and Safety

MEDICAL REVIEW: December 5, 1980

GENIUM PUBLISHING

# MATERIAL SAFETY DATA SHEET

GENIUM PUBLISHING CORPORATION  
 1145 CATALYN STREET  
 SCHENECTADY, NY 12303-1836 USA  
 (518) 377-8855



No. 385

ETHYL BENZENE

Date August 1978

SECTION I. MATERIAL IDENTIFICATION		
MATERIAL NAME: ETHYL BENZENE OTHER DESIGNATIONS: Phenylethane, Ethylbenzol, C <sub>2</sub> H <sub>5</sub> C <sub>6</sub> H <sub>5</sub> , CAS# 000 100 414 MANUFACTURER: Available from several suppliers.		
SECTION II. INGREDIENTS AND HAZARDS	%	HAZARD DATA
Ethyl Benzene	ca 100	8-hr TWA 100 ppm*
*Current OSHA permissible exposure level. A Standard was proposed by OSHA in October 1975 which includes an <u>action level</u> of 50 ppm, and detailed requirements of monitoring, medical surveillance, employee training, etc.; when exposure exceeds 50 ppm. It has not yet issued as a legal requirement.		Human, inhalation TCl <sub>o</sub> 100 ppm for <u>8 hr (irritation)</u> Rat, Oral LD50 3500 mg/kg
SECTION III. PHYSICAL DATA		
Boiling point at 1 atm, deg C -- 136	Specific gravity 20/4C -----	0.867
Vapor pressure at 25.9 C, mm Hg - 10	Volatiles. % -----	ca 100
Vapor density (Air=1) ----- 3.66	Evaporation rate (BuAc=1) -----	<1
Water solubility at 20 C Wt. % - 0.015	Melting point, deg C -----	-95
	Molecular weight -----	106.16
Appearance & Odor: Clear, colorless liquid with an aromatic hydrocarbon odor.		
SECTION IV. FIRE AND EXPLOSION DATA		
Flash Point and Method	Autoignition Temp.	Flammability Limits In Air
59 F (15 C) (closed cup)	810 F (432 C)	Volume %
		LOWER UPPER
		1.0 6.7
Extinguishing media: Carbon dioxide, dry chemical or "alcohol" foam. A water spray may be ineffective to put out fire, but may be used to cool fire-exposed containers. A stream of water can spread fire of burning liquid. This is a flammable liquid (OSHA Class IB) which can readily form explosive mixtures with air, especially when heated. Heavier-than-air vapors can flow along surfaces to reach distant ignition sources, and then flash back. Firefighters should use self-contained breathing equipment and eye protection to fight fires in enclosed places.		
SECTION V. REACTIVITY DATA		
This material is stable in storage in closed containers at room temperature. It does not polymerize. This flammable material should be kept separated from oxidizing agents, strong acids and bases and ammonia. Thermal-oxidative degradation can produce toxic products, including carbon monoxide.		

**SECTION VI. HEALTH HAZARD INFORMATION**

TLV 100 ppm

Excessive exposure to vapors will irritate the eyes and mucous membranes of the upper respiratory tract. Sustained high levels can produce headache, depression of the central nervous system, narcosis and coma.  
Liquid contact is irritating to the eyes and irritation and defatting to the skin, leading to dermatitis on prolonged or repeated exposures. Ingestion may lead to aspiration of liquid into the lungs small amounts of aspirated ethyl benzene cause extensive edema and hemorrhage of lung tissue. FIRST AID:

Eye contact: Wash eyes well with plenty of running water. Get medical help if irritation persists.

Skin contact: Wash exposed areas of skin. Promptly remove contaminated clothing.

Inhalation: Remove victim to fresh air. Restore breathing if necessary. Get medical help for serious exposure.

Ingestion: Get prompt medical help! (The danger of aspirating ethyl benzene into the lungs indicates medical direction before inducing vomiting.)

**SECTION VII. SPILL, LEAK, AND DISPOSAL PROCEDURES**

Personnel involved in leak or spill control and clean-up must use protective equipment to avoid inhalation of vapors and contact with liquid. Eliminate ignition sources. Provide maximum explosion-proof ventilation.

Pick-up spilled material for recovery or disposal. Absorb with sand, etc. for disposal in a sanitary landfill or with paper towels or cloths for burning. Water can be used to flush liquid away from sensitive areas to special catch basins or ground, but not to sewer or surface water.

DISPOSAL: Scrap material can be burned in approved incinerators in accordance with Federal, State and local regulations.

**SECTION VIII. SPECIAL PROTECTION INFORMATION**

Provide explosion-proof general and local exhaust ventilation to meet TLV requirements. Approved respirators must be available for non-routine or emergency use. A full face respirator with organic vapor cartridge can be used up to 1000 ppm; a gas mask with organic vapor canister can be used up to 5000 ppm. a self-contained respirator is needed for high and unknown concentrations of vapor.

Use impervious gloves and clothing and a face shield to prevent repeated or prolonged contact with the liquid. Where splashing is possible chemical goggles should be used. Clothing contaminated with ethyl benzene should be promptly removed and not reused until free of the contaminant.

Exposures above the action level, liquid contact, or working where fire and explosion hazards exist may require instituting employee training, medical surveillance, vapor concentration monitoring, record keeping, etc. when the proposed standard issues.

**SECTION IX. SPECIAL PRECAUTIONS AND COMMENTS**

Store this material in tightly closed containers in cool, well-ventilated areas, away from oxidizing agents, heat and sources of ignition. Use non-sparking tools around this material. Containers must be electrically bonded and grounded for transfers of liquid. Use safety cans for small amounts. No Smoking! where this material is stored or used.

Screen workers for history of kidney, liver, skin and lung problems which could give increased sensitivity and risk in ethyl benzene exposure.

Avoid breathing of vapors and contact with liquid. Do not ingest. Chronic properties are not fully known; use with care.

DATA SOURCE(S) CODE: 2-9, 11, 12

APPROVALS: MIS, CRD *J. M. Nelson*

Industrial Hygiene and Safety *D. White*

Corporate Medical Staff *J. F. Marten MD*

Judgments as to the suitability of information herein for purchaser's purposes are necessarily purchaser's responsibility. Therefore, although reasonable care has been taken in the preparation of such information Genium Publishing Corporation extends no warranties, makes no representations and assumes no responsibility as to the accuracy or suitability of such information for application to purchaser's intended purposes or for consequences of its use.



