Western Operations

1252 Quarry Lane
P.O. Box 9019
Pleasanton, CA 94566
(415) 426-2600
Fax (415) 426-0106

Clayton
ENVIRONMENTAL
CONSULTANTS

March 12, 1991

Clayton Project No. 33909.00

Ms. Linda Foye
CITY OF ALAMEDA
Central Permits
2263 Santa Clara Avenue
Alameda, CA 94501

Dear Ms. Foye:

As you discussed on the phone with Ms. Laurene Compton on March 7, 1991, we are sending you a copy of our work plan and the proposed location of a monitoring well to be installed in the street at Shore Line Drive and Park Street in Alameda, California.

Our client, Harsch Investment Corporation, has been requested by the Alameda County Health Agency and the Regional Water Quality Control Board to install the well downgradient of the subject site to define the extent of petroleum hydrocarbons in the groundwater.

Your attention to this matter is greatly appreciated as Harsch is wanting to move rapidly on installing a groundwater remediation system. If you have any questions please call me at (415) 426-2676 or Ms. Compton at (415) 426-2671.

Sincerely,

Alan D. Gibbs, R.G.
Supervisor, Geology
Western Operations

ADG/lc
Enclosure

cc: Mr. Michael Dosen, Harsch Investment Corporation
Mr. Roy Ikeda, Crosby, Heafey, Roach & May
Ms. Rose Coughlin, Texaco Refining and Marketing, Inc.
Ms. Cynthia Chapman, ACHA

33909-Ltr

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Work Plan for Installation of One Groundwater Monitoring Well in the Intersection of Shore Line Drive and Park Street Alameda, California

Clayton Project No. 33909.00

March 12, 1991

CONTENTS

1.0 INTRODUCTION

Clayton Environmental Consultants, Inc. was retained by Harsch Investment Corporation to install a shallow groundwater monitoring well in the intersection of Shore Line Drive and Park Street in Alameda, California (Figures 1 and 2). This location is downgradient of Harsch's property located at 2375 Shore Line Drive. Harsch has been requested to complete this work by the Alameda County Health Agency (ACHA) Hazardous Material Division and the Regional Water Quality Control Board (RWQCB). The project was authorized by Mr. Michael Dosen, vice president for Harsch.

Parties involved in activities at the site include the following:

Harsch Investment Corporation, owner of subject site
Contact: Mr. Michael Dosen, vice president
235 W. MacArthur Boulevard
Oakland, CA 94611
Phone: (415) 658-1400

Consultant for Harsch:
Clayton Environmental Consultants
Contact: Mr. Alan D. Gibbs, supervisor, geology group
P.O. Box 9019
1252 Quarry Lane
Pleasanton, CA 94566
Phone: (415) 426-2600

Texaco Refining and Marketing, Inc., former tenant
Contact: Ms. Rose Coughlin, project manager
10 Universal Plaza, Suite 724
Universal City, CA 91608-7812
Phone: (818) 505-2719

2.0 BACKGROUND

The following subsections provide information on the results of previous investigations at the site and the site hydrogeology.

2.1 SITE INVESTIGATION

The site was formerly occupied by a Texaco Service Station and an auto repair shop. Work conducted by Woodward-Clyde Consultants in July 1989 revealed that the shallow groundwater at the site was impacted by petroleum hydrocarbons in the following concentrations: 2,500 ppb TPH as gasoline, 3,800 ppb TPH as diesel, 10,000 ppb benzene, 260 ppb toluene, 2,600 ppb ethylbenzene, and 1,600 ppb xylenes (Woodward-Clyde Project No. 8910116A, 7/18/89).

In June 1990, Clayton conducted further soil and groundwater investigation (Clayton Project No. 29196.00). This study revealed concentrations of 2,100 ppb benzene and 820 ppb ethylbenzene in groundwater samples from MW-5 (Figure 2).

Based on the above results, ACHA is requesting that an additional monitoring well be installed downgradient of the site to define the extent of contamination.

2.2 HYDROGEOLOGY

The site is underlain by dredged fill put in place in the 1950's by Utah International. The medium-grained sand fill material overlies "bay mud", the native sandy clays. While drilling wells MW-1 through MW-5 on the former Texaco site, we generally encountered the bay mud at 14 feet below ground surface (bgs).

Depth to groundwater ranges from 5 to 7 feet bgs. Well elevations for MW-1 through MW-9 were surveyed to datum sea level by Tronoff & Associates, a licensed land surveyor. From the well elevation data, groundwater flow direction was calculated to be S5°E, or almost directly south. The groundwater gradient on the site ranges from 0.1 to 0.6 feet of elevation drop per 100 feet horizontal distance. Groundwater flow direction and gradient may vary locally due to the non-homogeneous nature of the fill material used at the site.

3.0 OBJECTIVE AND SCOPE OF WORK

The objective of this investigation is to satisfy ACHA's requirements by determining whether the groundwater downgradient of the site has been affected by migrating petroleum hydrocarbons. We will install one downgradient groundwater monitoring well to obtain soil samples and a groundwater sample.

