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May 2, 2002
Project No. 3022.10

Work Plan for Installing

ADDITIONAL GROUND WATER MONITORING WELLS

in the vicinity of the former

1,000 Gallon Gasoline Tank, STID 1996

at the

Oro Loma Sanitary District Service Center

SAN LORENZO, CALIFORNIA

PREPARED FOR

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PREPARED BY

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1 INTRODUCTION

1.1 Preface

This work plan presents site history and documents rationale and procedures that will be used for installing and sampling 2 additional groundwater monitoring wells in the vicinity of a former 1,000 gallon underground fuel storage tank, removed in 1994. The Oro Loma Sanitary District (The District) proposes to install and monitor these wells in response to a request by Alameda County Environmental Health Services Department's Environmental Protection Division, (the Agency) in a letter dated August 20, 2001. This work supplements previous investigative work, including the 3 wells that the District installed and monitored in 1999 and 2000 in accordance with an Agency-approved work plan.

The Oro Loma Sanitary District, which owns the tank site, is a local public agency with responsibility for collecting and treating the sewage generated in San Lorenzo, Castro Valley and part of San Leandro. The District's offices and vehicle maintenance facility, in which the tank was located, are on land adjoining the District's sewage treatment works (POTW).

1.2 Site Location

The 1,000-gallon, underground, gasoline storage tank was located in the parking lot adjacent to the vehicle maintenance building at the District's Service Center at 2600 Grant Avenue, San Lorenzo, in un-incorporated Alameda County. The tank location was to the south of the Maintenance Building and west of the Engineering Building. The site vicinity is shown on Figure 1, taken from a USGS map, and more specifically in relation to the District facilities on Figure 2, and the various building.

1.3 Site History

This 1,000 gallon tank, installed in 1978, replaced a tank of the same volume in that same pit, installed in 1961. Inventory control showed the original tank to be leaking. There are few records of the tank replacement but long time employees remember that it was done under the observation of the (then) San Lorenzo Fire Protection District's fire marshal, now with the successor Alameda County Fire Department. The new tank, of the same size as the original, was installed in the same pit. The District first sampled soil around the tank in 1993. In 1994, this firm used a backhoe to excavate the seven exploratory test trenches in the parking lot, examining the shallow subsurface profile and collecting soil samples for testing. These showed a thin (less than one foot thick) sand layer at 6 or 7 feet depth, sandwiched between Bay Mud organic clay deposits. This was also the typical depth to groundwater noted in the 1993 borings. Locations of borings and test trenches are

shown on Figure 3. Test results for water and soil samples from the 1993 and 1994 investigations are on Tables 3A and 3B.

When the tank was removed in May 1995, the Agency's Ms. Amy Leech and I documented the absence of obvious leaks, nor damage to the corrosion protection, The only area of "blue soil" was a small area beneath the pump island, suggesting a minor line leak. Soil sampling results are on Table 3C. On the basis of observations it was concluded that the ground contamination in the pit walls must have predated the 2nd tank installation in 1978. No significant amount of water flowed into the pit following tank removal; in fact so little seepage that Ms. Leech documented that tank pit water sampling was unnecessary. (See report of removal dated 6/7/1995.)[1] The observations in the tank pit concurred with the subsurface conditions that I first observed in the test trenches I dug in November 1994. These showed a thin (less than one foot thick) sand layer at 7 feet depth, sandwiched between Bay Mud clay deposits. This was also the typical depth to groundwater noted in borings and wells.

From the results of subsurface investigations and sampling in 1993 and 1994, and the tank removal in 1995, it was concluded that soil removal would be the appropriate remedial measure. The District, on that basis, commissioned this firm to perform a remedial investigation/feasibility study, and to develop a corrective action plan for bulk soil removal. That report was published in December 1995 and submitted to the Agency. The District's significant concern was that the gasoline contamination plume extended beneath the Engineering Building and bulk soil removal would entail a significant underpinning and shoring project to protect its building. In review of that document, Ms. Leech discussed the findings with her (then) department supervisor Tom Peacock. At that time, the designation of 'non-attainment zones' had been promulgated in the Regional Board's most recent Basin Plan review, (the LLNL report") and the subject site was located within such a zone. Further, the Board had begun implementing the Risk-Based Corrective Action (RBCA). The Agency suggested that the District apply for 'non-attainment zone' status, and outlined for us a path towards achieving that designation, the intent of which was to relieve the District of the need for direct remediation of the soil. At Agency's request, the District had us perform a soil and groundwater investigation of the site, the results of which were submitted to the Agency in our report dated June 7, 1996. Ms. Madhulia Logan, the Agency's (then) Risk Assessor, reviewed the report, and recommended the District perform additional offsite plume definition (beyond boring #5), and a Tier 1 RBCA Risk Assessment (telecon: Logan and Sutton, 7/24/96) and Agency letter dated August 12, 1996, last Para, page 1.

Ms. Leech brought the case to the attention to the San Francisco Bay Regional Water Quality Control Board's (RWQCB's) Mr. Kevin Graves, and they met with District staff and me on site on September 9, 1996. Mr. Graves concurred with the proposed non-attainment zone designation for this site, describing the adjacent POTW as a huge bio-reactor, and thus, receiver and consumer of the plume. He concurred with the model of a multi-tiered, and redundant, seepage

[1] A list of all reports submitted to the Alameda County Health Agency is included in Section 8 of this document.

collector in the form of the pervious gravel that was the trench backfill for six parallel sewer pipes within Grant Avenue. These pipes, some of which have been in place for over 50 years, range in size up to 66 inches diameter, and to about 16 feet depth. Figure 3 depicts these pipes in plans and cross sectional views that show their relationship to District facilities and the former tank site. As these pipes border the site on the entire 'down gradient' direction from the tank area, i.e. there could be more than 90 degrees change in plume gradient direction, the plume would still would be intercepted.

The Agency followed the Board's lead by requesting the District to perform yet another subsurface soil and groundwater investigation, specifically to verify that the gravel backfill did in fact act as this curtain/collector. The Work Plan we submitted to the Agency, dated October 23, 1997 after the Case Officer became Mr. Oliva, included the results of all previous soil and groundwater sampling.

The subsequent Supplemental SGI report, dated July 13, 1998, confirmed all of the postulations about the low-risk nature of the site made by the Board and the Agency and the District. The benzene plume presented on Figure 4 was developed in that study. The Risk Assessment evaluated the potential for harm to staff in the Engineering Building from volatized soil contamination underneath it, that might permeate into the building, and groundwater contamination offsite into the surrounding public areas. The sampling program included air, soil and groundwater-borne contaminant sources. The RBCA Risk Assessment, performed by Barbara Marks, CIH, a risk assessment professional whose qualifications were approved in advance by Ms. Logan, demonstrated that there was no significant health risk to the public or to the District's staff that could be attributed to fuel-related contaminants emanating from the source area. Results of 1996 and 1998 soil sampling are summarized on Table 3D.

