



ENGINEERING, ARCHITECTURAL AND PLANNING CONSULTANTS

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ACTION PLAN
FOR
TEXACO CARIBBEAN INC.
U.S. VIRGIN ISLANDS

AUGUST 19, 1987
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TUT 003 0874

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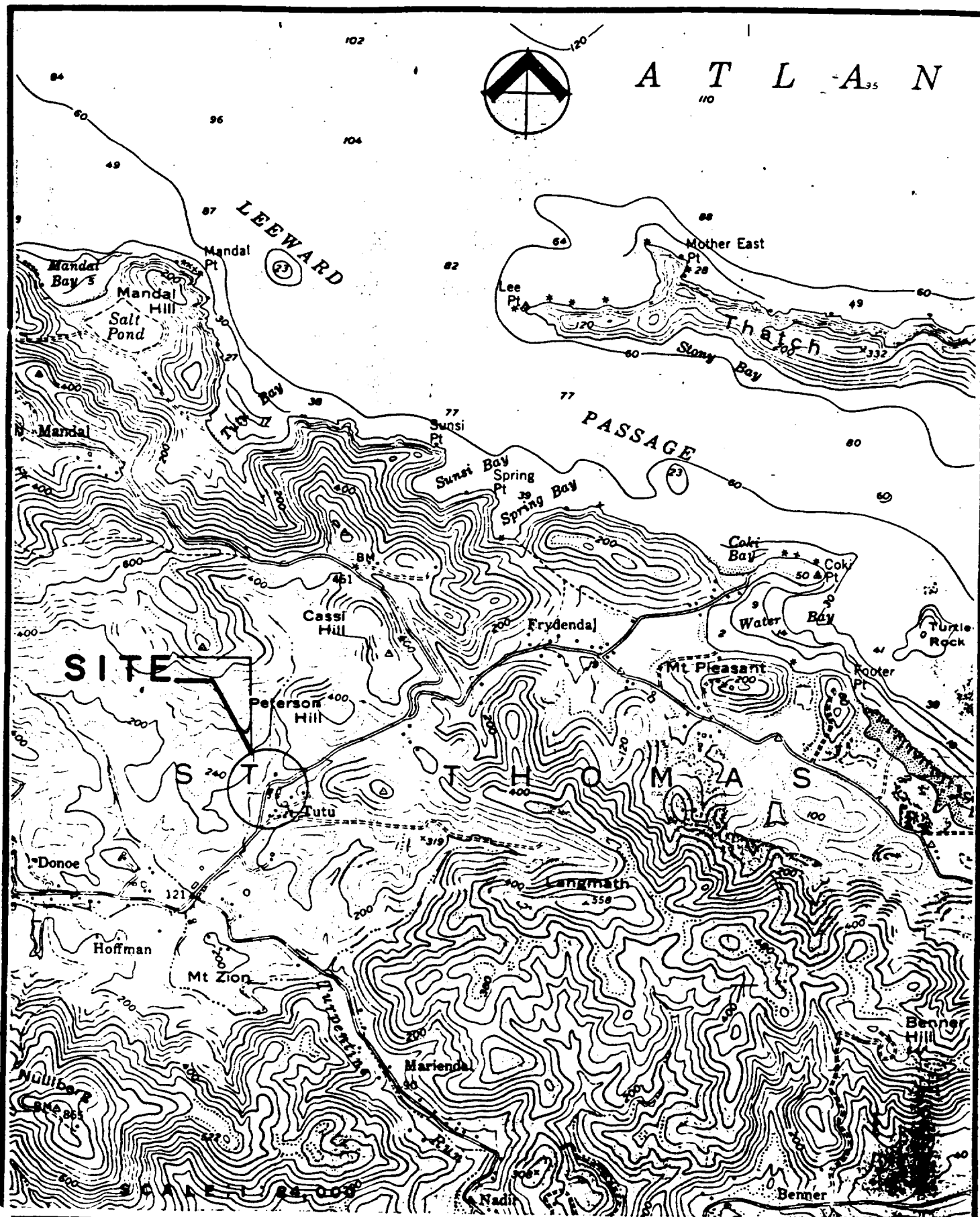

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1.0 GENERAL

As part of its regular improvements schedule, specific actions have been planned for a service station located at Annas Retreat #126, St. Thomas, U.S.V.I. (see figure 1). Said improvements include the removal of two underground gasoline storage tanks and its replacement with new ones. Existing waste oil stored at this service station will be removed in accordance to the procedures established in the Solid and Hazardous Waste Management Law, Rules and Regulations enforced by the DPNR. However, in order to comply with the requirements established in an order issued by the Department of Planning and National Resources dated August 5, 1987, this action plan is being submitted.

In complying with this order, a great effort has been given to provide as much details as possible, considering the limited time available. Notwithstanding this fact, it should be kept in mind that the primary goal of this action plan is to determine the nature and extent of hydrocarbons at the service station facility and to develop remedial alternatives, if the data collected indicate that remediation is warranted. If the presence of hydrocarbons is detected, adequate clean up procedures comensurate with the affected area will be implemented. Any residues or debris will be handled according to the results obtained during the sampling procedures. That is, if wastes prove to exhibit the characteristics of EP toxicity, ignitability, corrosivity or reactivity, as defined in 40CFR Part 261





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FIGURE : I

LOCATION N

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Subpart C, they will be disposed as hazardous waste in accordance to the requirements set forth in 40 CFR Part 260 - 266, 270 and 271.

2.0 SAMPLING PLAN

Prior to initiating tank removal, a soil gas survey will be conducted to delineate the extent of subsurface contamination with gasoline, if any. A work plan for the soil gas survey is being prepared separately and will be submitted under separate cover.

Once the existing tanks are removed, soil samples will be collected from each excavation, in order to assess potential hydrocarbon loss. In addition to sample collection, the nature of the excavated subsurface materials will be described, through visual inspection of the excavation walls by a geologist in the employ of Lebrón Associates (LA).

If the results of the soil gas survey, tank excavation, or post-excavation sampling indicate that hydrocarbons have leaked into the subsurface environment, the need for monitoring wells will be addressed. Should it be determined that monitoring wells are required, locations will be selected based on available data.

The subsoil investigation to be performed should define the following information:

- The stratigraphic sequence of the geologic material to the excavated depth.
- The visual classification of the excavated material.

- The vertical and lateral extent of hydrocarbons, if any.
- The type of hydrocarbons and their concentration to the explored depth.
- Free product, if encountered.

2.1 Sampling Procedures

The sampling procedure in this investigation will be conducted within the non-saturated zone (above the water table) and saturated if necessary.

For this service station, the dealer will be informed in advance of the tank excavation and will be consulted concerning his knowledge of the operational history of the facility and the location of underground utilities. Representatives of USEPA and DPNR will have access to the site when work is being conducted at this site; access at other time will be coordinated on a case-by-case basis with Texaco Caribbean Inc. personnel.

Prior to any excavation, underground utilities will be marked with the assistance of utility companies, utility maps and field investigations.

Soil sampling will be conducted in the tank excavations once the tanks have been removed. The procedures to be implemented during the tank removal are described in Section 4.0. For each tank excavation, a minimum of five samples will be collected.

2.1.1 Post Excavation Soil Sampling

Soil samples will be collected in each tank excavation from the bottom of the excavation if the water table is not encountered, or just above the top of the water table, if it is present in the excavation. The soil samples will be collected from a point approximately midway along each wall, and from below the center of the tank.

The soil samples will be collected with hand-held equipment, such as a trowel or bucket type hand auger. No field personnel will climb into an excavation deeper than five (5) feet; either the sampling personnel will be lowered to the desired sampling depth in the bucket of the backhoe used to remove the tank, the sampling personnel will collect the samples from ground surface with a hand auger with extensions of different lengths to reach the desired depth, or representative material will be collected from the bottom of the excavation by the backhoe and transferred to sample containers by the attending geologist.



The soil samples will be examined and described by the on-site geologist. The description will be recorded on the Sample/Core Log form for future reference. Samples will be screened in the field with a portable organic vapor analyzer (OVA or equivalent) equipped with a photoionization detector. The meter will be calibrated to a standard gas. The reading will be recorded on the Sample/Core Log.

The geologist will wear disposable plastic gloves when handling and packaging the soil in the sample container. The auger sample will be trimmed with a clean knife and spatula. The outside of each core will be trimmed off, and the samples will be cut to the size of the sample container. At least two 40 ml teflon-sealed vials will be filled with as much sample as possible for each sample to be analyzed. Decontaminated tools, including spatulas and narrow spoons, will be used to pack the sample in the vials in order to minimize the amount of head space in the vial. The threaded portion of the vials will be wiped clean of sample debris to ensure that proper sealing of the vials takes place.

The samples for volatile organic analysis will be handled and packaged as efficiently and expeditiously as possible, in order to minimize loss of volatile constituents. The samples will be packed into the container with a minimum of head space. Sample jars for the analysis of other parameters will be filled accordingly.

Sufficient material will be collected to insure good laboratory performance and to offer USEPA/DPNR split samples, if required. USEPA and/or DPNR will be consulted for procedures for splitting samples.

2.1.2 Monitoring Well Installation

Monitoring wells will be installed, if warranted by the results of the soil gas survey, the post-excavation sampling, or visual and/or instrument observations during excavation. The number of monitoring wells and their locations will be determined based on evaluation of the available data. Monitoring wells will be installed in accordance with the protocol presented in Appendix A.

Ground-water samples will be collected from monitoring wells, if installed, after

the wells have been developed. Ground-water samples will be analyzed for volatile organic compounds (VOCs) by USEPA Method 602, and petroleum hydrocarbons. Ground-water samples will be collected in accordance with the protocol presented in Appendix B.

2.1.3 Equipment Decontamination

The backhoe bucket will be cleaned between excavations, and between samples if the backhoe is used to collect representative sample material. The trowels and the hand augers will be cleaned between each use as follows: laboratory grade detergent scrub and rinse, potable water rinse, and a final rinse with de-ionized water. Other tools used in sample preparation are to be similarly cleaned.

A controlled decontamination area will be installed to prevent potential off-site migration of contaminants. All equipment decontamination will take place in this area. The water generated during decontamination will be routed to a central location and disposed in an acceptable manner.

2.2 Parameters to be Analyzed

Parameters to be analyzed and for which samples will be taken could be divided in two categories:

- a. Parameters to determine the presence of hydrocarbons - because the facility is engaged in the dispensing of gasoline and other petroleum products, the parameters of interest are: benzene, O-xylene, m-xylene, toluene and ethylbenzene. The samples will be analyzed by USEPA Method 602, with search for xylene peaks and total petroleum hydrocarbons.
- b. Parameters to determine if wastes are hazardous or not - samples will be analyzed for EP toxicity, ignitability, corrosivity, and reactivity.

The contract laboratory will be Environmetnal Testing and Certification (ETC) of Edison, New Jersey, or Radian Corp., Austin, Texas and their certification No. is 68-01-6790 (WA 83-A093) and 68-01-6880 (WA 83-A196) respectively. The complete Quality Assurance/-Quality Control documentation for these two laboratories are on file with USEPA. Other EPA approved laboratories may be used prior consultation with EPA/DPNR representatives at the site.

2.3 Preservation of Data

A great deal of time and effort are required to assure that the results of the samples' analyses provide reliable information of a particular set of conditions. Although the procedures which are discussed below are discussed with details in Test Methods of Evaluating Solid Wastes, published by the Environmental Protection Agency, it will be useful to

discuss in general terms its content as to their relevance in this sampling program.

It is important to recall that these procedures are routinely used to control the sample flow.

2.3.1 Labeling of Samples

Every sample taken during the sampling procedures will be labeled to prevent the false identification of samples (see figure 2). For this purpose gummed paper labels offer the best choice. For each one of the samples the following information will be carefully noted:

- Sample number
- Data and time of collection
- Place of collection
- Name of sampler

It is advised to put the labels on sample containers prior to sampling. Then, at the time of sample collection, the labels should be filled out.

2.3.2 Sample Seals

By sealing sample containers, any unauthorized tampering of the samples can be noticed. It is suggested to use gummed paper for this purpose. This seal should be filled out with the sample number, collector's name, and date and time of sampling. It is important to observe that this seal must be placed



Collector _____ Sample No. _____

Place of Collection _____

Date Sampled _____ Time Sampled _____

Field Information _____

Figure 2: Example of Sample Label

on containers before the sample leaves the custody of the collector (see figure 3).

2.3.3 Field Log Book

A field log book will serve as a diary on which all the relevant information pertaining to the sampling and field survey are properly recorded. For this reason, it should be bounded with numbered pages of 8-1/2 by 11 inches. Information to be entered into the log book shall include but not limited to the following:

- Purpose of sampling
- Location and address of field contact
- Name and address of the owner of the facility to be sampled.
- Type of activity performed at the facility.
- Parameters for which samples will be analyzed.
- Number and volume of samples taken
- Description of sampling point and sampling methodology.
- Date and time of collection
- Collector's sample identification number(s).
- Sample distribution and method of transportation (including name of laboratory, Federal Express, etc.).
- References such as maps or photographs of the sampling site.

NAME AND ADDRESS OF ORGANIZATION COLLECTING SAMPLES

Person Collecting Sample _____ Sample No. _____
(signature)

Date Collected _____ Time Collected _____

Place Collected _____

Figure 3: Example of Official Sample Seal

- Any field measurements made (including flammability, explosivity, etc.).
- Signatures of personnel responsible for observations.

The maximum extent of information that must be entered varies according to certain conditions such as the actual sampling conditions. However, as a general rule of thumb there should be enough information so that someone can reconstruct the sampling procedures without the necessity to rely on the collector's memory. As an important and final note on this subject, the log book must be kept in a safe place.

In addition to the field logbook, daily logs will be filled out documenting the systematic conduct of each investigation, personnel involved, and their responsibilities. Separate Sample/Core Logs will be utilized to document the nature of geologic materials penetrated and excavated. A daily check list will be followed during each day of work. All field records will be kept at site in a water-proof place and ultimately be transferred to the master filing system in the office. A duplicate of the field note book will be kept on-site as a working copy.

2.3.4 Chain of Custody Record

An important step in the preservation of data is constituted by the chain-of-custody record. This document serves to trace the movement of the sample beginning with the time of collection. A sample of this type of record is observed in figure 4. The recorded information must include at least the following:

- Sample number
- Signature of collector
- Date and time of collection
- Place and address of collection
- Sample description
- Signature of persons involved in the chain of possession.
- Inclusive dates of possession

2.3.5 Sample Analysis Request Sheet

The sample analysis request sheet is aimed to accompany the sample on its delivery to the laboratory. There is a field portion on this form which must be completed by the person collecting the sample and includes most of the information which has to be noted in the log book. The other part of the form is intended to be completed by the laboratory personnel. This form must include at least:

- Name of person receiving the sample
- Laboratory sample number
- Date of sample receipt
- Sample allocation
- Analyses to be performed

2.3.6 Sample Delivery to the Laboratory

Samples will be delivered to the laboratory after a proper preservation, packing and labeling. Sample preservation procedures for ground-water samples are described in Appendix B; these procedures will also be followed for soil samples.

2.4 Quality Assurance/Control Program

Detailed protocols and quality assurance plans for the various sampling plan activities are contained in the following sections and appendices.

- Section 2.1.1: Post Excavation Soil Sampling
- Appendix A : Monitoring Well Specifications
- Appendix B : Ground-Water Sampling Protocol
- Appendix C : Document and Data Management
- Appendix D : Material Safety Data Sheet for Selected Chemicals

As the Quality Assurance/Quality Control (QA/QC) documentation of ETC and Radian are on file with USEPA, no additional laboratory QA/QC documentation has been provided.

The procedures described in Appendix C: Document and Data Management have been developed to insure the accuracy and integrity of the data collected during the

investigation. In more specific terms, the quality control program defines the frequency and methods of checks, audits, and reviews which are necessary to identify problems. This measure will allow the development of an appropriate corrective action which in turn permit to verify product's quality. For the purposes of complying with these requirements the Quality Assurance/Control Program, all the laboratories which are being considered to perform the analyses have a written QC/QA Program which will be provided. Blank samples will also be used to verify the compliance with QC/QA procedures.



3.0 SITE CONTINGENCY AND HEALTH AND SAFETY PLAN

3.1 Introduction

This Health and Safety Plan (HASP) has been developed to address health and safety issues that may arise during the soil gas survey, soil sampling, drilling/excavation, tank removal, and monitoring well installation (if required) at the Texaco Tutu Service Station site in St. Thomas, USVI. This HASP was developed with the involvement of occupational and industrial health and safety personnel, physicians, chemists, and other appropriate personnel using current Federal Regulations and published guidelines, texts, and references.

The protection of workers and environmental safety and health are major concerns during this project and

cannot be compromised. The objective of this health and safety plan is to assure that safe working conditions exist at the site. The safety organization and procedures have been established based on an analysis of potential hazards and personnel protection measures which have been selected in response to these risks.

The elements of this HASP are based upon requirements described in the EPA Standard Operating Safety Guide, the U.S. Department of Labor, OSHA Standards 29 CFR Part 1910. All reasonable precautions shall be taken by Lebrón Associates (LA) and its subcontractors to ensure the safety and health of workers and the general public. All work will be performed in accordance with applicable federal, state, territory, and local regulations and recommendations.

3.2 Site Location

The investigation will be conducted at the Texaco Tutu Service Station, located in St. Thomas, USVI.

3.3 Management

All site operations will be under the direction of the site Project Coordinator. This individual is empowered to make the routine decisions regarding working conditions and safety equipment selection. At the beginning of each day, site personnel will be briefed on the expected activities for that day by the site Project Coordinator.

Lebrón Associates will designate a Safety Manager; this person will be conversant with safety and health issues associated with field investigative activities. The project personnel report directly to the Safety Manager on safety issues. The Safety Manager is responsible for the preparation and implementation of the HASP. Disputes over the safety issues will be resolved by the safety manager.