To accomplish the stated objective, Clayton will conduct the tasks addressed in the following sections.

3.1 SITE SAFETY PLAN

A site safety plan has been prepared for the work outlined in this workplan in accordance with Title 29 of the Code of Federal Regulations, Section 1910.120 (29 CFR 1910.120) and is included as Appendix A.

3.2 SOIL BOREHOLE AND MONITORING WELL INSTALLATION

Clayton will install one monitoring well downgradient of the site in the right hand lane of east-bound traffic on Shore Line Drive (Figures 2 and 3). Clayton will obtain permits for installation of the well from the Alameda County Flood Control and Water Conservation District, Zone 7). A copy of the permit application is included as Appendix B.

We will drill the well with a Mobile truck-mounted drilling rig. We anticipate that we will need to block the right lane of the east-bound traffic for approximately 4 hours while drilling the borehole and installing the monitoring well. It may take longer if unforeseen problems arise while drilling the borehole. All necessary permitting and safety precautions will be taken.

Underground Service Alert (USA) will be informed of our activities at least three days before field work commences. They will call companies with utility lines in the area so they will be marked before we start drilling. The location of the borehole will be preexcavated or predrilled with a hand auger to approximately 3 feet bgs to assure that no underground utilities exist at that location. If any underground utilities are encountered during the predrill we will relocate the borehole.

During drilling of the borehole, the soil characteristics will be logged in the field by a Clayton geologist, using the Unified Soil Classification System. Distinguishing features such as color, odor, and relative soil moisture content will be noted. All work will be conducted in accordance with the Clayton's Drilling, Well Construction, and Sampling Protocols for Borehole/Monitoring Well Installation, which are contained in Appendix C.

The monitoring well will be constructed to a depth of 20 to 25 feet bgs using 4-inch diameter schedule 40 PVC. Entry into the well will be secured with a locking cap directly on the PVC. The entire well will be within a secured traffic box that will be flush with the street surface (Figure 4).

Soil cuttings from the drilling and sampling operations will be placed into Department of Transportation (DOT)-approved drums, labeled with the name of the site, address, and well number, and moved onto the former Texaco site. No drums will be left in the street.

3.3 WELL DEVELOPMENT AND SAMPLING

We will need to block the right lane of east-bound traffic two additional times while developing and sampling the newly installed monitoring well. At these visits, only a pickup truck will be in the lane. The time required will be approximately 1 to 2 hours for each visit. All necessary safety precautions will be taken.

4.0 SCHEDULE

Clayton will begin work on scheduling subcontractors immediately upon receipt of the well permit and authorization to proceed from the City of Alameda. Clayton will contact the City of Alameda 48 hours prior to commencing all field activities.

This report prepared by:

Laurene Compton
Geologist

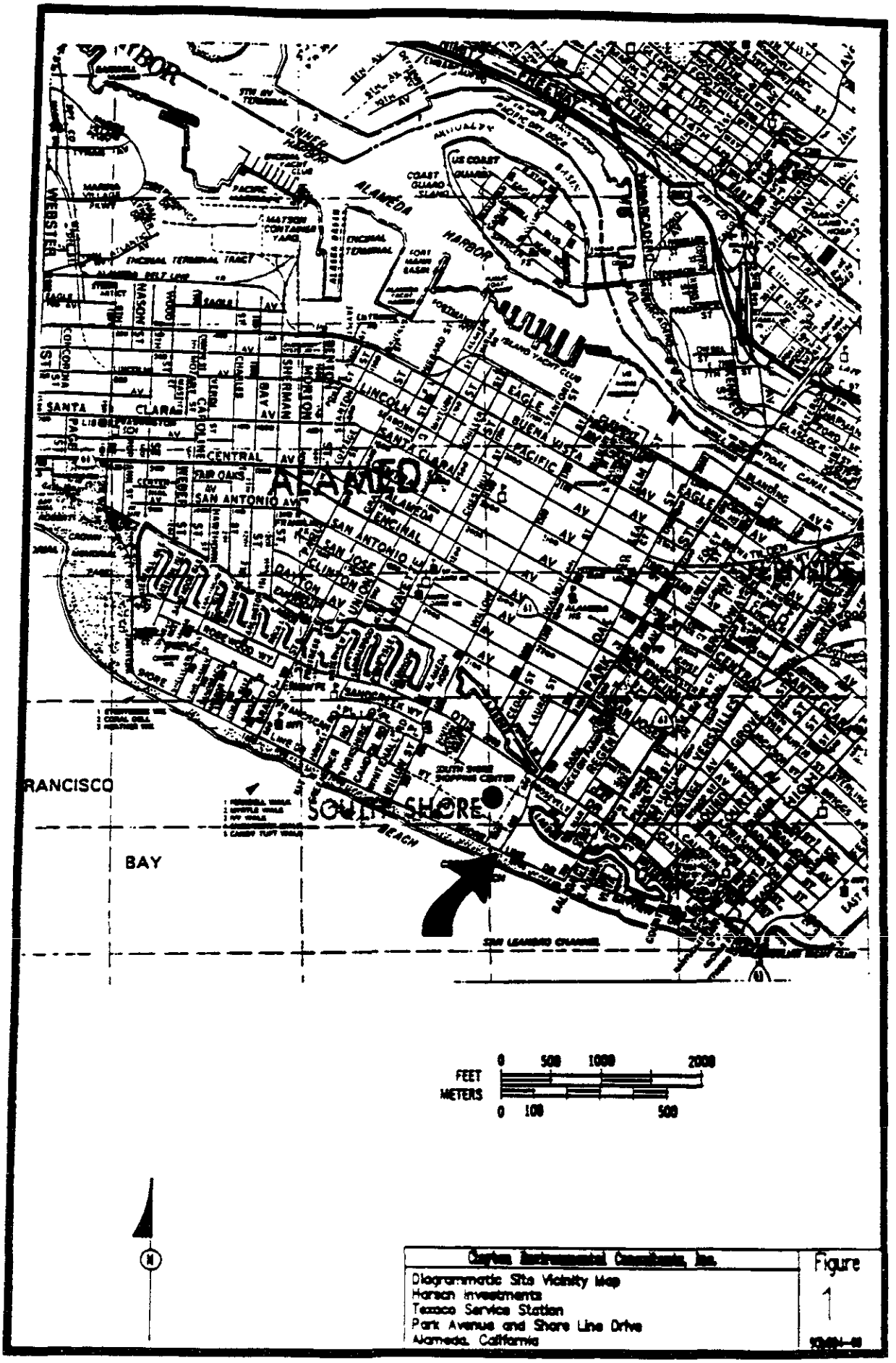
This report reviewed by:

