- is weekly removal of GW from TPW-1 still ongoing?

GETTLER-RYAN INC.

TRANSMITTAL

TO: Mr. David B. De Witt
Tosco Marketing Company
2000 Crow Canyon Place, Suite 400
San Ramon, California

DATE: August 14, 2001
PROJ. #: 140101.04
SUBJECT: Work Plan
Tosco 76 Station No. 6419
6401 Dublin Boulevard
Dublin, California

FROM:
Douglas J. Lee
Project Manager
Gettler-Ryan Inc.
6747 Sierra Court, Suite J
Dublin, California 94568

AUG 16 2001

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COMMENTS:

Enclosed is a draft copy of the referenced Report. If you have any questions, please call me at (925) 551-7555.

cc: Ms. Eva Chu, Alameda County Environmental Health Service, 1131 Harbor Bay Parkway, Suite 250, Alameda, California 94502-7577.

GETTLER-RYAN INC.

WORK PLAN FOR MONITORING WELL INSTALLATION

at

Tosco (76) Service Station No. 6419
6401 Dublin Boulevard
Dublin, California

Report No. 140101.04-1

AUG 16 2001

Prepared for:

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August 14, 2001

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WORK PLAN FOR MONITORING WELL INSTALLATION

at

Tosco (76) Service Station No. 6419
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Report No. 140101.04-1

INTRODUCTION

At the request of Tosco Marketing Company (Tosco), Gettler-Ryan Inc. (GR), has prepared this Work Plan for the installation of two off-site groundwater monitoring wells to further evaluate groundwater and soil conditions beneath the subject site. The proposed scope of work includes: updating the site safety plan; obtaining the required well installation permits; installing two off-site monitoring wells; surveying wellhead elevations; developing and sampling the wells; collecting and submitting selected soil samples for chemical analysis; arranging for Tosco's contractor to dispose of the waste materials and preparing a report presenting the observations associated with the well installation.

The scope of work proposed in this Work Plan is intended to comply with the State of California Water Resources Control Board's *Leaking Underground Fuel Tanks (LUFT) Manual,* the Regional Water Quality Control Board's (RWQCB) *Tri-Regional Board Staff Recommendations for Preliminary Investigation and Evaluation of Underground Tank Sites*, and the Alameda County Flood Control and Water Conservation District (Zone 7).

SITE DESCRIPTION

General

The subject site is an active service station located on the western corner of the intersection of Dublin Boulevard and Dougherty Road in Dublin, California (Figure 1). The site is bounded to the southeast by Dublin Boulevard, to the northeast by Dougherty Road, and to the northwest and southwest by a shopping center parking lot. Properties in the immediate site vicinity are used for a mix of commercial purposes that include service stations and shopping facilities.

Current aboveground site facilities consist of two dispenser islands under a canopy, car wash, and a station building/convenience store. Two 12,000-gallon gasoline underground storage tanks (USTs) are located in the common pit immediately east of the station building. Pertinent site features are shown on Figure 2.

Geology and Hydrogeology

The subject site is located at approximately 330 feet above mean sea level within the Dublin Sub-basin of the Livermore Valley Groundwater Basin, as defined by the Alameda County Flood Control and Water Conservation District (Zone 7), and by the California Department of Water Resources Bulletin 118-2. The site vicinity is underlain by Holocene age fine grained alluvium (Qhaf) that is described as unconsolidated, plastic, moderately to poorly sorted carbonaceous silt and clay materials that are generally less than 10 feet thick. The site is situated less than 0.5 miles from two mapped geologic contacts separating the Qhaf from Late Pleistocene alluvial deposits (Qpa) and Holocene medium-grained alluvium (Qham). The Qpa sequence consists of weakly consolidated slightly weathered, poorly sorted, irregularly interbedded clay, silt, sand, and gravel, with a thickness of at least 150 feet. The younger Qham deposits consist of unconsolidated, moderately sorted, permeable fine sand, silt, and clayey silt with a few thin beds of coarse sand, with a maximum thickness of 12 feet in the vicinity of the site (United States Geological Survey, 1979). The site is approximately 0.6 miles west of the Pleasanton Fault and 1.4 miles east of the Calaveras Fault (California Division of Mines and Geology, 1990). The nearest surface water is the Chabot Canal, located approximately 1,600 feet east of the site.

The most recent semi-annual monitoring event was conducted at the site on February 2, 2001. The measured depth to groundwater in the monitoring wells on that date ranged from 6.81 to 7.40 feet below the tops of the well casings. The groundwater flow direction on February 2, 2001 was to the west, southwest with a hydraulic gradient ranging from 0.004 to 0.02 ft/ft. The groundwater flow direction has historically been to the southwest (GR, 2001).