The Agency accepted the Supplemental SGI report in a letter dated August 26, 1998, and requested installation of three monitoring wells around the site with one year's monitoring, to confirm that contamination was contained on the District's property. Subsequently Agency verbally requested District perform a one-time sampling of the wells for 7 oxygenates. The work plan to install and sample the 3 monitoring wells, dated December 18, 1998, included a map again showing the site's benzene plume contours, the locations of the proposed wells, and including oxygenate sampling, was submitted to the Agency. The Case officer, by then Mr. A. K. Gholami, accepted the plan without change in a letter dated January 26, 1999.

The monitoring wells were installed in January 1999, sampled in February 1999, and documented to the Agency and to County Public Works in March 1999. The Agency's letter dated March 31, 1999 concurred with the documentation and the future sampling plan. The wells were re-sampled quarterly during 1999, and reported to the Agency. The District's final report of the sampling was submitted to the Agency by this firm under a letter dated January 17, 2000.

Section 8, "References" below includes a listing of the documents prepared and submitted by the District to the Agency since 1993 in relation to this tank closure.

1.4 Regional Geology and Hydrogeology

1.4.1 Geology

The site is comprised of artificial fill placed over bay land of the East Bay Plain Geomorphic Province. Recent nomenclature (RWQCB, 1999) identifies the bay land as the Young Bay Mud (YBM) unit of the Alameda Formation. Across the province the YBM ranges in thickness from less than 1 foot to 75 feet. It is underlain by the San Antonio Unit, an alluvial outwash deposit, originated from the Oakland Hills, some 5 miles to the east. The alluvium is underlain by the Yerba Buena Mud Unit, formerly called Old Bay Mud. The YBM is a black to green, organic-rich, clay being deposited today in the San Francisco Bay. The clay is typically of high plasticity, high moisture content, high compressibility, and is essentially impervious. It contains occasional gravel and sand layers, shell fragments/layers, peat, and organic debris.

1.4.2 Hydrogeology

The site is located within the San Lorenzo-San Leandro hydrogeological sub-area of the San Francisco Basin. The San Lorenzo and San Leandro sub areas are distinct areas based on the separate origins of the outwash materials. While the majority of these sub-basins are alluvial outwash, including sandy zones, the YBM that comprises the bayland of the site area forms a virtually impervious groundwater barrier. Groundwater from the outwash deposits exit to the bay via the local stream chanels. Shallow water in the YBM is bay-influenced and is thus brackish.

Regional groundwater flow across the East Bay Plain is generally to the west, i.e. from the Hayward Fault to the Bay, and generally correlates with topography, with flow direction and velocity influenced by buried stream channels that typically are oriented in an east-west direction. Groundwater flow in the site vicinity is to the south. Not only has this has been confirmed in the studies performed at the site by this firm but the southward local flow of the San Lorenzo sub-area, is confirmed in the reference (RWQCB, 1999)[2].

1.4.3 Groundwater Quality

The 1999 RWQCB report also discusses proposed re-zonation of the San Francisco Basin into 3 zones. This site is located in "Zone C: - Shallow, non-potable groundwater proposed for de-designation of the Municipal Supply Beneficial Use". The report presents a recommendation that the Regional Board should locally de-designate the municipal beneficial use for brackish, shallow groundwater in Bay-

[2] RWQCB, 1999 page 40: *In the very southern end of the study area. in the San Lorenzo Sub-Area, the direction of flow may not be this simple. The small set of water level measurements available seem to show that the groundwater in the upper aquifers may be flowing south, with the deeper aquifers, the Alameda Formation, moving north.*

front artificial fill, young bay mud and the San Antonio Formation/Merritt Sand. It goes on to propose: "This groundwater meets the exemption criteria of the State Water Resources Control Board's (SWRCB's) Sources of Drinking Water Policy because the groundwater could not reasonably be expected to serve a public water supply and exceeds the 3000 mg/L total dissolved solids criteria." (Page 4 (Executive Summary, and page 92.) This proposed plan is the successor to the 'non-attainment zone' designation for the site area discussed above under 'History'.

2 SITE DESCRIPTION

2.1 Site Locale and Conditions

2.1.1 Land Use

The site is at the foot of Grant Avenue, an area zoned 'heavy industrial'. Other facilities along Grant Avenue include a major packaging manufacturer, several heavy construction equipment distributors, large distribution warehouses, a PG&E transformer farm, and contractor yards. The District's Sewage Treatment Works (POTW), which this site adjoins, was initially constructed in the 1940s. The subject site is located approximately 1,000 feet inland from the San Francisco Bay shoreline. All the land to the west of the site is associated with the District's sewage treatment works.

To the north of the site, the adjoining land behind the maintenance building is owned by Alameda County, and has historically been an asphalt disposal site. That land filling operation, which has been in progress for decades, extends to the levee that borders San Lorenzo Creek, a quarter mile to the north. A PG&E power line crosses this area to a major substation north of the county land.

Land further north beyond San Lorenzo Creek is the San Leandro shoreline, while land south of the treatment plant, formerly salt evaporators, is the Hayward shoreline area. A half mile to the east of the site are the Union Pacific (formerly Southern Pacific) Railway's main freight lines that serve the Port of Oakland. Beyond the UP tracks are San Lorenzo's residential neighborhoods. The site area, and these features are shown on Figure 1, 'Location Map with Geology', which is taken from the USGS San Leandro Quadrangle map.

2.1.2 Topography

Land in the vicinity of the sewage treatment plant facility and adjacent Service Center was filled more than 40 years ago and is generally level. The elevations range from elevations 6 to 9 feet above mean sea level (msl) for much of the filled areas. Site elevations range 8 to 9 feet msl. Elevations along the UP railroad embankment a half mile to the east of the site are only a couple of feet higher. Figure 1 includes regional elevation contours.

2.2 Subsurface Conditions

The subsurface profile on the District property comprises man-made fill placed over bayland deposits. The bayland soils immediately underlying the fill soils often have a peat layer or crusted clay surface, which is typically brown to black, about one foot thick, and with a noticeable organic odor. In many of the borings a layer of fine, gray to black sand, which was typically clean but with silty or clayey stringers, and varying in thickness from one to three feet, underlay the crust. The top of this sand layer was at from three to six feet depth where found, which is at the approximate native soil interface. The crust, peat and sand layers were underlain by characteristic green to black, organic-rich, moderately to highly plastic, Bay Mud clays.