Alan D. Gibbs, R.G.
Supervisor, Geology

March 12, 1991

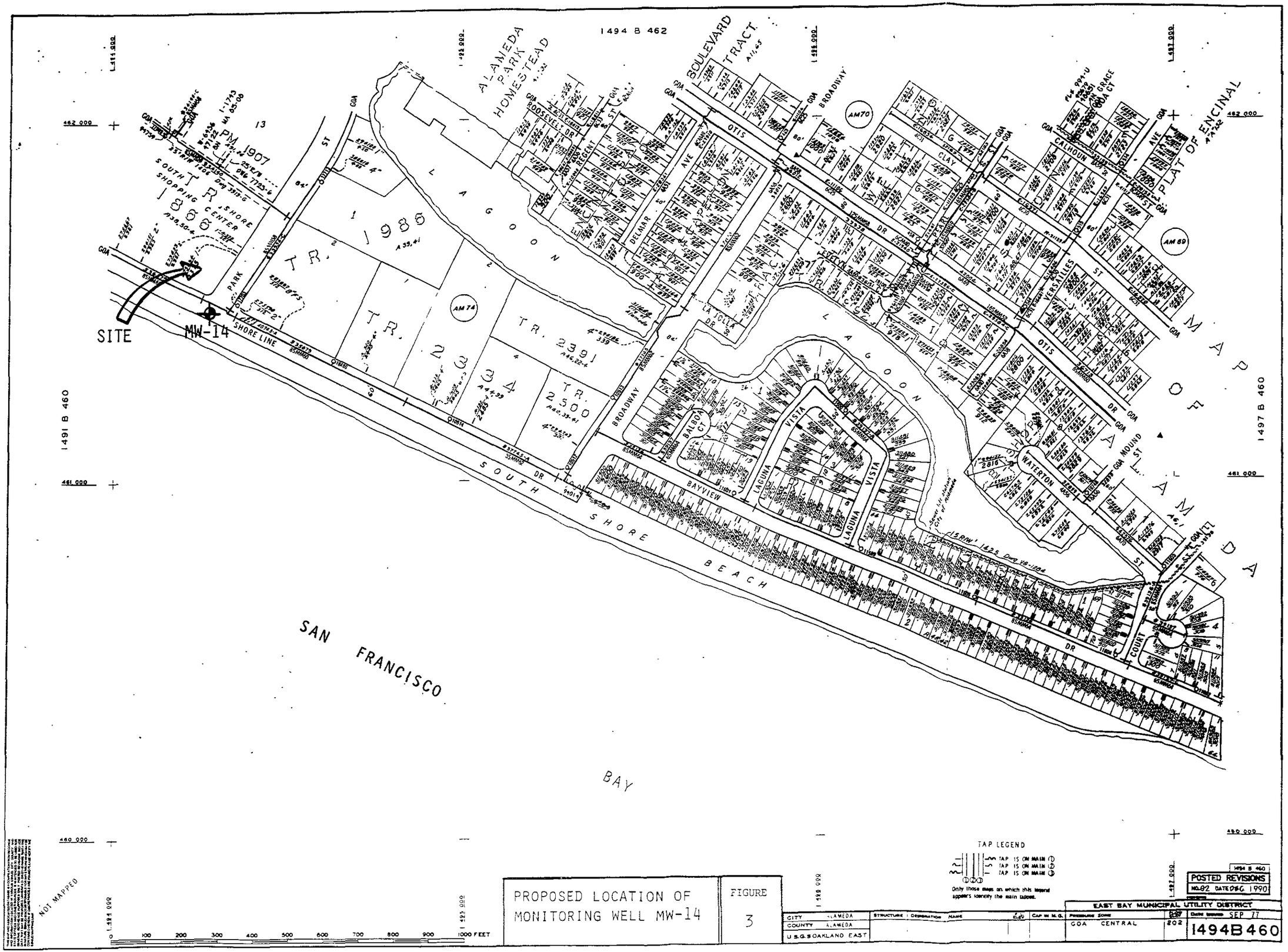
REGISTERED GEOLOGIST
ALAN D. GIBBS
NO. 4827
STATE OF CALIFORNIA

FIGURES



Diagrammatic Site Vicinity Map
Hansen Investments
Texaco Service Station
Park Avenue and Shore Line Drive