3.4. Hazard Evaluation

Constant attention shall be given to physical hazards encountered during everyday work activities, particularly those associated with heavy equipment; special consideration is given to chemical hazards. The field activities previously described consist generally of drilling/excavation, tank removal, and sampling. An evaluation of the potential hazards has been completed utilizing site history. The following exposure pathways have been identified:

- Ingestion of contaminated sediments and surface soils (accidental/poor hygiene)
- Inhalation and ingestion of contaminated particles and vapors
- Dermal contact with contaminated sediments and surface soils
- Dermal contact with contaminated equipment and structures.

The preliminary hazard assessment has been developed from existing information at the Texaco

Caribbean, Inc. service station in the Tutu area. The affected area is under a concrete pad and for that reason no direct exposure to any contaminated soil will take place at present. There are no detectable signs of leakage such as odor, product loss, etc. Toxicological and hazard data for gasoline have been attached. Data obtained during the project will be used to update this evaluation. These data will be explained and made available to site personnel at the training session.

Because the facility was engaged in the dispensing of gasoline and other petroleum products, toxicological and hazard data for the following compounds have also been attached in Appendix D: benzene, o-xylene, m-xylene, toluene, and ethyl-benzene.

3.5 Personnel Protective Equipment

Based on the hazard evaluation, the use of respiratory protective equipment is expected to be limited. Level D protection has been selected for site activities. Protection will be upgraded to Level C if monitoring indicates a higher degree of hazard. A sustained reading of 300 ppm will trigger an upgrade in protection. This value is the Threshold Limit Value-Time Weighted Average (TLV-TWA) for gasoline. This value represents an acceptable workplace exposure, and allows a margin of error in assuming that all 300 ppm reading is gasoline. Other data obtained during the

project will be used to update the use of respiratory protective equipment. If other contaminants are encountered on-site, all personnel will be made fully aware of their hazards and the appropriate procedures will be utilized to prevent exposure.

The levels of protection are defined as follows

Level D: Tyvek Coveralls

Hard hat

Gloves - nitrile or equivalent

Safety glasses

Level C: Coveralls - Tyvek with hoods

Full face respirators with appropriate cartridges

Hard Hat

Rubber boots

Inner gloves - surgical type

Outer gloves - nitrile or equivalent

No changes to the specified level of protection shall be made without the approval of the safety manager.

If the conditions warrant more stringent personal protection, the following be employed, but not limited to:

- Duct taping of boots and gloves to coveralls to eliminate possible leakage at the wrist and ankle
- Inner gloves
- Eye protection
- Polyethylene-coated coverall or rain gear

3.6 Air Monitoring

Air monitoring equipment to be used for measurements will include, but not be limited to: photoionization detector, oxygen meter, and explosimeter. The air around the excavations will be surveyed, as well as the air at shoulder height (breathing zone) around the operating equipment. This survey will take place at different points of the operation. The air monitoring equipment will be calibrated according to manufacturer instructions.

3.7 Site Control

The working area will be divided into three zones: restricted zone (exclusive zone), decontamination zone (contaminant reduction zone), and a clean zone (support zone). The restricted zone is a limited access area, which will be established at each work location. Only authorized personnel, who have satisfied the training and health monitoring requirements of this HASP, will be allowed in the restricted zone. Personnel will exit the restricted zone by passing through the decontamination zone. Equipment and clothing will be removed beginning with boots, then coveralls, gloves, hard hat and respirators. Respirators, if used, will be sanitized daily and stored in plastic bags. Equipment which is to be reused, such as rubber boots, will be decontaminated properly and stored in plastic bags.

Disposable equipment will be placed in plastic bags or drums and disposed of properly. Personnel will wash face and hands before leaving the decontamination area. The clean zone will serve as a meeting and storage area.

The following practices and precautions will be adhered to at all times in the working areas.

- No smoking, drinking, eating, or chewing gum/tobacco in the exclusive or decontamination zone
- The use of specified personnel protection at all times in the exclusive zone.
- No combustible materials or uncontrolled sources of ignition in the exclusive zone.
- All personnel should take a hygienic shower at the end of the day.

In addition, the following materials/equipment will be present at the site during the conduct of this investigation: emergency eye washes will be provided in the exclusive and decontamination zones, and fire extinguishers (for small local fires) and emergency first-aid kits will be kept at the working areas.

Equipment will be decontaminated by washing with a detergent solution and rinsing with de-ionized water.

3.8 Training

Prior to initiating site work, all site personnel (Lebrón Associates and subcontractors) will be required to attend a training session given by the Safety Manager. This session will include, but is not limited to, the following topics:

- Site history
- Specific hazards (including toxicological data)
- Hazard recognition
- Standard operation procedures
- Decontamination (personnel and equipment)
- Emergency procedures
- Respirator fit test and use

3.9 Emergency Procedures

The following standard emergency procedures will be used by on-site personnel. The safety manager shall be notified of any on-site emergencies and be responsible for ensuring that the appropriate procedures are followed.

3.9.1 Personal Injury in the Exclusion Zone

In the event of an injury in the exclusion zone, all site personnel shall assemble at the decontamination line. The Project Coordinator should evaluate the nature of the injury and the affected person should be decontaminated to the extent possible prior to movement to the support zone. Appropriate first aid should be initiated, and contact should be made for an ambulance and with the designated medical facility (if required). No persons shall reenter the exclusion zone until the cause of the injury or symptoms is determined.

3.9.2 Personal Injury in the Support Zone

Upon notification of an injury in the support zone, the Project Manager and Safety Manager will

assess the nature of the injury. If the cause of the injury or loss of the injured person does not affect the performance of site personnel, operations may continue; the appropriate first aid and necessary follow-up as stated above should be initiated.

3.9.3 Fire/Explosion

Upon notification of a fire or explosion on the site, all personnel will assemble at the decontamination line. The fire department shall be alerted and all personnel moved to a safe distance from the involved area.

3.9.4 Personal Protective Equipment Failure

If any site worker experiences a failure or alteration of protective equipment that affects the protection factor, that person and his/her buddy shall immediately leave the exclusion zone. Reentry shall not be permitted until the equipment has been repaired or replaced.

3.10 EMERGENCY ROUTE AND PHONE NUMBERS

A map showing the most direct route from the work site to the nearest hospital is attached.

Emergency phone numbers will be posted at conspicuous places in the support zone. These phone numbers along with the directions to the nearest medical facility will be available at the site.

Phone Numbers

Site Representative	809-723-3332
Fire Department	809-921
Ambulance	809-922
Hospital*	809-776-8311
Police Department	809-915
USEPA Caribbean	
Field Office	809-725-7825/7818/7891/7864
Department of Planning	
and Natural	
Resources USVI	809-774-3320

* Location of hospital and route map is on Figure 5.

3.11 SPECIAL CONDITIONS

This plan must be provided to all field personnel who will participate in the drilling investigation at the Texaco Caribbean, Inc. Tutu Service Station facility. Field personnel must sign the signature list below to indicate that they have reviewed the document, and are familiar with its contents. Adherence to provisions of the plan is mandatory. Modifications are at the discretion of the on-site Lebrón Associates representative. A copy of the plan will be kept on site. The safety procedures and the planned operations



for each day should be discussed between the Safety Manager and all site personnel.

I have reviewed the Health and Safety Plan for the Tank Removal and Soil Sampling activities at the Texaco Caribbean, Inc. Tutu Service Station provided by Lebrón Associates. I am familiar with its contents.

Signature/Date

Firm Name



4.0 TANKS REMOVAL

Parallel to the sampling procedures, the following activities will be performed:

- Removal of the concrete slab
- Removal of soil within the tank pit
- Collection of soil samples from the sides and the excavation for the analysis of volatile organic compounds using USEPA method 602 (with additional library search for xylene compounds) and total petroleum hydrocarbons. Samples of excavated materials will also be collected for the purpose

of waste classification and be analyzed for E.P. Toxicity, ignitability, corrosiveness, and reactivity.

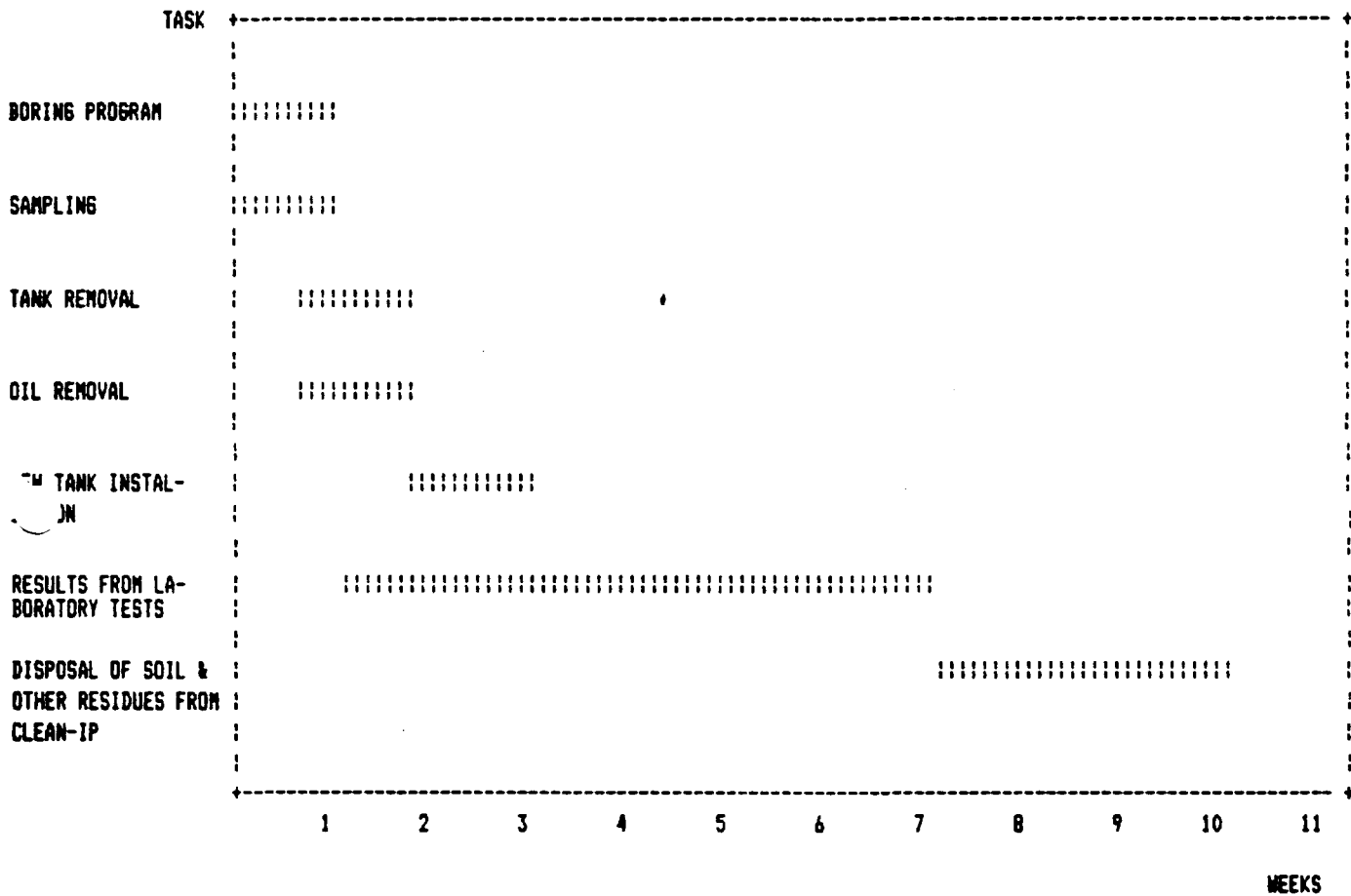
- Documentation of sample locations, sampling procedures, sample depths, decontamination procedures for sampling equipment. A minimum of five soil samples per tank will be collected from sides and bottom of the excavations as described in Section 2.1.1.
- In site storage of the removed soil. For this purpose, stockpiles covered with a plastic liner are considered the best alternative.
- Removal of the existing underground storage tanks.
- Collection of pictures of the tank/tank walls prior to its transportation.
- Transportation of tanks to Texaco Caribbean, Inc.'s terminal.
- Disposal of the removed soil in accordance to applicable regulations after laboratory analytical results on waste classification are obtained.
- Back filling the tank with approved or tested fill materials Lebrón Associates will keep records of the source of fill, geologic materials, etc.

If the material within the tank pit proves to be hazardous, it will be disposed in accordance with the applicable regulations. That is, all of the removed material will be substituted with new material, and the residues will be disposed in a state approved facility.

Table 1 presents each one of the proposed activities as well as its estimated duration. It is important to remark that this estimate begins after ten (10) days of receiving Action Plan approval.



TABLE I
WORK SCHEDULE



NOTES:

- 1) ESTIMATED TIME FOR TASK #7 DEPENDS UPON LABORATORY TEST RESULTS.
- 2) LABORATORY TEST RESULTS WILL BE AVAILABLE IN SIX WEEKS (AS PER CONVERSATION WITH CONTACTED LABORATORIES).
- 3) BORINGS AT TANK PIT AREA AND THE NEW TANK AREA WILL RECEIVE PRIORITY.

5.0 APPLICABLE REGULATIONS

Due to the location of the affected site, there are some regulations which in one way or another could affect the activities. They could be further divided into two broad categories: local and federal regulations. Following is a brief description of the above mentioned regulations:

5.1 Federal Regulations

Federal Regulations which may affect the sampling procedures are:

- 40 CFR Part 260-265 (Hazardous Wastes Management)
- 29 CFR Part 1910 (OSHA regulations pertaining to employee protection at work areas).

5.2 Local Regulations

At a local level the Department of Planning and Natural Resources enforces the Solid and Hazardous Waste Management Law, Rules and Regulations.

6.0 ADDITIONAL SITE INVESTIGATIONS

Additional site investigations will be performed after the results of the soil samples herein described are obtained, if necessary.

Additional investigations may also be conducted during the first phase of this work if USEPA, DPNR and Lebrón Associates/Texaco see the immediate need for such investigation.

7.0 PERSONNEL QUALIFICATIONS

Lebrón Associates will assign capable personnel to perform this job. Key personnel to be included in this team will include:

Eng. Pedro A. Marrero - Project Coordinator

Eng. Jesús Medero

Eng. David Moreno

Geol. Hernán Cortés

Geol. Oscar Fontán

Personnel qualifications for each one of them has been included in Appendix E.

In order to perform the drilling work, Lebrón Associates will contract the services of Soil Tech, a geoconsultant firm with experience in this type of activities. In the event that Lebrón Associates need further assistance in terms of compliance with OSHA Regulations, the services of specialist in safety will be retained.

8.0 DATA REPORTING

Lebrón Associates will maintain all field records and monitor laboratory performance and data. This information, along with existing data, will be compiled and interpreted, and a report rendered which describe the environmental conditions of the site.

APPENDIX A

MONITORING WELL SPECIFICATIONS

APPENDIX AMONITORING WELL BORING SPECIFICATIONS1.0 GENERAL

1.1 THE CONTRACT DOCUMENTS apply to this Section. All monitoring well must be drilled by, or under the supervision of an experienced driller.

1.2 QUALIFICATIONS OF DRILLERS

A. EQUIPMENT in first-class working order must be provided. The Driller shall use his own drilling equipment, having the minimum capabilities necessary to do the described work. No unnecessary delays or work stoppages will be tolerated because of equipment failure. These will not be considered as valid reasons for extending the length of the contract. The Driller shall be held responsible and payment may be withheld for damages to the well through any cause of negligence, faulty operation, or equipment failure.

B. THE DRILLER shall employ only competent workmen, expert in the performance of the type of work required by these Specifications. The crew shall be under the direct supervision of an experienced driller; the Driller shall provide the services of a drilling foreman, who shall be available to the job at all times. The crew and foreman shall be in the employ of the Driller.

1.3 CODES AND STANDARDS

A. THE DRILLER shall obtain all permits, certificates, and licenses required of him by law for the execution of the work.

B. THE DRILLER shall comply with all federal and USVI laws, ordinances, or rules and regulations relating to the performance of the work and the installation of monitoring wells.

- C. WHERE PROVISIONS OF THE PERTINENT CODES, STANDARDS, THE REGULATIONS conflict with this Specification, the more stringent provision shall govern.

1.4 DESCRIPTION OF THE SYSTEM TUTU SERVICE STATION

- A. THE MONITORING WELLS described herein are part of a program to monitor ground-water quality at the Tutu Service Station facility in St. Thomas, USVI.

1.5 DRILLING SITE

- A. DRILLING will be carried out at or in the vicinity of the Tutu Service Station of Texaco in St. Thomas, USVI.
- B. THE WELL locations will be shown to the driller by the Consultant.

1.6 LOCAL GEOLOGY

- A. THE SERVICE STATION is reportedly underlain by a heterogeneous mixture of sand, silt, clay, and man-made fill. The depth to bedrock is unknown at this time.
- B. INFORMATION regarding subsurface conditions is intended to assist the Driller in preparing his bid. The Consultant does not guarantee its accuracy or that it is necessarily indicative of conditions to be encountered in drilling the wells. The Driller shall satisfy himself regarding all local conditions including access, affecting this work by personal investigation and neither the information on local geology nor that derived from maps or drawings, nor from the Consultant or his agents or employees shall act to relieve the Driller of any responsibility hereunder or from fulfilling all of the terms and requirements and Specifications.

2.0 PRODUCTS

2.1 GRAVEL

- A. THE GRAVEL shall be free of foreign material and water washed prior to emplacement.
- B. THE GRAVEL shall be clean gravel, free of silt or clay.
- C. THE SIZE of the gravel shall be determined by the Consultant prior to the startup of drilling and shall be compatible with the size of the well screens to be installed.

2.2 BENTONITE PELLETS

- A. BENTONITE PELLETS shall not be larger than 1/2 inch in diameter and must be dry prior to placement in the well annulus.