# MATERIAL SAFETY DATA SHEET

GENIUM PUBLISHING CORPORATION  
 1145 CATALYN STREET  
 SCHENECTADY, NY, 12303-1836 USA  
 (518) 377-8855



No. 467

AUTOMOTIVE  
 GASOLINE, LEAD-FREE

Date October 1981

SECTION I. MATERIAL IDENTIFICATION				
<p>MATERIAL NAME: AUTOMOTIVE GASOLINE, LEAD-FREE                      DESCRIPTION: A volatile blend of hydrocarbons for automotive fuel                      OTHER DESIGNATIONS: Petrol, CAS #008 006 619, ASTM D439                      MANUFACTURER: Available from several suppliers.</p>				
SECTION II. INGREDIENTS AND HAZARDS		%	HAZARD DATA	
<p>Gasoline                      A hydrocarbon blend that can include normal and branched chain alkanes, cycloalkanes, alkenes, aromatics and other additives.** (Lead max 0.013 g/L, phosphorus max 0.0013 g/L, sulfur max 0.10 wt%. May contain benzene, &lt;5%; see ASTM D3606).                      *ACGIH 1981 TLV (Intended Changes List). See also Am. Ind. Hyg. A. 39 110-117 (1978)                      **The composition of fuel is varied with altitude and seasonal requirements for a locality. The blend must meet antiknock requirements. (Antiknock Index min 85, ASTM D439.)</p>		100	<p>8-hr TWA 300 ppm or 900 mg/m<sup>3</sup>*                       Man:                      Eye: 500 ppm/1H                      Moderate irritation                       Inhalation:                      TCLo 900 ppm/1H                      TFX:CNS</p>	
SECTION III. PHYSICAL DATA				
<p>Distillation at 1 atm, Initial, deg C &gt;39                      50% distilled - 77-121                      End point ----- &lt;240</p>		<p>Specific gravity, 60/60 F - 0.72-0.76                      Melting point, deg C ----- -90.5-95.4                      Evaporation rate ----- N/A</p>		
<p>Vapor density (Air=1) ----- 3.0-4.0                      Solubility in water ----- Insoluble</p>				
<p>Appearance and Odor: A clear, mobile liquid with a characteristic odor which can be recognized at about 10 ppm in air. (Gasoline may be colored with dye.)</p>				
SECTION IV. FIRE AND EXPLOSION DATA			LOWER	UPPER
Flash Point and Method	Autoignition Temp.	Flammability Limits In Air		
-45 F	536-853 F	% by volume	1.4	7.6
<p>Extinguishing Media: Dry chemical, carbon dioxide, alcohol foam. Use of water may be ineffective to extinguish fire, but use water spray for cooling fire-exposed drums and tanks to prevent pressure rupture. It is a dangerous fire and explosion hazard when exposed to heat and flames. Vapors can flow along surfaces, reach distant ignition sources and flash back. Can react violently with oxidizing agents.                      Firefighters should wear self-contained breathing apparatus and full protective clothing.</p>				
SECTION V. REACTIVITY DATA				
<p>This is a stable material in closed containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization.                      This is an OSHA Class IA flammable liquid. A mixture of gasoline vapors and air can be explosive. It is incompatible with oxidizing agents.                      Thermal-oxidative degradation can yield carbon monoxide and partially oxidized hydrocarbons.</p>				

**SECTION VI. HEALTH HAZARD INFORMATION**

TLV 300 ppm (See Sect. II)

Inhalation causes intense burning of the mucous membranes, throat and respiratory tract; overexposure to vapors can lead to bronchopneumonia. Inhalation of high conc. can cause fatal pulmonary edema. Repeated or prolonged skin exposure causes dermatitis. Can cause blistering of skin due to its defatting properties. Exposure to eyes can cause hyperemia of the conjunctiva.  
 Ingestion or excessive vapors can cause inebriation, drowsiness, blurred vision, vertigo, confusion, vomiting and cyanosis (2000 ppm produces mild anesthesia in 30 min, higher conc. are intoxicating in less time.) Aspiration after ingestion causes bronchitis, pneumonia, or edema which can be fatal.

**FIRST AID:**

- Eye Contact: Flush thoroughly with running water for 15 min. including under eyelids.
- Skin Contact: Remove contaminated clothing. Wash affected area with soap and water.
- Inhalation: Remove to fresh air. Restore breathing and administer oxygen if needed.
- Ingestion: Do not induce vomiting. Aspiration hazard. Contact physician.

Seek prompt medical assistance for further treatment, observation and support.

**SECTION VII. SPILL, LEAK, AND DISPOSAL PROCEDURES**

Notify safety personnel of leaks or spills. Remove sources of heat or ignition. Provide adequate ventilation. Clean-up personnel require protection against liquid contact and vapor inhalation. If a leak or spill has not ignited, use water spray to disperse vapors and to protect men attempting to stop the leakage. Contain spill. Do not allow to enter sewer or surface water. Add absorbent solid to small spills or residues and pick up for disposal.

DISPOSAL: Burn scrap material in an approved incinerator. Burn contaminated liquid by spraying into an incinerator. Follow Federal, State, and Local regulations.

**SECTION VIII. SPECIAL PROTECTION INFORMATION**

Use general and local exhaust ventilation (explosion-proof) to keep vapors below the TLV requirements in the workplace. Respirators should be available for nonroutine or emergency use above the TLV.

Avoid eye contact by use of chemical safety goggles and/or full faceshield where splashing is possible. Wear protective clothing appropriate for the work situation to minimize skin contact such as rubber gloves and boots. Clothing to be changed daily and laundered.

Eyewash fountains, showers and washing facilities should be readily accessible. Provide suitable training to those handling and working with this material.

**SECTION IX. SPECIAL PRECAUTIONS AND COMMENTS**

Store in closed containers in a cool, dry, well-ventilated area away from sources of heat, ignition and strong oxidizing agents. Protect containers from physical damage.

Avoid direct sunlight. Storage must meet requirements of OSHA Class IA liquid.

Outdoor or detached storage preferred. No smoking in areas of use. Prevent static electric sparks and use explosion-proof electrical services. (Must meet code.)

Avoid skin and eye contact. Avoid inhalation of vapors. Wear clean work clothing daily.

Indoor use of this material requires exhaust ventilation to remove vapors.

ICC Flammable Liquid, Red Label. IABFI.: Flammable Liquid DOT I.D. No. UN 1203.