Alameda, California

Figure 1



PROPOSED LOCATION OF MONITORING WELL MW-14

FIGURE 3

TAP LEGEND

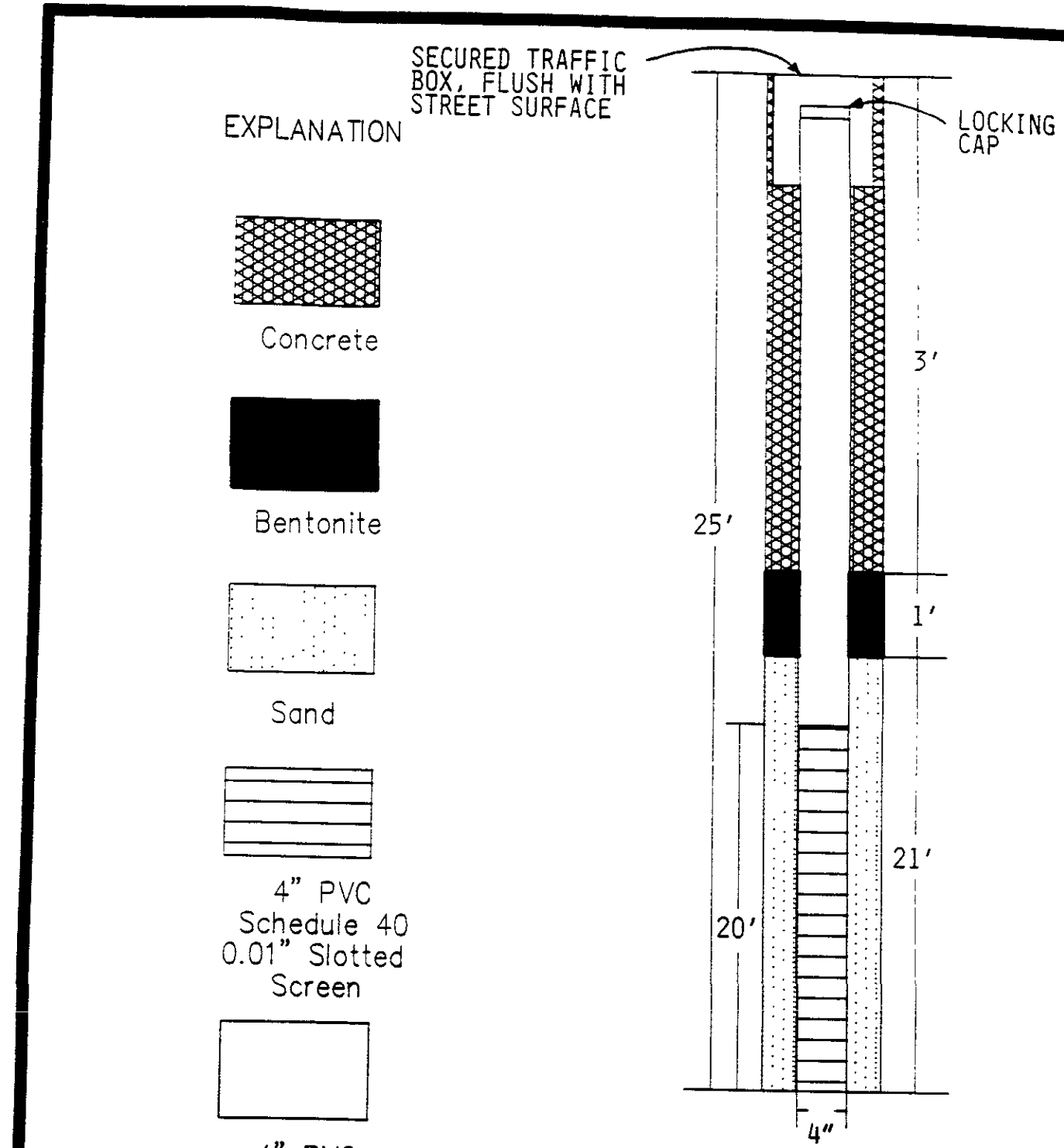
TAP IS ON MAIN ①
TAP IS ON MAIN ②
TAP IS ON MAIN ③

Only those maps on which this legend appears identify the main taps.