In the borings in Grant Avenue, gravely fill extended to approximately five feet depth. The artificial fill that is the backfill around the trunk sewer pipes are open-work gravels, some of which extend to 16 feet depth. The native soil profile was typical of the bayland, including a layer of brown, fibrous peat found at 12 to 13½ feet depth.

Previous investigations at the site have shown that contact between the Younger Bay Mud clays and the San Antonio Formation is at about 25 feet depth. The 1995 geotechnical investigation, in which borings have extended to as deep as 51 feet, have found brown clays below the Bay Mud at that depth (Sutton, 1995a).

2.3 Groundwater Conditions

Groundwater depth has been measured in temporary wells drilled for the previous investigations, and in the three monitoring wells installed and monitored through 1999, all located on Figure 3. Groundwater depth ranged between 4½ and 8½ feet depth in the year of well sampling, averaging 6 ½ feet depth, and with about 1.7 feet fluctuation in any well over the period. The on-site well, MW-3 had the highest groundwater level, while the surface elevation is a half foot higher than at MW-1 and –2 in the street. This is no doubt due to the de-watering effect of the gravel bedding that surrounds the sewer mains.

It has previously been shown (Sutton, 1998) that on-site shallow groundwater essentially is confined to a sand layer at approximately six feet depth, at the surface of the Bay Mud. Groundwater from the direction of the former tank site flows generally southeasterly towards the street until it is intercepted by the trench backfill of an abandoned sewer main beneath the sidewalk of the southwesterly-aligned Grant Avenue. This was demonstrated in the Supplemental Site Investigation (Sutton, 1998) and confirmed by the monitoring wells installed southwest to southeast, i.e. 'down gradient' of that alignment (Sutton, 2000). Figure 3 includes a cross section cut from the former tank site, south across the width of Grant Avenue. The cross section, when studied with the water levels measured in 1999 and the plume concentrations on Figure 4, confirm the local south to southeast gradient.

The gravel backfill in the on site sewer branch that extends from the Maintenance Building to the line in the Grant Avenue sidewalk. It is fortuitously positioned to intercept any flow towards the west, and direct it into the same sidewalk trench gravel. The high porosity gravel backfill, and westerly grade of the

sidewalk sewer trench bottom provides a preferential pathway through the impervious YBM, a substantial potential difference (i.e. a 'sink') which intercepts all groundwater (and contaminants). The effect is that the gravel then transports all of the groundwater flow transiting the site in the vicinity of the former tank, carrying it west along Grant Avenue and into the District's POTW. (Again, see Figure 4). This barrier effect created by the trench gravel was postulated from the soil and grab groundwater analysis results, as shown on the Benzene in Groundwater Iso-Concentration Map, of Figure 4, which was drawn in 1998. The absence of contamination in both monitoring wells in Grant Avenue, down gradient of the 'sink', confirms not only the existence but also the efficiency of the barrier trench.

3 PROPOSED MONITORING WELLS

3.1 Program and Rationale

Two additional groundwater monitoring wells will be installed down gradient of the source within the onsite plume. The wells will be positioned, at Agency request (Letter dated August 20, 2001) within th eon site plume to document the decrease of plume concentration with distance from the contaminant source.

The 2 wells will be located within the District's paved parking lot, in the locations shown on Figure 4. These wells will supplement the well installed in the parking lot southwest of the former tank location, and the other two in the paved portion of Grant Avenue. Those were installed in 1999 and monitored for a year.

3.2 Borings

Test borings will be drilled in the planned well locations shown on Figure 4. The borings will be permitted through Alameda County Public Works Department. Boring locations will be marked on the ground or staked based on measurements from the site boundaries or other landmarks. The boring sites will be surveyed by Underground Service Alert (USA) in advance of rig mobilization. Borings will not be relocated without the approval of the engineer-of-record.

The soil borings will be drilled by a C-57 licensed contractor. A truck-mounted drill rig equipped with 8-inch OD or larger hollow stem augers will be used to dig the borings. All equipment will be steam-cleaned prior to drilling. The soil sampler will be cleaned with a laboratory grade detergent and rinsed with clear and then distilled water between samples. Thus, the potential for cross-contamination will be minimized.

Borings will be extended to approximately 15 feet depth. They may be terminated at a shallower depth if a minimum of five feet of clay, acting as an aquitard is encountered at shallower depth. The borings will be completed as monitoring wells.

3.3 Logging and Soil Sampling

The soil borings will be logged by an engineer or geologist from The Sutton Group. Soil samples will be collected at approximate 5 foot depth intervals as each hole is advanced. Selected soil samples from above the groundwater table will be for tested for gasoline-related ground contaminants.

All soil samples will be classified in the field using the Unified Soil Classification System. The samples will be screened on-site using a portable photo-ionization detector (PID). Samples will be labeled with the project number, boring number, sample depth interval and date of collection. The soil samples will be appropriately packed, refrigerated and transported to the chemical analytical laboratory for testing. A chain-of-custody form will be initiated by the sampler and accompany the soil samples during transport to the laboratory.

3.4 Monitoring Well Construction

The borings will be converted to monitoring wells utilizing 2" ID, schedule 40, threaded PVC pipe and factory-slotted screen. The perforations will extend approximately 10 feet below and one foot above the upper zone of saturation. The perforated section annulus will be packed with clean graded sand. Due to the shallow depth of groundwater, sand will extend to a level approximately two feet above the highest screen slots. The wells will then be surged to consolidate the sand pack and a one-foot thick bentonite plug will be placed over the sand pack. The remaining annulus will be backfilled with a cement/bentonite slurry to grade.

The wells will be finished with a traffic rated concrete or metal box grouted to match the existing grade. The wells will be completed with a locking cap to guard against vandalism. No solvents or glues will be used during monitoring well construction.

After installation, the wells will be developed utilizing surging, hand bailing or a submersible pump. Development will consist of the rapid removal of water from the well until the water is relatively free of sand, silt, and turbidity.

3.5 Soil Cuttings and Collected Water Management

The soil cuttings will be placed on visqueen at a designated location on the site, for eventual disposition by the District. Excess purge water and rinsate from the cleaning will be temporarily contained in drums or portable tanks at the project site and then, with District approval, discharged into the effluent well at the District's POTW.

3.6 Groundwater Sampling

The initial samples will be collected from each well following development. The three existing wells will also be sampled at the time of this initial sampling. Beginning 3 months after the initial sampling, additional water samples will be collected at three-month intervals, for a total of four sampling events.

At each sampling event, groundwater level in each well will be measured. Then a minimum of three well-casing volumes of water will be purged from each well in an attempt to collect a representative formation sample. Should a well become completely evacuated during purging, samples will be collected after the well has recovered to 80 percent of this initial water elevation.