2.3 GROUT

- A. GROUT shall consist of a mixture of 6 parts Portland Type 1 cement to 3 parts water to 1 part bentonite.

2.4 CASINGS

- A. THE WELL CASINGS shall be 4-inch diameter PVC pipe. No grease or oil shall be used when joining casing sections together.

2.5 SCREENS

- A. THE WELL SCREEN shall be 4-inch diameter PVC screen; slot size will be determined upon completion of the test boring. Slot sizes for most wells will range from 0.010 to 0.020 inch.

3.0 EXECUTION

3.1 DRILLING METHOD - MONITORING WELLS

- A. THE CONVENTIONAL hollow-stem-auger method of drilling shall be employed. However, when the Consultant determines that the hollow-stem-auger method is ineffective due to local geologic conditions, the mud rotary method may be required. Any drilling fluid utilized must be approved by the Consultant and the EPA/DPNR prior to its use. The diameter of the finished hole must be a minimum of 8 inches.

3.2 DRILLING

- A. THE MONITORING WELLS will be installed in unconsolidated deposits to depths 15 ft below water table. Twenty feet of screen will be installed in these wells.

3.3 FORMATION SAMPLES

- A. SOIL SAMPLES will be taken during the drilling of each monitoring well continuously, or at intervals specified by the Consultant. The driller will be required to use a standard 2-foot long split-spoon sampling device to obtain soil samples.
- B. ACTUAL SAMPLING DEPTHS shall be determined from information derived during drilling operations and as directed by the Consultant.

3.4 SCREEN AND CASING

- A. THE CASINGS AND SCREENS shall be installed to depths designated by the Consultant. Alternate depths suggested because casing cannot be set to depth, because of equipment problems, hole straightness problems, or for any other reason will not be given consideration. The Driller must insure that the hole stays open to the final depth during the installation of casing, screen, gravel, and grout.
- B. IT IS ESTIMATED that 20 feet of screen will be installed in each of the monitoring wells.

3.5 GRAVEL PACK AND CEMENTING, SCREEN AND CASING

- A. AFTER SETTING THE SCREEN AND CASING to the bottom of the hole, gravel will be placed in the annulus between the auger flyte and the casing/screen to 2 to 3 feet above the top of the screen in the intermediate and deep wells. A three-foot thick layer of bentonite pellets will be placed on top of the gravel pack. The gravel will be emplaced by carefully pouring in by hand and washed down with water or by means of a one-inch diameter tremie pipe, at the discretion of the Consultant.
- B. CEMENT GROUT will be emplaced in the hole from the top of the bentonite pellets to land surface. The cement will be mixed to a density approved by the Consultant and emplaced by means of a tremie pipe.
- C. THE WELL shall be completed with a locking well head assembly set in a concrete pad. A protective triangular array made of 2-inch diameter G.I. pipe will be installed around selected well heads for additional protection.

3.6 DEVELOPING THE WELL

- A. AFTER THE GROUT has set for a minimum of 12 hours in the well annulus, the well shall be developed to the satisfaction of the Consultant. The well will be developed using compressed air and/or a suitable pump. The Driller will also be required to surge the well with a surge-block plunger of appropriate diameter.

3.7 ABANDONMENT OF WELLS

- A. IN THE EVENT that the Driller shall fail to drill a well or place the casings to the depths specified or to such lesser depths as ordered by the Consultant or should abandon the well because of loss of tools or for any other cause, he shall, if requested and as directed by the Consultant, remove salvageable casings and equipment and fill the abandoned hole in accordance with State and local regulations. The Driller shall then move over and drill a new hole at a location approved by the Consultant. This work shall be done at the Driller's expense employing the use of salvaged materials, if usable, at the discretion of the Consultant.

4.0 DECONTAMINATION OF EQUIPMENT

- A. AFTER THE DRILLING, SAMPLING, AND INSTALLATION of each well, and prior to the drilling of the first well, the Driller shall decontaminate all augers, rods, split-spoon samplers, tremie pipes and any other tools to be used in the drilling and well installation operations.
- B. THE DRILLER shall have a steam-cleaning unit on the work site to be used for decontamination of his equipment.
- C. ALL CASING AND SCREEN shall be steam cleaned prior to being emplaced in the drilled hole.

- D. ALL SPLIT-SPOON samplers shall be scrubbed and washed between each use. The samplers will be washed with a laboratory detergent and then rinsed in fresh water of known quality.
- E. AN AREA WILL BE DESIGNATED for decontamination of the drill rig and drilling equipment. A potable water source will be accessible and runoff will be diverted from the paved surface and collected for disposal.

5.0 BORING LOGS

- A. THE DRILLER shall maintain a detailed boring log of the operations during all drilling procedures. The log shall give a complete description of all formations encountered, footage, size of the hole drilled, depth, sizes of all casings installed, water-level changes and depths at which they occurred, a description of cementing operations, and other such pertinent data as may be requested by the Consultant. The daily log shall be maintained on the site and be available for inspection by the Consultant at all times.

6.0 SAFETY REQUIREMENTS

6.1 ON-SITE REQUIREMENTS

- A. DRILLING OPERATIONS under this contract will require work in a potentially hazardous environment and the contractor shall issue adequate protection for all drilling personnel. The soils might contain gasoline vapors with chemicals such as benzene, toluene, ethylbenzene and xylenes. In order to minimize exposure of drilling personnel to these contaminants during field operations, the contractor shall outfit drilling personnel in modified Level D protection described herein.

B. PERSONAL PROTECTIVE EQUIPMENT shall be compatible and provide protection against chemical compounds listed in paragraph 6.1-A. The level of personnel protection provided shall be modified Level D as described below:

- o Safety glasses, goggles or face shields at all times.
- o Hard hat in plant areas and within the work zone.
- o Foot covering shall consist of disposable boot covers or rubber or plastic boots which shall be cleaned after each day of work.
- o Outer garment shall consist of a disposable splash resistant fabric coverall or a reusable splash suit. It is strongly suggested that the next layer of clothing consist of cloth coveralls; these coveralls will be removed on site at the end of each day and stored on site in the support zone.
- o Gloves shall be worn at all times during drilling operations and during sample examination. Personnel will not handle samples with bare hands. The gloves should be constructed of heavy duty neoprene or nitrile, and cover the hand and lower forearm.
- o Respirators equipped with organic vapor cartridges will be required as necessary based on air-monitoring results.

All required respiratory protection devices shall be provided and maintained by the contractor.

6.2 SUPPORT AREA

- A. A support area for personnel equipment donning and doffing shall be designated at the site. Except for the support area, no work clothing (outermost garment only) shall be worn off site.

6.3 WORK ZONES

- A. Eating, drinking, chewing, and smoking shall be prohibited in the drilling areas.
- B. Specified personal protection will be utilized at all times in the work zone.
- C. No combustible materials will be allowed in the work zones.

6.4 MODIFICATIONS TO PERSONNEL PROTECTION REQUIREMENTS

- A. At the discretion of the Lebron Associates representative, recommendations may be made to either upgrade or downgrade the personnel protection level, based on actual conditions encountered during the drilling operations. The Lebron Associates representative will also have the authority to temporarily suspend drilling activities, if extremely hazardous conditions are encountered, until such time when the situation has been evaluated, and provisions can be made to upgrade the level of protection.

6.5 DISPOSAL OF CONTAMINATED EQUIPMENT

- A. The Contractor will properly dispose of all contaminated clothing, equipment and other items and materials in conformance with applicable USVI and Federal regulations. The Contractor will provide a suitable number of 55 gallon drums or other suitable containers for the disposal of coveralls, boots, respirator cartridges, etc., to support

the work for the duration of drilling operations. Offsite disposal of these materials shall be the responsibility of Texaco Caribbean, Inc.

Project # _____
Client Name _____
Boring # _____
Sample # _____
Depth _____
Blows / / /
Recovery _____
Date _____

SAMPLE/CORE LOG

Boring/Well _____ Project/No. _____ Page _____ of _____

Site Location	Drilling Started	Drilling Completed

Total Depth Drilled _____ **(feet)**

Hole Diameter _____ (inches) Type of Sample/
Coring Device _____

Length and Diameter
of Coring Device _____ Sampling Interval _____ feet

Drilling Fluid Used _____ Drilling Method _____

Drilling Contractor _____ Driller _____ Helper _____

Prepared By _____ Hammer Weight _____ Hammer Drop _____ inches

**Sample/Core Depth
(feet below land surface)**

**Cone
Recovery
(feet)**

**Time/Hydraulic
Pressure or
Blows per 6
inches**

Sample/Core Description

[illegible]

APPENDIX B

Ground-Water Sampling Protocol

APPENDIX BGROUND-WATER SAMPLING PROTOCOLCollection of Monitoring Well Water Samples

Water samples will be collected from the monitoring wells installed. The samples will be analyzed for petroleum hydrocarbons and volatile organic compounds by USEPA Method 602.

This protocol has been designed to insure that uniform and proper procedures are adhered to in the collection of all samples, in order to provide for the quality and integrity of each sample at each location.

1.0 Well Evacuation Procedures

- 1.1 Identify the well and record its number and other pertinent data on the Water Sampling Log. Prior to sampling, the sampling sites (monitoring wells) will be grouped into three categories: suspected background, suspected slight contamination, and suspected high contamination. Background sites will be sampled first, and the most highly contaminated locations last.
- 1.2 Place clean plastic sheeting on the ground surface adjacent to the well. Equipment and supplies to be used for sampling are to be stored on the plastic.
- 1.3 Remove the well cap or plug and wipe the inside of the casing with a clean cloth. Place the cap on plastic sheeting.
- 1.4 Clean the first 5 feet of the steel measuring tape with laboratory detergent and distilled water. Measure the depth to water from the top of the well casing and record on the Water Sampling Log. A sample log form

1.5 Compute and record the volume of water in the well according to the following:

- 1) For a 4-inch diameter well: height of water column
x 0.65 gallons/foot
- 2) For a 2-inch diameter well: height of water column
x 0.16 gallons/foot

1.6 Remove five times the volume of standing water in the well using a centrifugal pump or with a clean bailer.

1.6.1 The intake opening of the pump hose should be positioned and maintained just below the water surface in the well casing to ensure that the well is properly flushed. If there is a slight decrease in the well's water level as a result of pumping, the intake line should be lowered as needed. This procedure does not have to be followed for those wells in which there is a rapid and pronounced decline in the water level, even to the point where the well is pumped dry. These wells will be pumped by placing the hose near the bottom of the well.

1.6.2 If the well has been pumped or developed recently, the water level may not yet have recovered or returned to static conditions. This does not require a change in the evacuation procedures outlined above. Although the actual volume of water in the casing under such conditions is less than normally found, the removal of five times this volume is sufficient to provide samples for analysis that are representative of the water in the surrounding formation. After 5 volumes have been evacuated, the intake hose will be quickly removed from the well while the pump is still operating in order to prevent backwash from re-entering the well.

- 1.6.3 If the well is pumped dry during the procedure and shows essentially complete recovery within 15 minutes, removal of water should continue for four additional pump down and recovery periods. If recovery is less than 75 percent during the 15 minutes after complete evacuation, sampling can begin with the next appearance of water. However, the initial volume which eventually becomes available may not be large enough to complete the sampling in the brief period of time normally required.
- 1.7 The pump will be purged with potable water between sample locations. Any bailer that is reused will be washed with MicroTM solution and distilled water.
- 1.8 The intake hose will be disposed of and replaced with clean, new hose for use at the next well location.

2.0 Well Sampling Procedure

- 2.1 Sample the wells with a teflon bailer that has been thoroughly cleaned with MicroTM solution, followed by a rinse with distilled water. A nylon cord will be used to secure the bailer; the cord will be discarded after each sampling. Sampling personnel will wear surgical gloves during handling of sampling equipment and containers. The gloves will be disposed after sampling is finished at each well location.
- 2.2 Fill the bailer; discard the water retrieved in the bailer and refill the bailer. Fill sample containers in succession from the same bailer full of water. For wells which contain floating free product the special procedures described below will be followed:
- 2.2.1 Use a peristaltic pump to sample the water occurring below the product. Upon lowering the intake of

the pump, hook up the pump in reverse. Start the pump while the intake is lowered. When the intake hose is located at a sufficient depth below the product, reverse the pump setting to intake. Fill sample containers from the outflow as usual.

- 2.2.2 To sample the floating free product, fill the bailer as described in 2.2 above. Carefully decant the water in the bailer using the ball check-valve on the bailer bottom. Free product remaining in the bailer will be transferred to a sample container using the ball check-valve on the bailer bottom. Fill sample containers as usual.

3.0 Sample Handling and Bottling

- 3.1 The type of sample container and the manner of sample preservation are described in Table B-1.

In addition, field analysis (recorded on the water sampling log) will consist of a qualitative sample description and measurement of pH, temperature, and specific conductance. Field instruments for the measurement of pH and specific conductance will be calibrated with standard solutions prior to sampling each day.

- 3.1.1 At critical locations, a replicate sample will be collected. The replicate sample will be used for quality-control purposes. A trip blank will accompany each set of volatile organic vials from and to the lab. One (1) field blank will be prepared when the samples are collected; the field blank will serve as an additional check that sampling tools are not a source of cross contamination.

- 3.2 For samples exhibiting obvious signs of contamination or strong odors, the sample containers will be stored in separate zip-locTM plastic storage bags. This is especially crucial for volatile vials, in order to avoid cross contamination of samples by diffusion of volatile organics (particularly fluorocarbons and methylene chloride) through the septum seal during shipment and storage.
- 3.3 Samples will be stored in a secure area until they are relinquished to a courier for overnight delivery to the laboratory. Samples will be shipped from the site on a daily basis using proper chain-of-custody.

Table B-1: List of Constituents to be Analyzed for and Preparation Methods

<u>Constituent</u>	<u>Container/Size</u>	<u>Preparation & Preservation</u>
Physical Properties		
pH		Field
Conductance		Measurement
Temperature		

Organic Compounds

Volatiles (USEPA Method 602)	G/(2)-40 ml. No air space.	
	teflon-septa	
Total Petroleum Hydrocarbons	G/ 1 liter	H ₂ SO ₄

Notes:

G - Glass
H₂SO₄ - Sulfuric Acid

WATER SAMPLING LOG

Project/No. _____

Page _____ of _____

Site Location _____

Site/Well No. _____

Coded/
Replicate No. _____

Date _____

Weather _____

Time Sampling
Began _____

Time Sampling
Completed _____

EVACUATION DATA

Description of Measuring Point (MP) _____

Height of MP Above/Below Land Surface _____ MP Elevation _____

Total Sounded Depth of Well Below MP _____ Water-Level Elevation _____

Held _____ Depth to Water Below MP _____ Diameter of Casing _____

Wet _____ Water Column in Well _____ Gallons Pumped/Bailed
Prior to Sampling _____

Gallons per Foot _____

Gallons in Well _____

Sampling Pump Intake Setting-
(feet below land surface) _____

Evacuation Method _____

SAMPLING DATA/FIELD PARAMETERS

Color _____ Odor _____ Appearance _____ Temperature _____ °F/°C

Other (specific ion; OVA; HNU; etc.) _____

Specific Conductance,
umhos/cm _____ pH _____

Sampling Method and Material _____

Constituents Sampled	Container Description From Lab _____ or G&M _____	Preservative
_____	_____	_____
_____	_____	_____
_____	_____	_____

Remarks _____

Sampling Personnel _____

WELL CASING VOLUMES				
GAL/FT	1-1/4" = 0.077	2" = 0.18	3" = 0.37	4" = 0.65
	1-1/2" = 0.10	2-1/2" = 0.24	3-1/2" = 0.50	

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Page 1 of 1

Sampler(s) _____

TOTAL[illegible]**Total No. of Bottles/
Containers**

	Yes	No	N/A
--	-----	----	-----

Yes, No N/A

Special Instructions/Remarks:

Delivery Method: ☐ In Person ☐ Common Carrier _____ SPECIFY ☐ Lab Courier ☐ Other _____ SPECIFY

APPENDIX C

Document and Data Management

APPENDIX CDOCUMENT AND DATA MANAGEMENT

This Quality Assurance Program component is designed to assure the reliability and safety of documents and data collected for compliance and/or litigation purposes. This program includes a document numbering system, inventory procedure and a filing system under the supervision of the Project Officer.

Documents included in the program include original field notes and logbooks, field data records, correspondence, sample numbering and descriptions, laboratory data, and chain-of-custody records.

All documents must be dated. Logbook entries made by individuals other than to whom the logbook was assigned must be signed by the person making the entry.

All field notes and logbooks must be turned over to the project manager at the end of a field assignment.

Chain-of-Custody

All samples shipped to a laboratory will be accompanied by a Chain-of-Custody Record which identifies the contents. The chain-of-custody form will be completed in the field; the original form will accompany the shipment and a copy will be retained by the field personnel for distribution to the project manager. A sample chain-of-custody form is attached.

If sent by mail, the package will be registered with return receipt requested. If sent by common carrier, an airbill or Bill of Lading will be used. Receipts from post officers and bills of lading will be retained as part of the project documentation.

Samples will be properly packaged for shipment and dispatched to the appropriate laboratory for analysis with a separate record prepared for the laboratory. Shipping containers will be sealed. The "Courier to the Airport" space on the Chain-of-Custody record shall be dated and signed.

Field Data Records

Where ordered by the project manager or officer, serialized field data records in the form of individual sheets or bound logbooks will be maintained for each sampling station or location. All in-situ measurements and field observations will be recorded along with all pertinent information necessary to explain and reconstruct sampling operations. Each page of the field data record will be dated and initialed by all individual making entries on that page or engaged in field activities related to the entry.

All working documents used in evaluating data should contain information sufficient to recall and describe each step of the analysis performed should the analyst be required to testify in subsequent enforcement proceedings. Sufficient information must be provided to enable others to reconstruct the analysis if the analyst is not available to do so. If the analyst believes it necessary to deviation shall be justified and documented.