PREVIOUS ENVIRONMENTAL WORK

On September 7, 1993, two 10,000-gallon gasoline USTs, one 550-gallon waste oil UST, one 6,000-gallon underground septic tank, and the associated product piping were removed from the site. Groundwater was observed entering the UST excavation at a depth of approximately 14 feet below ground surface (bgs). Two 12,000-gallon and one 520-gallon double-wall glasteel USTs were installed in the same pit immediately northeast of the canopy and dispenser islands. Seven soil samples were collected from the sidewalls and bottom of the gasoline UST excavation at depths ranging from 13.5 to 17 feet bgs and analyzed for Total Petroleum Hydrocarbons as gasoline (TPHg), benzene, toluene, ethylbenzene, and xylenes (BTEX), and total lead. Petroleum hydrocarbon concentrations ranged from not detected to 2.6 parts per million (ppm) of TPHg and 0.11 ppm of benzene.

Eight soil samples were collected from beneath the dispenser islands at depths of 2.5 and 5.5 feet bgs. These samples were reported as not detected for TPHg and BTEX. Total lead concentrations in these samples ranged from 4.8 to 14 ppm. Seven soil samples were collected from beneath the product lines at depths ranging from 3 to 7 feet bgs and analyzed for TPHg, BTEX, and total lead. Petroleum hydrocarbon concentrations ranged from not detected to 9.7 ppm of TPHg and not detected to 0.15 ppm of benzene.

Two soil samples were collected from beneath the former septic tank at a depth of 10 feet bgs and was reported as not detected for TPHg and BTEX. One soil sample was collected from beneath the former

waste oil UST at a depth of 8 feet bgs and analyzed for TPHg, BTEX, Total Petroleum Hydrocarbons as diesel (TPHd), Oil and Grease (O&G), volatile organic compounds (VOCs) and 5 metals. The sample contained 6.8 ppm of TPHg, 0.050 ppm of benzene, allowable concentrations of various metals, and was not detected for TPHd, O&G, and VOCs (Kaprealian Engineering Inc., 1993).

Approximately 7,000 gallons of groundwater were removed from the UST excavation on September 10, 1993 by H&H Environmental Services (H&H). After purging, groundwater stabilized at approximately 15 feet bgs, at which time groundwater sample W1 was collected. The sample was reported to contain 2,600 parts per billion (ppb) of TPHg, 33 ppb of benzene, 530 ppb of TPHd, allowable concentrations of 5 metals, and was reported as not detected for O&G and VOCs. On September 13 and 14, 1993, approximately 12,000 gallons of groundwater was removed from the excavation by H&H. Groundwater sample W2 was collected from the excavation after groundwater had stabilized at approximately 12 feet bgs and was analyzed for TPHg and BTEX. The sample contained 740 ppb of TPHg and 14 ppb of benzene. A sheen was observed on the surface of the groundwater in the southwest corner of the excavation (Kaprealian Engineering Inc., 1993a).

As part of the UST replacement activities, approximately 850 cubic yards of soil was excavated and stockpiled on-site and sampled for acceptance at an appropriate disposal facility. Approximately 750 cubic yards of soil was transported to The Browning Ferris Incorporated (BFI) Vasco Road Landfill in Livermore, California. In addition, approximately 100 cubic yards of soil was transported to Forward, Inc. Landfill in Stockton, California for disposal (Kaprealian Engineering Inc., 1993b).

Three on-site 2-inch diameter groundwater monitoring wells (MW-1, MW-2, and MW-3 on Figure 2) were installed in February 1994. Ten soil samples were collected during drilling at depths ranging from 5 to 17 feet bgs and analyzed for TPHg and BTEX. The samples were reported as not detected for TPHg and BTEX. The initial groundwater samples from MW-1 through MW-3 were analyzed for TPHg and BTEX. Hydrocarbon concentrations ranged from not detected (MW-2) to 1,800 ppb (MW-1) of TPHg and not detected (MW-2 and MW-3) to 17 ppb (MW-1) of benzene. In addition, sample MW-1 was reported to contain 810 ppb of a TPHd. Depth to groundwater was reported at between 7.09 and 7.93 feet below top of casing (TOC)(Kaprealian Engineering, Inc., 1994).

In 1996, the former service station facilities were demolished and the current convenience store, self-service fueling and car wash facilities were constructed at the site. As part of the site upgrade activities, the current dispenser islands and canopy were constructed and new double-wall fiberglass product piping was installed from the existing USTs to the islands. In addition, a 550-gallon waste oil UST, formerly located within the pea gravel of the current UST cavity, was removed.