CITY ALAMEDA	STRUCTURE / DESIGNATION NAME	Elev	CAP IN M.G.	PRESSURE ZONE	DATE
COUNTY ALAMEDA				GOA CENTRAL	SEP 77
U.S.G.S. OAKLAND EAST				202	1494B460

EAST BAY MUNICIPAL UTILITY DISTRICT

1494 B 460
POSTED REVISIONS
NO. 92 DATE DEC 1990



MONITORING WELL SCHEMATIC
SHORE LINE DRIVE AND PARK STREET
ALAMEDA, CALIFORNIA
HARSCH INVESTMENT CORPORATION

Figure 4

Clayton
ENVIRONMENTAL CONSULTANTS

(not to scale)

APPENDIX A

SITE SAFETY PLAN
FOR
DRILLING AND SAMPLING OPERATIONS

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Fax (415) 426-0106

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ENVIRONMENTAL
CONSULTANTS

SITE SAFETY PLAN

FOR

DRILLING AND SAMPLING OPERATIONS

PERFORMED FOR

HARSCH INVESTMENT CORPORATION

CLAYTON PROJECT NO: 33909.00

I. SITE DESCRIPTION

Dates to be worked: March 1990

Location: The north corner of Shore Line Drive and Park Street, Alameda, CA (See attached site location map)

Activities: Drilling and installation of monitoring wells using a mobile truck-mounted drilling rig

Possible Hazardous Substances:

- gasoline
- benzene, toluene, ethylbenzene, and xylene
- diesel fuel
- waste oil
- metals

Physical Hazards:

- operations around drilling rig including overhead hazards, moving machinery, noise
- potential explosion and fire hazards due to diesel fuel and operations of drilling rig
- traffic hazards

33909sf.pln

II. SITE ORGANIZATION AND COORDINATION

Contacts for the site include the following:

Consultant: Contacts:	Clayton Environmental Consultants Ms. Laurene Compton, project geologist Mr. Alan D. Gibbs, supervisor, geology group P.O. Box 9019 Pleasanton, CA 94566 (415) 426-2676
Owner: Contact:	Harsch Investment Corporation Mr. Michael Dosen, vice president 235 W. MacArthur Boulevard Oakland CA 94611 (415) 658-1400
Contractor: Contact:	Aqua Science Engineers Mr. William Rusk P.O. Box 535 San Ramon, CA 94583 (415) 820-1850
Site safety officer:	Ms. Laurene Compton Clayton Environmental Consultants
Alameda County Representatives: Contact:	Alameda County Health Agency Ms. Cynthia Chapman 80 Swan Way, Suite 200 Oakland, CA 94621 (415) 271-4320
Alameda County Representatives: Contact:	Alameda County Flood Control and Water Conservation District Mr. Craig Mayfield 5997 Parkside Drive Pleasanton, CA 94566 (415) 484-2600

III. Hazard Evaluation

TABLE 1

HAZARD IDENTIFICATION AND PROCEDURES FOR HAZARD REDUCTION

Potential Hazards	Procedures for Hazard Reduction
Volatilization of organic vapors during operation can pose a potential hazard via the inhalation of vapors	The ambient air within the work area and in all confined spaces must be monitored prior to entry with a photo-ionization detector (PID). Workers should stand upwind of the source of contamination whenever possible.
Traffic	Barricades with blinking lights on them, traffic cones, and a flagman will be staged around the working area to protect workers from traffic hazards
Noise	Approved ear plugs/muffs shall be made available for noisy work operations
Contaminated surfaces Skin and eye contact with the separate-phase petroleum and hydrocontaminated groundwater and/or soil may occur during drilling, well development, or groundwater sampling	Contact with contaminated surfaces, or surfaces suspected to be contaminated should be avoided. Use of approved gloves and goggles will be required when potential skin and eye contact with contaminated substances is apparent.
Physical hazards	Hard hats shall be worn at all times Safety glasses will be worn when necessary
Ingestion of petro-chemicals can occur by accidental swallowing of contaminated soils, liquids and/or transfer of contaminated particles onto ingestible substances	Eating, smoking, drinking and/or application of cosmetics is prohibited onsite. This minimizes the possibility of exposure to the petro-chemicals potentially encountered onsite via ingestion.

TABLE 2

POTENTIAL HAZARDOUS SUBSTANCES ONSITE

The following substances are known or suspected to be onsite.
The primary hazards of each are identified below.

Hazardous Substance	Expected Concentration	Health Effects
Benzene	<10 ppm	Carcinogen, Abdominal pain, eye irritation, headache, nausea, respiratory irritation
Ethylbenzene	<10 ppm	Coma, dermatitis, eye irritation, headache
Toluene	<10 ppm	dermatitis, dilated pupils, headache
Xylene	<10 ppm	abdominal pain, diarrhea, eye irritation, nausea, staggering gait, throat irritation
Gasoline	<10 ppm	dizziness, eye irritation, headache nausea, dermatitis
Waste oil	<160 ppm	dizziness, eye irritation, nausea, dermatitis
Diesel fuel	<10 ppm	eye irritation, dermatitis, nausea
Lead	<12 ppm	lassitude, insomnia, anorexia, constipation,anemia
Cadmium	<0.1 ppm	cough, tight chest, headache, chills
Chromium	<37 ppm	Carcinogen, histologic fibrosis of lungs
Zinc	<22 ppm	eye irritation, dermatitis

ppm parts per million

IV. Personal Protective Equipment

R = required A = as needed

Hard hat	R
Safety boots	R
Hearing Protection	A
Tyvek coveralls	A
Safety eyewear	A
Respirator	A
Filter type, organic	
Gloves	A
First Aid Kit	R
Two Fire Extinguishers	R