Document Correction and Changes

No serialized documents are to be destroyed even if they are illegible or contain inaccuracies. When an error is made in a project logbook, the individual may make corrections by crossing out the error and entering the correct information. Changes made in this manner must be dated and initialed. If an error is discovered on a chain-of-custody record or field document, the person who made the error should correct it whenever possible. Corrections or insertions are made by writing "corrected", the date, and the person's initials beside the correction.

Consistency of Documentation

Before releasing any field data, laboratory data, or data evaluation, the project staff shall assemble and cross-check information on corresponding sample tags, custody records, laboratory reports, analyst logbooks, and field logbooks to ensure that data are consistent throughout the project record.

Project Files

After a particular investigation is completed, all documents generated as part of the project are to be assembled in a central file. Staff may retain clean (no handwritten comments) copies of documents for their personal files but only after personally verifying that the original or similar copy is in the project file. The project manager is responsible for assuring the collection, assembly, and inventory of all project documents at the time the project is completed. The file then becomes accountable and any records leaving the file must be signed out.

All documents in an accountable file are to be labeled with a serialized number. The following documents are to be included:

- Project Logbooks
- Field Data Records
- Sample Identification Documents
- Chain-of-Custody Records
- Analytical Logbooks, Lab Data, Calculations Correspondence
- Report Notes and Drafts (including all changes requested by a client)
- References
- Miscellaneous - photos, maps, drawings, etc.

Draft reports are numbered and accountable. They are stamped FOR REVIEW ONLY, DO NOT DUPLICATE on the cover. The author is responsible for disseminating draft reports for peer review.

Laboratory: _____

SAMPLE CONTAINER DESCRIPTION

[illegible]**Total No. of Containers**

Relinquished by: _____ Organization: _____ Received by: _____ Organization: _____

Date: _____ Time: _____ Date: _____ Time: _____

Relinquished by: _____ Organization: _____ Received by: _____ Organization: _____

Date: _____ Time: _____

Relinquished by: _____ Organization: _____ Received by: _____ Organization: _____

Date: _____ Time: _____

Delivery Method: _____ (attach shipping bill, if any)

(Use extra sheets, if necessary)

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APPENDIX D

Material Safety Data Sheets for Selected Chemicals

type 1/msds.ohmtads

Conversion to local identifiers resulted in 1 unique occurrences.

Conversion Entry 1; Accession No. 7217073

(CAS) CAS Registry Number: 8006-61-9

(MAT) Material Name: GASOLINE

(SGM) Synergistic Materials: MAY ACT AS SYNERGIST TO PESTICIDES

(STD) Standard Codes: NFPA - 1,3,0; ICC - FLAMMABLE LIQUID, RED LABEL,
10 GALLON; USCG - NONFLAMMABLE LIQUID, RED LABEL; IATA -
FLAMMABLE LIQUID, RED LABEL, 1 LITER PASSENGER, 40 LITER CARGO.

(FLM) Flammability: QUITE FLAMMABLE, COMBUSTION PROBABLE

(LFL) Flammability Limit(%), Lower: 1.4

(UFL) Flammability Limit(%), Upper: 7.6

(TCP) Toxic Combustion Prod.: SLIGHT - USE CANISTER-TYPE MASKS

(EXT) Extinguishing Method: WATER MAY BE INEFFECTIVE. USE FOAM, DRY
CHEMICAL, CARBON DIOXIDE AND CARBON TETRACHLORIDE.

(FLP) Flash Point (C.): -43

(AIP) Auto Ignition Point(C.): 280

(EXP) Explosiveness: STABLE

(LEL) Explosive limit(%), Lower: 1.4

(UEL) Explosive Limit(%), Upper: 7.6

(BLP) Boiling Point (C.): 39 TO 204 (IGNITES)

(SPG) Specific Gravity: .8

(PFA) Potential for Accumulation: NONE NOTED UNLESS LEAD IS PRESENT.
POTENTIAL.

(TRT) Major Species Threatened: WATERFOWL AND AQUATIC LIFE

(INH) Inhalation Limit (Value): 500

(INT) Inhalation Limit (Text): THERE ARE NO OSHA REGULATIONS.

RECOMMENDATIONS--

TUT 003 0938

ACGIH TLV (TWA) 900 MG/M3 300 PPM (TLVADM 83/ACGIH)

ACGIH STEL 1500 MG/M3/15 MIN

500 PPM/15 MIN (TLVADM 83/ACGIH)

UPDATED 3/84

(DRC) Direct Contact: EYES

(JNS) General Sensation: IRRITANT - ACUTE AND CHRONIC RECOGNITION ODOR
IN AIR, 10 PPM (R99*** 0001)

(LOT) Odor Threshold, Lower (ppm): .005

(UOT) Odor Threshold, Upper (ppm): .01

(SAF) Personal Safety Precautions: AVOID SOURCES OF IGNITION

(AHL) Acute Hazard Level: COATING ACTION OF OILS CAN DESTROY WATER
BIRDS, PLANKTON, ALGAE AND FISHES

(HEL) Degree of Hazard to Public Health: WILL CAUSE TASTE AND ODOR
PROBLEMS BEFORE REACHING TOXIC LEVELS. VAPORS NOT CONSIDERED
VERY HAZARDOUS.

(AIR) Air Pollution: LOW

(ACT) Action Levels: CALL LOCAL FIRE AUTHORITY. REMOVE ALL POTENTIAL
SOURCES OF IGNITION.

(AML) In Situ Amelioration: THERE ARE A WIDE VARIETY OF SORBENTS,
SINKING AGENTS, GELLING AGENTS, COMBUSTION PROMOTERS,
DISPERSANTS, AND MECHANICAL SYSTEMS TO TREAT OIL SPILLS. IN
ADDITION, STRAW, POLYURETHANE FOAM, ACTIVATED CARBON, AND PEAT
CAN BE USED TO SOAK UP OIL. SEEK PROFESSIONAL ENVIRONMENTAL
ENGINEERING ASSISTANCE THROUGH EPA'S ENVIRONMENTAL RESPONSE TEAM
(ERT), EDISON, NJ, 24-HOUR NO. 201-321-6660.

(SHR) Beach/Shore Restoration: OIL CAN BE BURNED OFF OF BEACHES. MAY
REQUIRE ADDITIONAL FUEL FOR COMPLETE COMBUSTION.

(AVL) Avail. of Countermeasure Material: OIL TREATING AGENTS ARE
STOCKED IN MANY MAJOR HARBOR; IN ADDITION: STRAW - FARMSTEAD
STABLES; POLYURETHANE FOAM - UPHOLSTERY SHOPS; ACTIVATED CARBON

- WATER TREATMENT PLANTS, SUGAR REFINERIES; AND PEAT -
NURSERIES, FLORAL SHOPS

(DIS) Disposal Method: SPRAY INTO INCINERATOR

(IFP) Industrial Fouling Pot.: BOILER WATER FEED SHOULD BE LIMITED TO
7 PPM OR LESS. OIL CAN RESULT IN POOR HEAT TRANSPORT,
BLISTERING, OVERHEATING AND FOAMING. IN REUSED COOLING WATER,
NO OIL IS ACCEPTABLE. OIL CAUSES TASTES IN FOOD PROCESSING WATER
AND IS ESPECIALLY DETRIMENTAL TO CEMENT AND PAPER MAKING
OPERATIONS.

(WTP) Effects on Water Treatment Process: GASOLINE UP TO .2% HAD
LITTLE EFFECT ON DIGESTION. HIGHER CONCENTRATIONS HAD GREAT
EFFECT. 1% DOUBLED DIGESTION TIME REQUIRED. WILL INTERFERE WITH
SETTLING AND FLOC FORMATION. MAY PLUG FILTERS AND EXCHANGE BEDS.

(WAT) Major Water Use Threatened: RECREATION; FISHERIES; POTABLE
SUPPLY; IRRIGATION; INDUSTRIAL

(LOC) Probable Location and State of Material: CLEAR AMBER LIQUID.
DISSOLUTION PROGRESSES FROM 100 PPM TO 600 PPM OVER 40 DAY
PERIOD(WATRA6 0022); WILL FLOAT IN SLICK ON SURFACE.

(COL) Color in Water: YELLOW

(DAT) Adequacy of Data: FAIR

type 1/mds.rtecs

Entry 1 CAS RN 8006-61-9 NIOSH number LX3300000

MAT: GASOLINE

TOXICITY DATA:

1hl-man TCLo: 900 ppm/1H

1hl-man LCLo: 30000 ppm/5M

DATA REFERENCES:

CLASS: SKIN AND EYE IRRITANT

OCCER: TLV-TWA 300 ppm; STEL 500 ppm

DOTST: DOT-HAZARD: FLAMMABLE LIQUID; LABEL: FLAMMABLE

LIQUID

EPAINF: REPORTED IN EPA TSCA INVENTORY, 1983

EPAINF: EPA TSCA SECTION 8(a) STATUS REPORT BEHQ-1281-0422

OSHMED: MEETS CRITERIA FOR PROPOSED OSHA MEDICAL RECORDS RULE

FEREAC 47,30420,82

type 1/2

CTCP

Conversion to local identifiers resulted in 1 unique occurrences.

Conversion Entry 1

(PNAME)Primary Name: Gasoline

(ACC)Location Number: 5550

(PCAS)CAS Registry Number: 8006-61-9

(TOXR)Toxicity Rating: 3

Other names

ICode*ICAS RN

Ethyl gasoline

| a |

Leaded gasoline

| a |

Petrol

| a | 8006-61-9

* Code (Relationship to Primary Name):

a - Synonym

(TEXT)Text: A mixture chiefly of C5 to C12 aliphatic hydrocarbons

obtained as a petroleum distillate, often after "cracking" heavy fractions. Boiling point range is approximately 40 to 225°C.

Tetraethyl lead content is not of toxic significance in acute exposures by ingestion or inhalation, but persons who are careless about repeated and massive skin contact have developed lead poisoning (See Lead in Section III). No nonpetroleum additives are believed to be significantly toxic as present in commercial formulations. Appreciable amounts of aromatic hydrocarbons (e.g., xylenes) are found in commercial fuels, especially when the petroleum is from Texas and California (but not from eastern U.S. fields). A high content of aromatic hydrocarbons and a consequent

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high toxicity are also associated with a high "octane rating" (whenever the latter is not due to additives, such as tetraethyl lead or alcohol). Gasoline has been used by sniffers to produce euphoria. See also Kerosene.

See also Reference Congener at Loc No. 5560: Kerosene

(DOM)Date of Last Modification: 07-01-83

Number of Bibliographic References Available: 4

163 (BSHR) Ainsworth, 1960

1893 (BSHR) Eason, 1962

4181 (BSHR) Machle, 1941

6973 (BSHR) White, 1955

Conversion to local identifiers resulted in 1 unique occurrences.

Conversion Entry 1: Accession No. 3714

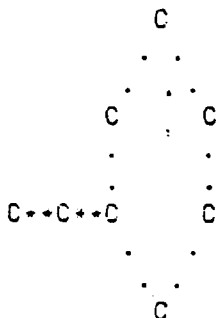
(MONO) Monograph: 3714

(MMAT) Monograph Title Name: Ethylbenzene

(CAS) C.A.Registry Number: 100-41-4

(TEXT) Monograph Text:

Prepn from acetophenone: Clemmensen, Ber. 46, 1638 (1913); Gattermann-Wieland, Praxis des organischen Chemikers (de Gruyter, Berlin, 40th ed., 1961) p 332. By Huang-Minlon modification of Wolff-Kishner reduction: A. I. Vogel, Practical Organic Chemistry (Longmans, 3rd ed., 1959) p 516. Physical properties: L. C. Gibbons et al., J. Am. Chem. Soc. 68, 1130 (1946). Manuf: Faith, Keyes & Clark's Industrial Chemicals, F. A. Lowenheim, M. K. Moran, Eds. (Wiley-Interscience, New York, 4th ed., 1975) pp 365-370. Toxicity: H. F. Smyth et al., Am. Ind. Hyg. Assoc J. 23, 95 (1962).



Colorless liquid; flammable. $d_{(25/25)} 0.866$. bp 136.25 deg. mp -95.01 deg. $n_{(25/D)} 1.4932$. Flash pt, closed cup: 64 deg.F (18 deg.C). Practically insol in water; misc with the usual organic solvents. LD50 orally in rats: 5.46 g/kg (Smyth).

Caution: Irritating to eyes, skin, mucous membranes, and, in high concns, narcotic.

(USE) Use: For conversion to styrene monomer; as resin solvent.

(MOL) Molecular Formula: C_8H_{10}

(COMP) Composition: C 90.50%, H 9.50%

(MWT) Molecular Weight: 106.16

(LFORM) Line Formula: $C_8H_{10}C_2H_5$

(DENS) Density: $d_{(25/25)} 0.866$

(MP) Melting Point: mp -95.01 deg.

(BP) Boiling Point: bp 136.25 deg.

(REF) Index of Refraction: $n_{(25/D)} 1.4932$

Option?

Invalid format code specified or saved FORMAT file not found

Option? TYPE 2/MSDS. CHRIS

Conversion to local identifiers resulted in 1 unique occurrences.

Conversion Entry 1; Accession No. 2262623

(CAS) CAS Registry No.: 100-41-4

(MAT) Material Names: ETHYLBENZENE; Phenylethane; EB

(FML) Formula: C6H5CH2CH3

(DES) Description: Liquid Colorless Sweet, gasoline-like odor
Floats on water. Flammable, irritating vapor is produced.

(LCT) Label Category: Flammable liquid

(LCL) Label Class: 3

(LOC) Physical State (as shipped): Liquid

(COL) Color: Colorless

(ODR) Odor: Aromatic

(BLP) Boiling Point at 1 atm.: 136.2 (deg.C) (= 409.4 deg.K = 277.2 deg.F)

(TFP) Freezing Point: -95 (deg.C) (= 172 deg.K = -139 deg.F)

(STT) Storage Temperature: Ambient

(IGT) Ignition Temperature: 560 (deg.F)

(SIF) Behavior in Fire: Vapor is heavier than air and may travel considerable distance to the source of ignition and flash back.

(TCP) Special Hazards of Combustion Products: Irritating vapors are generated when heated.

(EXT) Fire Extinguishing Agents: Foam (most effective), water fog, carbon dioxide or dry chemical.

(FLA) Flammable Limits in Air: 1.0 TO 6.7 (%)

(FLP) Flash Point: 60 (deg.F O.C.) ; 59 (deg.F C.C.)

(RWT) Reactivity With Water: No reaction

(RCM) Reactivity With Common Materials: No reaction

(ACT) Actions in Case of Emergency: Avoid contact with liquid and vapor. Keep people away. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Stop discharge if possible. Stay upwind and use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.

FIRE

FLAMMABLE.

Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.

EXPOSURE

CALL FOR MEDICAL AID.

HAZARD

Irritating to eyes, nose and throat. If inhaled, will cause

dizziness or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.

LIQUID

Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

WATER POLLUTION

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.

Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

- (RSD) Response to Discharge: Mechanical containment
Should be removed
Chemical and physical treatment
- (SAF) Personal Protective Equipment: Self-contained breathing apparatus; safety goggles.
- (SRC) Symptoms Following Exposure: Inhalation may cause irritation of nose, dizziness, depression. Moderate irritation of eye with corneal injury possible. Irritates skin and may cause blisters.
- (TFE) Treatment of Exposure: INHALATION: if ill effects occur, remove victim to fresh air, keep him warm and quiet, and get medical help promptly; if breathing stops, give artificial respiration. INGESTION: induce vomiting only upon physician's approval; material in lung may cause chemical pneumonitis. SKIN AND EYES: promptly flush with plenty of water (15 min. for eyes) and get medical attention; remove and wash contaminated clothing before reuse.
- (VIC) Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- (LSI) Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.
- (ODT) Odor Threshold: 140 (ppm)
- (IDL) IDLH Value: 2000 (ppm)
- (SIL) Short Term Inhalation Limit: 200 (ppm for 30 min.)
- (DHI) Toxicity By Ingestion: Grade 2; LD50 = 0.5 to 5 g/kg (rat)
- (NAS) NAS Hazard Rating For Bulk Water Transportation:

Category	Rating
Fire	13
HEALTH	1
Vapor Irritant	12
Liquid or Solid Irritant	12
Poisons	12
WATER POLLUTION	1
Human Toxicity	11
Aquatic Toxicity	12
Aesthetic Effect	12
REACTIVITY	1
Other Chemicals	11
Water	13
Self-Reaction	0

OHM/TADS (Version 7.15/9.5 December, 1985) (\$55/Hr.)
Latest Data Base Update: 12/85 - 1,402 Entries Total (See 17 Dec NEWS Mes-
sage)

Latest news for OHMTADS . . .
18 Oct 86: New OHM/TADS Manual Now Available!

Option? TYPE 2/MSDS. OHM

Conversion to local identifiers resulted in 1 unique occurrences.