In July 1998, Environmental Resolutions, Inc. (ERI) conducted a four day extended soil vapor extraction test at the site. Based on photoionization detector (PID) readings from each well, monitoring well MW-1 was selected as the extraction well. During the course of the test, MtBE concentrations in the vapor stream of MW-1 decreased from 1,700 to 47 micrograms per liter. ERI estimated that approximately 0.53 pounds of TPHg and 6.5 pounds of MtBE (approximately 1 gallon of gasoline/additive) were extracted during the

four day test. Vacuum measurements obtained from MW-2 and MW-3 during the test indicated that the effective radius of influence is likely to be less than 40 feet (ERI, 1998).

Four on-site soil borings were drilled in June 1999 and completed as groundwater monitoring wells MW-4 through MW-7. The wells were each installed to a total depth of approximately 19 feet bgs. Locations of the wells are shown on Figure 2. A total of four soil samples from the monitoring well borings. Petroleum hydrocarbons were not detected in the four soil samples collected from the soil borings, except for 0.33 ppm of MtBE in a sample from well boring MW-6 at 12 feet bgs, and 0.010 ppm of benzene and 0.0080 ppm of xylenes detected in a sample from well boring MW-7 at 6 feet bgs.

Groundwater has been historically reported at approximately 5 to 10 feet below ground surface (bgs). Petroleum hydrocarbon concentrations in groundwater have ranged from not detected to 9,200 ppb (MW-1) of TPHg, not detected to 130 ppb (MW-1) of benzene, and not detected to 140,000 ppb (MW-1) of MtBE. Groundwater flow direction has been reported as variable then becoming predominantly southwest for the quarterly and semi-annual sampling events dating back to March 1994 (MPDS, 1994 through 1997, GR, 1998 and 1999).

In November 1999, a four-inch diameter, slotted poly-vinyl chloride (PVC) Tank Pit Well (TPW-1 on Figure 2) was installed in the gasoline UST pit backfill to allow purging of MTBE-impacted groundwater. Purging of TPW-1 was initiated in December 1999.

Groundwater was removed from the UST pit by Onyx Industrial Services (Onyx) of Benicia, California and transported to the Tosco Refinery in Rodeo, California for disposal. The groundwater was purged from TPW-1 directly into Onyx vacuum trucks on an approximate weekly basis. From December 23, 1999 to August 21, 2000, approximately 129,800 gallons of groundwater were removed from the TPW-1. An estimated total of 110.60 pounds of MtBE have been removed from the site during the purging of 129,800 gallons of groundwater. Groundwater samples periodically collected from TPW-1 during the time period from December 23, 1999 to August 21, 2000 contained TPHg ranging from ND to 2100 ppb, benzene ranging from ND to 96 ppb and methyl tert-butyl ether (MtBE) ranging from 3,900 to 146,000 ppb.

How calculated ?

Currently the site is being monitored and sampled (M&S) twice a year, and the most recent M&S event took place on February 2, 2001. The groundwater samples contained MTBE in concentrations ranging from Non-Detect (ND) to 5,380 parts per billion (ppb).

PROPOSED SCOPE OF WORK

To further delineate the lateral extent of dissolved petroleum hydrocarbons in groundwater in the vicinity of the subject site, GR proposes to install two groundwater monitoring wells at the locations shown on Figure 2. Field work will be conducted in accordance with GR Field Methods and Procedures which are included in Appendix A. To complete the proposed scope of work, GR proposes the following tasks.

Task 1. Pre-Field Activities

GR will update the site-specific safety plan and obtain the necessary well installation permits from the Alameda County Flood Control and Water Conservation District (Zone 7). In order to install the off-site groundwater monitoring wells, Tosco will obtain an off-site access agreement with the owners of the lot adjacent to the subject site. A private utility locator will be contracted to locate any underground utilities near the proposed well locations and Underground Service Alert (USA) will be notified a minimum of 48 hours prior to drilling.

Task 2. Monitoring Well Installation

GR will install two off-site groundwater monitoring wells and at the locations shown on Figure 2. A California-licensed well driller will install the wells. A GR geologist will observe the drilling activities and prepare logs of the well borings. Prior to drilling, the boreholes will be hand augered to 5 feet bgs to confirm that the locations are clear of underground utilities. The well borings will be drilled with 8-inch-diameter hollow-stem augers.

