KAPREALIAN ENGINEERING
INCORPORATED

KEI-P90-0606.R13
February 17, 1995

Unocal Corporation
2000 Crow Canyon Place, Suite 400
P.O. Box 5155
San Ramon, California 94583

Attention: Mr. Adadu Yemane

RE: Case Closure Report
Former Unocal Service Station #5901
11976 Dublin Boulevard
Dublin, California

Dear Mr. Yemane:

INTRODUCTION

This report presents a comprehensive summary of all of the soil sampling, ground water monitoring, ground water sampling, and remediation activities that were conducted at the referenced site from June 1990 to date. Based on the analytical results of all of the soil and ground water samples collected and evaluated, it is Kaprealian Engineering, Inc's. (KEI) opinion that no further ground water monitoring or sampling work is warranted at this former Unocal facility, unless required by the regulatory agencies.

SITE DESCRIPTION AND BACKGROUND

The subject site formerly contained a Unocal service station facility. The site is situated on topography that slopes gently eastward, and is located approximately 700 feet northwest of a channelized portion of Dublin Creek. The site is also located near the southwest end of the San Ramon Valley, near Amador Valley. The station building, pump islands, and other station facilities have been demolished and removed from the site. A Location Map is attached to this report.

KEI's initial field work was conducted on June 13, 1990, when two underground gasoline storage tanks and one waste oil tank were removed from the site. The tanks consisted of one 10,000 gallon super unleaded gasoline storage tank, one 10,000 gallon regular unleaded gasoline storage tank, and one 280 gallon waste oil tank. The tanks were made of steel, and at least one hole (of up to 1/4-inch diameter) was observed in both of the fuel tanks. Numerous holes (up to 1/2-inch in diameter) were observed in the waste oil tank. Mr. Ravi Arulanantham of the Alameda County Health Care Services (ACHCS) Agency was present during tank removal and subsequent soil sampling.

2401 Stanwell Drive, Suite 400
Concord, California 94520
Tel: 510.602.5100 Fax: 510.687.0602

Water was encountered in the fuel tank pit at a depth of approximately 7 feet below grade, thus prohibiting the collection of any soil samples from immediately beneath the tanks. Six soil samples, labeled SW1 through SW6, were collected from the sidewalls of the fuel tank pit (each sample was collected at approximately 6 to 12 inches above the observed water table). One soil sample, labeled WO1, was collected from beneath the waste oil tank at a depth of approximately 6.5 feet below grade. An additional soil sample, labeled SWA, was collected from the waste oil tank pit sidewall at a depth of approximately 6.5 feet below grade. Sample point locations are as shown on the attached Figure 3.

KEI returned to the site on June 15, 1990, in order to collect soil samples from the product pipe trenches. Four samples, labeled P1 through P4, were collected from the trenches at depths of 6 feet below grade. After the soil sampling was completed, the pipe trenches were excavated to ground water at the areas indicated on the attached Figure 4. Pipe trench sample point locations are also shown on the attached Figure 4.

On June 15, 1990, after reviewing the analytical results of the soil samples SW1 through SW6, additional soil excavation was performed. Four additional soil samples, labeled SW1(3), SW2(3), SW5(2.5), and SW6(3), were collected from the sidewalls of the fuel tank pit (each sample was collected approximately 6 to 12 inches above ground water), in the vicinity of sample point locations SW1, SW2, SW5, and SW6, respectively.

After soil sampling was completed, approximately 25,000 gallons of ground water were pumped from the fuel tank pit. On June 20, 1990, one water sample, labeled W1, was collected from the fuel tank pit.

Also on June 20, 1990, based on the analytical results of soil samples SW1(3) and SW2(3), additional soil excavation was again performed. Two additional soil samples, labeled SW1(6.5) and SW2(6.5), were collected from the northerly sidewall of the fuel tank pit (each sample was collected approximately 6 to 12 inches above ground water), in the vicinity of sample point locations SW1(3) and SW2(3). The sample point locations and the area excavated are as indicated on the attached Figure 3.

On June 26, 1990, KEI again returned to the site, in order to collect soil samples from the sidewalls of the new underground fuel storage tank pit located to the west of the pump islands. Four soil samples, labeled SW11, SW12, SW13, and SW14, were collected from the sidewalls of the excavation (each sample was collected at 6 to 12 inches above ground water). Sample point locations are as shown on the attached Figure 5.

On July 3, 1990, after approximately 10,000 gallons of ground water were pumped from the new fuel tank pit, KEI collected a water sample (labeled W2) from the pit.

All samples were analyzed by Sequoia Analytical Laboratory in Redwood City, California. All soil samples, except the waste oil tank pit sidewall sample SWA, were analyzed for total petroleum hydrocarbons (TPH) as gasoline and benzene, toluene, ethylbenzene, and xylenes (BTEX). In addition to TPH as gasoline and BTEX, soil sample WO1 (collected from the waste oil tank pit) was also analyzed for TPH as diesel, total oil and grease (TOG), and EPA method 8010 constituents. The waste oil tank pit sidewall sample (SWA) was analyzed for TOG only. In addition to TPH as gasoline and BTEX, a soil sample (SW11) collected from the new fuel tank pit was also analyzed for TOG.

Both water samples were analyzed for TPH as gasoline and BTEX. In addition, water sample W2, collected from the new fuel tank pit, was analyzed for TOG. The results of the soil analyses are summarized in Table 6, and the results of the water analyses are summarized in Table 7.

KEI returned to the site on July 16, 1990, when three trenches were excavated laterally from the easterly, northerly, and westerly waste oil tank pit sidewalls. Water was encountered at a depth of approximately 7 feet below grade. Three soil samples, labeled SWB(13), SWC(10), and SWD(14), were collected from the sidewalls of the trenches, each approximately 6 to 12 inches above the observed water table. Sample point locations are as shown on the attached Figure 6. After sampling, the sidewalls of the waste oil tank pit were excavated laterally to the sample point locations and to depths of approximately 1 foot below the water table (or about 8 feet below grade).

On July 19, 1990, after having pumped approximately 5,000 gallons of ground water from the waste oil tank pit excavation, a water sample, labeled W3, was collected from the pit.

On July 20, 1990, KEI returned to the site to collect the additional soil samples required by the ACHCS. Four soil samples, labeled SWE, SWF, SWG, and SWH, were collected (each approximately 6 to 12 inches above the ground water level) from the four corners of the waste oil tank excavation. Sample point locations are also shown on the attached Figure 6.

All samples were analyzed by Sequoia Analytical Laboratory in Redwood City, California. All soil samples were analyzed for TPH as gasoline, BTEX, TPH as diesel, TOG, and EPA method 8010 constituents. The water sample was analyzed for TPH as gasoline,

BTEX, TPH as diesel, TOG, and EPA method 8010 constituents. The results of the soil analyses are summarized in Table 8, and the results of the water analyses are summarized in Table 9.

To comply with the requirements of the regulatory agencies and based on the analytical results, KEI proposed the installation of four monitoring wells. Documentation of the tank removal procedures, sample collection techniques, and the analytical results of the soil samples collected from the fuel and waste oil tank excavations are summarized in KEI's reports (KEI-J90-0606.R1 and KEI-J90-0606.R4) dated July 16, 1990, and July 30, 1990, respectively.

On November 6 and 7, 1990, four two-inch diameter monitoring wells (designated as MW1, MW2, MW3, and MW4 on the attached Figure 1) were installed at the site. The monitoring wells were drilled and completed to total depths ranging from 20 to 24 feet below grade. Ground water was encountered at depths ranging from about 5.4 to 9.5 feet below grade during drilling in all wells, except MW3, in which ground water was not encountered until a depth of about 15.2 feet below grade. All four wells were surveyed by a licensed land surveyor (Kier & Wright of Pleasanton, California) to Mean Sea Level (MSL) and to a vertical accuracy of 0.01 feet. The wells were developed on November 12, 1990, and were initially sampled on November 16, 1990.

Water and selected soil samples were analyzed at Sequoia Analytical Laboratory in Concord, California. Samples were analyzed for TPH as gasoline and BTEX. In addition, samples collected from MW1 (adjacent to the waste oil tank pit) were analyzed for TPH as diesel, TOG, and for EPA method 8010 compounds.

The results of the soil analyses are summarized in Table 3, and the results of the water analyses are summarized in Table 2. Based on the analytical results, KEI recommended the implementation of a monthly ground water monitoring and quarterly ground water sampling program. Documentation of the well installation procedures, sample collection techniques, and the analytical results are presented in KEI's report (KEI-P90-0606.R6) dated December 17, 1990. The monitoring and sampling program was initiated in February of 1991.

KEI conducted additional field work on May 21, 1992, when two 12,000 gallon storage tanks (formerly containing regular unleaded and super unleaded gasoline) and one 520 gallon waste oil tank were removed from the site. The tanks, which had been installed in July 1990, were made of double-walled steel. No apparent holes or cracks were observed in any of the tanks. Mr. Scott Seery of the ACHCS was present during tank removal and subsequent soil sampling. Mr. Tom Hathcox of the Dougherty Regional Fire Authority was also

present during tank removal. Ground water was encountered in the fuel tank pit at a depth of about 7 feet below grade, and in the waste oil tank pit at a depth of about 6.5 feet below grade, thus prohibiting the collection of any soil samples from immediately beneath the tanks. Four soil samples, labeled F-SW1 through F-SW4, were collected from the sidewalls of the fuel tank pit at depths of about 6.5 feet below grade. Four soil samples, labeled WO-1 through WO-4, were collected from the sidewalls of the waste oil tank pit at depths of about 6 feet below grade. Two soil samples, labeled H1 and H2, were collected from beneath the former hydraulic lifts at depths of about 5 and 5.5 feet, respectively. Five soil samples, labeled PT-1 through PT-5, were collected from beneath the abandoned product piping found during excavation activities at depths of about 1.75 feet below grade, except for samples PT-1 and PT-2, which were collected at depths of approximately 11.5 feet and 5 feet below grade. The undisturbed samples were collected from bulk material excavated by backhoe. The sample point locations are as shown on the attached Figure 7. In addition, one water sample, labeled Water-1, was collected from the fuel tank pit. A second water sample, labeled Water-2, was collected from the waste oil tank pit.