All samples collected will be placed in containers, provided by the laboratory, pre-dosed with preservative for the type of analyses required. Following EPA-approved sampling protocols, the samples will be labeled and immediately placed in refrigerated storage.

All samples will be labeled with the job identifier, well number, sample date, and requested analysis. A chain-of-custody form will be initiated by the sampler and accompany the samples to the analytical laboratory. All soil and water samples collected will be delivered to a hazardous waster testing laboratory approved by the California Department of Health Services for the type of analysis to be performed.

3.7 Chemical Analysis of Samples

Soil samples from the non-saturated zone of the borings will be analyzed for total petroleum hydrocarbons as gasoline, benzene, toluene, ethyl benzene, xylenes, (BTEX) and methyl tert-butyl ether (MTBE) using EPA methods 5030, and 8260, in accordance with Table 2 of the "Tri-Regional Guidelines, dated August 1990.

Groundwater samples will be analyzed for total petroleum hydrocarbons as gasoline, BTEX and MTBE using EPA method 8260, in accordance of the "Tri-Regional Guidelines, (RWQCB 1990).

At the initial sampling, groundwater in the 2 new wells will also be analyzed for the oxygenates on the RWQCB's 'oxy-7' list: tert-amyl methyl ether, tert-butyl alcohol, di-isopropyl ether, 1,2 dibromo ethane, 1,2 dichloroethane, ethanol, ethyl, tert–butyl ether and methyl tert-butyl ether by EPA method 8260.

4 HEALTH AND SAFETY

The work shall be performed in accordance with the District's Health and Safety Program dated January 1, 1993, prepared by Levine Fricke, Inc. which is appended by reference.

5 EVALUATION AND REPORT

The well drilling report, describing field and laboratory results for subsurface soil sampling, well installation details, and initial groundwater sampling results will be provided to the District for review, and then to the Agency. The Sutton Group will also provide well drilling logs to Alameda County Public Works Agency as required by State Regulations.

Quarterly well sampling results will be submitted for District review and to the Agency. Following the year's sampling, we compile and evaluate the year's

water sampling results in a written report to be submitted to the Agency. The evaluation will include an assessment of public health risk from the groundwater contamination. Dependent on the results, the District will request site closure or, if dictated by the results of the risk assessment, consider other alternatives.

6 PERSONNEL

This Work Plan has been prepared by The Sutton Group, under the direction of John R. Sutton, PE, California Registered Civil Engineer, No. 40324, and Geotechnical Engineer No. 812, with expiration date December 31, 2002.

Mr. Sutton, who has over 25 years of geo-environmental engineering experience, and has been responsible for, and directly involved in hazardous waste investigations in northern California since 1986, will be the Engineer-of-Record for the proposed groundwater monitoring well installation, and risk assessment. Ms. Barbara Marks, CIH, a risk assessment professional well known to the San Francisco Bay Regional Water Quality Control Board, will perform the risk assessment.

7 LIMITATIONS

This work plan has been prepared according to generally accepted local geologic, geotechnical and environmental engineering practices. No other warranty, either expressed or implied is made. The analysis, conclusions and recommendations contained in this work plan are based on review of customer-provided data and other available documents relevant to the site conditions. Changes in the information or data gained from any of these sources could result in the need for changes in conclusions and the recommended scope of work. If such changes do occur, we should be advised so that we can review this document and the work scope in light of these changes.

8 REFERENCES

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The Sutton Group, 1999 Installation of Groundwater Monitoring Wells, Former Gasoline Tank Closure, 2600 Grant Avenue, San Lorenzo, CA Prepared for Mike Cortez, Oro Loma Sanitary District. March 16, 1999.

The Sutton Group, 1999a, b, c Results of Quarterly Groundwater Monitoring, Former Gasoline Tank Closure, 2600 Grant Avenue, San Lorenzo, CA Results of 2nd, 3rd Quarterly Monitoring; Prepared for Mike Cortez, Oro Loma Sanitary District. June 9, September 21, 1999 and January 17, 2000.

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TABLE 1

SUMMARY OF ANALYTICAL RESULTS FOR GRAB GROUNDWATER SAMPLES, 1996, 1998

BORING No.	TPH-GAS µg/l (ppb)	Benzene µg/l (ppb)	Toluene µg/l (ppb)	Ethyl Benzene µg/l (ppb)	Xylenes µg/l (ppb)	MTBE µg/l (ppb)	Lead µg/l (ppb)	
EP-1	510*	31*	7.4*	3.8*	15*	19*	ND	1996 SGI
EP-2	230,000*	35,000*	47,000*	4,300*	21,000*	6,900*	74	1996 SGI
EP-3	210	5.8	2.6	1	3.1	5.4	16	1996 SGI
EP-4	ND	2.3	0.97	ND	0.59	36	15	1996 SGI
EP-5	64,000*	8,800*	4,800*	1,100*	4,800*	ND*	ND	1996 SGI
EP-6	ND	ND	0.99	ND	1.0	ND	19	1996 SGI
EP-7	ND	0.53	2.1	0.53	2.9	ND	ND	1996 SGI
EP-8	NA	24,000*	44,000*	3400*	17000*	4000*	NA	1998 SSGI
EP-9	NA	ND	ND	ND	ND	ND	NA	1998 SSGI
EP-9B	NA	0.81	ND	3.6	9.8	ND	NA	1998 SSGI
EP-10	NA	12,000*	13,000*	960*	5200*	1100*	NA	1998 SSGI
EP-11	NA	ND	ND	ND	ND	ND	NA	1998 SSGI
EP-12	NA	ND	ND	ND	ND	ND	NA	1998 SSGI
MDLs*	50	0.50	0.50	0.50	0.50	2.5	5	

* Indicates detection limits raised due to positive gasoline result. Refer to Laboratory report for actual detection limits.