DOT Classification: **FLAMMABLE LIQUID**

DATA SOURCE(S) CODE: 2.4-9.34.37

Judgments as to the suitability of information herein for purchaser's purposes are necessarily purchaser's responsibility. Therefore although reasonable care has been taken in the preparation of such information Genium Publishing Corporation extends no warranties, makes no representations and assumes no responsibility as to the accuracy or suitability of such information for application to purchaser's intended purposes or for consequences of its use.

APPROVALS: MIS  
 CRD

*J.M. Fisher*

Industrial Hygiene  
 and Safety

*JHU 10-27-81*

MEDICAL REVIEW: 14 November 1981

**ATTACHMENT B**

**Foxboro OVA Calibration Protocol**

## GENERAL DESCRIPTION

The OVA 128 Analyzer is designed to detect and measure hazardous organic vapors and gases found in most industries. It has broad application since it has a chemically resistant sampling system and can be calibrated to almost all organic vapors. It can provide accurate indication of gas concentration in one of three ranges: 0 to 10 ppm; 0 to 100 ppm; or 0 to 1000 ppm. While designed as a lightweight portable instrument, it can be permanently installed to monitor a fixed point.

The instrument utilizes the principle of hydrogen flame ionization for detection and measurement of organic vapors. The instrument measures organic vapor concentration by producing a response to an unknown sample, which can be related to a gas of known composition to which the instrument has previously been calibrated. During normal survey mode operation, a continuous sample is drawn into the probe and transmitted to the detector chamber by an internal pumping system.

The sample stream is metered and passed through particle filters before reaching the detector chamber. Inside the detector chamber, the sample is exposed to a hydrogen flame which ionizes the organic vapors. When most organic vapors burn, they leave positively charged carbon-containing ions. An electric field drives the ions to a collecting electrode. As the positive ions are collected, a current corresponding to the collection rate is generated. This current is measured with a linear electrometer preamplifier which has an output signal proportional to the ionization current. A signal conditioning amplifier is used to amplify the signal from the preamp and to condition it for subsequent meter or external recorder display. The display is an integral part of the Probe/Readout Assembly and has 270° scale deflection.

In general, the hydrogen flame ionization detector is more sensitive for hydrocarbons than any other class of organic compounds. The response of the OVA varies from compound to compound, but gives repeatable results with all types of hydrocarbons; i.e., saturated hydrocarbons (alkanes), unsaturated hydrocarbons (alkenes and alkynes) and aromatic hydrocarbons.

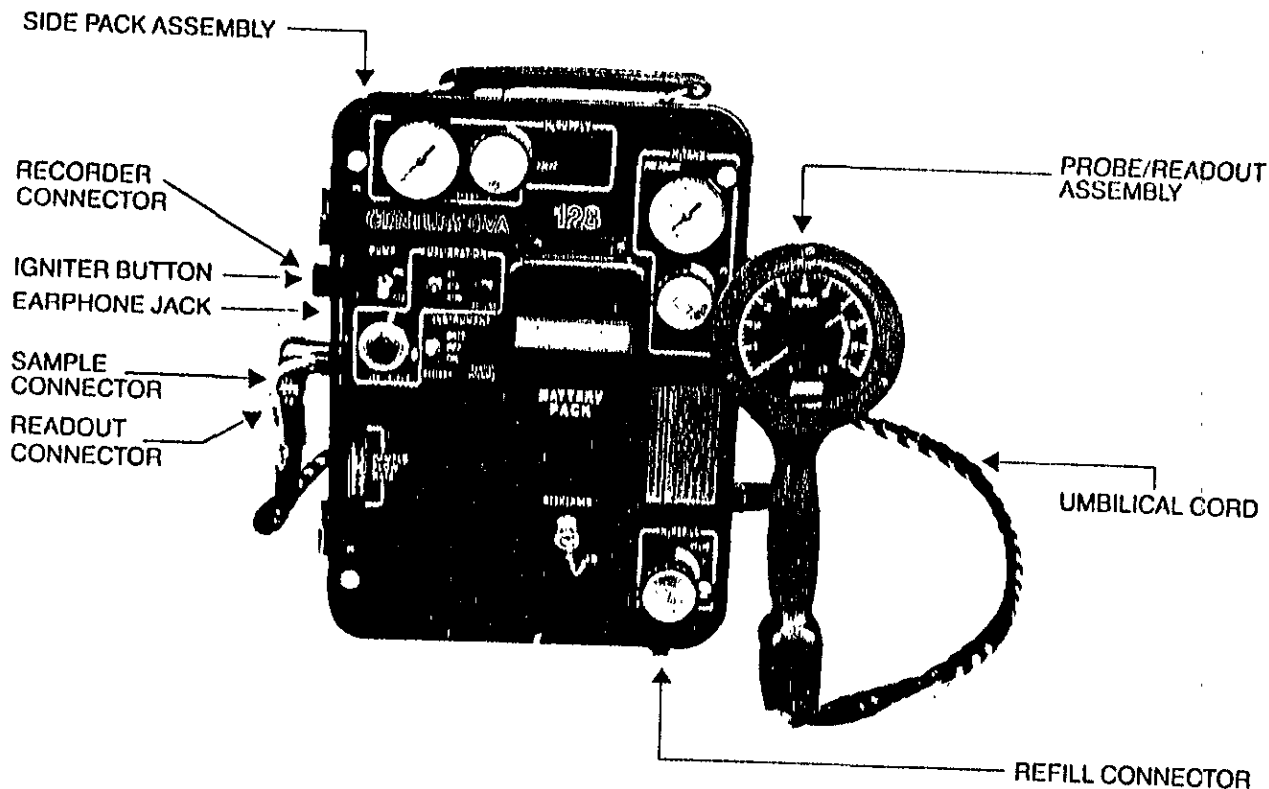


FIGURE 2  
PORTABLE ORGANIC VAPOR ANALYZER  
Model OVA 128

Typical response of various hydrocarbons, relative to methane is as follows:\*

Compound	Relative Response (percent)
Methane	100 (reference)
Hexane	70
Propane	64
N-butane	61
N-pentane	100
Ethylene	85
Acetylene	200
Benzene	150
Toluene	120
Ethane	90

Compounds containing oxygen, such as alcohols, ethers, aldehydes, carboxylic acid and esters give a lower response than that observed for hydrocarbons. This is particularly noticeable with compounds having a high ratio of oxygen to carbon such as the lower members of each series which have one, two or three carbons. With compounds containing higher numbers of carbons, the effect is diminished to such an extent that the response is similar to that of the corresponding hydrocarbons.