Upon review of the analytical results, KEI returned to the site on June 15, 1992, in order to attempt to define the extent of soil contamination in the vicinity of sample points PT-1 and PT-2 (in the former product pipe trench) and H2 (the former hydraulic lift area). Following additional soil excavation in the vicinity of the former product pipe trench (over an area of approximately 19 feet by 15 feet, and to a depth of about 16.5 feet below grade), four soil samples, labeled PT(SW1) through PT(SW4), were collected from the sidewalls of the new excavation at depths of about 12 feet below grade, and one soil sample, labeled PT(16.5), was collected from the bottom of the new excavation at a depth of approximately 16.5 feet below grade. Following additional soil excavation in the vicinity of the former hydraulic lift area (over an area of approximately 10 feet by 10 feet, and to a depth of about 6.5 feet below grade), four soil samples, labeled H2(SW1) through H2(SW4), were collected from the excavation sidewalls at depths of approximately 5.5 feet below grade, and one soil sample, labeled H2(6.5), was collected from beneath sample point location H2 at a depth of about 6.5 feet below grade. The sample point locations and the areas of additional excavation are shown on the attached Figure 7. After the soil sampling was completed, ground water was observed seeping through the former hydraulic lift area excavation.

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On June 17, 1992, KEI returned to the site in order to collect one water sample from the former hydraulic lift area excavation. Water was stabilized at a depth of approximately 5.75 feet below grade. One water sample, labeled Water-3, was collected from the former hoist pit.

All soil and water samples were analyzed by Sequoia Analytical Laboratory in Concord, California. All soil and water samples were analyzed for TPH as gasoline and BTEX. In addition, all initial soil samples, except samples PT-2 and H1, were also analyzed for total lead. Soil and water samples collected from the waste oil tank pit were also analyzed for TPH as diesel, TOG, EPA methods 8010 and 8270 constituents, and the metals cadmium, chromium, lead, nickel, and zinc. In addition to TPH as gasoline and BTEX, the soil sample H2, collected from beneath the former hydraulic lift, was analyzed for TPH as hydraulic fluid, TOG, EPA method 8010 and 8270 constituents, and the metals cadmium, chromium, lead, nickel, and zinc. All additional soil samples collected from the former hoist pit were analyzed for TPH as gasoline, BTEX, TPH as hydraulic fluid, TOG, and EPA method 8270 constituents. The water sample (Water-1) was analyzed for TPH as gasoline, BTEX, and organic lead. The water sample (Water-3) collected from the former hoist pit was analyzed for TPH as gasoline, BTEX, TPH as hydraulic fluid, TOG, EPA method 8270 constituents, and the metals cadmium, chromium, lead, nickel, and zinc. Analytical results of the soil samples are summarized in Tables 10, 11, and 12, and the analytical results of the water samples are summarized in Table 13.

Based on the analytical results of the final soil samples collected during the removal of the underground storage tanks in both 1990 and 1992, KEI concluded that the majority of the hydrocarbon-contaminated soil appeared to have been removed from the site. The final soil samples collected from beneath the former underground storage tanks, the former hydraulic lifts, and the former pipe trenches in 1992 showed non-detectable concentrations of TPH as gasoline and benzene, except for 0.0078 ppm and 0.069 ppm of benzene detected in one of the pipe trench and hydraulic lift samples, respectively. Samples collected from the former waste oil tank pit showed non-detectable levels of TPH as diesel and TOG. In addition, the final soil samples collected from beneath the former hydraulic lifts showed non-detectable concentrations of TPH as hydraulic fluid and TOG.

In addition, the final soil samples collected from beneath the underground storage tanks and the product pipe trenches in 1990 showed concentrations of TPH as gasoline ranging from non-detectable to 37 ppm, and concentrations of benzene ranging from non-detectable to 0.78 ppm. The final soil samples collected from the waste oil tank pit excavation also showed non-detectable levels of

TPH as diesel. TOG was detected at a concentration of 3,500 ppm in the sample collected between the former waste oil tank pit excavation and adjacent to the former building in 1990; however, this contamination appears to have been removed in the 1992 tank removal and building demolition project.

Documentation of the tank removal procedures, sample collection techniques, and the analytical results of the soil samples collected from the fuel and waste oil tank excavations are summarized in KEI's report (KEI-J90-0606.R7) dated August 31, 1992. At the request of Unocal, and in accordance with Unocal's procedures for sites that have been designated for divestment, KEI proposed the installation of 11 exploratory borings at the site (KEI's work plan/proposal KEI-P90-0605.P5 dated July 31, 1992). In addition, due to the damage that was sustained by MW2 during the most recent tank removal, the destruction of MW2 was also proposed.

Per Unocal Corporation's procedure for potential site divestment locations, on August 24 and 25, 1992, 11 exploratory borings (designated as EB1 through EB11 on the attached Figure 2) were drilled at the site. The 11 borings were drilled to depths of between 11 to 35.5 feet below grade. Ground water was encountered at depths between 10.5 and 35.5 feet below grade.

Also, on August 24, 1992, monitoring well MW2 was properly destroyed. Destruction of monitoring well MW2 was necessary because the well was damaged during the second tank removal project.

All samples were analyzed at Sequoia Analytical Laboratory in Concord, California. Water and selected soil samples were analyzed for TPH as gasoline and BTEX. In addition, water and selected soil samples from exploratory borings EB3 and EB6 (adjacent to the former waste oil tank) were analyzed for TPH as diesel, TOG, and for EPA method 8010 constituents. The samples collected from borings EB4 and EB5 (drilled inside the former service bay facility) were also analyzed for TPH as hydraulic fluid, TOG, and EPA method 8010 constituents. The results of soil analyses are summarized in Table 4, and the results of water analyses are summarized in Table 5. Because the water samples were collected during drilling, the results of the analyses may not be representative of formation water, and should be used for comparative purposes only. Documentation of the exploratory boring drilling procedures, sample collection techniques, and the analytical results are presented in KEI's report (KEI-P90-0606.R10) dated October 8, 1992.

A request for site closure was submitted to the ACHCS on January 5, 1993. In a response by the ACHCS to Unocal dated April 28, 1993,

further assessment of the eastern portion of the site was requested. The depth to ground water in the easternmost well (MW3), which historically had been significantly lower than all other wells, and regional geologic data indicated that an apparent splay of the Calaveras fault crosses the site. The fault splay was believed to separate well MW3 from the other wells to the west. The request for further assessment work was for the area on the east side of the inferred fault. Therefore, KEI proposed the installation of two additional monitoring wells in KEI's work plan/proposal (KEI-P90-0606.P6) dated June 11, 1993.

On October 4, 1993, two additional two-inch diameter monitoring wells (designated as MW5 and MW6 on the attached Figure 1) were installed at the site. It was anticipated that these wells, in conjunction with well MW3, would allow a determination of ground water flow direction and an assessment of ground water contamination on the eastern side of the inferred fault. The two new wells were each drilled and completed to a total depth of 25 feet below grade. Ground water was encountered during drilling at depths of 15 and 24 feet below grade in wells MW5 and MW6, respectively.

Well MW5 was developed on October 6, 1993. Well MW6 was dry on that date. Wells MW5 and MW6 were initially sampled on October 9, 1993. These wells have dewatered quickly and recovered slowly during all sampling events to date.

Water and selected soil samples from the borings of MW5 and MW6 were analyzed at Sequoia Analytical Laboratory. The samples were analyzed for TPH as gasoline by EPA method 5030/modified 8015, and BTEX by EPA method 8020.

The results of the soil analyses are summarized in Table 3, and the results of the water analyses are summarized in Table 2. Documentation of well installation procedures, sampling techniques, and the analytical results are presented in KEI's report (KEI-P90-0606.R11) dated November 17, 1993.

GROUND WATER MONITORING AND SAMPLING

A ground water monitoring and sampling program was initiated on November 16, 1990, for monitoring wells MW1 through MW4. Well MW2 was destroyed on August 24, 1992, and two additional monitoring wells (MW5 and MW6) were installed at the site. The most recent monitoring and sampling event was conducted on December 1, 1994, when wells MW1 and MW3 through MW6 were monitored, and wells MW5 and MW6 were sampled. The ground water elevations on December 1, 1994, in the five monitoring wells on-site are shown on the attached Figure 1. From March 3, 1994, to December 1, 1994, only monitoring wells MW5 and MW6 were sampled. The analytical results

of all of the ground water samples collected from the monitoring wells to date are summarized in Table 3.

HYDROLOGY AND GEOLOGY

The most recent monitoring and sampling event at the subject site was conducted on December 1, 1994, by MPDS Services, Inc. of Concord, California. On that date, the measured depth to ground water in the monitoring wells ranged from 4.67 to 20.64 feet. The depth to ground water in wells MW3 and MW5 was approximately 10 feet greater than the depth in wells MW1 and MW4. Also, the depth to ground water in well MW6 was approximately 6 to 7 feet greater than the depth in the nearest other wells (MW3 and MW5).

Historically, the ground water flow direction over the western portion of the site (MW1, MW2, and MW4) has appeared to be to the north-northeast at a relatively flat gradient (approximately 0.004).

The subject site is situated within the Dublin Subbasin of the larger Livermore Valley Ground Water Basin, as defined by the Alameda County Flood Control and Water Conservation District. As of the spring of 1990, the regional ground water flow direction was toward the southeast.