Level of protective equipment: Level D
Level C protective equipment will be available onsite

Monitoring equipment onsite: Soil samples and the ambient air will be monitored with an organic vapor analyzer (PID)

Respirators with organic vapor cartridges shall be worn by all personnel if photoionization detector readings exceed 50 ppm in the breathing zone.

Tyvek suits and appropriate gloves shall be worn if potential for dermal exposure exists while performing job tasks.

Decontamination Procedures: Steam cleaner onsite, wash with TSP and double rinse, final rinse with deionized water

V. Emergency Procedures

Hospital

Alameda Hospital	2070 Clinton Ave., Alameda	(415) 523-4357

Fire Department

City of Alameda Fire Dept., 1300 Park Street, Alameda	(415) 748-4601
Emergency Medical Division, 300 Park St., Alameda	(415) 748-4604

Police Department

City of Alameda Police Dept., 1555 Oak Street, Alameda (415) 522-1220

SEE ATTACHED MAP FOR LOCATIONS OF EMERGENCY FACILITIES

Other agency telephone numbers

National Response Center	(800) 424-8802
California Department of Health Services	(415) 540-2043
Regional Water Quality Management Board	(415) 464-1255
Bay Area Air Quality Management Board	(415) 771-6000
Environmental Protection Agency Region 9	(415) 974-8076
Chemtrec	(800) 424-9300
Department of Transportation	(415) 876-9085

Emergency Plans and Procedures: (1) Stabilize victim and call 911 (if applicable). Notify the receiving hospital of the nature of physical injury or chemical over exposure
(2) If the injury is minor, proceed to administer first aid
(3) Notify Clayton Environmental, Alan Gibbs
(4) Notify Harsch Investment Company, Joe Munyer

This report prepared by: _____
Laurene Compton
Geologist

This report reviewed by: _____
Alan D. Gibbs, R.G.
Supervisor, Geology Group

March 12, 1991

APPENDIX B

MONITORING WELL PERMIT APPLICATION

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

5997 PARKSIDE DRIVE • PLEASANTON, CALIFORNIA 94566 • (415) 484-2600

GROUNDWATER PROTECTION ORDINANCE PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT 2375 Shore Line Drive, Alameda, California

CLIENT
Name Harsch Investment Corporation
Address 235 W. MacArthur Phone (415) 658-1400
City Oakland CA Zip 94611

APPLICANT
Name Clayton Environmental Consultants
Address P.O. Box 9019 Phone (415) 426-2600
City Pleasanton, CA Zip 94566

TYPE OF PROJECT
Well Construction
Cathodic Protection ___
Water Supply ___
Monitoring xxx
Geotechnical Investigation
General ___
Contamination ___
Well Destruction ___

PROPOSED WATER SUPPLY WELL USE
Domestic ___ Industrial ___ Other ___
Municipal ___ Irrigation ___

DRILLING METHOD:
Mud Rotary ___ Air Rotary ___ Auger xxx
Cable ___ Other ___

DRILLER'S LICENSE NO. C57 48700

WELL PROJECTS
Drill Hole Diameter 10 in. Maximum
Casing Diameter 4 in. Depth 25 ft.
Surface Seal Depth 3 ft. Number 2 *

GEOTECHNICAL PROJECTS
Number of Borings ___ Maximum
Hole Diameter ___ in. Depth ___ ft.

ESTIMATED STARTING DATE April 1, 1991
ESTIMATED COMPLETION DATE April 1, 1991

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S SIGNATURE _____ Date _____

FOR OFFICE USE

PERMIT NUMBER _____
LOCATION NUMBER _____

PERMIT CONDITIONS

Circled Permit Requirements Apply

A. GENERAL
1. A permit application should be submitted so as arrive at the Zone 7 office five days prior proposed starting date.
2. Submit to Zone 7 within 60 days after complet of permitted work the original Department Water Resources Water Well Drillers Report equivalent for well projects, or drilling l and location sketch for geotechnical projects.
3. Permit is void if project not begun within days of approval date.

B. WATER WELLS, INCLUDING PIEZOMETERS
1. Minimum surface seal thickness is two inches cement grout placed by tremie.
2. Minimum seal depth is 50 feet for municipal Industrial wells or 20 feet for domestic a irrigation wells unless a lesser depth specially approved. Minimum seal depth monitoring wells is the maximum depth practica or 20 feet.

C. GEOTECHNICAL. Backfill bore hole with compacted c tings or heavy bentonite and upper two feet with c pacted material. In areas of known or suspec contamination, tremied cement grout shall be used place of compacted cuttings.