The two wells will be constructed of 2-inch-diameter schedule 40 polyvinyl chloride (PVC) well casing and 0.02-inch machine-slotted well screen. The proposed total depth of the well borings will be 20 feet bgs with screened intervals extending from 5 to 20 feet bgs.

Soil samples for description and possible chemical analysis will be obtained from the borings at a minimum of 5 foot intervals and will be collected with a split-spoon sampler fitted with clean brass sample rings. The actual number of samples submitted for chemical analysis will depend on site conditions and field screening data. As a minimum, it is expected that one unsaturated soil sample from the each boring will be submitted for chemical analysis as described in Task 5.

Soil from each sampled interval will be screened in the field for the presence of volatile organic compounds using a photoionization detector (PID). These data will be collected for reconnaissance purposes only, and will not be used as verification of the presence or absence of petroleum hydrocarbons.

Drill cuttings will be stockpiled at the site pending receipt of chemical analytical data. The drill cuttings will be stockpiled on and covered with plastic sheeting pending disposal. Four samples of the drill cuttings will be collected for disposal characterization. These samples will be submitted to the laboratory for compositing into one sample, and then analyzed as described in Task 5.

Task 3. Wellhead Survey

Following installation of the wells, a California-licensed surveyor will measure the elevation of the well casings relative to mean sea level. The horizontal coordinates of the wells will also be obtained at this time. latitude / longitude coordinates to 5.0 meter accuracy

Task 4. Well Development and Sampling

GR will develop the newly installed groundwater monitoring wells after they have been allowed to stand a minimum of 72 hours following installation. Groundwater removed from the wells during development and sampling will be transported to the Tosco San Francisco Area Refinery, located in Rodeo, California, for disposal.

Immediately following development a groundwater sample will be collected from each well and analyzed as described in task 5. The wells will then be added to the regularly scheduled semi-annual monitoring and sampling programs for the existing wells.

Task 5. Laboratory Analyses

Selected soil and groundwater samples will be submitted for chemical analyses to a California state-certified Hazardous Material Testing Laboratory. Soil and groundwater samples will be analyzed for Total Petroleum Hydrocarbons as gasoline (TPHg) by Environmental Protection Agency (EPA) Method 8015/Modified, benzene, toluene, ethylbenzene, total xylenes (BTEX) and methyl tertiary-butyl ether (MTBE) by EPA Method 8020. In addition, the groundwater samples will be analyzed for ethanol, tert-butyl alcohol (TBA), MtBE, di-isopropyl ether (DIPE), ethyl tert-butyl ether (ETBE), 1,2-dichloroethane (1,2-DCA), tert-amyl methyl ether (TAME) and ethylene dibromide by EPA method 8260. The stockpiled soil sample will be analyzed for TPHg, BTEX and MTBE, as well as total lead by EPA Method 6010.

Task 6. Reporting

Following receipt and analysis of all data, a report will be prepared which summarizes the procedures and the results associated with this investigation. This report will be submitted to Tosco for their use and distribution.

PROJECT STAFF

Mr. Douglas J. Lee, a Registered Geologist in the State of California (R.G. No. 6882) will provide technical oversight and review of the work and will supervise implementation of field and office operations. GR employs a staff of geologists, engineers, and technicians who will assist with the project.

SCHEDULE

Implementation of the proposed scope of work will commence upon receipt of regulatory approval, well installation permits, and drill rig availability.

REFERENCES

Gettler-Ryan Inc., February 2, 2001, Semi-Annual Groundwater Monitoring and Sampling Reports for Tosco (Unocal) Service Station No. 6419, 6401 Dublin Boulevard, Dublin, California: G-R Job #180021, dated March 28, 2001.