Based on a review of regional geologic maps (U.S. Geological Survey Professional Paper 943 "Flatland Deposits - Their Geology and Engineering Properties and Their Importance to Comprehensive Planning" by E.J. Helley and K.R. Lajoie, 1979), the subject site is underlain by Quaternary-age alluvium. The surficial alluvium has been mapped as Holocene coarse-grained alluvium (Qhac) that typically consists of unconsolidated, permeable sand and silt (with locally coarse sand and gravel materials) and that ranges in thickness from less than 10 feet to as much as 50 feet. This coarse-grained alluvium zone appears to have been deposited from sediments generated from erosion within Dublin Canyon, which is situated immediately west of the site. The site is also situated near a mapped geologic contact with Late-Pleistocene alluvium (Qpa). The Late Pleistocene alluvium is described as typically consisting of weakly consolidated, irregularly interbedded clay, silt, sand, and gravel materials. The overall thickness of the alluvium underlying the site is presently unknown to KEI.

In addition, the site is situated closely adjacent to the mapped trace of the active Calaveras Fault. A section of the Alquist-Priolo map (Dublin quadrangle) showing the fault zone as defined by the California Division of Mines and Geology is included as Figure 8.

On November 13, 1990, KEI conducted a review of available geologic fault study reports at the California Division of Mines and Geology (CDMG) in Pleasant Hill, California. Studies conducted at the adjacent parcel immediately north of the subject site encountered what was described as the western side of the Calaveras Fault zone. A fault was determined to be located between approximately 130 to 136 feet west of the curb along San Ramon Road, roughly parallel to San Ramon Road, and trending approximately N4°W. Significant changes in the color of the soil materials on opposite sides of the fault were noted, and the depth to ground water on the western side of the fault was noted to be significantly higher than on the eastern side of the fault. Geologic maps produced for this study project the trace of the Calaveras Fault onto the subject Unocal site.

Based on the results of our file review at the CDMG, and our monitoring activities of wells MW1 through MW4 at the subject site, it was KEI's opinion at that time that a splay (or splays) of the Calaveras Fault crossed the eastern portion of the site. It was inferred that one fault splay crossed between well MW3 and wells MW1, MW2, and MW4. Wells MW1, MW2, and MW4 appeared to overlie a ground water aquifer separate from that of well MW3, with the inferred fault splay representing a ground water barrier. In addition, based on the ground water elevation measured following the installation of well MW6 at the easternmost portion of the site, ground water in that vicinity appeared to occur in a third separate zone.

Based on the results of our subsurface studies, the site is underlain by fill materials to a depth of between 1 and 6 feet below grade. The fill is in turn underlain by alluvium to the maximum depth explored of 24 feet below grade, except for exploratory boring EB9, which was drilled and sampled to a total depth of 35.5 feet below grade.

The alluvium underlying the site consists predominantly of silty clay and clayey silt layers that extend to a depth of at least 35.5 feet below grade. Based on ground water levels encountered in the existing monitoring wells at the site, the unsaturated zone west of well MW2 is approximately 6 feet thick. The unsaturated zone on the east side of well MW2 in the vicinity of wells MW3 and MW5 is about 16 feet thick. Finally, the unsaturated zone in the vicinity of well MW6 varies from approximately 20 to 25 feet in thickness.

The first water bearing unit underlying the site also predominantly consists of fine grained silty clay or clayey silt soils. However, in MW3, an approximately 1 foot thick silty gravel lens was encountered at a depth of 15 to 16 feet below grade, and in MW2, a 0.5 foot thick silty sand and sandy silt layer was encountered at

a depth of 23.5 feet below grade. In exploratory boring EB8, a 1 foot thick sandy gravel layer was encountered at a depth of 17 feet below grade, and in EB9, a silty sand layer approximately 3 feet thick was encountered at a depth of 10.5 feet below grade. Also, in MW6, a 0.5 foot thick silty gravel layer was encountered at a depth of 9 feet below grade. These units do not appear to be laterally continuous across the site. Subsurface conditions are depicted on Geologic Cross-Sections A-A' through D-D' (Figures 10 through 13). The locations of the cross-sections are shown on Figure 9.

During the drilling of the ten exploratory borings, ground water was first encountered at depths of 10.5 to 13 feet below grade in the borings situated west of well MW2, and at depths of 16 to 35.5 feet below grade in the three borings located on the east of well MW2. However, within minutes of the termination of drilling of each exploratory boring, water levels were observed to rise, suggesting that a semi-confined condition may exist for the first aquifer(s) underlying the site.

The results of the particle size analysis (sieve and hydrometer) of the composite soil sample collected from the saturated zone in the boring for monitoring well MW5 at depths of 15 feet and 20 feet below grade indicate that the sample consists of approximately 49% silt, 28% sand, and 23% clay. The composite sample is classified as clayey silt/silty clay with sand (CL-ML).

Due to the fact that the site was intended to be sold and redeveloped, Unocal contracted with the geotechnical firm TerraSearch, Inc., of Dublin, California, to perform a fault hazard investigation of the subject site. This work is summarized in TerraSearch's reports (Project No. 6858) dated October 28 and December 20, 1994. TerraSearch excavated and logged trenches trending perpendicular to the inferred fault and extending the length of the Unocal property. The trenches were excavated to depths of between 7 and 10 feet below grade. No evidence of the fault was encountered in the trenches by TerraSearch. Also, based on additional trenching work recently performed by TerraSearch, it is KEI's understanding that no evidence of the fault was found in a trench extending 25 feet to the east of the southeastern corner of the site. Therefore, TerraSearch concluded that the Calaveras Fault was located to the east of the Unocal site, and at least 25 feet east of the southeastern corner of the site.

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Based on this additional data, it is KEI's opinion that irrespective of whether the Calaveras fault has a recognizable surface expression at the site or whether it is located further to the east, separate hydrologic regimes are present within the relatively soft, low permeability sediments beneath the site. It is likely

that the deformation accompanying movement along the Calaveras fault has created gouge zones which are barriers to ground water flow. This interpretation is supported by the previous study by Applied Soil Mechanics, Inc. (File No. A9-1044-J2) dated April 16, 1979, which documents higher ground water levels and a natural spring (Amillo Springs) to the west of the fault zone, in a study for "The Springs" Proposed 176-Unit Apartment Project located directly north of the Unocal site.

CONCLUSIONS

1. Soil Contamination Delineation

   Based on the analytical results of all of the soil samples collected and evaluated to date, the vertical and lateral extent of the hydrocarbon soil contamination appears to be well defined.

   Two sets of underground tanks and lines have been removed from the site in June 1990 and May 1992, respectively. Samples were collected during both removal projects. Excavation of contaminated soil was performed in the vicinity of the former underground storage tanks, the former pump islands, the former hydraulic lifts, and the former waste oil tank.

   The final soil samples collected in 1990 beneath the underground storage tanks and the product pipe trenches showed concentrations of TPH as gasoline ranging from non-detectable to 37 ppm (sample P2, Table 6, and Figure 4), and concentrations of benzene ranging from non-detectable to 0.78 ppm (P2). The final soil samples collected from the waste oil tank pit excavation also showed non-detectable levels of TPH as diesel. TOG was detected at a concentration of 3,500 ppm (sample SWA, Table 6, and Figure 6) in the sample collected in 1990 between the former waste oil tank pit excavation and adjacent to the former building. However, this contamination appears to have been removed in the 1992 tank removal and building demolition project (Table 11 and Figure 7).

   The final soil samples collected in 1992 from beneath the former underground storage tanks, the former hydraulic lifts, and the former pipe trenches showed non-detectable concentrations of both TPH as gasoline and benzene, except for 0.0078 ppm (sample PT3, Table 10, and Figure 7) and 0.069 ppm (sample H2[SW3], Table 12, and Figure 7) of benzene detected in one of the pipe trench and hydraulic lift samples, respectively. Samples collected from the former waste oil tank pit showed non-detectable levels of TPH as diesel and TOG. The final soil samples collected from beneath the former hydraulic lifts

showed non-detectable concentrations of TPH as hydraulic fluid and TOG (Tables 10, 11, and 12, Figure 7).

The analytical results of the soil samples collected from 11 exploratory borings that were installed at the site in August of 1992, following the second tank removal project, indicated predominantly non-detectable concentrations of petroleum hydrocarbon contamination. Detectable concentrations of petroleum contaminants were only encountered in two of the borings; the highest contaminant concentration was 10 ppm of TPH as gasoline in exploratory boring EB9 at a depth of 25 feet below grade (Table 4 and Figure 2). This sample was also the only sample collected from any exploratory boring that showed a detectable concentration of benzene at 0.028 mg/kg (Table 4).

KEI installed four monitoring wells (MW1 through MW4) at the site on November 6, 1990, and two additional monitoring wells (MW5 and MW6) on October 4, 1993. The analytical results of the soil samples collected during the installation of the six on-site monitoring wells indicated non-detectable concentrations of TPH as gasoline and BTEX in all soil samples that were analyzed, except in a soil sample collected in monitoring well MW6 at a depth of 24 feet below grade, where TPH as gasoline and benzene were detected at concentrations of 120 µg/L and 0.74 µg/L, respectively (Table 3 and Figure 1).

Based on the analytical results of the soil samples collected during the installation of the 11 exploratory borings and six monitoring wells, and based on the analytical results of the final soil samples collected during the removal of the underground storage tanks in both 1990 and 1992, it appears that the majority of the hydrocarbon-impacted soil has been removed from the site.

2. Soil Removal and Disposal

Approximately 40 cubic yards of soil that had been excavated from the waste oil tank pit in June 1990 was stockpiled on-site for further sampling to determine proper disposal. Based on the analytical results of the samples collected from the stockpile, all of this soil (a total of 40 cubic yards) was disposed of at a Class II disposal site.