D. CATHODIC. Fill hole above anode zone with concr placed by tremie.

E. WELL DESTRUCTION. See attached.

* On one of these wells we will be overdrill an existing 2" well and replacing it with a 4" well.

Approved _____ Date _____

1219

APPENDIX C

DRILLING, WELL CONSTRUCTION, AND SAMPLING PROTOCOLS FOR BOREHOLE/MONITORING WELL INSTALLATION

DRILLING, WELL CONSTRUCTION, AND SAMPLING PROTOCOLS FOR BOREHOLE/MONITORING WELL INSTALLATION

BOREHOLE INSTALLATION

Clayton Environmental Consultants, Inc. acquires the proper governmental agency permits to bore, drill, or destroy all proposed boreholes and monitoring wells that intersect with groundwater aquifers and writes a health and safety plan.

Clayton subcontracts only with drillers who possess a current C-57 water well contractor's license issued by the State of California and whose personnel have attended the OSHA 40-hour Hazardous Materials Safety Training. Prior to starting work, a "tailgate" safety meeting including discussion of the safety hazards and precautions relevant to the particular job will be held with all personnel working on the job. Well drillers are identified on permit applications.

Boreholes are drilled dry by hollow- or solid-stem, continuous flight augers. Augers, drill rods, and other working components of the drilling rig are steam-cleaned before arriving onsite to prevent the introduction of contaminants. These components are also steam-cleaned between borings away from boring locations. Cleaned augers, rods, and other components are stored, and/or covered when not in use.

Clayton examines the soil brought to the surface by drilling operations, and samples undisturbed soil every 5 feet or as otherwise specified. Borehole logs are filled out in the field by a geologist who is trained and working under the supervision of an engineer or geologist who is registered in the State of California. Our borehole logs include a detailed description of subsurface stratigraphy using the Unified Soil Classification System. Soil cuttings are screened for volatile hydrocarbon contamination using an organic vapor meter (OVM). Clayton uses two different organic vapor testing field testing methods. One is the open-air method and the other is an ambient temperature headspace method.

When we use the open-air method, we monitor the ambient air above a target area without collecting a physical sample. This method measures the hydrocarbon vapors as they exist in the particular environment at that specific point in time. This method is affected by existing weather conditions, particularly wind and temperature. Using this method, we can monitor the environment for worker safety as well as locate pockets of the more volatile hydrocarbons that may not be visible.

We use the ambient temperature headspace method to screen individual samples for the presence of various hydrocarbon vapors. We gather a soil or water sample and place it in a sample jar or ziplock plastic bag so that there is a vacant headspace in the container. If a sample jar is used, the mouth is covered with foil and the lid is screwed on. The sample is then allowed to reach ambient temperature (usually in 10-15 minutes) causing any hydrocarbon vapors to volatilize into the headspace. Monitoring of the headspace in the jar or plastic bag is done with an OVM by piercing the foil or bag with the OVM probe. This method allows for a rough indication of the presence and concentration of hydrocarbon vapors in a particular sample.

SOIL SAMPLING

Soil samples are taken every 5 feet, at areas of obvious contamination, or as otherwise specified, with a California modified split-spoon sampler that is lined with three six-inch brass tubes. The sampler and rod are inserted into the borehole to the current depth and a hammer of known weight and height above the sampler are allowed to free-fall onto the rod, advancing the assembly 18 inches into undisturbed soil. Clayton uses the number of blows necessary to drive the sampler into the ground to help evaluate the consistency of materials encountered. The sampler is then pulled from the borehole and disassembled, and the three brass tubes are separated for inspection and labeling.

Clayton uses new brass liners or liners cleaned with a trisodium phosphate (TSP) solution, double rinsed with clean tap water, and air dried prior to each sampling. The sampler is also cleaned with TSP and rinsed with tap water between sampling events.

Soil samples selected for laboratory analysis are left in the brass liners, sealed with aluminum foil and plastic caps, taped for air tightness, labeled, and immediately placed into a pre-cooled ice chest chilled to less than 4°C. Labels contain the following information: site name, date and time sampled, borehole number and depth, and the sampler's initials. The samples are transported under chain-of-custody to a state-certified laboratory. The laboratory analyzes soil samples within the prescribed holding time, storing them at temperatures below 4°C at all times.

Pending results of laboratory analysis, excess drilling and sampling cuttings are placed into Department of Transportation (DOT)-approved drums, labeled with the name of the site, address, and well number, and left at the site. Uncontaminated soil may be disposed of by the client. Soil found to contain levels of contaminants above local or state action levels will require that the client dispose of it in accordance with hazardous waste regulations. At the client's request, we will assist with the disposal of contaminated soil.

WELL CONSTRUCTION

Boreholes are converted to monitoring wells by placing 2-inch or 4-inch diameter well casing with flush-threaded joints and slotted screen into the borehole. Construction materials include polyvinyl chloride (PVC), stainless steel, or low carbon steel. The most suitable material for a particular installation will depend on the parameters to be monitored. All

screens and casings used are in a contaminant-free condition when placed in the ground. No thread lubrication is used, other than teflon tape, for connecting the casing segments.