Nitrogen-containing compounds (i.e., amines, amides, and nitriles) respond in a manner similar to that observed for oxygenated materials. Halogenated compounds also show a lower relative response as compared with hydrocarbons. Materials containing no hydrogen, such as carbon tetrachloride, give the lowest response; the presence of hydrogen in the compounds results in higher relative responses. Thus,  $\text{CHCl}_3$  gives a much higher response than does  $\text{CCl}_4$ . As in the other cases, when the carbon to halogen ratio is 5:1 or greater, the response will be similar to that observed for simple hydrocarbons.

\*NOTE: Each OVA detector will have slightly different responses for organic vapors relative to methane. The user should determine responses for his individual instrument. The typical response of various compounds relative to methane is as follows:

<b>KETONES</b>	
Acetone	60
Methyl ethyl ketone	80
Methyl isobutyl ketone	100
<b>ALCOHOLS</b>	
Methyl alcohol	15
Ethyl	25
Isopropyl	65
<b>HALOGEN COMPOUNDS</b>	
Carbon tetrachloride	10
Chloroform	65
Trichloroethylene	70
Vinyl chloride	35

The OVA has negligible response to carbon monoxide and carbon dioxide which, due to their structure, do not produce appreciable ions in the detector flame. Thus, other organic materials may be analyzed in the presence of  $\text{CO}$  and  $\text{CO}_2$ .

## Applications

- (1) Measurement of most toxic organic vapors present in industry for compliance with Occupational Safety and Health Administration (OSHA) requirements.
- (2) Evaluation and monitoring applications in the air pollution field.
- (3) Source identification and measurement for fugitive emissions (leaks) as defined by EPA.
- (4) Forensic science applications.
- (5) Controlling and monitoring atmospheres in manufacturing and packaging operations.
- (6) Leak detection related to volatile fuel handling equipment.
- (7) Monitoring the background level of organic vapors at hazardous waste sites.
- (8) Quality control procedures geared to leak checking, pressurized system checks, combustion efficiency checks, etc.

## Major Features

The basic instrument consists of two major assemblies, the Probe/Readout Assembly and the Side Pack Assembly (See Figure 2). The recorder is optional on all models, but is normally used with all instruments which incorporate the GC Option. The output meter and alarm level adjustments are incorporated in the Probe/Readout Assembly.

The Side Pack Assembly contains the remaining operating controls and indicators, electronic circuitry, detector chamber, hydrogen fuel supply, and electrical power supply.

Other major features are: linear scale readout, approximately two second response time and portable operating time of 8 hours for fuel supply and battery pack. A battery test feature allows charge condition to be read on the meter. Hydrogen flame-out is signified by an audible alarm plus a visual indication on the meter. The instrument contains a frequency modulated detection alarm which can be preset to sound at a desired concentration level. The frequency of the detection alarm varies as a function of detected level giving an audible indication of organic vapor concentration. An earphone is provided to allow the operator to hear the alarm in noisy areas or to avoid disturbing workers.

During use, the Side Pack Assembly can be carried by the operator on either his left or right side or as a back pack. The Probe/Readout Assembly can be detached from the Side Pack Assembly and disassembled for transport and storage.

### Standard Accessories

A variety of sampling fixtures can be used. In addition, small diameter tubing can be used for remote sampling or electrically insulated flexible extensions can be used for places that are difficult to reach.

### Telescoping Probe

Probe length can be increased or decreased over a 22 to 30 inch range to suit the individual user. A knurled locking nut is used to lock the probe at the desired length. The probe is attached to the Readout Assembly. When appropriate, the probe is replaced with a Close Area Sampler, which is supplied as a standard accessory.

### Sampling Accessories

Part Number	Description
510125-1	Close area sampler - Connects directly to the readout assembly.
510035-1	Telescoping wand - Adjustable length - accommodates the probe listed below.
510126-1	Tubular area sampler - Used with the telescoping wand.

### Particulate Filters

The primary filter of porous stainless steel is located behind the sample inlet connector (see Side Pack Assembly drawing). In addition, a replaceable porous metal filter is installed in the "close area" sampler.

### Carrying Case

An instrument carrying case is provided to transport, ship and store the disassembled Probe/Readout Assembly, the Side Pack Assembly and other equipment.

### Specifications

READOUT:	0 to 10, 0 to 100, 0 to 1000 ppm (linear)
SAMPLE FLOW RATE:	1 1/2 to 2 1/2 litre per minute at 22°C, 760 mm, using close area sampler
RESPONSE TIME:	Approximately 2 seconds for 90% of final reading.
PRIMARY ELECTRICAL POWER:	12 volt (nominal) battery pack.
FUEL SUPPLY:	Approximately 75 mL volume tank of pure hydrogen, maximum pressure 2400 psig, fillable in case.
HYDROGEN FLOW RATE:	Factory set 12.5 ±0.5 mL/min (minus GC option) 11.0 ±0.5 mL/min (GC models)
PORTABLE OPERATING TIME:	Minimum 8 hours with battery fully charged, hydrogen pressure at 1800 psig.
PHYSICAL DIMENSIONS:	9" x 12" x 5" (229 mm x 305 mm x 127 mm) Sidepack only.
WEIGHT:	12 pounds (5.5 kg) (sidepack and hand-held probe assembly)
DETECTION ALARM:	Audible alarm plus meter indication. User preset to desired level.
FLAME-OUT ALARM:	Audible alarm plus meter indication (needle drops off scale in negative direction).
BATTERY TEST:	Battery charge condition indicated on readout meter. Upon activation of momentary contact switch, a meter reading above the indicator line means that there is 4 hours minimum service life remaining (at 22°C).
FILTERS:	In-line sintered metal filters will remove particles larger than 10 microns.
OPERATING TEMPERATURE RANGE:	10°C to 40°C.
MINIMUM AMBIENT TEMPERATURE:	15°C for Flame Ignition (coldstart).
ACCURACY:	Based on the use of a calibration gas for each range:

Calibration Temp. °C	Operating Temp. °C	Accuracy in % of Individual Full Scale		
		X1	X10	X100
20 to 25	20 to 25	±20	+10	+10
20 to 25	10 to 40	±20	±20	±20