Also in June and July of 1990, approximately 1,450 cubic yards of soil was excavated from the underground fuel storage tank pits, from the pump islands and product pipe trenches, and from the waste oil tank pit. This soil was stockpiled on-site for further sampling to determine proper disposal. Based on

the analytical results of the soil samples collected from the stockpiled soil, approximately 1,450 cubic yards of soil were disposed of at an approved Class II disposal site.

In May 1992, approximately 500 cubic yards of soil were excavated from the underground fuel storage tank pit, from underneath the former hydraulic lifts, and from the product piping trenches. This soil was stockpiled on-site for further sampling to determine proper disposal. Based on the analytical results of the soil samples collected from the stockpiled soil, approximately 500 cubic yards of soil were disposed of at BFI Waste Systems, Inc. in Livermore, California (an approved Class III disposal site) by Conrad and Sons Trucking of Escalon, California.

Also in May 1992, approximately 60 cubic yards of soil were excavated from the waste oil tank pit during tank removal activities. This soil was stockpiled on-site to determine proper disposal. Based on the analytical results of the soil samples collected from the stockpiled soil, approximately 60 cubic yards of soil were disposed of at Laidlaw Environmental Services (an approved Class II disposal site) by Dillard Trucking of Byron, California.

3. Ground Water Contamination Delineation

Based on the analytical results of all of the ground water samples collected and evaluated to date, the extent of the petroleum hydrocarbons detected in ground water appears to be well defined.

During the installation of the exploratory borings at the site, ground water grab samples were collected from each of the borings. These samples were collected during drilling and may not be completely representative of formation water. However, the analytical results of these grab samples showed non-detectable concentrations of TPH as gasoline and benzene in 10 of the 11 samples. One sample (EB9) showed a concentration of TPH as gasoline of 840 ppb and a concentration of benzene of 0.70 ppb (Table 5), which is below the State of California Maximum Contaminant Level (MCL) for Drinking Water of 1.0 ppb of benzene (Table 14). TPH as hydraulic fluid and TPH as diesel were detected in two of the ground water grab samples at concentrations of 510 ppb and 500 ppb, respectively. No TOG or EPA method 8010 constituents were detected in any of the water grab samples.

TPH as gasoline and BTEX have not been detected to date in monitoring wells MW1 through MW4 (Table 2), except for

relatively minor concentrations of TPH as gasoline (just above the detection limit) on two occasions. In addition, TPH as gasoline and benzene were never detected in monitoring well MW5. The maximum concentrations of petroleum hydrocarbon contamination in ground water at this site was detected in monitoring well MW6. The maximum concentrations of TPH as gasoline and benzene detected in this well were 790 µg/L and 8.1 µg/L on December 9, 1993, and September 1, 1994, respectively.

In summary, it appears that moderate levels of hydrocarbon contamination in ground water occur only in the vicinity of well MW6. The analytical results of the most recent samples collected from monitoring well MW6 indicated TPH as gasoline and benzene concentrations of 240 µg/L and 5.1 µg/L, respectively.

As stated previously, the ground water elevation in well MW6, the easternmost well at the site, has historically been approximately 6 to 10 feet lower than that of wells MW3 and MW5. Ground water elevations in wells MW3 and MW5 are in turn approximately 10 feet lower than the wells on the western portion of the site. Based on the ground water data collected to date, it appears that well MW6 is in a different hydrogeologic regime than the other wells.

4. Fate and Transport of Contaminants in Ground Water

In addition to the fault-related migration barriers discussed previously in this report, there are several natural processes which occur in the subsurface, including hydrolysis, volatilization, adsorption, and biodegradation, that also tend to prevent or retard the migration of contaminants in ground water. Assuming the highest concentration of benzene (8.1 µg/L) detected in the ground water monitoring wells at the site to date were to migrate off-site, it is unlikely that detectable concentrations of benzene would reach the channelized portion of Dublin Creek (apparently the only sensitive receptor in this area), which is located approximately 700 feet from the Unocal site, due to natural attenuation (dispersion, adsorption, biodegradation, aeration, etc.) and the presence of fault gouge. Similarly, other gasoline constituents would likely be greatly attenuated within the shallow aquifer(s), and therefore would not significantly impact Dublin Creek.

5. Drinking Water Standards and Impact on Beneficial Uses

The Environmental Protection Agency (EPA) and California Department of Health Services' (DOHS) Drinking Water Standards for BTEX constituents are summarized in Table 14. Benzene has not been detected in wells MW1 through MW5 to date, and was only detected in well MW6 at a maximum concentration (8.1 µg/L) that is slightly above the DOHS drinking water standard for benzene (1 µg/L). During the most recent sampling event at the site (December 1, 1994), the concentrations of benzene detected in a ground water sample collected from monitoring well MW6 was 5.1 µg/L. Maximum concentrations of the other BTEX constituents that were detected in the monitoring wells are well below the drinking water standards.

RECOMMENDATIONS

In summary, it appears that the extensive soil excavation work conducted at the former Unocal site was effective in minimizing the majority of the hydrocarbon-impacted soil that would potentially cause any degradation to potential and/or existing beneficial uses of ground water beneath the Unocal site.

Based on the analytical results of all of the soil and ground water samples collected and evaluated to date, and based on the conclusions presented above, it does not appear that further delineation or remediation work associated with the petroleum hydrocarbon contamination detected at the Unocal site is warranted. Therefore, KEI recommends that Unocal request that "case closure" be granted from the RWQCB. Once case closure is granted, KEI will prepare a work plan/proposal to destroy the existing monitoring wells at the site.

DISTRIBUTION

A copy of this report should be sent to the ACHCS, and to the RWQCB, San Francisco Bay Region.

If you have any questions, please do not hesitate to call at (510) 602-5100.

Sincerely,

Kaprealian Engineering, Inc.

Haig (Gary) Tejirian
Senior Staff Geologist

Joel G. Greger, C.E.G.
Senior Engineering Geologist

License No. EG 1633
Exp. Date 8/31/96

Timothy R. Ross
General Manager

/jad

Attachments: Tables 1 through 14
Location Map
Figures 1 through 13
Report Reference List

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TABLE 1

SUMMARY OF MONITORING DATA

Well #	Ground Water Elevation (feet)	Depth to Water (feet)♦	Total Well Depth (feet)♦	Product Thickness (feet)	Sheen	Water Purged (gallons)
		(Monitored and Sampled on December 1, 1994)				
MW1*	362.13	4.67	19.75	0	--	0
MW3*	352.13	14.73	19.67	0	--	0
MW4*	362.48	5.10	19.70	0	--	0
MW5	351.55	14.00	24.97	0	No	7.5
MW6	345.04	20.64	25.13	0	No	3.5
		(Monitored and Sampled on September 1, 1994)				
MW1*	361.80	5.00	19.73	0	--	0
MW3*	351.83	15.03	19.66	0	--	0
MW4*	362.10	5.48	19.72	0	--	0
MW5	350.73	14.82	24.97	0	No	7
MW6	343.33	22.35	25.12	0	No	2
		(Monitored and Sampled on June 3, 1994)				
MW1*	362.01	4.79	NM	0	--	0
MW3*	351.94	14.92	NM	0	--	0
MW4*	362.35	5.23	NM	0	--	0
MW5	351.25	14.30	25.02	0	No	5.5
MW6	344.34	21.34	25.12	0	No	2
		(Monitored and Sampled on March 3, 1994)				
MW1*	362.05	4.75	19.81	--	0	
MW3*	352.05	14.81	19.71	--	0	
MW4*	362.42	5.16	19.74	--	0	
MW5	351.64	13.91	25.03	No	8	
MW6	346.47	19.21	25.11	No	4.5	

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TABLE 1

SUMMARY OF MONITORING DATA

Well #	Well Casing Elevation (feet)**
MW1	366.80
MW3	366.86
MW4	367.58
MW5	365.55
MW6	365.68

♦ The depth to water level and total well depth measurements were taken from the top of the well casings.

* Monitored only.

** The elevations of the top of the well casings have been surveyed relative to Mean Sea Level (MSL), per the National Geodetic Survey disk stamped "I-1257, reset 1975" (elevation = 439.93 feet MSL).

-- Sheen determination was not performed.

NM = Not measured.

NOTE: 1. Wells MW1 and MW4, wells MW3 and MW5, and well MW6 are considered to be located in three separate hydrologic regimes.

2. Monitoring and sampling data are supplied by MPDS Services, Inc. of Concord, California

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TABLE 2

SUMMARY OF LABORATORY ANALYSES
WATER

Date	Well #	TPH as Gasoline	Benzene	Toluene	Ethylbenzene	Xylenes
12/01/94	MW5	ND	ND	ND	ND	1.3
	MW6	240	5.1	2.6	ND	1.8
9/01/94	MW5	ND	ND	1.6	ND	2.1
	MW6	490	8.1	2.9	ND	1.9
6/03/94	MW5	ND	ND	ND	ND	ND
	MW6	ND	ND	ND	ND	ND
3/03/94	MW5	ND	ND	0.84	ND	0.60
	MW6	150	2.4	2.8	ND	1.2
12/09/93	MW1♦	--	--	--	--	--
	MW3	ND	ND	ND	ND	ND
	MW5	ND	ND	ND	ND	ND
	MW6	790	0.64	1.0	ND	ND
10/09/93	MW5	ND	ND	ND	ND	ND
	MW6	480	1.8	0.63	0.81	ND
9/16/93	MW1♦	--	--	--	--	--
	MW3	ND	ND	ND	ND	ND
6/18/93	MW1♦	--	--	--	--	--
	MW3	ND	ND	ND	ND	ND
4/03/92	MW1*	ND	ND	ND	ND	ND
	MW2	ND	ND	ND	ND	ND
	MW3	ND	ND	ND	ND	ND
	MW4	ND	ND	ND	ND	ND
1/02/92	MW1*	ND	ND	ND	ND	ND
	MW2	ND	ND	ND	ND	ND
	MW3**	38	ND	ND	ND	ND
	MW4	ND	ND	ND	ND	ND
10/03/91	MW1*	ND	ND	ND	ND	ND
	MW2	ND	ND	ND	ND	ND
	MW3	32	ND	ND	ND	ND
	MW4	ND	ND	ND	ND	ND

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TABLE 2 (Continued)

SUMMARY OF LABORATORY ANALYSES
WATER

Date	Well #	TPH as Gasoline	Benzene	Toluene	Ethylbenzene	Xylenes
7/02/91	MW1*	ND	ND	ND	ND	ND
	MW2	ND	ND	ND	ND	ND
	MW3	ND	ND	ND	ND	ND
	MW4	ND	ND	ND	ND	ND
4/01/91	MW1*	ND	ND	ND	ND	ND
	MW2	ND	ND	ND	ND	ND
	MW3	ND	ND	ND	ND	ND
	MW4	ND	ND	ND	ND	ND
11/16/90	MW1*	ND	ND	ND	ND	ND
	MW2	ND	ND	ND	ND	ND
	MW3	ND	ND	ND	ND	ND
	MW4	ND	ND	ND	ND	ND

♦ All EPA method 8100 constituents (polynuclear aromatic hydrocarbons) were non-detectable.