Wells extend at least 10 feet into the upper saturated zone, but do not extend through any clay layers greater than 5 feet that are below the shallow water table. Factory-slotted casing is used throughout and extends at least 2 feet above the permeable water-bearing zone. The top of the well is solid casing. The annular space of the borehole is backfilled with washed, kiln-dried sand to a point at least 1 foot above the slotted screen. A seal above the filter pack is formed by placing a 1- to 2-foot layer of bentonite pellets on top of the sand. The bentonite pellets are moistened by pouring clean tap water down the hole so that they can expand and seal the annulus. A neat cement grout is placed above the bentonite seal and brought to the ground surface.

Well casings are protected from surface contamination, accidental damage, and unauthorized entry or tampering with water-tight locking caps on the well casings. The caps are usually surrounded by a concrete vault. Wells are clearly identified with a metal tag or other device where the following information is recorded: well number, depth to water, depth of well, casing data including location of screened interval.

WELL DEVELOPMENT

The well seal in newly developed wells must set up for 48 to 72 hours prior to development. Since development of the well can volatilize contaminants present, the well must also settle for at least 48 to 72 hours between development and the first purging/sampling incident.

All monitoring wells are initially developed to clean the well and stabilize sand, gravel, and disturbed aquifer materials around the screened internal perforations. Wells are developed by pumping (or bailing) and surging until water turbidity and specific conductance stabilize. In some cases, where wells are installed in low permeability formations and the wells purge dry, the well is allowed to recover and is purged dry three times. Clean tap water is introduced into the well if it does not recover rapidly enough.

Pending results by laboratory analysis, purge water from well development and sampling is placed into DOT-approved drums, labeled with the name of the site, address, well number, and left at the site. Uncontaminated water may be disposed of by the client. Water found to contain levels of contaminants above local or state action levels requires that the client dispose of it in accordance with hazardous waste requirements. At the client's request, we can assist with the disposal of contaminated purge water.

GROUNDWATER SAMPLING

To collect a representative sample of the groundwater, stagnant water within the well casing and filter material must be purged and fresh aquifer water allowed to replace it. The water is purged from the well by pumping or bailing at least three well volumes. Well volumes are calculated by measuring depth to groundwater to the nearest 0.01 foot upon arrival at the well before any purging has begun. Groundwater samples are collected only after purging has

been of sufficient duration for pH, temperature, and electrical conductivity to stabilize. When purging low-yield wells, the wells are purged to dryness. When the well recovers to 80% of the depth measured upon arrival, samples are collected.

Field sampling logs maintained for each well include:

- Monitoring well identification
- Static water level, before and after pumping
- Well depth
- Condition of water prior to purging (e.g., amount of free product)
- Purge rate and volume
- pH, temperature, and conductivity during purging
- Time purged
- Time of sample collection
- Sampling method
- Name of sampler
- Climatic conditions

Water samples are collected using clean teflon or disposable bailers. All equipment that contacts samples is thoroughly cleaned before arrival at the site and between sampling events.

Water is collected in clean laboratory-supplied containers, labeled, placed immediately into an ice chest pre-cooled to 4°C, and transported to Clayton's laboratory for analysis. One trip blank will be furnished in accordance with our quality assurance/quality control (QA/QC) program.

All samples are collected in such a manner so as to minimize the volatilization of a sample due to agitation and/or transfer from bailer to sample container. Samples are collected so that contaminants most sensitive to volatilization are sampled first.

Preservatives are not added to any sample, unless instructed. If requested, they are supplied by Clayton's laboratory.

All sample containers are labeled in the field. Labels contain the following information: project name, sample identification number, project number, date and time of collection, and sampler's initials.

Under no circumstances are sealed sample containers opened by anyone other than the laboratory personnel who perform the requested analyses. If it is necessary for samples or sample chests to leave the immediate control of the sampler prior to delivery to the laboratory, for example during shipment by Federal Express, a custody seal is placed on each sample container and/or sample chest to ensure that the samples have not been tampered with during transportation. The custody seal is signed by the sampler, and the date and time that the seal was placed is recorded. The elapsed time between sample collection and delivery to the laboratory never exceeds 48 hours. Water samples are not held for more than 14 days prior to analysis and are kept at 4°C at all times.

To document and trace samples from time of collection, a signed chain-of-custody record is filled out by the sampler and accompanies the samples through the laboratory analyses. The completed chain-of-custody is included with the analytical report from the laboratory.

REFERENCES

Groundwater Monitoring Guidelines, Revised February 1990. Alameda County District Groundwater Protection Program.

Leaking Underground Fuel Tank (LUFT) Field Manual: Guidelines for Site Assessment, Cleanup, and Underground Tank Closure, May 1988. State of California LUFT Task Force.

Regional Board Staff Recommendations for Initial Evaluation and Investigation of Underground Tanks, Revised November 1989. North Coast, San Francisco Bay, and Central Valley regions of the California State Water Quality Control Board.

Standards for the Construction and Destruction of Wells and Other Deep Excavations in Santa Clara County, Revised June 1989. Santa Clara Valley Water District.