RELATIVE HUMIDITY: 5% to 95%, Effect on accuracy: ±20% of individual full scale

RECORDER OUTPUT: 0 to 5 volts

MINIMUM DETECTABLE LIMIT (METHANE): 0.2 ppm

STANDARD ACCESSORIES:

1. Instrument carrying and storage case
2. Hydrogen fuel filling hose assembly
3. Battery charger
4. Earphone
5. Various sampling fixtures
6. Maintenance tool kit
7. Operators manual (2 each)
8. Padded leather carrying straps

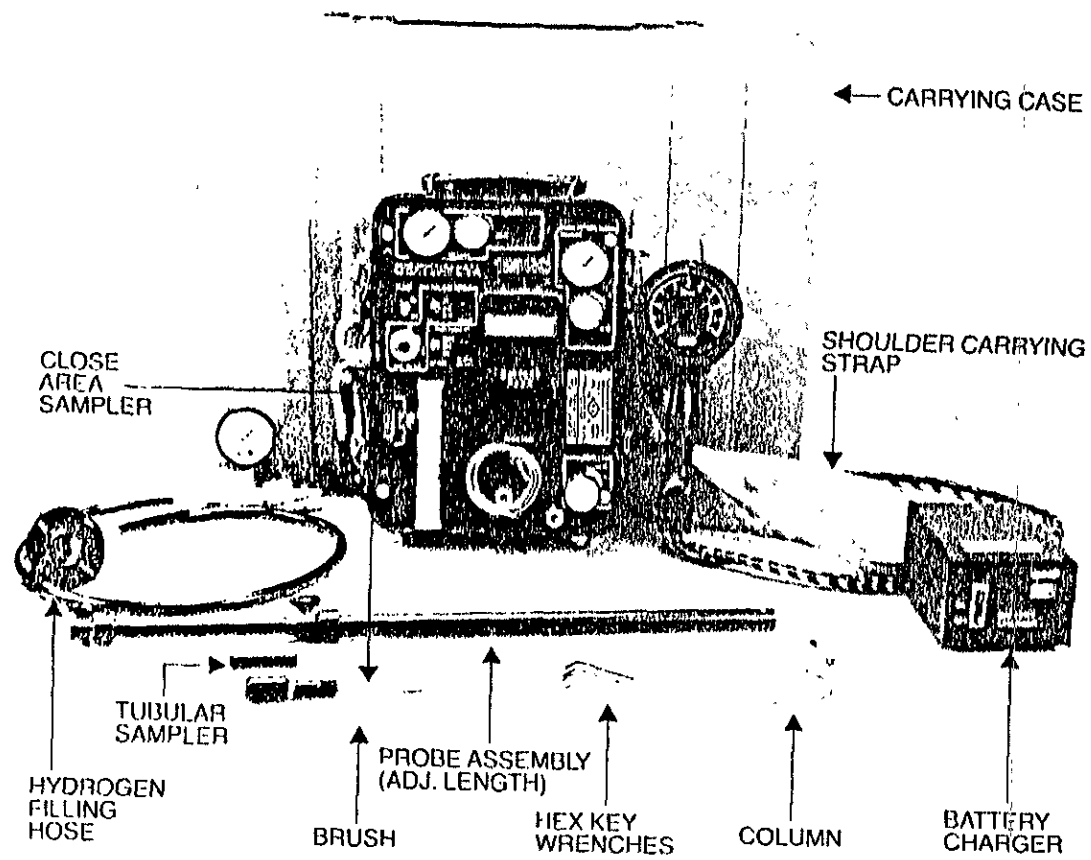


FIGURE 3  
OVA-L2B ANALYZER COMPONENTS  
(Gas Chromatograph Model Shown)

## CALIBRATION

### Recalibration to Various Organic Vapors

The OVA 128 is capable of responding to nearly all organic compounds. At the time of manufacture, the analyzer is calibrated to mixtures of methane in air. For precise analysis it is necessary to recalibrate with the specific compound of interest. The GAS SELECT control is used to set the electronic gain for a particular compound.

The instrument is recalibrated using a mixture of a specific vapor in air, with known concentration. After the instrument is in operation and the normal background is zeroed, draw a sample of the calibration gas into the instrument. The GAS SELECT Knob on the panel is then used to set the read-out meter indication to correspond to the concentration of the calibration gas mixture.

The instrument has now been calibrated to the vapor mixture being used. After this adjustment, the setting on the "digital" should be recorded for that particular organic vapor compound. This exercise can be performed for a large variety of compounds, thereby generating a "library" which can be used for future reference without need for additional calibration standards.

To read a particular compound, the GAS SELECT control is turned to the predetermined setting for the compound. Calibration on any one range automatically calibrates the other two ranges.

### Using Empirical Data

Relative response data can be used to estimate the concentration of a vapor without need to recalibrate the analyzer. With the instrument calibrated to methane, obtain the concentration reading for a calibration sample of the test vapor. The response factor (R) in percent, for that vapor is:

$$R = \frac{\text{Actual Concentration}}{\text{Measured Concentration}}$$

To determine the concentration of an unknown sample of that vapor, multiply the measured concentration by R.

## Calibration Standards

### Commercial Standards

Commercially available standard samples offer the most convenience and are recommended for the most precise analyses. Always remember to obtain the desired vapor in an air background. Samples should be drawn from the cylinder into a collapsed sample bag, then drawn from the bag by the instrument to prevent a pressure or vacuum at the sample inlet.

### Preparation of Standards

The following procedure is for generating calibration standards as an alternative to using commercial mixtures.

Obtain a five (5) gallon glass bottle and determine its volume by measuring the volume of water needed to fill it (use of a 1000 ml graduated cylinder is convenient). Another approach is to weigh the empty bottle, fill it with water and weigh again. The difference between the two values is the weight of water. By multiplying the weight of water in pounds by 0.455, obtain the volume of the bottle in liters. Empty the water and allow the bottle to dry. Place a one-foot piece of Teflon tubing in the flask to aid in mixing the vapors uniformly with the air. The volume of such a bottle should be about 20 liters, which is 20,000 mL. If the volume were 20,000 mL, then a 2 mL sample of a gas would be equivalent to 200 mL per 2 million mL or 100 ppm (V/V). Use of a gas tight syringe, readable in 0.01 mL, allows the preparation of mixtures in the 1-2 ppm range, which are sufficient for the quantitative estimation of concentrations. A plastic stopper is loosely fitted to the tip of the bottle. The needle of the syringe is placed inside the jug neck and the stopper squeezed against the needle to decrease leakage during sample introduction. Inject the sample into the bottle and withdraw the needle without removing the stopper. Tighten the stopper and shake the bottle for a few minutes with sufficient vigor that the plastic tubing in the bottle moves around to ensure good mixture of the vapors with the air.