* TPH as diesel, TOG, and EPA method 8010 constituents were all non-detectable for MW1.

** All EPA method 8010 constituents were non-detectable.

ND = Non-detectable.

-- Indicates analysis was not performed.

Results are in micrograms per liter (µg/L), unless otherwise indicated.

NOTE: Laboratory analyses data subsequent to October 9, 1993, were provided by MPDS Services, Inc., of Concord, California.

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TABLE 3

SUMMARY OF LABORATORY ANALYSES
SOIL

Date	Sample Number	Depth (feet)	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Ethyl-benzene	Xylenes
11/06/90 & 11/07/90	MW1(5)*	5.0	ND	ND	ND	ND	ND	ND
	MW1(8)	8.0	--	ND	ND	ND	ND	ND
	MW2(5)	5.0	--	ND	ND	ND	ND	ND
	MW2(7.5)	7.5	--	ND	ND	ND	ND	ND
	MW2(9)	9.0	--	ND	ND	ND	ND	ND
	MW3(5)	5.0	--	ND	ND	ND	ND	ND
	MW3(10)	10.0	--	ND	ND	ND	ND	ND
	MW3(15)	15.0	--	ND	ND	ND	ND	ND
	MW3(5)	5.0	--	ND	ND	ND	ND	ND
	MW3(10)	10.0	--	ND	ND	ND	ND	ND
	MW3(15)	15.0	--	ND	ND	ND	ND	ND
	MW4(5)	5.0	--	ND	ND	ND	ND	ND
10/04/93	MW5(5)	5.0	--	ND	ND	ND	ND	ND
	MW5(9.5)	9.5	--	ND	ND	ND	ND	ND
	MW5(14.5)	14.5	--	ND	ND	ND	ND	ND
	MW6(5)	5.0	--	ND	ND	ND	ND	ND
	MW6(9.5)	9.5	--	ND	ND	ND	ND	ND
	MW6(15)	15.0	--	ND	ND	ND	ND	ND
	MW6(19.5)	19.5	--	ND	ND	ND	ND	ND
	MW6(24)	24.0	--	120	0.74	0.072	0.036	0.15

* TOG and EPA method 8010 constituents were non-detectable.

ND = Non-detectable.

-- Indicates analysis was not performed.

Results are in milligrams per kilogram (mg/kg), unless otherwise indicated.

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TABLE 4

SUMMARY OF LABORATORY ANALYSES
SOIL

(Collected on August 24 & 25, 1992)

Sample Number	Depth (feet)	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Ethyl-benzene	Xylenes	TOG
EB1(5)	5.0	--	ND	ND	ND	ND	ND	--
EB1(8)	8.0	--	ND	ND	ND	ND	ND	--
EB1(10)	10.0	--	2.3	ND	ND	0.0057	0.11	--
EB1(12.5)	12.5	--	ND	ND	ND	ND	ND	--
EB2(5)	5.0	--	ND	ND	ND	ND	ND	--
EB2(10.5)	10.5	--	ND	ND	ND	ND	ND	--
EB3(5)*	5.0	ND	ND	ND	ND	ND	ND	ND
EB3(10)*	10.0	ND	ND	ND	ND	ND	ND	ND
EB3(13)*	13.0	ND	ND	ND	ND	ND	ND	ND
EB4(5)*+	5.0	--	ND	ND	ND	ND	ND	ND
EB4(10)*+	10.0	--	ND	ND	ND	ND	ND	ND
EB5(5)*+	5.0	--	ND	ND	ND	ND	ND	ND
EB5(10.5)*+	10.5	--	ND	ND	ND	ND	ND	ND
EB6(5.5)*	5.5	ND	ND	ND	ND	ND	ND	ND
EB6(10)*	10.0	ND	ND	ND	ND	ND	ND	ND
EB7(5)	5.0	--	ND	ND	ND	ND	ND	--
EB7(10)	10.0	--	ND	ND	ND	ND	ND	--
EB8(5)	5.0	--	ND	ND	ND	ND	ND	--
EB8(10)	10.0	--	ND	ND	ND	ND	ND	--
EB8(13)	13.0	--	ND	ND	ND	ND	ND	--
EB8(15.5)	15.5	--	ND	ND	ND	ND	ND	--
EB8(17.0)	17.0	--	ND	ND	ND	ND	ND	--
EB9(5)	5.0	--	ND	ND	ND	ND	ND	--
EB9(10)	10.0	--	ND	ND	ND	ND	ND	--
EB9(15)	15.0	--	ND	ND	ND	ND	0.010	--
EB9(17.5)	17.5	--	2.6	ND	0.010	0.015	0.018	--
EB9(20)	20.0	--	ND	ND	ND	ND	ND	--
EB9(25)	25.0	--	10	0.028	0.032	0.41	2.1	--
EB9(30)	30.0	--	ND	ND	ND	ND	ND	--
EB9(35)	35.0	--	ND	ND	ND	ND	ND	--

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TABLE 4 (Continued)

SUMMARY OF LABORATORY ANALYSES
SOIL

(Collected on August 24 & 25, 1992)

Sample Number	Depth (feet)	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Ethyl-benzene	Xylenes	TOG
EB10(5)	5.0	--	ND	ND	ND	ND	ND	--
EB10(10)	10.0	--	ND	ND	ND	ND	ND	--
EB10(15.5)	15.5	--	ND	ND	ND	ND	ND	--
EB11(5.5)	5.5	--	ND	ND	ND	ND	ND	--
EB11(10)	10.0	--	ND	ND	ND	ND	ND	--
EB11(15.5)	15.5	--	ND	ND	ND	ND	ND	--

* All EPA method 8010 constituents were non-detectable, except in samples EB3(13), EB5(10.5), and EB6(10), where tetrachloroethene was detected at a concentration of 11 µg/kg in each case. Tetrachloroethene was also detected in sample EB6(5.5) at a concentration of 19 µg/kg.

\+ TPH as Hydraulic Fluid was non-detectable.

ND = Non-detectable.

-- Indicates analysis was not performed.

Results are in milligrams per kilogram (mg/kg), unless otherwise indicated.

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TABLE 5

SUMMARY OF LABORATORY ANALYSES
WATER

(Collected on August 24 & 25, 1992)

Sample Number	TPH as Hydraulic Fluid	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Ethyl-benzene	Xylenes	TOG (mg/L)
EB1	--	--	ND	ND	ND	ND	ND	--
EB2	--	--	ND	ND	ND	ND	ND	--
EB3*	--	ND	ND	ND	ND	ND	ND	ND
EB4*	510	--	ND	ND	ND	ND	ND	ND
EB5*	ND	--	ND	ND	ND	ND	ND	ND
EB6*	--	500**	ND	ND	ND	ND	ND	ND
EB7	--	--	ND	ND	ND	ND	ND	--
EB8	--	--	ND	ND	ND	ND	ND	--
EB9	--	--	840***	0.70	ND	ND	98	--
EB10	--	--	ND	ND	ND	ND	ND	--
EB11	--	--	ND	ND	ND	ND	ND	--

-- Indicates analysis was not performed.

ND = Non-detectable.

* All EPA method 8010 constituents were non-detectable.

** Sequoia Analytical Laboratory reported that the hydrocarbons detected appeared to be a diesel and non-diesel mixture.

*** Sequoia Analytical Laboratory reported that the hydrocarbons detected did not appear to be gasoline.

NOTE: Water samples were collected during drilling. The results of the analyses may not be representative of formation water, and should be used for comparative informational purposes only.

Results are in micrograms per liter (µg/L), unless otherwise indicated.

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TABLE 6

SUMMARY OF LABORATORY ANALYSES
SOIL

(Collected on June 13, 15, 20 & 26, 1990)

Sample	Depth (feet)	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Ethyl-benzene	Xylenes
SW1	6.0	--	5,700	2.1	41	110	640
SW1(3)	6.0	--	2,200	1.8	6.3	30	76
SW1(6.5)	6.0	--	32	0.020	0.14 ✓	0.13 ✓	0.17 ✓
SW2	6.0	--	1,500	0.35	0.57	8.0	56
SW2(3)	6.0	--	360	ND	1.0	3.0	2.0
SW2(6.5)	6.5	--	6.8	0.020	0.052	0.029	0.063
SW3	6.0	--	ND	ND	ND	ND	ND
SW4	6.0	--	8.0	0.019	0.088	0.0071	0.16
SW5	6.5	--	340	0.80	0.26	2.5	3.6
SW5(2.5)	6.0	--	11 ✓	0.027 ✓	0.054	0.070	0.12
SW6	6.5	--	120	ND	0.21	0.19	0.14
SW6(3)	6.0	--	1.2	0.0084	0.012	0.012	0.021
P1	6.0	--	2.5	0.099	0.079	ND	0.034
P2	6.0	--	37	0.78	0.14	0.43	3.8
P3	6.0	--	8.5	0.028	0.016	0.35	0.080
P4	6.0	--	16	0.091	ND	0.52	1.3
SW11*	6.0	--	ND	ND	ND	ND	0.0079
SW12	6.0	--	ND	ND	ND	ND	ND
SW13	6.0	--	ND	ND	0.022	ND	ND
SW14	6.0	--	ND	ND	ND	ND	0.020
WO1**	6.5	120	36	0.091	0.17	0.38	1.8
SWA***	6.0	--	--	--	--	--	--

-- Indicates analysis was not performed.