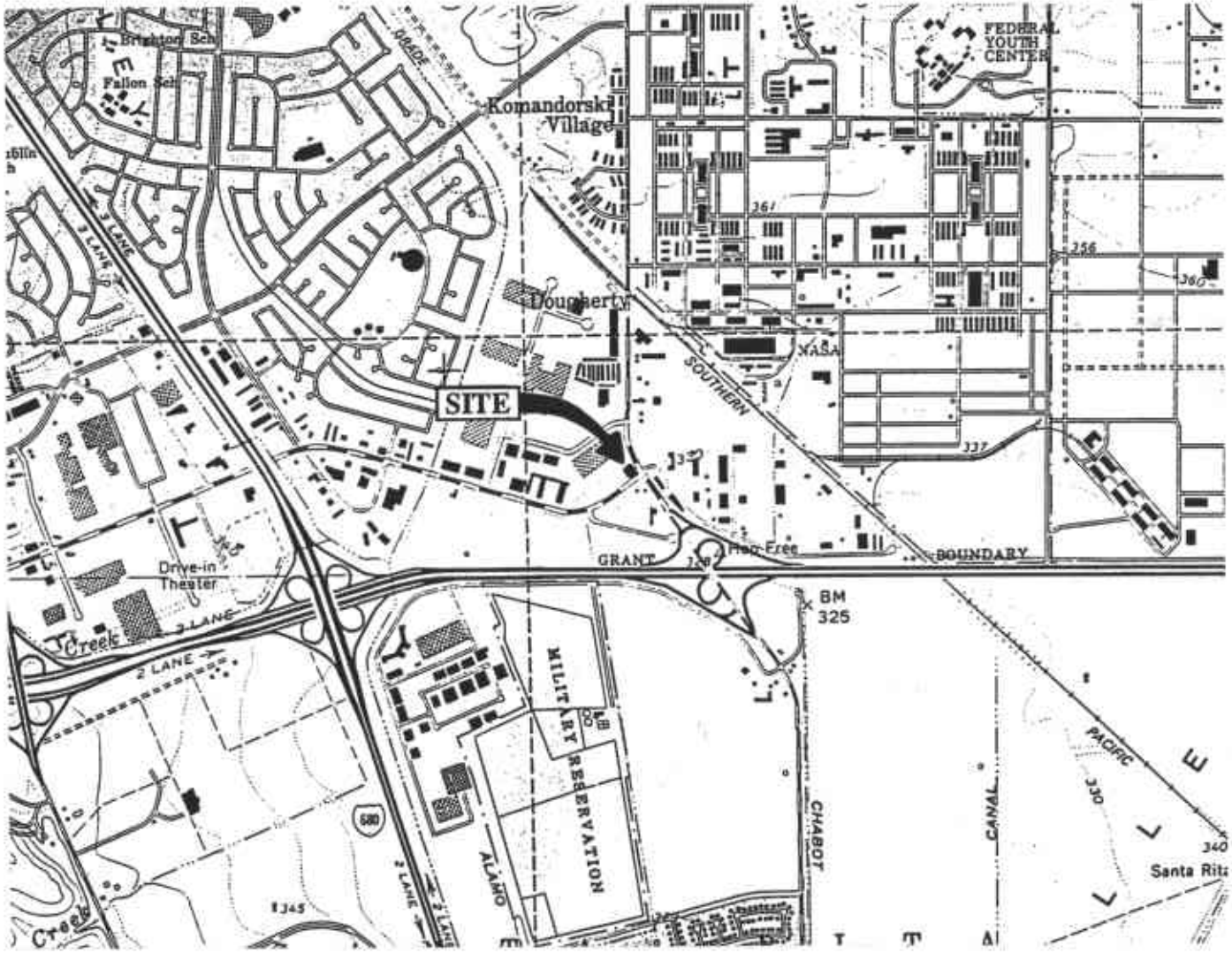
Gettler-Ryan Inc., November 20, 2000, Remedial Status Report for Tosco (76) Service Station No. 6419, 6401 Dublin Boulevard, Dublin, California.

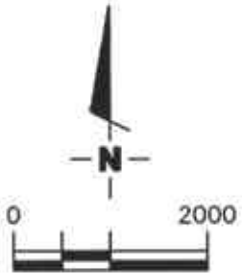
Gettler-Ryan Inc., 1998-2000, Semi-Annual Groundwater Monitoring and Sampling Reports for Tosco (Unocal) Service Station No. 6419, 6401 Dublin Boulevard, Dublin, California: G-R Job #180021, various dates.

Environmental Resolutions Inc., 1998, Extended Soil Vapor Extraction Test at Tosco 76 Service Station No. 6419, 6401 Dublin Boulevard, Dublin, California: Report No. ERI 233004.L04 dated September 24, 1998.

Kaprealian Engineering Inc., 1993, Soil Sampling Report for Unocal Service Station No. 6419, 6401 Dublin Boulevard, Dublin, California: Report No. KEI-P93-0401.R1 dated October 15, 1993.

California Division of Mines and Geology, 1990, Geologic Map of the San Francisco – San Jose Quadrangle, Map No. 5A (Geology).