**Calculations**

$$\text{Injection} = \frac{\text{Volume Concentration} \times \text{Molecular Weight} \times \text{System Volume}}{\text{Density} \times \text{Molar Volume at STP}^*}$$

$$= \frac{(C) (MW) (V)}{(D) (V)}$$

Using the Ideal Gas Law,  $PV=RT$ , the molar volume of any gas at STP (25°C and 1 atm) is:

$$V = \frac{RT}{P} = \frac{\text{Universal Gas Constant} \times \text{Temperature}}{\text{Pressure}}$$

$$= \frac{(0.08206 \frac{\text{litre atm}}{\text{mol K}}) (298.15 \text{ K})}{1 \text{ atm}}$$

$$= (24.47 \text{ L}) (\text{mol}^{-1})$$

Therefore, the injection volume necessary to prepare 1 liter of a 100 ppm sample of hexane would be:

$$\text{Injection Volume} = \frac{(100 \text{ ppm}) (86.18 \text{ g}) (\text{mol}^{-1}) (1 \text{ liter})}{(0.659 \text{ g}) (\text{mL}^{-1}) (24.47 \text{ L}) (\text{mol}^{-1}) (1000 \text{ mL}) (1^{-1})}$$

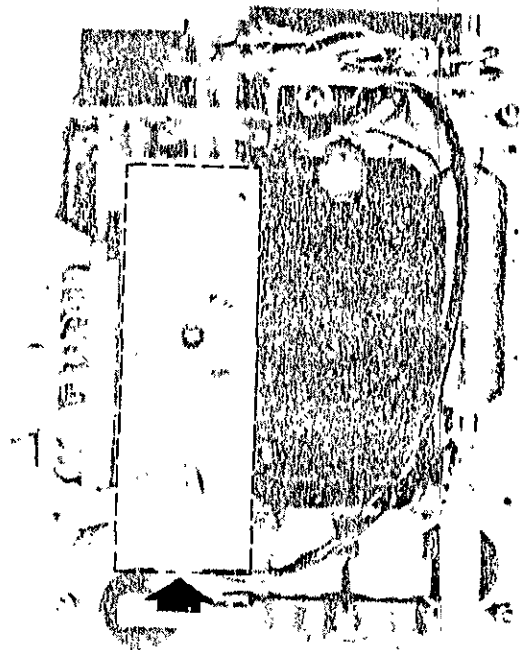
$$= 0.534 \mu\text{L}$$

\* STP - Standard Temperature and Pressure

**Primary Calibration for Methane**

Internal electronic adjustments are provided to calibrate and align the circuits. After initial factory calibration, it should not be necessary to repeat the calibration unless the analyzer undergoes repairs which affect calibration. If the OVA 120 will be extensively used for analysis of a sample other than methane, recalibration of the electronics (after resetting the GAS SELECT CONTROL) may result in better accuracy. See Recalibration to Various Organic Vapors above.

Primary calibration of this instrument is accomplished at the factory using methane-in-air, sample gases.



R-31 R-32 R-33 R-38

FIGURE 4  
LOCATION OF ELECTRONIC ADJUSTMENTS

## Calibration Using Known Samples for Each Range (Refer to Figure 4)

The accuracy stated under Specifications is obtained when the instrument is calibrated with known concentrations for each range. Prepare separate samples of methane-in-air in these concentration ranges: 7 to 10 ppm, 90 to 100 ppm, and 900 to 1000 ppm. Calibrate the instrument as follows:

- a) Place the instrument in normal operation and allow a minimum of 15 minutes for warm-up and stabilization.
- b) Set the GAS SELECT control to 300.
- c) Set the CALIBRATE Switch to X1.
- d) Set the CALIBRATE ADJUST (Zero) Knob so that the meter reads zero.
- e) Check that the meter reads zero on the X10 and X100 ranges.
- f) Set the CALIBRATE Switch to X1 and introduce the sample with known concentration in the 7 to 10 ppm range.
- g) Adjust R31 so that the meter reading corresponds to the sample concentration.
- h) Set the CALIBRATE Switch to X10 and introduce the sample with known concentration in the 90 to 100 ppm range.
- i) Adjust R32 so that the meter reading corresponds to the sample concentration.
- j) Set the CALIBRATE Switch to X100 and introduce the sample with known concentration in the 900 to 1000 ppm range.
- k) Adjust R33 so that the meter reading corresponds to the sample concentration.
- l) The instrument is now calibrated for methane and ready for service.

## Calibration Using a Single Sample Calibration (Refer to Figure 4)

Calibration may be accomplished using a single known sample of methane in air in the range of 90 to 100 ppm. This may not provide the accuracy stated under specifications but is adequate for field survey work.

- a) Place instrument in normal operation with CALIBRATE Switch set to X10 and GAS SELECT control set to 300.
- b) Use the CALIBRATE ADJUST (zero) Knob to adjust the meter reading to zero.
- c) Introduce a methane sample of a known concentration (between 90 and 100 ppm not to exceed 100 ppm) and adjust trimpot R-32 so the meter reading corresponds to the known sample.
- d) This sets the instrument gain for methane with the panel mounted gain adjustment (GAS SELECT) set at a reference number of 300.
- e) Turn off HYDROGEN SUPPLY VALVE to put out flame.
- f) Leave CALIBRATE Switch on X10 position and use CALIBRATE ADJUST (zero) Knob to adjust meter reading to 4 ppm.
- g) Place CALIBRATE Switch in X1 position and using trimpot R-31 adjust meter reading to 4 ppm.
- h) Move CALIBRATE Switch to X10 position again. Use CALIBRATE ADJUST (zero) Knob to adjust meter to a reading of 40 ppm.
- i) Move CALIBRATE Switch to X100 position and use trimpot R-33 to adjust meter reading to 40 ppm.
- j) Move CALIBRATE ADJUST (zero) Knob to adjust meter reading to zero.
- k) Unit is now balanced from range to range, calibrated to methane, and ready to be placed in normal service.