ND = Non-detectable.

* TOG was 78 mg/kg.

** TOG was 1,500 mg/kg, and all EPA method 8010 constituents were non-detectable, except 1,2-dichlorobenzene at 210 µg/kg.

*** TOG was 3,500 mg/kg.

Results are in milligrams per kilogram (mg/kg), unless otherwise indicated.

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TABLE 7

SUMMARY OF LABORATORY ANALYSES
WATER

(Collected on June 20 & July 3, 1990)

Sample #	TOG (mg/L)	TPH as Gasoline	Benzene	Toluene	Ethyl-benzene	Xylenes
W1*	--	2,300	3.1	0.88	0.39	250
W2**	ND	ND	ND	0.96	ND	ND

* Collected from the former fuel storage tank pit.

** Collected from the new fuel storage tank pit.

-- Indicates analysis was not performed.

ND = Non-detectable.

Results are in micrograms per liter (μg/L), unless otherwise indicated.

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TABLE 8

SUMMARY OF LABORATORY ANALYSES
SOIL

(Collected on July 16 & 20, 1990)

Sample	Depth (feet)	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Ethyl-benzene	Xylenes
SWB(13)*	6.0	ND	ND	ND	0.0095	ND	ND
SWC(10)*	6.0	ND	1.1	0.0061	0.0330	0.024	0.044
SWD(14)*	6.0	ND	ND	0.0052	0.015	ND	ND
SWE*	6.3	ND	ND	ND	0.031	ND	ND
SWF*	6.3	ND	ND	ND	0.029	0.0059	0.013
SWG*	6.3	ND	ND	ND	0.028	ND	ND
SWH*	6.3	ND	ND	ND	0.015	ND	ND

* TOG and all EPA method 8010 constituents were non-detectable.

ND = Non-detectable.

Results are in milligrams per kilogram (mg/kg), unless otherwise indicated.

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TABLE 9

SUMMARY OF LABORATORY ANALYSES
WATER

(Collected on July 19, 1990)

Sample #	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Ethyl-benzene	Xylenes
W3*	ND	ND	ND	ND	ND	ND

ND = Non-detectable.

* TOG and all EPA method 8010 constituents were non-detectable.

Results are in micrograms per liter (μg/L), unless otherwise indicated.

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TABLE 10

SUMMARY OF LABORATORY ANALYSES
SOIL

Date	Sample Number	Depth (feet)	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Ethyl-benzene	Xylenes	Total Lead
5/21/92	F-SW1	6.5	--	ND	ND	ND	ND	ND	7.4
	F-SW2	6.5	--	ND	ND	ND	ND	ND	4.1
	F-SW3	6.5	--	ND	ND	ND	ND	ND	4.9
	F-SW4	6.5	--	ND	ND	ND	ND	ND	3.8
	PT-1	11.5	--	6.2	0.0072	0.072	0.054	0.33	4.0
	PT-2	5.0	--	940	ND	0.81	12	100	--
	PT-3	1.75	--	ND	0.0078	0.061	0.026	0.14	5.1
	PT-4	1.75	--	ND	ND	ND	ND	ND	6.5
	PT-5	1.75	--	ND	ND	ND	ND	ND	4.8
	WO-1*	6.0	ND	ND	ND	ND	ND	ND	4.9
	WO-2*	6.0	ND	ND	ND	ND	ND	ND	5.2
	WO-3*	6.0	ND	ND	ND	ND	ND	ND	5.0
	WO-4*	6.0	ND	ND	ND	ND	ND	ND	5.3
	H1**	5.0	--	ND	ND	ND	ND	ND	--
	H2***	5.5	--	230	ND	ND	1.3	0.66	4.4

-- Indicates analysis was not performed.

ND = Non-detectable.

* TOG and EPA method 8010 and 8270 constituents were all non-detectable.

** TPH as hydraulic fluid was 1.3 mg/kg.

*** TOG was non-detectable. TPH as hydraulic fluid was detected at a concentration of 120 mg/kg. EPA method 8010 and 8270 constituents were non-detectable, except for bis(2-ethylhexyl)phthalate at 670 µg/kg, 2-methylnaphthalene at 5,800 µg/kg, naphthalene at 4,100 µg/kg, phenanthrene at 240 µg/kg, and pyrene at 120 µg/kg.

Results are in milligrams per kilogram (mg/kg), unless otherwise indicated.

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TABLE 11

SUMMARY OF LABORATORY ANALYSES
SOIL

Date	Sample Number	Cadmium	Chromium	Nickel	Zinc
5/21/92	WO-1	ND	29	35	44
	WO-2	ND	24	27	37
	WO-3	ND	24	26	39
	WO-4	ND	32	39	49
	H2	ND	33	43	55

ND = Non-detectable.

Results are in milligrams per kilogram (mg/kg), unless otherwise indicated.

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TABLE 12

SUMMARY OF LABORATORY ANALYSES
SOIL

Date	Sample Number	Depth (feet)	TPH as Hydraulic Fluid	TPH as Gasoline	Benzene	Toluene	Ethyl-benzene	Xylenes	TOG
6/15/92	PT(16.5)	16.5	--	ND	ND	ND	ND	ND	--
	PT(SW1)	12.0	--	ND	ND	ND	ND	ND	--
	PT(SW2)	12.0	--	ND	ND	ND	ND	ND	--
	PT(SW3)	12.0	--	ND	ND	ND	ND	ND	--
	PT(SW4)	12.0	--	ND	ND	ND	ND	ND	--
	H2(6.5)*	6.5	ND	ND	ND	ND	ND	ND	ND
	H2(SW1)*	5.5	ND	ND	ND	ND	ND	ND	ND
	H2(SW2)*	5.5	ND	ND	ND	0.0098	ND	0.022	ND
	H2(SW3)*	5.5	ND	ND	0.069	0.068	0.064	0.21	ND
	H2(SW4)*	5.5	ND	ND	ND	ND	ND	ND	ND

-- Indicates analysis was not performed.

ND = Non-detectable.

* EPA method 8270 constituents were all non-detectable

Results are in milligrams per kilogram (mg/kg), unless otherwise indicated.

KEI-P90-0606.R13
February 17, 1995

TABLE 13

SUMMARY OF LABORATORY ANALYSES
WATER

Date	Sample	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Ethyl-benzene	Xylenes	Organic Lead
5/21/92	Water-1	--	ND	ND	ND	ND	2.7	ND
	Water-2*	86	ND	ND	ND	ND	ND	--
6/17/92	Water-3**	--	ND	ND	ND	ND	ND	--

-- Indicates analysis was not performed.

ND = Non-detectable.

* TOG, cadmium, chromium, lead, nickel, EPA method 8010 and 8270 constituents were all non-detectable. Zinc was detected at 0.037 ppb.

** TPH as hydraulic fluid, TOG, EPA method 8270 constituents, and the metals cadmium, chromium, lead, nickel, and zinc were all non-detectable.

Results are in micrograms per liter (μg/L), unless otherwise indicated.

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February 17, 1995

TABLE 14

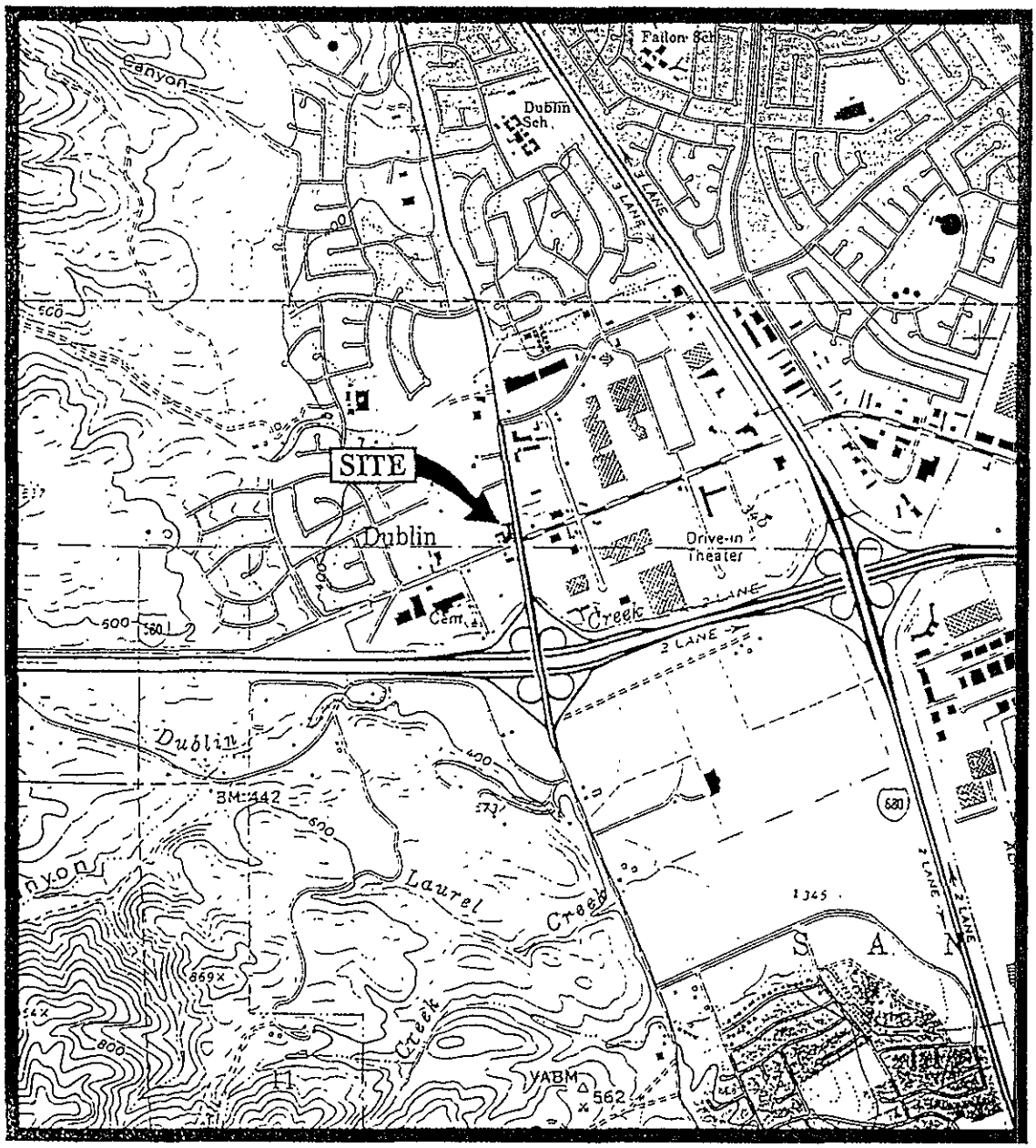
COMPARISON OF CONTAMINANTS DETECTED AT THE UNOCAL SITE
-vs-
U.S. EPA AND CALIFORNIA DOHS DRINKING WATER STANDARDS