Scale in Feet

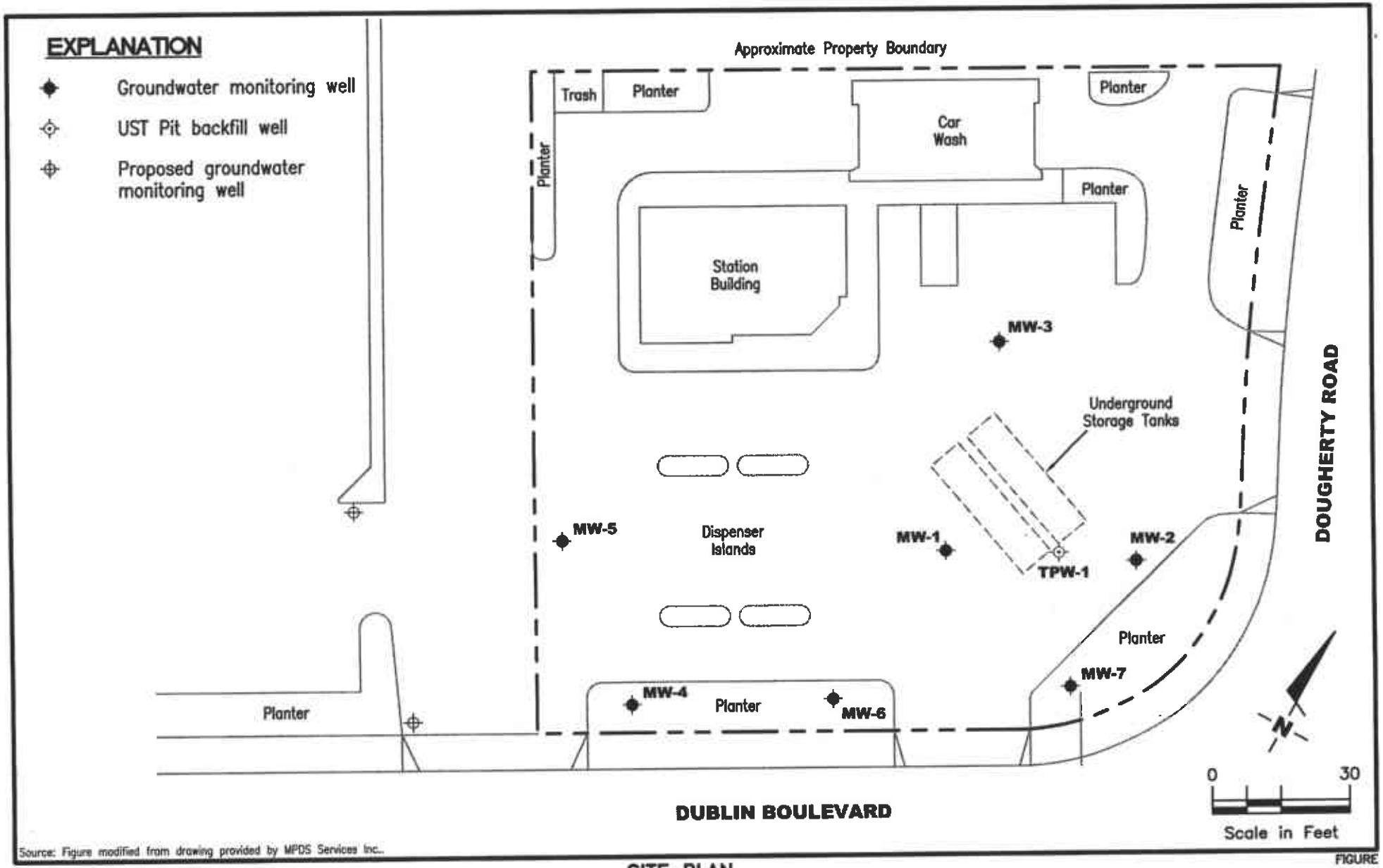
Base Map: USGS Topographic Map

Gettler - Ryan Inc.
6747 Sierra Ct., Suite J (925) 551-7555
Dublin, CA 94568

VICINITY MAP
Tosco 76 Branded Facility #6419
6401 Dublin Boulevard
Dublin, California

FIGURE
1

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
140101		November, 1998	



Source: Figure modified from drawing provided by MPDS Services Inc.