NA Indicates sample was not analyzed for the constituent

ND Indicates constituent not detected at the method detection limit

TABLE 2A
SUMMARY OF GROUND WATER SAMPLE ANALYSES
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, BTEX AND MTBE
EPA METHOD 8015M/8020M
results in µg/l (ppb)

Sample Location	Sample Date	Gasoline	Benzene	Toluene	Ethyl Benzene	Xylenes (total)	MTBE
MW-1	2/19/99	ND	ND	ND	ND	ND	ND
	5/10/99	ND	ND	ND	ND	ND	ND
	8/30/99	NA	ND	ND	ND	ND	ND
	11/23/99	ND	ND	ND	ND	ND	ND
DUP	11/23/99	ND	ND	ND	ND	ND	ND
MW-2	2/19/99	ND	ND	ND	ND	ND	ND
	5/10/99	ND	ND	ND	ND	ND	ND
	8/30/99	NA	ND	ND	ND	ND	ND
	11/23/99	ND	ND	ND	ND	ND	ND
MW-3	2/19/99	ND	ND	ND	ND	ND	**1.5** [1]
DUP	2/19/99	ND	ND	ND	ND	ND	NA
	5/10/99	ND	ND	ND	ND	ND	**1.5** [2]
	8/30/99	NA	ND	ND	ND	ND	ND
	11/23/99	ND	ND	[0.69] [3]	[0.58] [3]	[1.3] [3]	ND
	1/6/00	ND	ND	ND	ND	ND	**3.1** [4]
DUP	1/6/00	ND	ND	ND	ND	ND	**2.6** [4]
TRIP BLANK	2/10-22/99	ND	ND	ND	ND	ND	NA
	5/8-20/99	NA	NA	NA	NA	NA	NA
	8/27-31/99	NA	NA	NA	NA	NA	NA
REPORTING LIMITS		50.0	0.50	0.50	0.50	0.50	2.00

NOTES:

ND Analyte not detected at stated reporting limit
NA Not analyzed for this constituent
1. Analyzed by EPA method 8260B, reporting limit was 1 µg/l.
2. Estimated value below method reporting limit of 2 µg/l.
3. Inconsistent contaminant pattern. Sample result spurious, re-sampled
4. Re-sampled, analyzed at different lab, reporting limit at 2.5 µg/l.

TABLE 2B

SUMMARY OF GROUND WATER SAMPLE ANALYSES, SHEET 2

SELECTED FUEL OXYGENATES AND ADDITIVES

EPA METHOD 8015M/8020M

RESULTS IN µg/l (ppb)

Sample ID/ Location	*Tert-Amyl Methyl Ether* (TAME)	*Tert-Butyl Alcohol* (TBA)	*Di-Isopropyl Ether* (DIPE)	*1,2 Dibromo Ethane* (EDB)	*1,2 Dichloro Ethane* (EDC / 1,2 DCA)	*Ethanol*	*Ethyl Tert-Butyl Ether* (ETBE)	*Methyl Tert-Butyl Ether* (MTBE)
021999A **MW-1**	ND	ND	ND	ND	ND	ND	ND	ND
021999B **MW-2**	ND	ND	ND	ND	ND	ND	ND	ND
021999C **MW-3**	ND	ND	ND	ND	ND	ND	ND	1.49
REPORTING LIMITS	1.00	20.0	1.00	0.500	0.500	100	1.00	1.00

Samples collected 2/19/99

TABLE 3A
ANALYTICAL RESULTS FOR SOILS & WATERS
GASOLINE TANK AREA, 1993 INVESTIGATION

ANALYTICAL RESULTS FOR SOILS

BORING	DEPTH Ft.	TPH-GAS mg/kg	Benzene mg/kg	Toluene mg/kg	Ethyl Benzene mg/kg	Xylenes mg/kg	LEAD,Total mg/kg
SB1	5.5	**2,100**	**23**	**200**	**55**	**330**	NA
SB2	3.5	**4,300**	**14**	**250**	**130**	**680**	NA
SB4	3.5	**1,100**	**11**	**51**	**39**	**210**	NA
SB5	3.5	**3.2**	**0.25**	ND	**0.27**	**0.83**	NA
SB6	3.5	**160**	**2.8**	**14**	**5.9**	**26**	NA
SB6	5.5	**2,100**	**14**	**210**	**80**	**430**	NA
SB6	7.5	**1,500**	**4.8**	**120**	**61**	**340**	NA
MDLs*	SOIL, mg/kg	0.2	0.005	0.005	0.005	0.005	5

ANALYTICAL RESULTS FOR GRAB GROUNDWATER SAMPLES

		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
SB3	GW	**0.12**	**0.0007**	ND	ND	ND	NA
SB4	GW	**1,600**	**27**	**39**	**4.2**	**22**	NA
SB5	GW	**1,100**	**8**	**29**	**4.2**	**20**	NA
MDLs*	WATER,mg/kg	0.05	0.0005	0.0005	0.0005	0.0005	NA

* Refer to Laboratory Report for complete listing of results

TABLE 3B

ANALYTICAL RESULTS FOR SOILS

GASOLINE TANK AREA

1994 INVESTIGATION

TRENCH No	DEPTH Ft.	TPH-GAS mg/kg	Benzene mg/kg	Toluene mg/kg	Ethyl Benzene mg/kg	Xylenes mg/kg	LEAD,Total mg/kg	LEAD, Sol. mg/kg
TT-1	4.5-5.0	ND	ND	ND	ND	ND	**57**	**1.8**
TT-2	2.5-3.0	ND	ND	ND	ND	**0.007**	ND	--
TT-2	6.0-6.5	ND	ND	ND	ND	ND	**21**	--
TT-2	7.0-7.5	ND	**0.015**	ND	ND	**0.015**	**15**	--
TT-3	2.0-2.5	ND	ND	ND	ND	ND	ND	--
TT-3	3.5-4.0	**160**	**4.7**	**25**	**4.6**	**22**	**31**	**5.3**
TT-3	6.0-6.5	**1600**	**6.8**	**77**	**25**	**130**	**7.4**	--
TT-4	5.0-5.5	ND	ND	**0.009**	ND	**0.008**	**9.3**	--
TT-5	2.5-3.0	ND	ND	ND	ND	ND	ND	--
TT-5	5.5-6.0	ND	ND	ND	ND	ND	**37**	**0.2**
TT-8	2.0-2.5	ND	ND	ND	ND	ND	ND	--
MDLs*		1.0	0.005	0.005	0.005	0.005	5	0.1

* Refer to Laboratory Report for complete listing of results

TABLE 3C

TANK REMOVAL ANALYTICAL RESULTS, 1995

GASOLINE TANK AREA

TEST RESULTS FOR SOILS

SAMPLE ID	LOCATION	DEPTH Ft.	TPH-GAS mg/kg	Benzene mg/kg	Toluene mg/kg	Ethyl Benzene mg/kg	Xylenes mg/kg	LEAD,Total mg/kg	LEAD, Sol. mg/kg
S1	East End of Tank Pit	5.8	**1,900**	**7.1**	**57**	**39**	**190**	**18**	NA
S2	West End of Tank Pit	6	**3,300**	**37**	**18**	**61**	**350**	**260**	**6.4**
S3	Center of Tank Pit	11.5	**43**	**0.3**	**0.56**	**0.41**	**1.7**	ND	NA
S4	Island: beneath fuel pipe	1.5	**49**	**0.25**	**0.28**	**0.45**	**2.6**	**15**	NA
MDLs*			0.2	0.005	0.005	0.005	0.005	5	0.1