	Benzene	Toluene	Ethylbenzene	Xylenes
Maximum Concentration in Unocal's Wells on 12/01/94	5.1	2.6	ND	1.8
Maximum Concentration in Unocal's Wells to date	8.1	2.9	0.81	1.9
DOHS MCL	1	--	680	1,750
DOHS Action Level	--	100	--	--
EPA MCL	5	1,000	700	10,000
Proposed EPA Secondary Standard	--	40	30	20

MCL = Maximum Contaminant Level.

-- Indicates no current standard or action level.

Results are in micrograms per liter ($\mu g/L$).

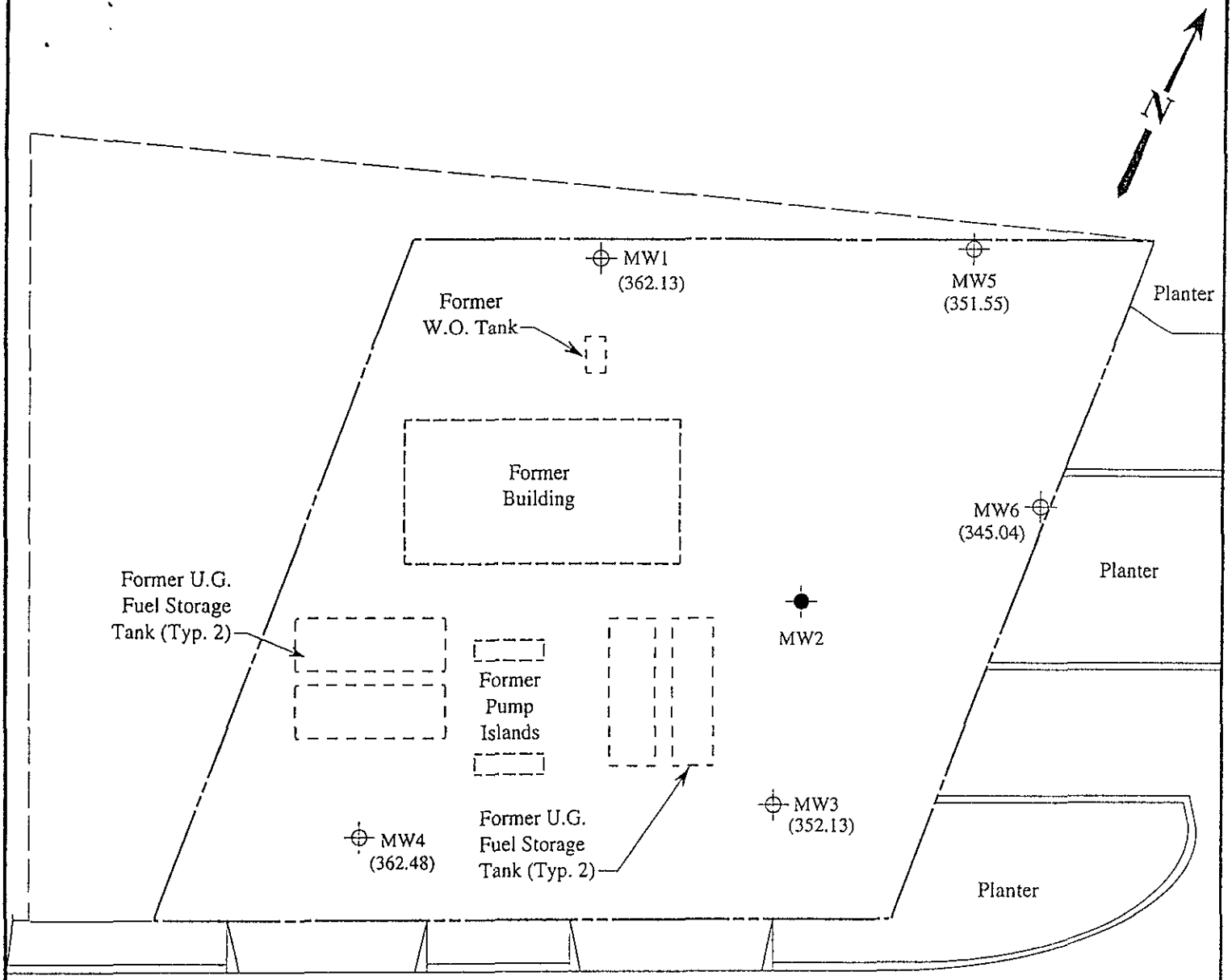


Base modified from 7.5 minute U.S.G.S. Dublin Quadrangle
(photorevised 1980)

0 2000 4000

Approx. scale feet

KAPREALIAN ENGINEERING INCORPORATED	UNOCAL SERVICE STATION #5901 11976 DUBLIN BOULEVARD DUBLIN, CALIFORNIA	LOCATION MAP



LEGEND

- Monitoring well (existing)
- Monitoring well (destroyed on 8/24/92)
- ( ) Ground water elevation in feet above Mean Sea Level

Notes:

1) The monitoring wells might be located in separate hydrologic regimes; therefore, ground water elevation contours are not shown.
2) The ground water elevations were obtained from MPDS Services, Inc.'s Quarterly Data Report (MPDS-UN5901-05) dated December 21, 1994