**ATTACHMENT C**

**Gastech LEL Calibration Protocol**

## C. Oxygen Zero Adjustment

The following steps should be carried out with range switch in OXY (in) position, to check and adjust zero on a known oxygen-free sample.

1. While instrument is still open, identify ZERO potentiometer, which is located on oxygen (upper) circuit board and which can be reached through the rearmost of the two clearance holes in main circuit board.
2. Expose oxygen detector to a known oxygen-free sample, such as nitrogen, argon or helium.
3. Watch meter carefully. If reading does not go exactly to zero, adjust it by turning ZERO potentiometer. Counterclockwise rotation will decrease reading.
4. If zero adjustment cannot be made, replace detector.
5. After zero adjustment has been completed, return detector to normal atmospheric air. Readjust OXY CAL control as necessary to bring meter reading to 21%.
6. If reading cannot be set high enough, replace detector.

## D. Oxygen Alarm Threshold

The reading at which the alarm is actuated can be set by use of the ALARM threshold potentiometer. To set:

1. Turn OXY CAL knob to bring meter needle to desired alarm setting.
2. Locate oxygen alarm threshold potentiometer, on oxygen circuit board, which can be reached through the foremost of the two clearance holes in the main circuit board.
3. Turn ALARM threshold potentiometer to the point where alarm just operates. Clockwise rotation will raise alarm setting. Verify setting by turning OXY CAL control to bring meter needle into and out of alarm zone.
4. To complete the oxygen circuit settings, turn the OXY CAL control as necessary to bring meter needle to the 21% position on the scale.

## E. Oxygen High Alarm (25%)

This alarm point is factory set and generally need not be changed. It can be readjusted to some other level, by trial, but this can only be done when the main board is loosened and pulled aside (see Section V.D. steps 1-6). The high alarm potentiometer is the one closest to the the rear, without an access hole.

## V. MAINTENANCE

## A. Batteries

1. Check battery voltage periodically by pressing BATTERY CHECK switch. Recharge before voltage reaches minimum.

When connecting charger, always follow these steps:

- a) Confirm that the plug is inserted in the correct way, with the THIS SIDE UP label upwards. The socket is polarized, with the pins offset below the centerline, but can sometimes be forced on the wrong way, particularly if it has become worn with use.
- b) Verify that a charge is actually entering battery. To do this, turn instrument on and check meter reading while BATTERY CHECK button is pressed. Observe reading while charger is plugged and unplugged at wall socket. If reading increases when charger is connected, and decreases when unplugged, battery is receiving a charge. If no change is observed, then probably charger or power circuit is at fault. If charger is defective, return it for repair or replacement.

2. If sufficient voltage cannot be obtained after charging, open instrument and:

- a) Check voltage output with a voltmeter, between red and black wires (unplug connector to gain access to pins). Voltage should be about 8.5 volts.

If voltage is acceptable, but volt check reading is too low, meter or switch could be at fault. If voltage is too low, battery is at fault.

- b) If no output voltage can be obtained, check fuse by unscrewing recessed cap, marked "FUSE", and removing fuse. It can be checked visually or with an ohmmeter. If burned out, replace with a new one, but be sure to attempt to identify the cause of the overload or short circuit. Fuse must be type 2AG-1A.

- c) If battery voltage is too low, and cannot be brought up by overnight charging, it probably needs replacement. To remove, take out the two screws holding it to bottom of case, and disconnect black and orange wires at charging end. If soldered at charger socket, they must be unsoldered at the tips of the socket pins.

Most instruments are equipped with plug connectors at the charging end. If so equipped, then just unplug the white plastic connector.

New batteries will be received complete with a plug connector, and a mating socket which can be installed on the charger socket is available if needed. Order Stock No. 45-6902.

## IV. CALIBRATION AND ADJUSTMENT

## A. Combustibles Circuit Calibration

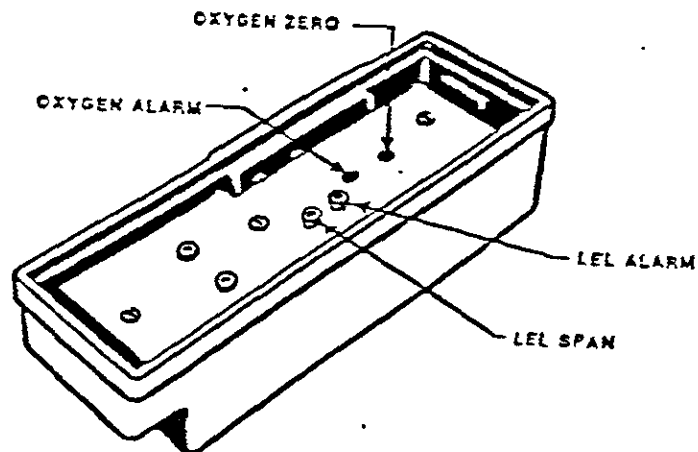
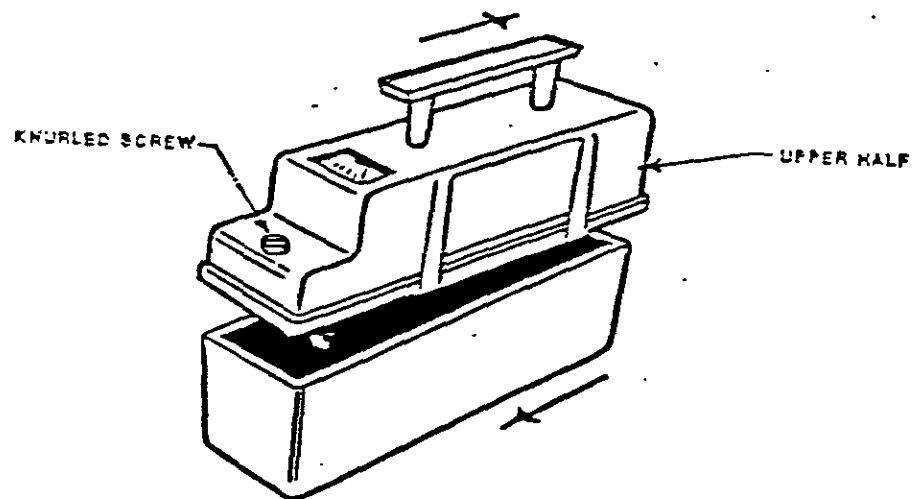
The following steps should be carried out with range switch in LEL (out) position. To check and adjust calibration on a known gas sample:

1. Turn instrument on and allow it to warm up and stabilize preferably for 5 minutes. Be sure batteries are charged sufficiently to read above the check mark.
2. Open instrument case by loosening captive knurled screw located in front of meter. (On diffusion models, this can be done more conveniently when detectors are unplugged. After loosening screw, replace detectors.) Lift upper half of case slightly, move 1/4" to rear to disengage rear latch bar; then separate the two halves. Locate LEL SPAN potentiometer on underside of main circuit board.
3. Expose detector to a known calibrating gas sample. If the sample exists within a large container at atmospheric pressure, the sensor or probe (of 1214S) may be immersed in the container. If sample is under pressure, e.g., the GasTech Calibration Kit, the mixture should be allowed to flow over and surround sensor.
4. Watch meter carefully. If reading does not correspond to desired value, adjust it by turning LEL SPAN potentiometer. Counterclockwise rotation will increase reading.
5. Recheck zero, adjust if necessary, and repeat above steps until correct reading is obtained.
6. If reading cannot be set high enough, replace detector.

## B. Combustibles Alarm Threshold

The reading at which the combustibles alarm is actuated can be set by use of the ALARM threshold potentiometer. To set:

1. Turn LEL ZERO control to bring meter needle to desired alarm setting.
2. Turn ALARM threshold potentiometer to the point where alarm just operates. Clockwise rotation will lower alarm setting. Verify setting by turning LEL ZERO knob to bring meter needle into and out of alarm zone.
3. To complete combustibles circuit settings, turn LEL ZERO control to bring meter needle to the zero position on the scale.



ADJUSTMENT LOCATIONS

**APPENDIX B**

**RESNA Sampling Protocol -  
Quality Assurance and Quality Control Program**



1500 So. Union Avenue  
Bakersfield, California 93307  
Phone: (805) 835-7700  
FAX: (805) 835-7717

**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**

## **TABLE OF CONTENTS**

<b>Section</b>	<b>Description</b>	<b>Page</b>
<b>1.0</b>	<b>RECORDING OF FIELD DATA</b>	<b>1</b>
<b>2.0</b>	<b>SAMPLE CONTAINERS</b>	<b>1</b>
<b>3.0</b>	<b>QUALITY CONTROL OF WATER SAMPLES</b>	<b>1</b>
3.1	Travel Blanks	
3.2	Duplicates	
3.3	Field Blanks	
<b>4.0</b>	<b>GROUNDWATER SAMPLING PROTOCOL</b>	<b>2</b>
<b>5.0</b>	<b>CHAIN-OF CUSTODY PROCEDURES</b>	<b>3</b>
5.1	Sample Labels	
5.2	Chain-of-Custody Record and Sample Analysis Request Form	
5.3	Delivery of Samples to Laboratory	
<b>6.0</b>	<b>SAMPLING AND DRILLING EQUIPMENT DECONTAMINATION</b>	<b>4</b>
<b>7.0</b>	<b>FIELD EQUIPMENT CALIBRATION AND MAINTENANCE</b>	<b>5</b>
<b>8.0</b>	<b>GROUNDWATER MONITORING PROTOCOL</b>	<b>5</b>
<b>9.0</b>	<b>WELL DEVELOPMENT PROTOCOL</b>	<b>6</b>
<b>10.0</b>	<b>QUALITY CONTROL OF SOIL SAMPLES</b>	<b>6</b>
10.1	Travel Blanks	
10.2	Duplicates	
10.3	Field Blanks	
<b>11.0</b>	<b>SOIL SAMPLING PROTOCOL</b>	<b>7</b>
11.1	Sample Collection During Drilling Activities	
11.2	Sample Collection During Tank Removal	
11.3	Sampling from Soil Piles or Shallow Soil Pits	

## **TABLES**

<b>1</b>	<b>Sample Containers, Holding Times and Preservation</b>	<b>9</b>
<b>2</b>	<b>Laboratory Test Methodology</b>	<b>11</b>
<b>3</b>	<b>Abbreviations</b>	<b>12</b>



# **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.

## **SAMPLING PROTOCOL-QUALITY ASSURANCE AND QUALITY CONTROL**

---

### **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

## **SAMPLING PROTOCOL-QUALITY ASSURANCE AND QUALITY CONTROL**

---

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:

## **SAMPLING PROTOCOL-QUALITY ASSURANCE AND QUALITY CONTROL**

---

- 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.

## **SAMPLING PROTOCOL-QUALITY ASSURANCE AND QUALITY CONTROL**

---

### **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

# **SAMPLING PROTOCOL-QUALITY ASSURANCE AND QUALITY CONTROL**

---

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.

## **SAMPLING PROTOCOL-QUALITY ASSURANCE AND QUALITY CONTROL**

---

### **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.

## **SAMPLING PROTOCOL-QUALITY ASSURANCE AND QUALITY CONTROL**

---

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.



# SAMPLING PROTOCOL-QUALITY ASSURANCE AND QUALITY CONTROL

**TABLE 1**  
**Sample Containers, Holding Times and Preservation**

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

**Notes:**

- <sup>1</sup> Maximum holding time for sample (sample must be extracted within this time or analyze if extraction is not required).
- <sup>2</sup> Maximum holding time for sample if preserved with HCl,  
**Caution:** HCl is a strong acid, avoid eye and skin contact
- <sup>3</sup> 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
<b>Poly-Chlorinated Biphenyls</b>	Soil	8 oz. wide mouth glass with teflon seal	7 days <sup>1</sup> 40 days <sup>3</sup>	4°C
	Water	1000 ml amber glass with teflon seal	7 days <sup>1</sup> 40 days <sup>3</sup>	4°C
<b>Total Metals</b>	Soil	3" stainless steel or brass cylinder	6 months	
	Water	1000 ml plastic	6 months	pH < 2 HNO <sub>3</sub>
<b>Dissolved Metals</b>	Water	1000 ml plastic .45 Micron Filtration	6 months	pH < 2 HNO <sub>3</sub>
<b>Pesticides</b>	Soil	3" stainless steel or brass cylinder	14 days <sup>3</sup>	4°C
	Water	1000 ml amber glass	7 days <sup>1</sup> 40 days <sup>3</sup>	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 2

### Laboratory Test Methodology Underground Tank Sites

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

# SAMPLING PROTOCOL-QUALITY ASSURANCE AND QUALITY CONTROL

**TABLE 3**  
**ABBREVIATIONS**

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