* Refer to Laboratory Report for complete listing of results

Job No. 3022, Stage 7

TABLE 3D

ANALYTICAL RESULTS FOR SOIL SAMPLES

SOIL AND GROUNDWATER INVESTIGATION, 1996
SUPPLEMENTAL SOIL AND GROUNDWATER INVESTIGATION, 1998

BORING	*DEPTH*	TPH-GAS	Benzene	Toluene	Ethyl Benzene	Total Xylenes	MTBE	Lead
	FEET	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EP-1	6.5-7	**4.5**	ND	ND	ND	.059	ND	**7.7**
EP-2	6.5-7	**1800**	**21**	**120**	**3.5**	**180**	ND*	**16**
EP-2B	2.5-3	ND	ND	ND	ND	ND	NA	**13**
EP-2B	3.1-3.6	ND	ND	ND	ND	ND	NA	ND
EP-3	6.5-7	**5.3**	ND	ND	ND	**.036**	ND	ND
EP-3A	1.5-2	ND	ND	ND	ND	ND	NA	NA
EP-3B	3.5-4	ND	ND	ND	ND	ND	ND	NA
EP-3B	4.5-5	**1.5**	ND	ND	ND	0.010	NA	NA
EP-5	3.5-4	**29**	**1.5**	**0.24**	**0.90**	**2.2**	NA	**49**
EP-6	3.5-4	ND	ND	ND	ND	ND	ND	**46**
EP-7	NS	NS	NS	NS	NS	NS	NS	NS
EP-8	3.5-4.0	ND	ND	ND	ND	NA	NA	NA
EP-9	3.5-4.0	ND	**0.005**	ND	ND	NA	NA	NA
EP-9B	6-6.5	ND	ND	ND	ND	NA	NA	NA
EP-10	NS	NS	NS	NS	NS	NS	NS	NS
EP-11	2.5-3.0	ND	ND	ND	ND	NA	NA	NA
EP-12	3.5-4.0	ND	**0.007**	ND	**0.014**	NA	NA	NA
MDL'S		1.0	0.005	0.005	0.005	0.005	.025	5.0

Refer to Laboratory Report in Appendix C for complete listing of results

NS... Indicates no sample recovered for testing.

NA Indicates sample was not analyzed for the constituent

ND Indicates constituent not detected at the method detection limit

TABLE 3E

SUMMARY OF SOIL SAMPLE ANALYSES: MONITORING WELL BORINGS, 1999

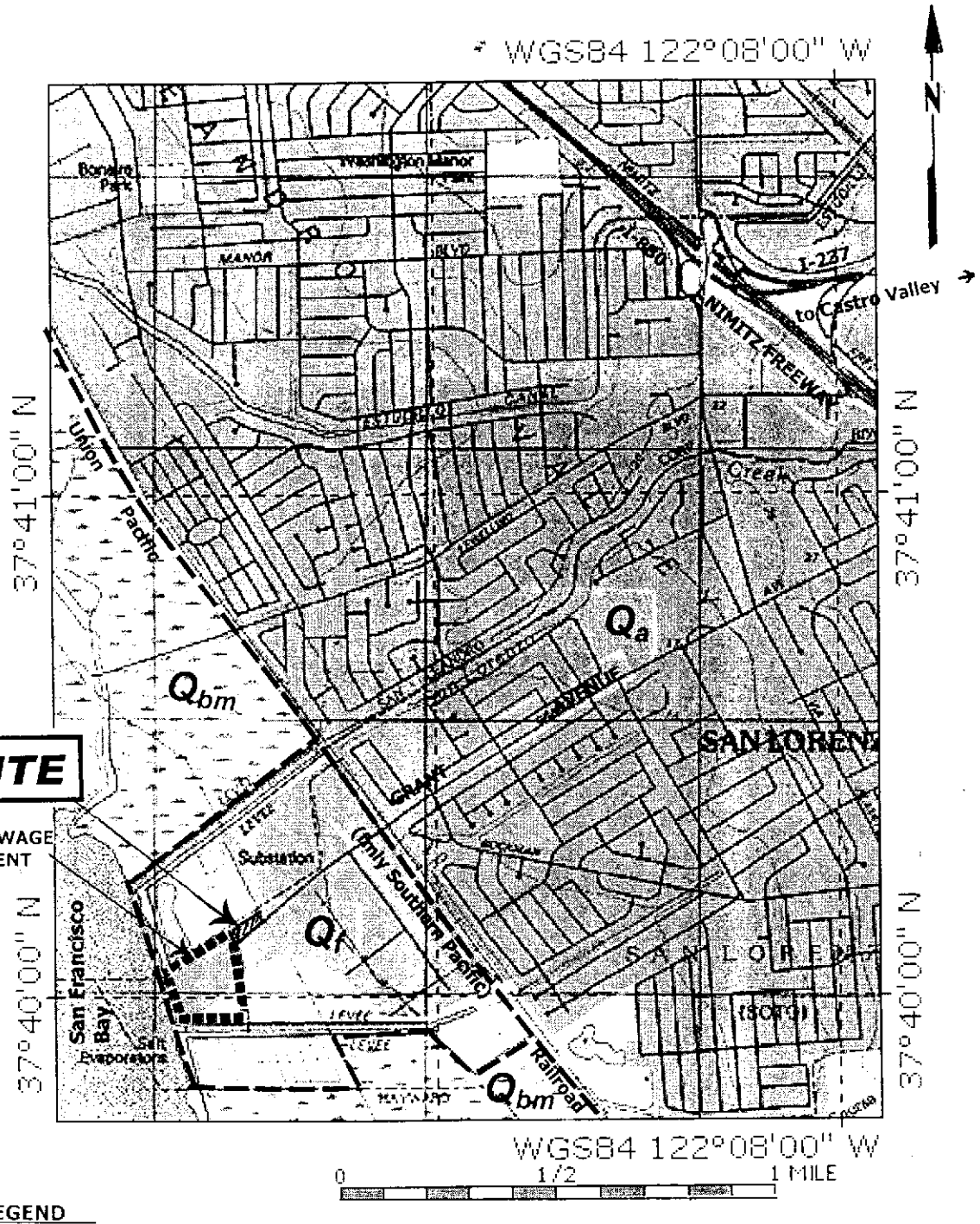
TOTAL PETROLEUM HYDROCARBONS AS GASOLINE AND BTEX

EPA METHOD 8015/8020M

RESULTS IN mg/kg (ppm)

SAMPLES COLLECTED FEBRUARY 12, 1999

Sample ID Boring No, Depth	Gasoline	Benzene	Toluene	Ethyl Benzene	Xylenes (total)
30229-MW-1 1-1 Boring 1 @ 3.5-4 '	ND	ND	ND	ND	ND
30229-MW-2 2-1 Boring 2 @ 3.5-4'	1.35	.004	ND	ND	ND
30229 MW-2 2-2 Boring 2 @ 5.5-6'	ND	ND	ND	ND	ND
30229 MW-3 3-1 Boring 3 at 3.5-4'	ND	ND	ND	ND	ND
30229 MW-3 3-2 Boring 3 at 6-6.5'	ND	ND	ND	ND	ND
REPORTING LIMITS	0.400	0.002	0.002	0.002	0.004