FIGURE 2

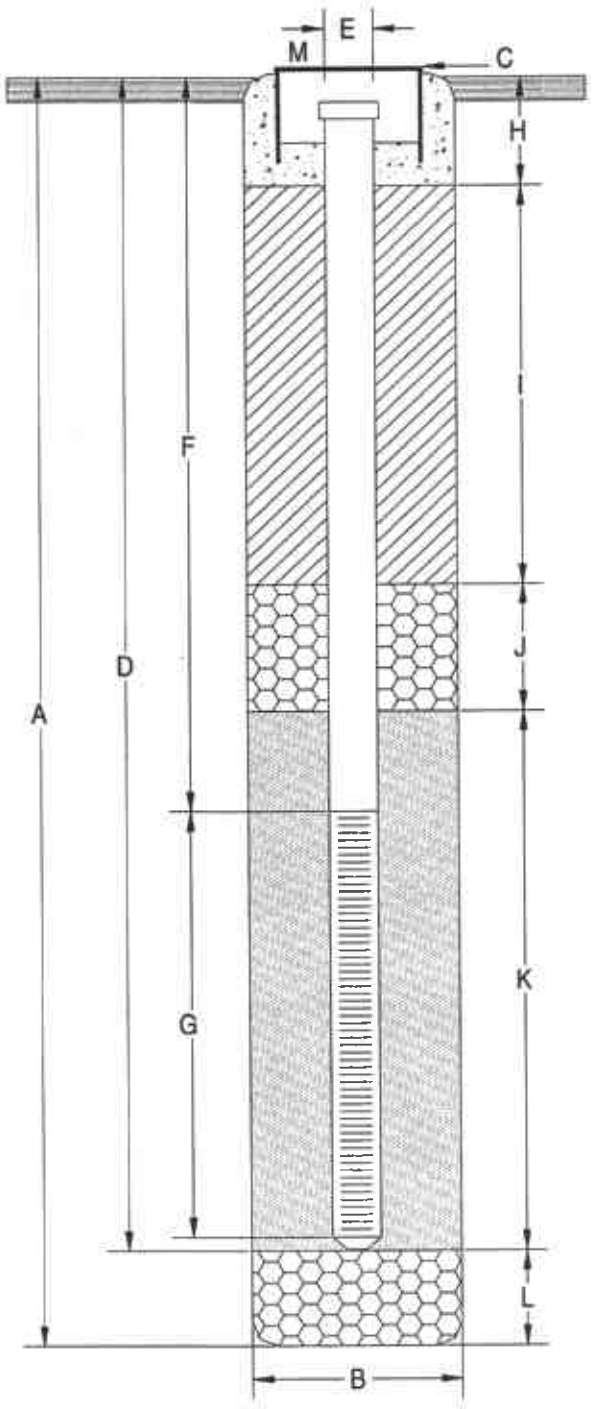
SITE PLAN
Tosco (76) Service Station No. 6419
6401 Dublin Boulevard
Dublin, California

GETTLER - RYAN INC.
6747 Sierra Ct., Suite J
Dublin, CA 94568 (925) 551-7555

PROJECT NUMBER	REVIEWED BY	DATE	REVISED DATE
140101		7/01	

FILE NAME: P:\ENVIRO\TOSCO\6419\A00-6419.DWG | Layout Tab: Work Plan 7-01

WELL CONSTRUCTION DETAIL



A Total Depth of Boring 20 ft.

B Diameter of Boring 8 in.
Drilling Method Hollow Stem Auger

C Top of Box Elevation ft.
[x] Referenced to Mean Sea Level
[ ] Referenced to Project-Datum

D Casing Length 20 ft.
Material PVC

E Casing Diameter 2 in.

F Depth to Top Perforations 5 ft.

G Perforated Length 15 ft.
Perforated interval from 5 to 20 ft.
Perforation Size 0.02 in.

H Surface Seal from 0 to 1 ft.
Seal Material Portland Cement

I Backfill from 1 to 3 ft.
Seal Material Neat Cement

J Seal from 3 to 4 ft.
Seal Material Bentonite

K Gravel Pack from 4 to 20 ft.
Pack Material Lonestar #3

L Bottom Seal None ft.
Seal Material None

M

Note: Depths measured from initial ground surface.

FIGURE
3

Gettler - Ryan, Inc.
6747 Sierra Ct., Suite J (925) 551-7555
Dublin, CA 94568

Tosco (76) SS #6419
6401 Dublin Blvd.
Dublin , California

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE	REVISED DATE
140101		7/25/01		

APPENDIX A

GR FIELD METHODS AND PROCEDURES

GETTLER-RYAN INC.
FIELD METHODS AND PROCEDURES

Site Safety Plan

Field work performed by Gettler-Ryan Inc. (GR) is conducted in accordance with GR's Health and Safety Plan and the Site Safety Plan. GR personnel and subcontractors who perform work at the site are briefed on the of these plans contents prior to initiating site work. The GR geologist or engineer at the site when the work is performed acts as the Site Safety Officer. GR utilizes a photoionization detector (PID) to monitor ambient conditions as part of the Health and Safety Plan.