	Conversion Entry	1: Accession No.	7216709	
(CAS)	CAS Registry Number:	100-41-4		
(MAT)	Material Name:	\$\$\$ ETHYLBENZENE \$\$\$		
(FML)	Chemical Formula:	C6H5.C2H5		
(CON)	Containers:	GLASS BOTTLES, CANS, DRUMS, TANK CARS - TRUCKS - BARGES.		
(STO)	General Storage Procedure:	OUTSIDE OR DETACHED PREFERRED. ISOLATE FROM ACUTE FIRE HAZARDS AND OXIDIZING AGENTS.		
(FDL)	Detection Limit (Field: Techniques,Ref) (ppm):	5.0, AROMATICS, (BNW45+ 0022)		
(LCL)	Detection Limit (Lab: Techniques,Ref) (ppm):	.001, GAS CHROMATOGRAPHY, (BNW28+ 0001)		
(STD)	Standard Codes:	EPA 311: NO CFR: USCG - GRADE C FLAMMABLE LIQUID: NFPA - 2,3,0: IATA - FLAMMABLE LIQUID, RED LABEL, 1 LITER PASSENGER, 40 LITER CARGO: NO ICC: SUPERFUND DESIGNATED (HAZARDOUS SUBSTANCES) LIST.		
(FLM)	Flammability:	QUITE FLAMMABLE, COMBUSTION PROBABLE.		
(LFL)	Flammability Limit(%), Lower:	1		
(UFL)	Flammability Limit(%), Upper:	6.7		
(TCP)	Toxic Combustion Prod.:	HAZARDOUS, EMPLOY SELF-CONTAINED BREATHING APPARATUS.		
(EXT)	Extinguishing Method:	WATER MAY BE INEFFECTIVE. WATER SPRAY, CARBON DIOXIDE, DRY CHEMICAL OR FOAM. GOGGLES AND SELF-CONTAINED BREATHING APPARATUS.		
(FLP)	Flash Point (C.):	20		
(AIP)	Auto Ignition Point(C.):	432.22		
(EXP)	Explosiveness:	STABLE VAPORS FORM EXPLOSIVE MIXTURES WITH AIR.		
(MLT)	Melting Point (C.):	-95.01		
(BLP)	Boiling Point (C.):	136.25 (IGNITES)		
(SOL)	Solubility (ppm @ 25C):	14		
(SPG)	Specific Gravity:	.856		
(VPM)	Vapor Pressure (mm Hg):	10: 100		
(VDN)	Vapor Density:	0.66		
(PER)	Persistence:	QUITE RESISTANT TO NONACCLIMATED CULTURES.		
(TST)	Major Species Threatened:	ALL LIFE.		
(TIC)	Toxic Impacting Characteristics (ppm):	.25		
(IDLH)	Inhalation Limit (Value):	2000 (PPM) IDLH)		
(INT)	Inhalation Limit: Text:	REGULATIONS-- OSHA PEL TWA 405 MG/M3 100 PPM (280PPM- 1910). RECOMMENDATIONS-- NIOSH IDLH 2000 PPM PEL TSD- 30MG/M3- 603H TLV TWA 405 MG/M3 100 PPM- TLV TSD		

- (DRC) Direct Contact: SEVERELY IRRITATING TO EYES, MUCOUS MEMBRANE.
TLV 100 PPM. NARCOTIC IN HIGH CONCENTRATIONS. LACRIMATOR.
- (JNS) General Sensation: .1% IRRITATING TO EYES. SKIN IRRITATION GRADE
4 - CAPILLARY INJECTION FROM DILUTED SOLUTION: .2% IS EXTREMELY
IRRITATING FINALLY CAUSING DIZZINESS, IRRITATION OF NOSE AND
THROAT, AND CONSTRICTION OF CHEST. EYE IRRITATION GRADE 2 -
SMALL BURNS FROM .5 ML (R119** 0001); 1% HAS BEEN FATAL TO
GUINEA PIGS.
- (LOT) Odor Threshold, Lower (ppm): .25
- (SAF) Personal Safety Precautions: FULL PROTECTIVE CLOTHING AND SELF-
CONTAINED BREATHING APPARATUS REQUIRED.
- (AHL) Acute Hazard Level: 10,400 PPM IN AIR LETHAL TO MICE. MODERATE
TOXICANT VIA ALL ROUTES. IRRITANT. TOXIC TO AQUATIC LIFE.
- (CHL) Chronic Hazard Level: RABBIT - 5 G/KG IN DRINKING WATER. EFFECT
ON CNS, GROWTH, MORPHOLOGICAL COMPOSITION OF BLOOD, PATH. AND
HISTOLOGICAL CHANGES IN ORGANS. (A1*** 0001)
- (HEL) Degree of Hazard to Public Health: MODERATE TOXIC ACTION VIA ALL
ROUTES. STRONG IRRITANT.
- (AIR) Air Pollution: HIGH
- (ACT) Action Levels: NOTIFY AIR AND FIRE AUTHORITY. WARN CIVIL DEFENSE
OF POSSIBLE EXPLOSION. EVACUATE AREA. ENTER FROM UPWIND.
REMOVE IGNITION SOURCE. ATTEMPT TO CONTAIN SLICK.
- (AML) In Situ Amelioration: OIL SKIMMING EQUIPMENT AND SORBENT FOAMS
CAN BE APPLIED TO SLICK. SEEK PROFESSIONAL ENVIRONMENTAL
ENGINEERING ASSISTANCE THROUGH EPA'S ENVIRONMENTAL RESPONSE
TEAM (ERT), EDISON, NJ, 24-HOUR NO. 201-321-6660.
- (AVL) Avail. of Countermeasure Material: OIL SKIMMING EQUIPMENT-STORED
AT MAJOR PORTS; SORBENT FOAMS (POLYURETHANE) - UPHOLSTERY SHOPS.
- (DIS) Disposal Method: SPRAY INTO INCINERATOR OR BURN IN PAPER
PACKAGING. ADDITIONAL FLAMMABLE SOLVENT MAY BE ADDED.
- (IFP) Industrial Fouling Pot.: SLICK MAY REDUCE HEAT TRANSFER OR CAUSE
HOT SPOTS AND SCALING.
- (WTP) Effects on Water Treatment Process: 1000 MG/L IS NOT SUBSTRATE
LIMITING TO ANAEROBIC PROCESSES (R66*** 0001).
- (WAT) Major Water Use Threatened: RECREATION, FISHERIES, POTABLE
SUPPLY, INDUSTRIAL
- (LOC) Probable Location and State of Material: COLORLESS LIQUID. WILL
FLOAT IN SLICK.
- (HCH) Water Chemistry: SUBJECT TO SLOW BIOCHEMICAL ATTACK.
- (COL) Color in Water: COLORLESS
- (DAT) Adequacy of Data: FAIR

Option?

tyype 1/msds. merck

Conversion to local identifiers resulted in 1 unique occurrences.

Conversion Entry 1: Accession No. 1063

(MONO) Monograph: 1063

(MMAT) Monograph Title Name: Benzene

(AMAT) Alternate Name(s): Benzol; cyclohexatriene

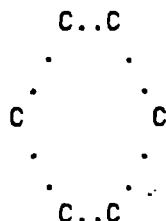
(XMAT) Additional Name(s): phenyl sodium

(CAS) C.A.Registry Number: 71-43-2

(TEXT) Monograph Text:

Discovered by Faraday in compressed oil gas in 1825. Obtained in the coking of coal and in the production of illuminating gas from coal. Purification by washing with water: Brit. pat. 863,711 (1961 to Schloven-Chemie and H. Koppers GmbH), C.A. 55, 16971f (1961). Lab prepn from aniline: Gattermann-Wieland, Praxis des organischen Chemikers (de Gruyter, Berlin, 40th ed., 1961) p 247. Production of pure benzene: French, Ind. Chemist 39, 9-12 (1963). Manuf: Faith, Keyes & Clark's Industrial Chemicals, F. A. Lowenheim, M. K. Moran, Eds. (Wiley-Interscience, New York, 4th ed., 1975) pp 126-137. Physical properties: Thorne et al., Ind. Eng. Chem. Anal. Ed. 17, 481 (1945). Solubility studies: F. P. Schwarz, Anal. Chem. 52, 10 (1980). Toxicity data: Kimura et al., Toxicol. Appl. Pharmacol. 19, 699 (1971). Review of toxicology: E. Browning, Toxicity and Metabolism of Industrial Solvents (Elsevier, New York, 1955) pp 3-65; R. Snyder et al. Rev

TUT 003 0949



Clear, colorless, highly flammable liquid; characteristic odor. $d_{15/4}$ 0.8787. bp 80.1 deg. mp +5.5 deg. n_{D20} 1.50108. Flash pt, closed cup: 12 deg.F (-11 deg.C). Soly in water at 23.5 deg.C (w/w): 0.188%. Miscible with alcohol, chloroform, ether, carbon disulfide, carbon tetrachloride, glacial acetic acid, acetone, oils. Keep in well-closed containers in a cool place and away from fire. LD50 orally in young adult rats: 3.8 ml/kg (Kimura).

Sodium deriv, C_6H_5Na , phenyl sodium. Prepn: Schlosser, Angew. Chem. 76, 267 (1964). Solid mass, dec by water, acids, alkalis. Sol in liquid ammonia, tetrahydrofuran.

Human Toxicity: Acute (from ingestion or inhalation): irritation of mucous membranes, restlessness, convulsions, excitement, depression. Death may follow from respiratory failure. Chronic: bone marrow depression and aplasia; rarely,

leukemia. Harmful amts may be absorbed through skin. This substance has been listed as a carcinogen by the EPA: Second Annual Report on Carcinogens (NTP 81-43, Dec. 1981) pp 47-50.

(USE) Use: Manuf of medicinal chemicals, dyes and many other organic compounds, artificial leather, linoleum, oil cloth, airplane dopes, varnishes, lacquers; as solvent for waxes, resins, oils, etc.

(THCVET) Therapeutic Category (Vet.): Destroys screwworm larvae in wounds.

(MOL) Molecular Formula: C_6H_6

Sodium deriv: C_6H_5Na

(COMP) Composition: C 92.25%, H 7.75%

(MWT) Molecular Weight: 78.11

(DENS) Density: $d_{15/4}$ 0.8787

(MP) Melting Point: mp +5.5 deg.

(BP) Boiling Point: bp 80.1 deg.

(RFR) Index of Refraction: n_{D20} 1.50108

Option?

go rtecs

RTECS Search System (Version 6.5/14.2 January 1986) (\$55/hr)

Toxicity data in RTECS have not been critically evaluated

Latest news for RTECS . . .

21 May 86: Correction Made to Database

Option? type 1/msds. rtecs

Entry 1 CAS RN 71-43-2 NIOSH number CY1400000

MAT: BENZENE

FML: C6-H6

TOXICITY DATA:

ihl-hmn LCLo:2 pph/5M
orl-hmn TDLo:130 mg/kg
ihl-hmn LCLo:20000 ppm/5M
ihl-hmn TCLo:210 ppm
ihl-man TCLo:150 ppm/1Y-1
ihl-hmn TCLo:100 ppm
ihl-hmn LCLo:65 mg/m3/5Y
unr-man LDLo:194 mg/kg
orl-rat LD50:4894 mg/kg
ihl-rat LC50:10000 ppm/7H

TUT 003 0901

orl-mus LD50:4700 mg/kg
ihl-mus LC50:9980 ppm
ipr-mus LD50:990 ug/kg
orl-dog LDLo:2000 mg/kg
ihl-dog LCLo:146000 mg/m3
ihl-cat LCLo:170000 mg/m3
ivn-rbt LDLo:88 mg/kg
ipr-gpg LDLo:527 mg/kg
scu-fng LDLo:1400 mg/kg
ihl-mam LCLo:20000 ppm/5M

DATA REFERENCES:

CLASS: AGRICULTURAL CHEMICAL
CLASS: TUMORIGEN
CLASS: DRUG
CLASS: MUTAGEN
CLASS: TERATOGEN
CLASS: SKIN AND EYE IRRITANT
IARC: CARCINOGENIC REVIEW:HUMAN SUSPECTED
IARC: CARCINOGENIC REVIEW:ANIMAL SUSPECTED
IARC: CARCINOGENIC REVIEW:HUMAN POSITIVE
IARC: CARCINOGENIC REVIEW:ANIMAL INDEFINITE
OCCER: TLV-SUSPECTED CARCINOGEN
OCCER: TLV-TWA 10 ppm; STEL 25 ppm
OSHA: OSHA STANDARD-air:TWA 10 ppm;CL 25 ppm;Pk 50
ppm/10M/8H (SCP-U)
OSHA: MSHA STANDARD-air-CL 25 ppm (80 mg/m3) (skin)

DOTST: DOT-HAZARD:FLAMMABLE LIQUID; LABEL:FLAMMABLE
LIQUID
OCCER: OCCUPATIONAL EXPOSURE TO BENZENE recm
std-air:CL 1 ppm/60M
NTP: NTP CARCINOGENESIS STUDIES; TEST COMPLETED, NOVEMBER 1985
NTP: NTP FOURTH ANNUAL REPORT ON CARCINOGENS, 1984
NIOSH: "NIOSH MANUAL OF ANALYTICAL METHODS, 3rd Ed." see: METHODS 1500
and

1501

EPAINF: REPORTED IN EPA TSCA INVENTORY, 1983
EPAINF: EPA GENETIC TOXICOLOGY PROGRAM, JANUARY 1984
EPAINF: EPA TSCA SECTION 8(e) STATUS REPORT
8EHQ-0680-0345;8EHQ-1277-0027;8EHQ-0378-0112
EPAINF: EPA TSCA SECTION 8(e) STATUS REPORT 8EHQ-0978-0244;8EHQ-0379-027
7
EPAINF: EPA TSCA SECTION 8(e) STATUS REPORT 8EHQ-0378-0112
OSHMED: MEETS CRITERIA FOR PROPOSED OSHA MEDICAL RECORDS RULE
FEREAC 47,30420,82
PESTCL: Outdated pesticide

Option? go ohm

TUT 003 0952

Latest news for OHMTADS . . .

16 Oct 86: New OHM/TADS Manual Now Available!

Option?

type 1/msds. ohm

Conversion to local identifiers resulted in 1 unique occurrences.

	Conversion Entry	1: Accession No.	7216601
(CAS)	CAS Registry Number: 71-43-2		
(SIC)	SIC Code: 2821; 2879; 2841; 2818; 2815		
(MAT)	Material Name: \$\$\$ BENZENE \$\$\$		
(FML)	Chemical Formula: C6H6		
(USS)	Common Uses: SOLVENT AND INTERMEDIATE FOR SYNTHESIS IN THE CHEMICAL AND PHARMACEUTICAL INDUSTRIES. APPROXIMATELY 86% OF BENZENE PRODUCTION IS USED IN THE MANUFACTURING OF STYRENES, PHENOLS, CYCLOHEXANES, AND OTHER ORGANIC CHEMICALS. THE REMAINDER IS USED PRIMARILY IN THE MANUFACTURE OF DETERGENTS, PESTICIDES, SOLVENTS, AND PAINT REMOVERS. BENZENE OCCURS AS A COMPONENT OF GASOLINE AT LESS THAN 2%.		
(CON)	Containers: SMALL GLASS BOTTLES, 1 GALLON CANS, 5-55 GALLON METAL DRUMS, TANK CARS, TRUCKS, BARGES, AND PLASTIC OR EARTHENWARE BOTTLES AND RECEPTACLES.		
(STO)	General Storage Procedure: OUTSIDE OR DETACHED PREFERABLE. PROTECT AGAINST PHYSICAL DAMAGE. WELL-CLOSED CONTAINERS, COOL AREA. SHOULD NOT USE GLASS CONTAINERS.		
(HND)	General Handling Procedure: AVOID ALL POTENTIAL SOURCES OF IGNITION.		
(BIN)	Binary Reactants: CHLORINE, OXYGEN, OZONE, PERMANGANATES SULFURIC ACID, PEROXIDES, PERCHLORATES, NITRATING ACID, 1 TUT 003 0953 ACID, CHROMIC ACID ANHYDRIDE, AND CHROMIUM TRIOXIDE		
(COR)	Corrosiveness: NONCORROSIVE		

(LDL) Detection Limit (Lab: Techniques,Ref) (ppm): .001, GAS CHROMATOGRAPHY, (BNW28* 0001); EPA HAS PROPOSED A GAS CHROMATOGRAPHIC METHOD WITH A FLAME IONIZATION DETECTOR (FID) FOR DETERMINATION OF BENZENE IN INTEGRATED BAG SAMPLES OF INDUSTRIAL STACK GASES. (FEREAC 0015)

(STD) Standard Codes: UN NO. 1114; NFPA - 2,3,0; ICC - FLAMMABLE LIQUID, RED LABEL, 10 GALLON IN AN OUTSIDE CONTAINER; USCG - GRADE C FLAMMABLE LIQUID; IATA - FLAMMABLE LIQUID, RED LABEL, 1 LITER PASSENGER, 40 LITER CARGO. IMCO- CLASS 3.2: NONFLAMMABLE LIQUIDS, NONFLAMMABLE LIQUID LABEL, PACKAGING GROUP II (85E2A0 IMDG,77/IMCO) CFR-ID NO. UN1114, CLASS FLAMMABLE LIQUID, FLAMMABLE LIQUID LABEL, CFR PACKAGING CODE 173.119, EXCEPTION 173.118, 1QT MAXIMUM NET CAPACITY PACKAGE LIMIT IN PASSENGER AIRCRAFT AND RAILCAR, 10 GALLON MAXIMUM NET CAPACITY PACKAGE LIMIT IN CARGO AIRCRAFT. STOW ON DECK ON PASSENGER SHIPS, ON OR UNDER DECK ON CARGO SHIPS. (FEREAC 0017) SUPERFUND DESIGNATED (HAZARDOUS SUBSTANCES) LIST.

(FLM) Flammability: QUITE. COMBUSTION IMMINENT. VERY FLAMMABLE.

(LFL) Flammability Limit(%), Lower: 1.3

(UFL) Flammability Limit(%), Upper: 7.1

(TCP) Toxic Combustion Prod.: HAZARDOUS, EMPLOY SELF-CONTAINED BREATHING APPARATUS.

(EXT) Extinguishing Method: WATER MAY BE INEFFECTIVE - (USE WATER SPRAY), CARBON DIOXIDE, DRY CHEMICAL OR FOAM.

(FLP) Flash Point (C.): 10-12

(AIP) Auto Ignition Point(C.): 580

(EXP) Explosiveness: VAPOR FORMS EXPLOSIVE MIXTURE WITH AIR. HIGHLY REACTIVE. VAPOR IS HEAVIER THAN AIR - MAY TRAVEL CONSIDERABLE DISTANCE TO IGNITION SOURCE AND FLASH BACK.