LEGEND

Qbm	Bay Land
Qf	Filled Bay Land
Qa	Alluvium

SCALE: 1:24,000

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Engineering and Environmental Services
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Lafayette, California, 94549
Phone: (925).284-4208
Fax: (925).284-4189

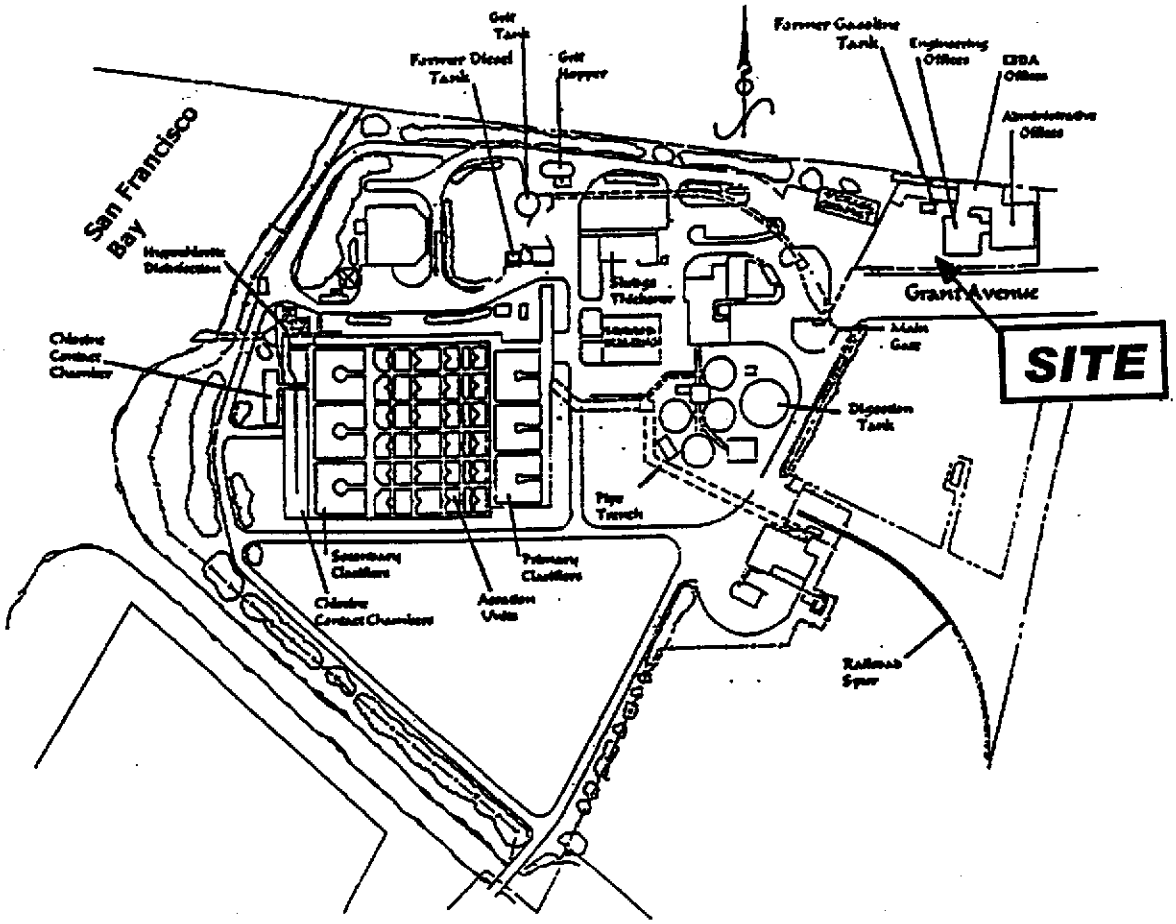
LOCATION MAP with GEOLOGY

ORO LOMA SANITARY DISTRICT
SERVICE CENTER
2600 GRANT AVENUE,
SAN LORENZO, CA

PROJECT No. 3323.10

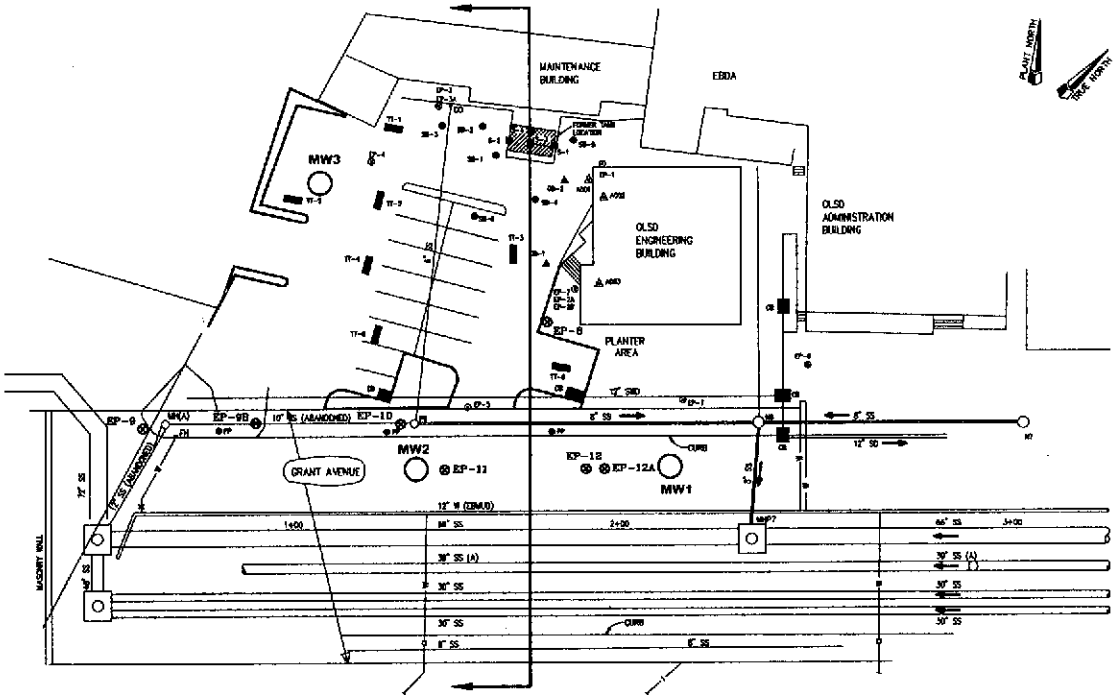
FIGURE 1

4.29/02

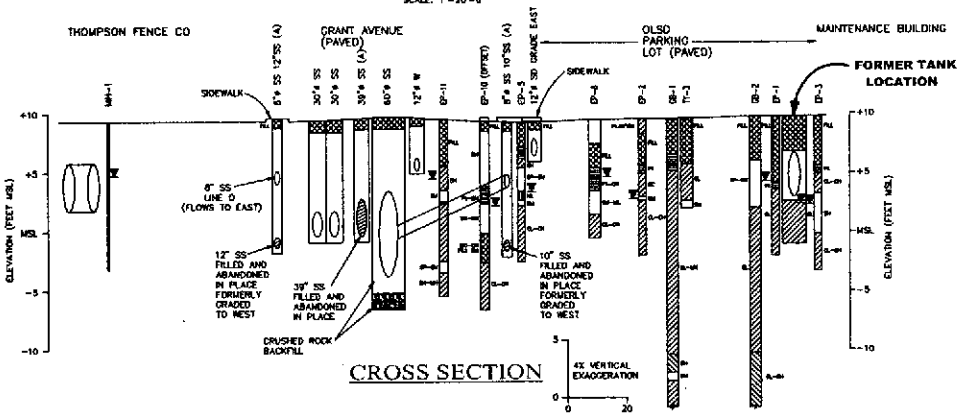


THE SUTTON GROUP *Engineering and Environmental Services* *3708 Mount Diablo Blvd, Suite 215* *Lafayette, California, 94549* *Phone: (925).284-4208* *Fax: (925).284-4189*	**PLANT AREA MAP** *ORO LOMA SANITARY DISTRICT* *SERVICE CENTER* 2600 GRANT AVENUE, SAN LORENZO, CA	*PROJECT No. 3022.10* **FIGURE 2** *4/29/02*