Collection of Soil Samples

Exploratory soil borings are drilled by a California-licensed well driller. A GR geologist is present to observe the drilling, collect soil samples for description, physical testing, and chemical analysis, and prepare a log of the exploratory soil boring. Soil samples are collected from the exploratory soil boring with a split-barrel sampler or other appropriate sampling device fitted with clean brass or stainless steel liners. The sampling device is driven approximately 18 inches with a 140-pound hammer falling 30 inches. The number of blows required to advance the sampler each successive 6 inches is recorded on the boring log. The encountered soil is described using the Unified Soil Classification System (ASTM 2488-84) and the Munsell Soil Color Chart.

After removal from the sampling device, soil samples for chemical analysis are covered on both ends with teflon sheeting or aluminum foil, capped, labeled, and placed in a cooler with blue ice for preservation. A chain-of-custody form is initiated in the field and accompanies the selected soil samples to the analytical laboratory. Samples are selected for chemical analysis based on:

a. depth relative to underground storage tanks and existing ground surface
b. depth relative to known or suspected groundwater
c. presence or absence of contaminant migration pathways
d. presence or absence of discoloration or staining
e. presence or absence of obvious gasoline hydrocarbon odors
f. presence or absence of organic vapors detected by headspace analysis

Field Screening of Soil Samples

A PID is used to perform head-space analysis in the field for the presence of organic vapors from the soil sample. This test procedure involves removing some soil from one of the sample tubes not retained for chemical analysis and immediately covering the end of the tube with a plastic cap. The PID probe is inserted into the headspace inside the tube through a hole in the plastic cap. Head-space screening results are recorded on the boring log. Head-space screening procedures are performed and results recorded as reconnaissance data. GR does not consider field screening techniques to be verification of the presence or absence of hydrocarbons.

Stockpile Sampling

Stockpile samples consist of four individual sample liners collected from each 100 cubic yards (yd^3) of stockpiled soil material. Four arbitrary points on the stockpiled material are chosen, and discrete soil sample is collected at each of these points. Each discrete stockpile sample is collected by removing the upper 3 to 6 inches of soil, and then driving the stainless steel or brass tube into the stockpiled material with a wooden mallet or hand driven soil sampling device. The sample tubes are then covered on both ends with teflon sheeting or aluminum foil, capped, labeled, placed in the cooler with blue ice for preservation. A chain-of-custody form is initiated in the field and accompanies the selected soil samples to the analytical laboratory. Stockpiled soils are covered with plastic sheeting after completion of sampling.

Construction of Monitoring Wells

Monitoring wells are constructed in the exploratory borings with Schedule 40 polyvinyl Chloride (PVC) casing. All joints are thread-joined; no glues, cements, or solvents are used in well construction. The screened interval is constructed of machine-slotted PVC well screen which generally extends from the total well depth to a point above the groundwater. An appropriately-sized sorted sand is placed in the annular space adjacent to the entire screened interval. A bentonite transition seal is placed in the annular space above the sand, and the remaining annular space is sealed with neat cement or cement grout.

Wellheads are protected with water-resistant traffic rated vault boxes placed flush with the ground surface. The top of the well casing is sealed with a locking cap. A lock is placed on the well cap to prevent vandalism and unintentional introduction of materials into the well.

Storing and Sampling of Drill Cuttings

Drill cuttings are stockpiled on plastic sheeting or stored in drums depending on site conditions and regulatory requirements. Stockpile samples are collected and analyzed on the basis of one composite sample per 50 cubic yards of soil. Stockpile samples are composed of four discrete soil samples, each collected from an arbitrary location on the stockpile. The four discrete samples are then composited in the laboratory prior to analysis.

Each discrete stockpile sample is collected by removing the upper 3 to 6 inches of soil, and then driving the stainless or brass sample tube into the stockpiled material with a hand, mallet, or drive sampler. The sample tubes are then covered on both ends with teflon sheeting or aluminum foil, capped, labeled, and placed in a cooler with blue ice for preservation. A chain-of-custody form is initiated in the field and accompanies the selected soil samples to the analytical laboratory. Stockpiled soils are covered with plastic sheeting after completion of sampling.

Wellhead Survey

The top of the newly-installed well casing is surveyed by a California-licensed Land Surveyor to mean sea level (MSL).

Well Development

The purpose of well development is to improve hydraulic communication between the well and surrounding aquifer. Prior to development, each well is monitored for the presence of separate-phase hydrocarbons and the depth-to-water is recorded. Wells are then developed by alternately surging the well with the bailer, then purging the well with a pump to remove accumulated sediments and draw groundwater into the well. Development continues until the groundwater parameters (temperature, pH, and conductivity) have stabilized.