(LEL) Explosive limit(%), Lower: 1.5

(UEL) Explosive Limit(%), Upper: 8

(MLT) Melting Point (C.): 5.5

(BLP) Boiling Point (C.): 80.1 (IGNITES)

(SOL) Solubility (ppm @ 25C): 820

(SPG) Specific Gravity: .879

(VPN) Vapor Pressure (mm Hg): 95.2

(VDN) Vapor Density: 2.77

(PER) Persistency: LOW BOD VALUES INDICATED THE BENZENE WILL REMAIN A PROBLEM IF NOT CLEANED UP OR SUBJECTED TO NATURAL DILUTION AND DISPERSION. HALF-LIFE OF LESS THAN SATURATED SOLUTIONS IS ESTIMATED AS 37.3 MINUTES DUE TO EVAPORATION. 62% EVAPORATES WITH THE FIRST .01% OF WATER (ESTHAG 0008).

(PFA) Potential for Accumulation: CAN ACT AS ACCUMULATIVE POISON. POTENTIAL. BREATH CONCENTRATIONS OF BENZENE IN HUMAN SUBJECTS REPEATEDLY EXPOSED TO BENZENE VAPORS APPROACHED A MAXIMUM AFTER 30, WHICH INDICATED THAT TISSUE CONCENTRATIONS WERE APPROACHING SATURATIONS. ELIMINATION WAS BIPHASIC WITH HALF-LIVES OF 2.6 AND 24 HOURS (SWEHDO 0001)

(CAG) Carcinogenicity: MOUSE- +/21 - TWICE WEEKLY (SKIN) +/36 - 25 UL TWICE/24 WEEKS (SKIN) +/40 - PAINTED TWICE/40 WEEKS (SKIN) NEGATIVE - ONCE A WEEK/4 MONTHS, THRICE WEEKLY THEREAFTER FOR 108 APPLICATIONS IN 12 MONTHS (TOTAL DOSE # 8.9 GM) (SKIN) POSITIVE. ANIMAL EXPERIMENTS HAVE NOT CLEARLY DEMONSTRATED BENZENE IS A CARCINOGEN, BUT AN INTERNATIONAL AD HOC WORK GROUP OF EXPERTS IN CANCER RESEARCH CONCLUDED FROM EPIDEMIOLOGICAL DATA IN JANUARY 1979 THAT BENZENE IS "CARCINOGENIC FOR HUMANS." THE EXTENSIVE LITERATURE RELATING TO THE CARCINOGENICITY OF BENZENE HAS BEEN REVIEWED IN (AMCOO* 0004)

ANIMALS AND HUMANS. THE SPECIFIC LITERATURE HAS BEEN REVIEWED IN (CGH5** 80/EPA)

- (TER) Teratogenicity: FEMALE RATS AND MICE EXPOSED TO UP TO 209.7 PP,M BENZENE IN THE AIR OR TO SUBCUTANEOUS INJECTIONS OF BENZENE SHOWED STERILITY, RESORPTION OF EMBRYOS, AND/OR SKELETAL DEFORMITIES IN THEIR OFFSPRING. IN ONE STUDY, HOWEVER, NO INCREASE IN FETAL RESORPTIONS WAS SEEN WHEN EXPOSURE WAS TO 100-2000 PPM. THESE EXPERIMENTS ARE REVIEWED IN (AWQCD* 0004).
- (TRT) Major Species Threatened: GAMEFISH AND ANY ANIMAL EXPOSED TO FUMES IN AIR. WATERFOWL.
- (INH) Inhalation Limit (Value): 2000 (PPM; IDLH)
- (INT) Inhalation Limit (Text): REGULATIONS-- OSHA PEL (TWA) 10 PPM (29CFR* 1910) OSHA PEAK 50 PPM/10 MIN (29CFR* 1910) OSHA CEILING 25 PPM (29CFR* 1910). RECOMMENDATIONS-- NIOSH CEILING 3.2 M6/M3/60 MIN 1 PPM/60 MIN (CRSOE* 74-137,74/NIOSH) NIOSH IDLH 2000 PPM (PKT6D* 80/MAC) ACGIH SUSPECT CARCINOGEN (TLVADM 83/ACGIH) ACGIH TLV (TWA)30 M6/M3 10 PPM (TLVADM 83/ACGIH) ACGIH STEL 75 M6/M3/15 MIN 25 PPM/15 MIN (TLVADM 83/ACGIH) UPDATED 3/84
- (DRC) Direct Contact: ACUTE DERMAL EXPOSURE WILL CAUSE ERYTHEMIA, SCALING, BURNING, AND CRACKING OF THE SKIN, WITH EDEMA AND BLISTERING IN SEVERE CASES. (DMPADX 0001)
- (JNS) General Sensation: AROMATIC ODOR. 4.68 PPM RECOGNITION ODOR IN AIR (R99*** 0001); INHALATION OF HIGH CONCENTRATIONS MAY CAUSE ACUTE POISONING, DEATH. SKIN IRRITATION GRADE 3 - CAPILLARY INJECTION FROM UNDILUTED; REPEATED INHALATION OF LOW CONCENTRATIONS CAN RESULT IN SEVERE OR FATAL ANEMIA. EYE

IRRITATION GRADE 3 : SMALL BURNS FROM .5 ML (R119** 0001); ACUTE POISONING IS ACCOMPANIED BY DIZZINESS , DRUNKENNESS, UNCONSCIOUSNESS AND FINALLY DEATH. FULL LIST OF SYMPTOMS OF EXPOSURE AS FOLLOWS: ANEMIA, ANOREXIA, CNS DEPRESSANT, COMA, CONVULSIONS, DIZZINESS, EPISTAXIS, EUPHORIA, HEADACHE, MENSTRUAL DISTURBANCE, MENTAL CONFUSION, MYDRIASIS, NAUSEA AND VOMITING, PULMONARY EDEMA, PURPURA, RAPID RESPIRATION, SPEECH PROBLEMS, TIGHTNESS IN CHEST , TREMORS, URINE COLOR CHANGE, VISUAL BLURRING, WEAKNESS, WEIGHT LOSS (AWQCD* 0004)

- (LOT) Odor Threshold, Lower (ppm): .84
- (MOT) Odor Threshold, Medium (ppm): 31.3
- (UOT) Odor Threshold, Upper (ppm): 53
- (LTT) Taste Threshold, Lower (ppm): .5
- (DHI) Direct Human Ingestion (Mg./KGwt.): .174
- (PHC) Prolonged Human Contact (ppm): 2
- (SAF) Personal Safety Precautions: NEOPRENE IS NOT RECOMMENDED, PVC AND RUBBER ARE POOR FOR GLOVES. WEAR SELF-CONTAINED BREATHING APPARATUS. (CHEEA3 0001); APPROACH FROM UPWIND SIDE. REMOVE ANY IGNITION SOURCE. EYE PROTECTION, HARD HAT, GLOVES AND PLASTIC COATED CLOTHING. PERMEABILITY COEFFICIENTS FOR BENZENE VAPOR IN AIR HAVE BEEN CALCULATED FOR NATURAL RUBBER, NITRILE RUBBER, NEOPRENE, NATURAL RUBBER PLUS NEOPRENE, BUTYL RUBBER, POLY(VINYL CHLORIDE) (PVC), AND POLYETHYLENE. AT 10 PPM BENZENE, THE PERMEABILITY COEFFICIENT FOR NATURAL RUBBER AT APPROXIMATE. 23 DEGREES CELSIUS WAS 4.2E-10 SQ. CM/S. SKIN EXPOSURE WHILE TOTALLY CLOTHED IN A NATURAL RUBBER SUIT FOR 8H WAS ESTIMATED TO BE NEGLIGIBLE COMPARED TO THE AMOUNT INHALED WHILE WEARING A RESPIRATOR WITH A PROTECTION FACTOR FOR 100 (.3 .MU.G VS .MU.G). THE RATES AT WHICH LIQUID BENZENE PERMEATES PROTECTIVE GARMENT MATERIALS WAS REPORTED BY R.W. WEEKS, JR. ET AL., (1979) IN (CHABA8 0010). VALUES WERE DETERMINED FOR THE FOLLOWING MATERIALS: BUTYL, NATURAL, NEOPRENE, NITRILE

BUTYL RUBBER-COATED NYLON, VINYL CHLORIDE/POLYETHYLENE-COATED
POLYESTER, POLYETHYLENE-COATED TYVEK, AND POLY(VINYL ALCOHOL).
(AIHAAP 0010)

- (AHL) Acute Hazard Level: EXTREME DUE TO INHALATION PROBLEMS. WATER POLLUTION PROBLEMS ARE RELATED MOSTLY TO YOUNG FISH. SINGLE EXPOSURES TO 20,000 PPM BENZENE IN AIR HAVE PROVED TO BE FATAL WITHIN 5 TO 10 MIN. DEATH IS USUALLY THE RESULT OF RESPIRATORY OR CARDIAC FAILURE. (AWQCD* 0004)
- (CHL) Chronic Hazard Level: CHRONIC HAZARD IS RELATED MOSTLY TO INHALATION AND STATIC WATERS WHERE GAME FISH MAY BE EXPOSED TO SLOWLY DIMINISHING CONCENTRATIONS. NUMEROUS HEMATOLOGICAL DISORDERS HAVE BEEN ASSOCIATED WITH BENZENE EXPOSURE, BUT ONLY PANCYTOPENIA AND ITS VARIANTS (SUCH AS ANEMIA, LEUKOPENIA, THROMBOCYTOPENIA, AND APLASTIC ANEMIA) AND ACUTE MYELOGENOUS LEUKEMIA AND ITS VARIANTS ARE CLEARLY RELATED TO BENZENE EXPOSURE. CONCLUSIONS CANNOT BE DRAWN ON THE DOSE-RESPONSE RELATION BETWEEN BENZENE AND THESE DISORDERS, HOWEVER THE NO-EFFECT LEVEL FOR BLOOD CHANGES IN RATS, GUINEA PIGS, AND RABBITS WAS <88 PPM WHEN THE ANIMALS WERE EXPOSED FOR 7H/D FOR <= 269 D. (AWQCD* 0004)
- (HEL) Degree of Hazard to Public Health: EXTREME AIR POLLUTION HAZARD AND WATER POLLUTION PROBLEMS. MORE DANGEROUS FOR WOMEN THAN MEN DUE TO HIGHER INCIDENCE OF ANEMIA. TOXIC IN ACUTE AND CHRONIC APPLICATIONS VIA ALL ROUTES.
- (AIR) Air Pollution: HIGH HAZARD THE HALF-LIFE FOR REACTION OF BENZENE IN THE ATMOSPHERE WITH AN OZONE CONCENTRATION OF .2 MG/CU M IS ABOUT 90 Y.

- (ACT) Action Levels: NOTIFY LOCAL AIR AND FIRE AUTHORITY IMMEDIATELY. EXPLOSION HAZARD IS GREAT IF IGNITION HAS NOT ALREADY OCCURRED AND HENCE CIVIL DEFENSE AUTHORITIES SHOULD ALSO BE ALERTED. WATER INTAKES ARE THREATENED AND SHOULD BE CLOSED. AREA SHOULD BE EVACUATED IMMEDIATELY. ATTEMPT TO CONTAIN SLICK.
- (AML) In Situ Amelioration: BENZENE ADSORBS ON SYNTHETIC SORBENT RESINS. MUCH OF IT WILL BE IN A SLICK ON THE SURFACE AND CAN BE SKIMMED IF RESPONSE IS RAPID. STRAW MAY ALSO BE USED TO MOP UP SLICKS. SEEK PROFESSIONAL ENVIRONMENTAL ENGINEERING ASSISTANCE THROUGH EPA'S ENVIRONMENTAL RESPONSE TEAM (ERT), EDISON, NJ, 24-HOUR NO. 201-321-6660.
- (SHR) Beach/Shore Restoration: BEACH SHOULD NOT BE FOULED TO ANY DEGREE. BENZENE WILL RAPIDLY WORK DOWN TO AN IMPERVIOUS LAYER. VOLATILIZATION WILL TAKE CARE OF RESIDUAL AMOUNTS. RESULTING AIR POLLUTION WILL HAVE TO BE MONITORED. RESIDUALS CAN BE BURNED TO ACCELERATE THE CLEANING PROCESS BUT EXTREME CAUTION SHOULD BE EMPLOYED.
- (AVL) Avail. of Countermeasure Material: STRAW SHOULD BE AVAILABLE FROM FARMS AND RIDING ACADEMIES. OIL SKIMMING EQUIPMENT MAY BE LOCATED AT LARGE PORT AREA. CARBON MAY BE AVAILABLE FROM WATER TREATMENT PLANTS OR NEARBY INDUSTRY, ESPECIALLY SUGAR REFINERIES.
- (DIS) Disposal Method: SMALL QUANTITIES CAN BE IGNITED AFTER POURING ON DRY SAND OR EARTH. LARGE QUANTITIES SHOULD BE BURIED OR SENT TO A REFINERY FOR RECOVERY.
- (DEN) Disposal Notification: NOTIFY AIR AND FIRE AUTHORITIES
- (IFP) Industrial Fouling Pot.: VOLATILITY POSES EXPLOSION THREAT IN BOILER WATER AND COOLING SYSTEMS.
- (WTP) Effects on Water Treatment Process: CHLORINATED BENZENES ARE MORE TOXIC THAN BENZENE AND DETECTABLE TO TASTE AT LOWER CONCENTRATIONS. .1% SERIOUSLY RETARDED SEWAGE DIGESTION
- (WAT) Major Water Use Threatened: ALL
- (LOC) Probable Location and State of Material: COLORLESS LIQUID
- TUT 003 0956

(HOH) Water Chemistry: BENZENE SOLUTIONS AND SLICKS UNDERGO RAPID
EVAPORATIVE LOSSES. DISSOLVED FRACTION IS SLOWLY BIODEGRADABLE,
BUT WILL DISSIPATE FROM EVAPORATION BEFORE BACTERIAL ACTION IS
SIGNIFICANT.
(COL) Color in Water: COLORLESS
(DAT) Adequacy of Data: GOOD

Option?

go chris

CHRIS (Chemical Hazard Response Info Sys) - Version 1.0/1.0 (June 86) (
\$55/Hr.)

Latest Data Base Update: June, 1986 (Initial CIS Database)

Latest news for CHRIS . . .
24 Nov 86: New CHRIS Manual Now Available!

Option? type 1/msds. chris

Conversion to local identifiers resulted in 1 unique occurrences.

Conversion Entry 1: Accession No. 2162836
(CAS) CAS Registry No.: 71-43-2
(MAT) Material Names: BENZENE; Benzol; Benzole
(FML) Formula: C6H6
(DES) Description: Watery liquid Colorless Gasoline-like odor
Floats on water. Flammable, irritating vapor is produced.
Freezing point is 42 deg. F
(LCT) Label Category: Flammable liquid
(LCL) Label Class: 3
(LOC) Physical State (as shipped): Liquid
(COL) Color: Colorless
(ODR) Odor: Aromatic; rather pleasant aromatic odor; characteristic

TUT 003 0957

80.1 (deg.C) (= 353.3 deg.K = 176 deg.F)
(TFP) Freezing Point: 5.5 (deg.C) (= 278.7 deg.K = 42.0 deg.F)
(STT) Storage Temperature: Open
(IGT) Ignition Temperature: 1097 (deg.F)
(EHZ) Electrical Hazard: Class I, Group D
(BIF) Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back
(EXT) Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide
(NFE) Fire Extinguishing Agents NOT to Be Used: Water may be ineffective
(FLA) Flammable Limits in Air: 1.3 TO 7.9 (%)
(FLP) Flash Point: 12 (deg.F C.C.)
(RWT) Reactivity With Water: No reaction
(RCM) Reactivity With Common Materials: No reaction
(ACT) Actions in Case of Emergency: Avoid contact with liquid and vapor. Keep people away. Wear goggles and self-contained breathing apparatus. Shut off ignition sources and call fire department. Stop discharge if possible. Stay upwind and use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.

FIRE

FLAMMABLE.

Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained

breathing apparatus. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.

EXPOSURE

CALL FOR MEDICAL AID.

VAPOR

Irritating to eyes, nose and throat. If inhaled, will cause headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.

LIQUID

Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

WATER POLLUTION

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.

May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

(RSD) Response to Discharge: Issue warning-high flammability
Restrict access

(SAF) Personal Protective Equipment: Hydrocarbon vapor canister, supplied air or a hose mask; hydrocarbon-insoluble rubber plastic gloves; chemical goggles or face splash shield
hydrocarbon-insoluble apron such as neoprene.

(DRC) Symptoms Following Exposure: Dizziness, excitation, pallor.

(TFE) Treatment of Exposure: SKIN: flush with water followed by soap and water; remove contaminated clothing and wash skin. EYES: flush with plenty of water until irritation subsides. INHALATION: remove from exposure immediately. Call a physician. IF breathing is irregular or stopped, start resuscitation, administer oxygen.

(VIC) Vapor (Gas) Irritant Characteristics: If present in high concentrations, vapors may cause irritation of eyes or respiratory system. The effect is temporary.

(LSI) Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

(ODT) Odor Threshold: 4.68 (ppm)

(IDL) IDLH Value: 2000 (ppm)

(SIL) Short Term Inhalation Limit: 75 (ppm for 30 min.)

(DHI) Toxicity By Ingestion: Grade 3; LD50 = 50 to 500 mg/kg

(LTX) Late Toxicity: Leukemia

(NAS) NAS Hazard Rating For Bulk Water Transportation:

Category	Rating
Fire	13
HEALTH	1
Vapor Irritant	11
Liquid or Solid Irritant	11
Poisons	13
WATER POLLUTION	1

Human Toxicity	11
Aquatic Toxicity	13
Aesthetic Effect	12
REACTIVITY	1
Other Chemicals	11
Water	10
Self-Reaction	10

Option?

Conversion to local identifiers resulted in 1 unique occurrences.