3022.10 WP Fig2



PLAN VIEW
SCALE: 1"=20'-0"



CROSS SECTION

LEGEND

PLOTLINE PLOT 1/240

Revision	Description	Submit	Appr'd	Date
Refer to Original for Latest Revision				

Reference Information and Notes:

Designed	JRS
Drawn	JRS
Checked	JRS
Date	4/30/02

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ORO LOMA SANITARY DISTRICT

Gasoline Tank Area
Site Plan & Cross Section

Scale	AS SHOWN
Job No.	3022.10
Sheet	
	FIGURE 3

THE SUTTON GROUP
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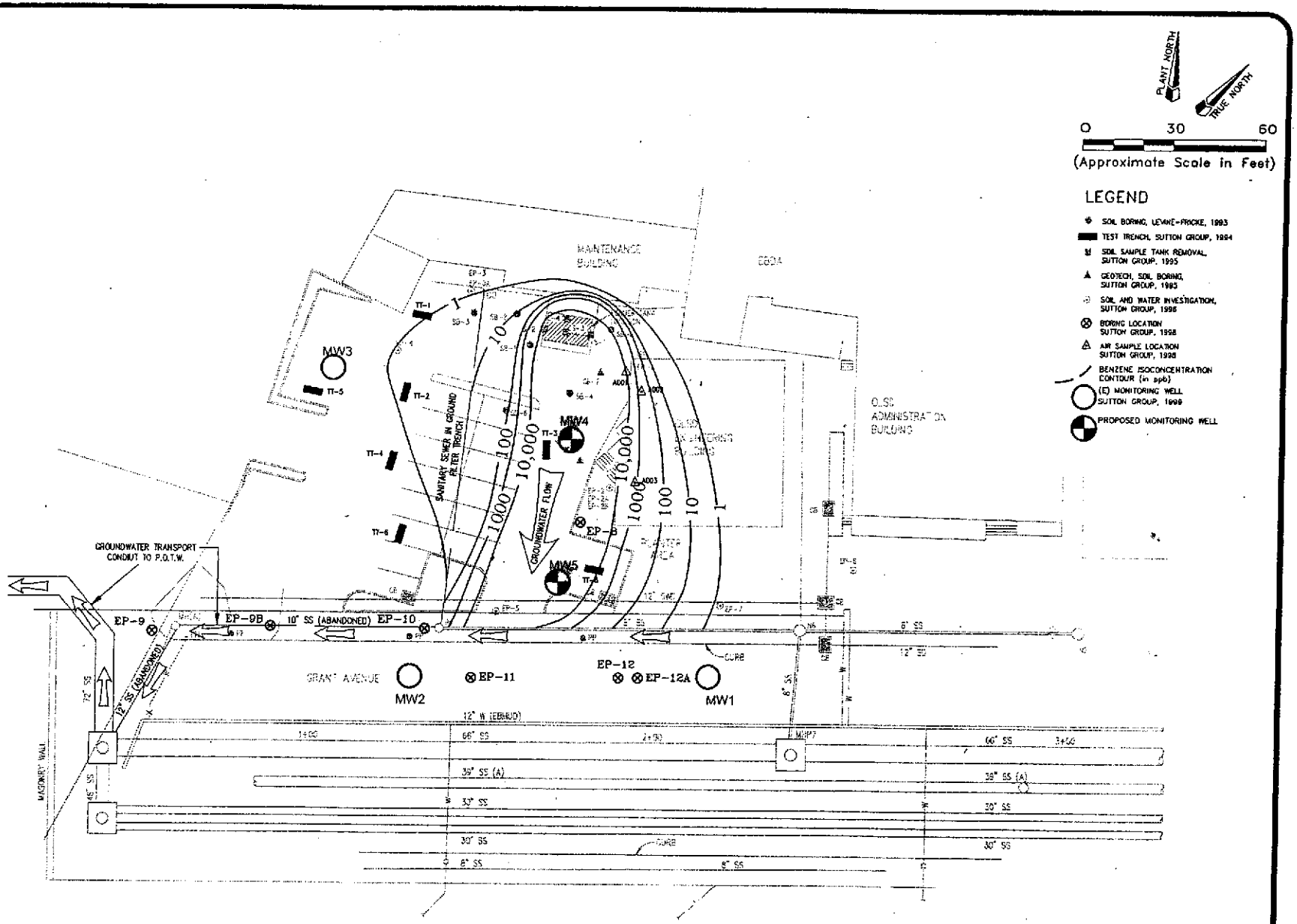
Phone 925 284-4208

Proposed Well Locations on Benzene Plume Map

Gasoline Tank Area
ORO LOMA SANITARY DISTRICT
SAN LORENZO, CALIFORNIA



PROJECT NO. 3022.10

FIGURE 4

04/30/02

P:\GLDWG PLOT 1/360