Conversion Entry 1; Accession No. 7216928

(CAS) CAS Registry Number: 108-88-3
(SIC) SIC Code: 2829; 2815
(MAT) Material Name: \$\$\$ TOLUENE \$\$\$
(FML) Chemical Formula: C7H8
(USS) Common Uses: DYES, EXPLOSIVES, ORGANIC COMPOUNDS, SOLVENT
MANUFACTURING, BENZALDEHYDE AND BENZOIC ACID EXTRACTANT
(CON) Containers: GLASS BOTTLES, CANS, DRUMS, TANK CARS, TANK TRUCKS,
TANK BARGES.
(STO) General Storage Procedure: PROTECT AGAINST PHYSICAL DAMAGE.
OUTSIDE OR DETACHED STORAGE IS PREFERABLE. INSIDE STORAGE SHOULD
BE IN A STANDARD FLAMMABLE LIQUIDS STORAGE ROOM OR CABINET.
(HND) General Handling Procedure: USE NON-SPARKING TOOL. GROUND LARGE
PIECES OF UIPMENT.
(COR) Corrosiveness: NONCORROSIVE
(FDL) Detection Limit (Field; Techniques,Ref) (ppm): 20, AROMATICS,
(BNW45* 0022)
(LDL) Detection Limit (Lab; Techniques,Ref) (ppm): .001, C7C, (BNW28*
0001)
(STD) Standard Codes: EPA 311; NFPA - 2,3,0; ICC - FLAMMABLE LIQUID,
RED LABEL, 1D GALLON IN AN OUTSIDE CONTAINER; USCG - GRADE
CELSIUS FLAMMABLE LIQUID; IATA - FLAMMABLE LIQUID, RED LABEL, 1
LITER PASSENGER, 40 LITERS CARGO; SUPERFUND DESIGNATED
(HAZARDOUS SUBSTANCES) LIST.
(FLM) Flammability: QUITE FLAMMABLE, COMBUSTION PROBABLE.
(LFL) Flammability Limit(%), Lower: 1.2
(UFL) Flammability Limit(%), Upper: 7.1
(TCP) Toxic Combustion Prod.: HAZARDOUS-EMPLOY SELF-CONTAINED
BREATHING APPARATUS.
(EXT) Extinguishing Method: WATER MAY BE INEFFECTIVE. USE WATER SPRAY,
CARBON DIOXIDE, DRY CHEMICAL OR FOAM.
(FLP) Flash Point (C.): 6
(AIP) Auto Ignition Point(C.): 536.11
(EXP) Explosiveness: STABLE-VAPORS CAN EXPLODE IF EXPOSED TO FLAME.
(LEL) Explosive limit(%), Lower: 1.2
(UEL) Explosive Limit(%), Upper: 7.1
(MLT) Melting Point (C.): -95
(BLP) Boiling Point (C.): 110.6 (IGNITES)
(SOL) Solubility (ppm @ 25C): 470
(SPG) Specific Gravity: .866
(VPN) Vapor Pressure (mm Hg): 284; 36.7; 200
(VDN) Vapor Density: 3.14
(PER) Persistency: BIODEGRADES WITH ACCLIMATED SEED. HALF-LIFE IN LESS
THAN SATURATED SOLUTION (TOP METER) IS 30.6 MINUTES AS A RESULT
OF EVAPORATION. 70% EVAPORATES WITH FIRST .01% OF WATER. SEWAGE
SEED HAS NO EFFECT (TAFSAI 0008).
(CAG) Carcinogenicity: RAT-NEGATIVE-118, 354, OR 590 MG/KG/D IN 2-3 ML
OLIVE OIL SOLUTION. EMULSIFIED AND 5-10% AQUEOUS SOLUTION OF
ACACIA FOR 138 FEEDINGS.
(TRT) Major Species Threatened: WATERFOWL
(IC) Taste Imparting Characteristics (ppm): <.25
(INH) Inhalation Limit (Value): 2000 (MG/M3: IDLH)

TUT 003 0960

OSHA PEL (TWA) 200 PPM (29CFR* 1910)

OSHA PEAK 500 PPM/10 MIN (29CFR* 1910)

OSHA CEILING 300 PPM (29CFR* 1910)

RECOMMENDATIONS--

NIOSH CEILING 750 MG/M3/10 MIN 200 PPM/10 MIN (CRSOE* 73-11023,73/NIOSH)

NIOSH TWA 375 MG/M3 100 PPM (CRSOE* 73-11023,73/NIOSH)

NIOSH IDLH 2000 PPM (PKTGD* 80/MAC)

ACGIH TLV (TWA)

(SKIN) 375 MG/M3 100 PPM (TLVADM 83/ACGIH)

ACGIH STEL

(SKIN) 560 MG/M3/15 MIN 150 PPM/15 MIN (TLVADM 83/ACGIH)

UPDATED 3/84

(DRC) Direct Contact: EYE AND RESPIRATORY TRACT

(JNS) General Sensation: AROMATIC ODOR. ODOR DETECTABLE AT .17-1.74 PPM IN AIR. VAPOR PRESSURE 17 TIMES ODOR THRESHOLD; 200-500 PPM MAY CAUSE HEADACHE, NAUSEA, AND GIDDINESS. (CHWKA9 0001) IRRITATION TO RABBIT BELLY GRADE 4 - SOME CAPILLARY INJECTION DILUTED; NO WARNING PROPERTIES. EYE IRRITATION GRADE 6 - SEVERE BURN FROM LESS THAN .005 ML. (R119** 0001); NARCOTIC IN HIGH CONCENTRATIONS. 8 HOUR EXPOSURE TO 200 PPM MAY CAUSE IMPAIRMENT OF COORDINATION AND REACTION TIME.

(LOT) Odor Threshold, Lower (ppm): .25

(DHI) Direct Human Ingestion (Mg./KGwt.): 1.7

(PHC) Prolonged Human Contact (ppm): 600

(SAF) Personal Safety Precautions: SAFETY GOGGLES, SELF-CONTAINED BREATHING APPARATUS AND IMPERVIOUS OUTERWEAR SHOULD BE WORN. RUBBER IS NOT RECOMMENDED AND PVC IS CONSIDERED POOR FOR GLOVE. (CHEEA3 0001).

(AHL) Acute Hazard Level: LETHAL CONCENTRATION FOR MICE IN AIR, 6000 PPM (12VXA5 0001). MODERATELY TOXIC WHEN INGESTED OR INHALED. SLIGHTLY HAZARDOUS WHEN ABSORBED THROUGH SKIN. EMITS TOXIC VAPORS WHEN HEATED. MAY CONTAIN TOXIC BENZENE IMPURITIES. MAY PRODUCE BOD. MODERATELY TOXIC TO FISH.

(CHL) Chronic Hazard Level: RABBIT .25, 1.0, AND 10 MG/KG/9 1/2 AND 5 MONTH NO EFFECT. (A1**** 0001) MILD CHRONIC IRRITANT. MODERATELY TOXIC VIA ALL CHRONIC EXPOSURE ROUTES.

(HEL) Degree of Hazard to Public Health: MODERATELY TOXIC WHEN INGESTED OR INHALED. SLIGHTLY HAZARDOUS WHEN ABSORBED THROUGH SKIN. MILD CHRONIC IRRITANT CHRONIC HAZARDS ARE MODERATE BY ALL ROUTES. EMITS TOXIC VAPORS WHEN HEATED.

(AIR) Air Pollution: HIGH

(ACT) Action Levels: NOTIFY FIRE AND AIR AUTHORITY. ENTER FROM UPWIND. IF INTENSE HEAT PREVAILS, EVACUATE AREA AND GUARD AGAINST EXPLOSION. REMOVE IGNITION SOURCE. ATTEMPT TO CONTAIN SLICK.

(AML) In Situ Amelioration: OIL SKIMMING AND SORBENT FOAMS CAN BE APPLIED TO SLICK. USE CARBON OR PEAT ON DISSOLVED PORTION. SEEK PROFESSIONAL ENVIRONMENTAL ENGINEERING ASSISTANCE THROUGH EPA'S ENVIRONMENTAL RESPONSE TEAM (ERT), EDISON, NJ, 24-HOUR NO. 201-321-6660.

(SHR) Beach/Shore Restoration: DO NOT BURN

(AVL) Avail. of Countermeasure Material: OIL SKIMMING EQUIPMENT - STORED AT MAJOR PORTS; SORBENT FOAMS (POLYURETHANE) - UPHOLSTERY SHOPS; CARBON - WATER TREATMENT PLANTS, SUGAR REFINERIES; PEAT - NURSERIES, FLORAL SHOPS

(DIS) Disposal Method: TOLUENE CAN BE BURNED UNDER CONTROLLED CONDITIONS. SPRAY INTO INCINERATOR OR BURN IN PAPER PACKAGING. ADDITION FLAMMABLE SOLVENT MAY BE ADDED.

(IFP) Industrial Fouling Pot.: SLICK MAY CAUSE HEAT TRANSFER OR CAUSE

BOILER FEED OR COOLING SYSTEM WATERS.

- (WTP) Effects on Water Treatment Process: > .05% INHIBITED SEWAGE SLUDGE DIGESTION.
- (WAT) Major Water Use Threatened: RECREATION, POTABLE SUPPLY, FISHERIES, INDUSTRIAL
- (LOC) Probable Location and State of Material: COLORLESS LIQUID.- WILL FLOAT ON SURFACE OF WATER. WILL DISSOLVE VERY SLOWLY.
- (HCH) Water Chemistry: TOLUENE CAN BE OXIDIZED IN AIR TO FORM PHENOL, BUT THE REACTION GENERALLY REQUIRES CATALYSIS.
- (COL) Color in Water: COLORLESS
- (DAT) Adequacy of Data: GOOD

Option?

RTECS Search System (Version 6.5/14.2 January 1986) (\$55/hr)

Toxicity data in RTECS have not been critically evaluated

Latest news for RTECS . . .

21 May 86; Correction Made to Database

Option? type 1/msds.rtecs

Entry 1 CAS RN 108-88-3 NIOSH number XS5250000

MAT: TOLUENE

FML: C7-H8

TOXICITY DATA:

ihl-hmn TCLo:200 ppm
ihl-man TCLo:100 ppm
orl-rat LD50:5000 mg/kg
ihl-rat LCLo:4000 ppm/4H
ipr-rat LDLo:800 mg/kg
unr-rat LD50:6900 mg/kg
ihl-mus LC50:5320 ppm/8H
ipr-mus LD50:1120 ug/kg
unr-mus LD50:2000 mg/kg
skn-rbt LD50:12124 mg/kg
ihl-gpg LCLo:1600 ppm
scu-frg LDLo:920 mg/kg

DATA REFERENCES:

CLASS: TUMORIGEN

CLASS: MUTAGEN

CLASS: TERATOGEN

CLASS: SKIN AND EYE IRRITANT

OCCER: TLV-TWA 100 ppm; STEL 150 ppm (skin)

OSHA: OSHA STANDARD-air:TWA 200 ppm;CL 300;Pk 500/10M
(SCP-V)

OSHA: MSHA STANDARD-air:TWA 100 ppm (375 mg/m3) (skin)

DOTST: DOT-HAZARD:FLAMMABLE LIQUID; LABEL:FLAMMABLE
LIQUID

OCCER: OCCUPATIONAL EXPOSURE TO TOLUENE recm
std-air:TWA 100 ppm;CL 200
ppm/10M

NTPT: NTP CARCINOGENESIS STUDIES; ON TEST, NOVEMBER 1985

NIOSH: "NIOSH MANUAL OF ANALYTICAL METHODS, 3rd Ed." see: METHODS 1500,
1501

and 8002

EPAINF: REPORTED IN EPA TSCA INVENTORY, 1983

INF: EPA GENETIC TOXICOLOGY PROGRAM, JANUARY 1984

EPAINF: EPA TSCA 8(a) PRELIMINARY ASSESSMENT INFORMATION, FINAL RULE

FEDREG 47,26992,82

EPAINF: EPA TSCA SECTION 8(e) STATUS REPORT

BEHQ-0680-0345;BEHQ-1080-0368;BEHQ-0278-0079 TUT 003 0963

OSHMED: MEETS CRITERIA FOR PROPOSED OSHA MEDICAL RECORDS RULE
FEREAC 47,30420,82

Conversion to local identifiers resulted in 1 unique occurrences.

Conversion Entry 1; Accession No. 2772888
(CAS) CAS Registry No.: 108-88-3
(MAT) Material Names: TOLUENE; Toluol; Methylbenzene; Methylbenzol
(FML) Formula: C₆H₅CH₃
(DES) Description: Watery liquid Colorless Pleasant odor
Floats on water. Flammable, irritating vapor is produced.
(LCT) Label Category: Flammable liquid
(LCL) Label Class: 3
(LOC) Physical State (as shipped): Liquid
(COL) Color: Colorless
(ODR) Odor: Pungent; aromatic, benzene-like; distinct, pleasant
(BLP) Boiling Point at 1 atm.: 110.6 (deg.C) (= 383.8 deg.K = 231.1 deg.F)
(TFP) Freezing Point: -95.0 (deg.C) (= 178.2 deg.K = -139 deg.F)
(STT) Storage Temperature: Ambient
(IGT) Ignition Temperature: 997 (deg.F)
(EHZ) Electrical Hazard: Class I, Group D
(BIF) Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.
(EXT) Fire Extinguishing Agents: Carbon dioxide or dry chemical for small fires, ordinary foam for large fires.
(NFE) Fire Extinguishing Agents NOT to Be Used: Water may be ineffective
(FLA) Flammable Limits in Air: 1.27 TO 7 (%)
(FLP) Flash Point: 55 (deg.F O.C.) ; 40 (deg.F C.C.)
(RWT) Reactivity With Water: No reaction
(RCM) Reactivity With Common Materials: No reaction
(ACT) Actions in Case of Emergency: Stop discharge if possible. Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.

FIRE

FLAMMABLE.

Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.

EXPOSURE

CALL FOR MEDICAL AID.

VAPOR

Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing difficult, give oxygen.

Irritating to skin and eyes. If swallowed, will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

DO NOT INDUCE VOMITING.

WATER POLLUTION

Dangerous to aquatic life in high concentrations.

Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

- (RSD) Response to Discharge: Issue warning-high flammability
Evacuate area
- (SAF) Personal Protective Equipment: Air-supplied mask; goggles or face shield; plastic gloves.
- (DRC) Symptoms Following Exposure: Vapors irritate eyes and upper respiratory tract; cause dizziness, headache, anesthesia, respiratory arrest. Liquid irritates eyes and causes drying of skin. If aspirated, causes coughing, gagging, distress, and rapidly developing pulmonary edema. If ingested causes vomiting, griping, diarrhea, depressed respiration.
- (TFE) Treatment of Exposure: INHALATION: remove to fresh air, give artificial respiration and oxygen if needed; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.
- (VIC) Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- (SI) Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- (ODT) Odor Threshold: 0.17 (ppm)
- (IDL) IDLH Value: 2000 (ppm)
- (SIL) Short Term Inhalation Limit: 600 (ppm for 30 min.)
- (DHI) Toxicity By Ingestion: Grade 2; LD50 = 0.5 to 5 g/kg
- (LTX) Late Toxicity: Kidney and liver damage may follow ingestion.
- (NAS) NAS Hazard Rating For Bulk Water Transportation:

Category	Rating
----------	--------

Fire	3
HEALTH	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
WATER POLLUTION	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	2
REACTIVITY	
Other Chemicals	1
Water	0
Self-Reaction	0

Conversion to local identifiers resulted in 1 unique occurrences.

Conversion Entry 1; Accession No. 9357

(MONO) Monograph: 9357

(MMAT) Monograph Title Name: Toluene

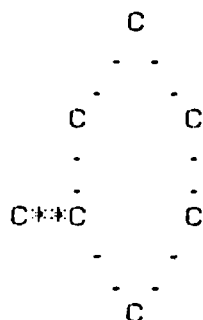
(AMAT) Alternate Name(s): toluol; phenylmethane

(TMAT) Trade Name(s): Methacide

(CAS) C.A.Registry Number: 108-88-3

(TEXT) Monograph Text:

Obtained mainly from tar oil. Review of mfg processes: Faith, Keyes & Clark's Industrial Chemicals, F. A. Lowenheim, M. K. Moran, Eds. (Wiley-Interscience, New York, 4th ed., 1975) pp 822-830. Solubility: F. P. Schwarz, Anal. Chem. 52, 10 (1980). Myelotoxic potential: L. Greenburg et al., J. Am. Med. Assoc. 118, 573 (1942). Comparison with benzene of effects on hematopoiesis and bone marrow metabolism: H. W. Gerard, AMA Arch. Ind. Health 13, 468 (1956). Acute toxicity: H. F. Smyth et al., Am. Ind. Hyg. Assoc. J. 30, 470 (1969). Evaluation of chronic occupational exposure: H. Tahti et al., Int. Arch. Occup. Environ. Health 48, 61 (1981). Review: M. C. Hoff in Kirk-Othmer Encyclopedia of Chemical Technology vol. 23 (Wiley-Interscience, New York, 3rd ed., 1983) pp 246-273.



Flammable, refractive liq; benzene-like odor. d[20/4] 0.866. mp -95 deg. bp 110.6 deg. n[20/D] 1.4967. Flash pt, closed cup: 40 deg.F (4.4 deg.C). Soly in water at 23.5 deg.C (w/w): 0.067%. Very slightly sol in water; misc with alc, chloroform, ether, acetone, glacial acetic acid, carbon disulfide. LD50 orally in rats: 7.53 g/kg (Smyth).

Caution: Narcotic in high concns: E. Browning, Toxicity and Metabolism of Industrial Solvents (Elsevier, New York, 1965) pp 66-76; Patty's Industrial Hygiene and Toxicology vol. 28, G. D. Clayton, F. E. Clayton, Eds. (Wiley-Interscience, New York, 3rd ed., 1981) pp 3283-3291.

(USE) Use: In manuf benzoic acid, benzaldehyde, explosives, dyes, and many other organic compds; as a solvent for paints, lacquers, gums, resins, in the extraction of various principles from plants; as gasoline additive.

(OL) Molecular Formula: C7H8

(COMP) Composition: C 91.25%, H 8.75%

(MWT) Molecular Weight: 92.13

(DENS) density: d[20/4] 0.866
(MP) Melting Point: mp -95 deg.
(BP) Boiling Point: bp 110.6 deg.
(RFR) Index of Refraction: n[20/D] 1.4967

Option?

Conversion to local identifiers resulted in 1 unique occurrences.

Conversion Entry 1

(PNAME)Primary Name: Toluene
(ACC)Location Number: 5320
(PCAS)CAS Registry Number: 108-88-3
(TOXR)Toxicity Rating: 4

Other names	Code*	CAS RN
Methyl benzene	a	108-88-3
Toluol	a	108-88-3

* Code (Relationship to Primary Name):
a - Synonym

(TEXT)Text: A mono-n-alkyl derivative of benzene, toluene is toxic by all portals of entry; percutaneous absorption, however, is generally too slow to produce signs of acute poisoning. As judged primarily in laboratory animals, essentially the same symptoms follow the acute administration of benzene, toluene and the various xylenes. Rat oral LD50 for toluene is 7.7 ml./kg. (specific gravity 0.87). Toluene in man is metabolized by oxidation to benzoic acid. It is further metabolized and largely excreted in the urine as hippuric acid which can be used as an index of toluene exposure. Hepatomegaly, lymphocytosis and minor deviations in red cell volume and corpuscular hemoglobin concentration have been associated with exposure. However, no chromosome aberrations have been reported. Chronic toluene abuse (by "sniffers") has been associated with metabolic acidosis and life-threatening hypokalemic muscle paralysis. The hypokalemia is secondary to renal tubular acidosis. See Xylene for signs, symptoms and treatment of acute poisoning.

See also Reference Congener at Loc No. 5330: Xylene

(DOM)Date of Last Modification: 07-29-83
Number of Bibliographic References Available: 3
801 (BSHR) Boor and Hurtig, 1977
2164 (BSHR) Fischman and Oster, 1979
6757 (BSHR) von Oettingen, 1940

Option?

APPENDIX E

PERSONNEL QUALIFICATIONS

Pedro A. Marrero

Project Assignment: Partner

Education: B.S.Ch.E./1969/Chemical Engineering/University of Puerto Rico

**Appointments: President, Atmospheric Pollution Control Board of Puerto Rico (1979-80)
Member, Review Board for Hazardous Waste Regulation (1979-80)**

Professional Organizations: P.R. Institute of Engineers and Surveyors, P.R. Institute of Chemical Engineers, P.R. College of Chemists, American Public Works Association, Air Pollution Control Association and Water Pollution Control Federation

Mr. Marrero is one of the most knowledgeable environmental engineers in Puerto Rico in all applicable environmental laws and regulations of both the local Environmental Quality Board and the U.S. Environmental Protection Agency. He has been responsible for the preparation of numerous Environmental Impact Statements prepared by the firm for different types of projects and for the preparation of operation and maintenance manual for several wastewater treatment plants and major pump stations. As a Former Vice-President for the Puerto Rico Environmental Quality Board, he participated in the establishment of public environmental policy for air, water, noise, and solid waste. Also, managed the Island-wide Wastewater Management Plan for Puerto Rico, which included the development and evaluation of alternatives for pollution abatement. The following is a representative sample of his areas of expertise relevant to the proposed project.

- o Project Manager in the preparation of Preliminary Hydrogeological Assessment for several Chevron/Gulf gasoline service stations in Puerto Rico. A Remedial Action Plan for some stations was prepared based in the information obtained during the assessment stage.
- o Roche Products, Inc., Manatí, P.R. - Wastewater treatment plant expansion: Design, equipment procurement, construction supervision; Mr. Marrero was in charge of the preparation of an O&M Manual.
- o Consultant for the operation of the Manatí Municipal Landfill.
- o Project Manager for the studies and design of a Regional Municipal Landfill at Barceloneta, P.R.
- o Project Manager for the studies and environmental evaluation of the trucking of the sludge of the Carolina Regional Sewage Treatment Plant into the Puerto Nuevo STP for incineration.

- o Study for the disposal of process water with a high BOD content using the land farming method for a petrochemical industry at Peñuelas, P.R.
- o Project Manager for the development of treatment storage and disposal of hazardous waste facility at Peñuelas, P.R., including engineering design, hydrogeological and environmental regulations (RCRA Clean Water Act; Clean Air Act).
- o Study to determine the efficiency of the operation of the sewage treatment plant for Syntex, Inc., a pharmaceutical industry in Humacao, P.R.
- o Study and design for the connection into process system of the effluent of the STP of Johnson & Johnson, Inc., a pharmaceutical industry in Las Piedras, P.R.
- o In charge of the complete production of three (3) O&M Manuals, including emergency operations plans, operations training, inventory control, laboratory sampling & testing, safety, personnel management for the Sewage Treatment Plants in Ciales, Orocovis and Santa Isabel.
- o In charge of clean-up plans and evaluating the extent of pollution damage caused by gasoline spills at several sites throughout the island for Esso Standard Oil.

Jesús M. Medero-Gallart

Education: Degree(s)/Year/Specialization

BSCE/1979/Civil/University of Puerto Rico
M.S./1981/Sanitary/Georgia Tech.

Before joining LA, he was Director of the Division of Land Pollution Control for the Environmental Quality Board of Puerto Rico. While at Lebrón Associates he has been Project Engineer in numerous projects of varying types and degrees of complexity. Following is a representative sample of his areas of expertise relevant to the proposed project.

- o Has been very actively involved in the consulting services rendered by the firm for the operation of the Manatí Municipal Landfill.
- o Project engineer for the studies and design of a Regional Municipal Landfill at Barceloneta.
- o Study and design for the connection into process system of the effluent of the STP of Johnosn & Johnson, Inc., a pharmaceutical industry in Las Piedras, Puerto Rico.
- o Environmental Consulting Services, technical services and design of a Hazardous Waste Facility; Peñuelas, P.R. - As Project Engineer, Mr. Medero has been influential in developing the engineering approach to the planned upgrading of the PROTECO hazardous waste management facility in Peñuelas, Puerto Rico. Design and permitting programs are underway for upgrading of the facility, whereby the facility will serve as the major hazardous waste management facility in Puerto Rico. It is the only such commercial facility accepting outside-generated waste streams on the island (in other words, the only other hazardous waste management facilities in existence are industrial facilities managing their own wastes).

The proposed upgrading plan is being designed to manage the largest reasonable range of typical hazardous wastes, except "high hazard" wastes. "High hazard" wastes such as dioxin and polychlorinated biphenyls (PCB's) will not be managed at the facility. Technical hazardous waste management processes planned for the facility include the following:

- o Waste Receipt Processing and Control - Waste receipt processing and control will take place in a new laboratory and office facility to be constructed at the entrance to the facility.

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Hernán Cortés

Project Assignment: Geologist

Education : BS Geology/1974/Geologist/University of Puerto Rico

Organizations : Geological Society of Puerto Rico, Water Resources Association of Puerto Rico, Environmental Fund, and National Water Well Association

Areas of Expertise:

- Geology

Planning and supervising subsurface investigations for building and bridge foundations, roadway slopes, solid waste and hazardous waste landfills. Analysis of geophysical data for electrical resistivity surveys and downhole geophysical logging. Review of geologic information derived from aerial photographs, including faults, landslide areas, erosion and flood zones.

- Hydrogeology

Responsible for planning and supervising field investigation for ground water monitoring assessment design, installation and developing monitor well analysis of ground water data for determination of water-bearing strata, ground-water gradient, ground-water boundaries. Developing ground water contamination clean-up programs.

Professional Experience:

- Environmental Scientist/Senior Hydrogeologist Acting Chief - Environmental Investigation Division, Environmental Quality Board in San Juan, Puerto Rico.

Responsible for the evaluation of geotechnical, hydrogeological and geophysical data related to the safe site selection for surface impoundments, sanitary landfill, underground injection facilities, storage tanks, hydrocarbon and toxic spills.

- Refinery Disposal Area (600 acres) - Field Geologist in charge of the identification of the physical properties of the uppermost aquifer within different depositional facies to identify potential avenues of contamination

toward the Bay Area. This investigation included groundwater flow patterns and how they were affected by existing water wells in the vicinity. In charge of a complex subsurface exploration which included a few deep borings, the installation of twelve monitor wells in places of potential avenues of contamination, interpretation of geophysical logging, testing and sampling of wells.

- Pesticide Contamination in a Small Island (80 acres) - Field Geologist for performance of investigation to detect any trace contamination, its plume, rate of movement, groundwater flow pattern of an abandoned landfill located in an island in the confluence of the Ohio River and Monongahila River.
- Industrial Waste Landfill (500 acres) - Geologist responsible for geologic interpretation, electrical resistivity survey, downhole geophysical logging, analysis of 76 borings for geologic correlation and water-bearing strata identification, well design, groundwater gradient and groundwater flow changes for year period.
- Municipal Landfill (20 acres) - Geologist responsible for the application of electrical resistivity survey to explore the entire site in order to evaluate all potential disposal areas in an existing landfill to prepare a master plan for site utilization, and to provide an estimate of the remaining life of the site.
- Industrial Plant - Geologist responsible for the subsurface exploration, monitor wells design and installation to find the extent of acid waste contamination. Also the interpretation of geophysical data to determine the shape and extent of the contamination plume.
- Environmental consulting services, technical services and design of a hazardous waste facility, Peñuelas, P.R.- Permit-related services pertaining to local agencies, technical assistance in hazardous waste management and the preliminary design of a state-of-the-art facility for the treatment, storage and/or disposal of hazardous wastes.
- Chevron USA./Puerto Rico - In charge of the Preliminary hydrogeologic assessment of twelve (12) service station to determine the extent of ground water contamination including the determination of the contamination plume its vertical and horizontal boundaries and the ground water flow and gradient. This information is to be used for the formulation of remedial measures and the implementation of a cleanup program.

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- Esso PR Inc. - In charge of the design and implementation of a sampling program to determine the extent and type of contamination in the soils originated by a hydrocarbon release. This exploration was aimed to comply with an Order from the Environmental Quality Board.
- Bristol Myer Co. - Directing a geologic and soil assessment in order to determine the probability of contamination by the operation of a Waste Water Treatment Plant. Overview of the subsoil exploration and the sampling program. Preparation of recommendation for the safe removal of the existing plant.
- Gulf PR Inc. - Responsible for the preparation of a Remedial Action Plan to be implemented at different facilities throughout the Island. This plan considered all the applicable methods for the removal of hydrocarbon.
- Marina del Oro - Preparation of an environmental impact statement (EIS) for a master planned recreational community of over 3,500 living units along the north coast of Puerto Rico. This facility will have two marinas, hotels, golf course, shopping mall, etc.; directly involved in the hydrological, topographic and geotechnical studies as part of the first phase of the project.

DAVID MORENO VAZQUEZ

- BSChE, Staff Engineer

Technical Area

- Environmental Engineer
Chemical Engineering

Special Courses

- Energy Conservation Using Computer Systems
- Energy Auditory Course - College of Engineers and Surveyors of Puerto Rico - 1984
Bachelor Science Chemical Engineering

Experience and
Qualifications

- As Staff Engineer Mr. Moreno has participated in the following projects:

.Preparation of Environmental Assessments for construction aggregate plant, animal feed plant, expansion of a tuna packaging facility, etc.

.Preparation of Environmental Impact Statement for a residential development project in Ponce.

.Preparation of a Hazardous Waste Management Plan for a custom jewelry plant in Aguadilla (Avon Mirabella). This plan included: Contingency Plan, Waste Analysis Plan, Personnel Training Program, following the applicable regulations (40 CFR 260-265).

.Design of a Wastewater Treatment Facility for the laboratory of the Sacred Heart University.

.Determination of the mixing zone for three (3) outfalls corresponding to treatment plants in Roosevelt Roads Naval Station at Ceiba, Puerto Rico.

.Coordination and support, as well as report preparation for a bioassay test performed for Sterling Pharmaceuticals, Inc.

- .Noise studies to establish the existence of violations and the corresponding corrective measures for the Bayamón Regional Hospital, Panadería La Ceiba, etc.
- .Preparation of five (5) special facility plans for the municipalities of Humacao, Naguabo, Salinas and Peñuelas for Puerto Rico Aqueduct and Sewer Authority.
- .Determination of the Air Conditioning Cooling Load for the Fernando Chardón Federal Office Building Complex and the General Post Office Building in Hato Rey as part of an Energy Study.
- .Preparation of applications for the construction and/or operation of air emission sources.
- .Preparation of applications for the construction and/or operation of Underground Injection Facilities (UIF).
- .Wastewater Treatment Plant (WTP)
 1. Carolina WTP - revision of the approved Facility Plan, mass balance analysis and evaluation of existing sludge handling facilities.
 2. Caguas WTP - mass balance analysis for a 2.0 MGD upgrading.
 3. Santa Isabel - preparation of an Operation and Maintenance Manual; in Spanish and English versions.
- .Hydraulic Study of a creek to establish flood levels.

David Moreno Vázquez

- 3 -

.Preparation of Environmental
Review Reports to obtain funds
on UDAG Program.

.Preparation of several location
permits for the Puerto Rico
Planning Board.

OSCAR L. FONTAN LA FONTAINE - Field Geologist
Education - BS Geology
University of Puerto Rico
Mayagüez Campus - 1986

Organizations:

Puerto Rico Geological Society

Area of Expertise:

- Hydrogeology

Responsible for the supervision of field investigation for ground water monitoring assessment. In charge of the installation monitoring wells, their development and sampling. Analysis of ground water data for the determination of water-bearing strata, gradient and flow path.

- Geology

Analysis of geologic information for erosion problems, landslide areas, flood prone areas. In charge of drilling operations for foundation purposes. Analysis of electric resistivity survey for cavity identification.

Professional Experience:

- Residential Complex - Earth resistivity survey for the identification of cavities in an area to be developed for a housing complex.
- Chevron USA/PR - Preliminary Hydrogeologic assessment to determine the extent of ground water contamination. In this activity, 12 sites were investigated and over 50 monitoring wells were installed and developed. This information is to be used for the formulation of remedial measures and the implementation of a clean-up program.
- Marina del Oro - In charge of the compilation of geologic information about the engineering properties of construction materials, erosion problems and foundation properties of the soils encountered in the area.
- Esso Puerto Rico, Inc. - Field geologist in charge of soil sampling exploration to determine the extent and type of contamination originated by a release. Two exploratory borings were drilled in the non-saturated zone. Soil samples were tested for EP tox and lead to comply with local regulations.

- Bristol Myer Co. - Assisting the senior geologist to carry out a geologic and soil assessment. Supervised five (5) exploratory borings to determine the probability of contamination by the operation of a waste water treatment plant. The removal of this plant was recommended based on the soil sampling.
- Gulf Puerto Rico, Inc. - In charge of the installation and development of fourteen (14) monitoring wells to determine the extent of the free product plume. Soil samples were collected and analyzed to determine hydraulic properties to recommend a Remedial Action Plan.

Francisco Aldecoa, P.E.

Project Assignment: Senior Construction Engineer

Education: BSCE/1949/Civil Engineering/University of Puerto Rico

Active Registration: Lic. No. 2098/1949/Puerto Rico

Mr. Aldecoa is the Firm's senior construction engineer. As a full-time staff member for the past ten years, Mr. Aldecoa has been directly involved and has held major responsibility in the construction supervision and management of several multimillion dollar projects. His services have included inspection and expediting, certification of invoices submitted by contractors and suppliers, and technical services connected with the interpretation of contract and project documents.

Particularly, Mr. Aldecoa has ample experience in cost estimating and project evaluation, having participated in the development of numerous construction projects of various types and complexities.

- Ponce Port Expansion - Extension of cargo wharf and provision of 600 ft. container terminal and back-up facilities at the Port of Ponce, Puerto Rico. Construction cost: \$7.5 million.
- Dominica Feeder Roads - Topographic surveys and design for the construction of 35 miles of feeder roads at ten different locations on the island of Dominica, W.I.; utilizing local direct labor construction force. Project financed by the Caribbean Development Bank.
- Dominica, Preliminary Airport Road Study - Participated in the preliminary field studies for the development of an Airport Road comprising 30 miles from the capital city of Roseau to Hatton Garden, via the Hillsboro Bridge and Pont Casse.
- Prime Computers - Project evaluation and construction supervision of a 92,000 sf. manufacturing plant. Construction cost: \$10.5 million.
- Reynolds Aluminum - Project evaluation and construction supervision of a 270,000 sf. manufacturing plant. Construction cost: \$17 million.
- West Terminal Building - Project evaluation and construction supervision of a 40,000 sf. terminal for baggage pick up and ticket counters at Puerto Rico International Airport. Construction cost: \$4.5 million.

- Arecibo Armory - Construction supervision of a 300 men armory, Puerto Rico National Guard.
- Humacao Vacation Center - Construction of 78 resort cabins, recreation trailer camp administration center with swimming pool and recreational facilities. Construction cost: \$2,400 million.
- Plaza Grillasca - Construction of central market place and parking at Ponce, Puerto Rico. Construction cost: \$6 million.
- Indoor Basketball Court and Gymnasium - Construction of indoor basketball court and gymnasium with a seating capacity of 4,000 people at Trujillo Alto, PR. Approximate construction cost: \$1,465 million.
- Orocovis Cultural Center - Construction of a 3-level building with a seating capacity for 650 people at Orocovis, PR. Approximate construction cost: \$1 million.
- Fishing Port Facilities - Construction of concrete platforms for travel-lift cranes, dredging of entrance channel and turning basin at Fajardo, PR at an approximate construction cost of \$325,000.