0 30 60

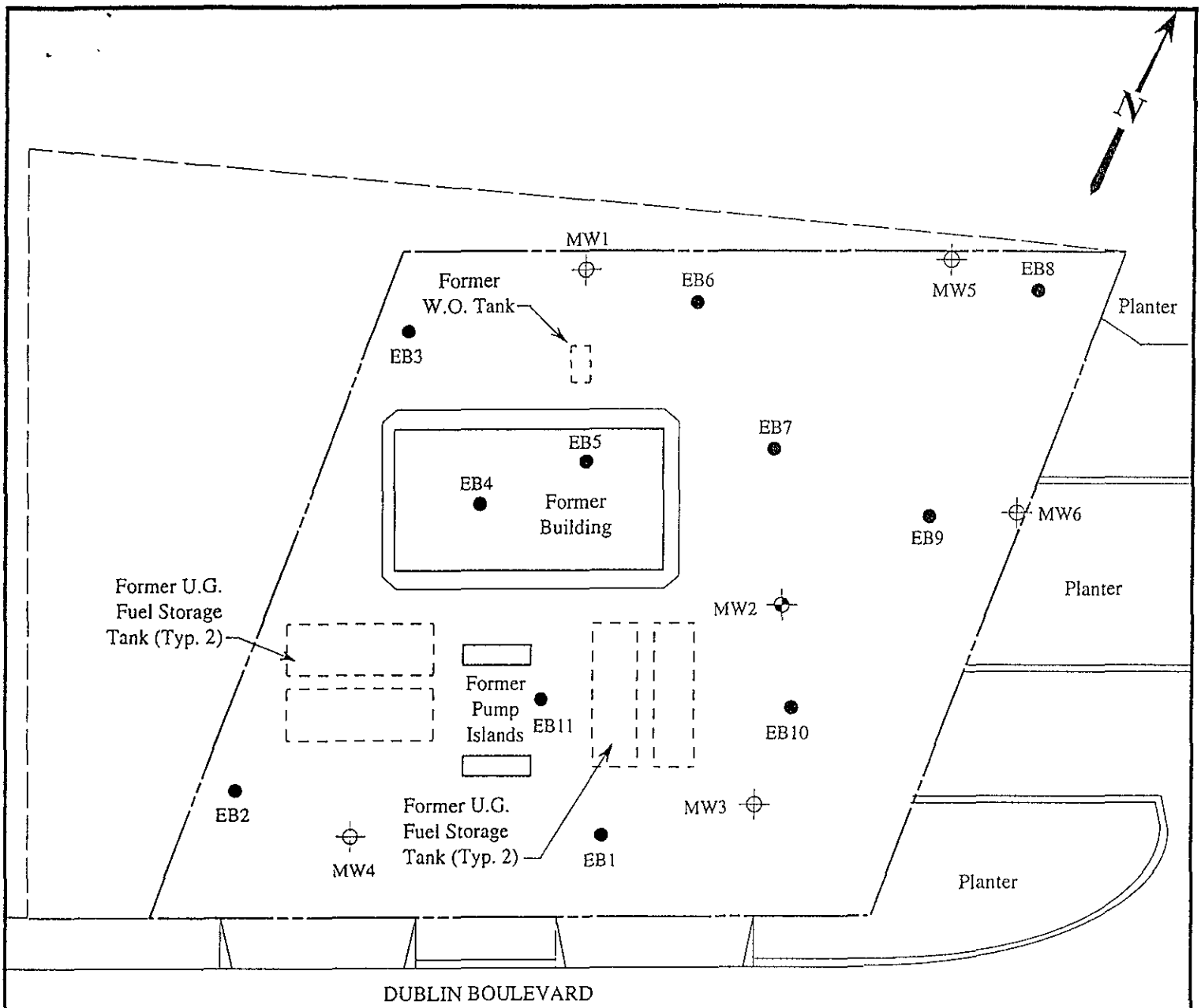
Approx. scale feet

GROUND WATER ELEVATION MAP FOR THE DECEMBER 1, 1994 MONITORING EVENT

KAPREALIAN ENGINEERING
INCORPORATED

FORMER UNOCAL S/S #5901
11976 DUBLIN BOULEVARD
DUBLIN, CALIFORNIA

FIGURE
1



LEGEND

- Monitoring well (existing)
- Monitoring well (destroyed)
- Exploratory boring

0 30 60

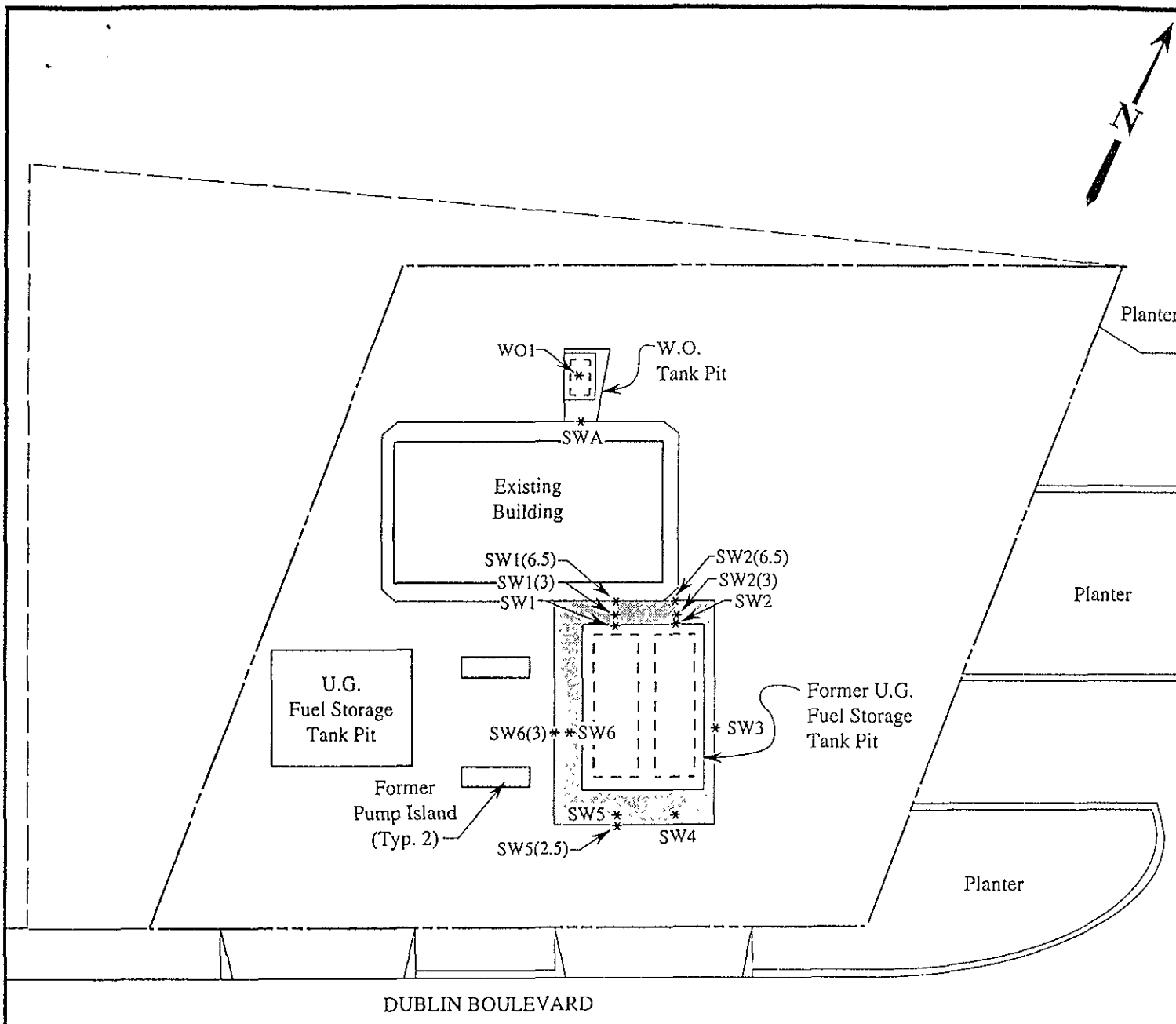
Approx. scale feet

EXPLORATORY BORING AND MONITORING WELL LOCATION MAP

KAPREALIAN ENGINEERING
INCORPORATED

FORMER UNOCAL S/S #5901
11976 DUBLIN BOULEVARD
DUBLIN, CALIFORNIA

FIGURE
2



LEGEND

* Sample point location

Additional area of excavation

Samples collected on June 13, 15 & 20, 1990

0 30 60

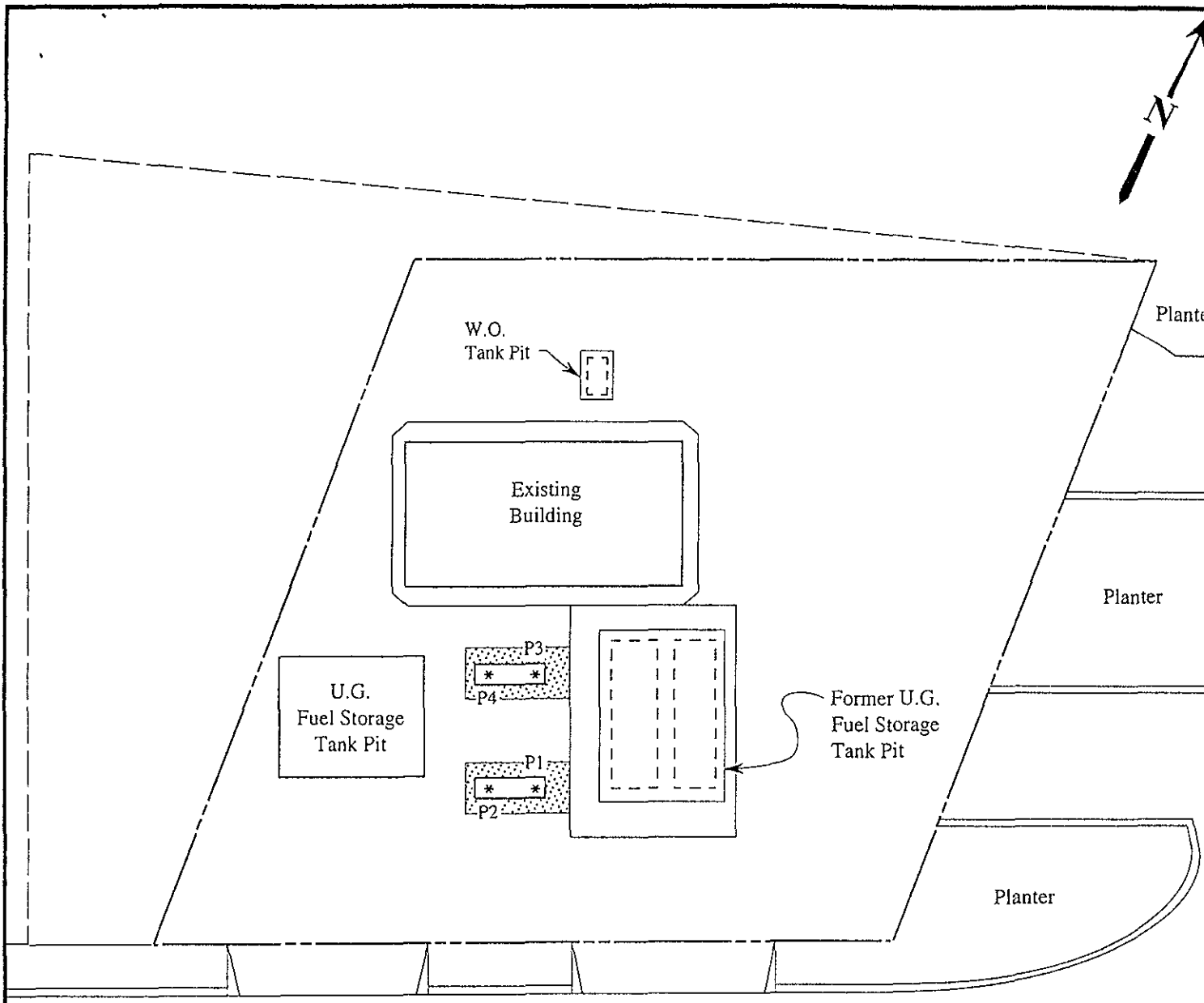
Approx. scale feet

SOIL SAMPLE POINT LOCATIONS MAP

KAPREALIAN ENGINEERING
INCORPORATED

FORMER UNOCAL S/S #5901
11976 DUBLIN BOULEVARD
DUBLIN, CALIFORNIA

FIGURE
3



LEGEND

* Sample point location

Area of additional Tank Pit excavation

Area of additional Pipe Trench excavation

Samples collected on June 15, 1990

0 30 60

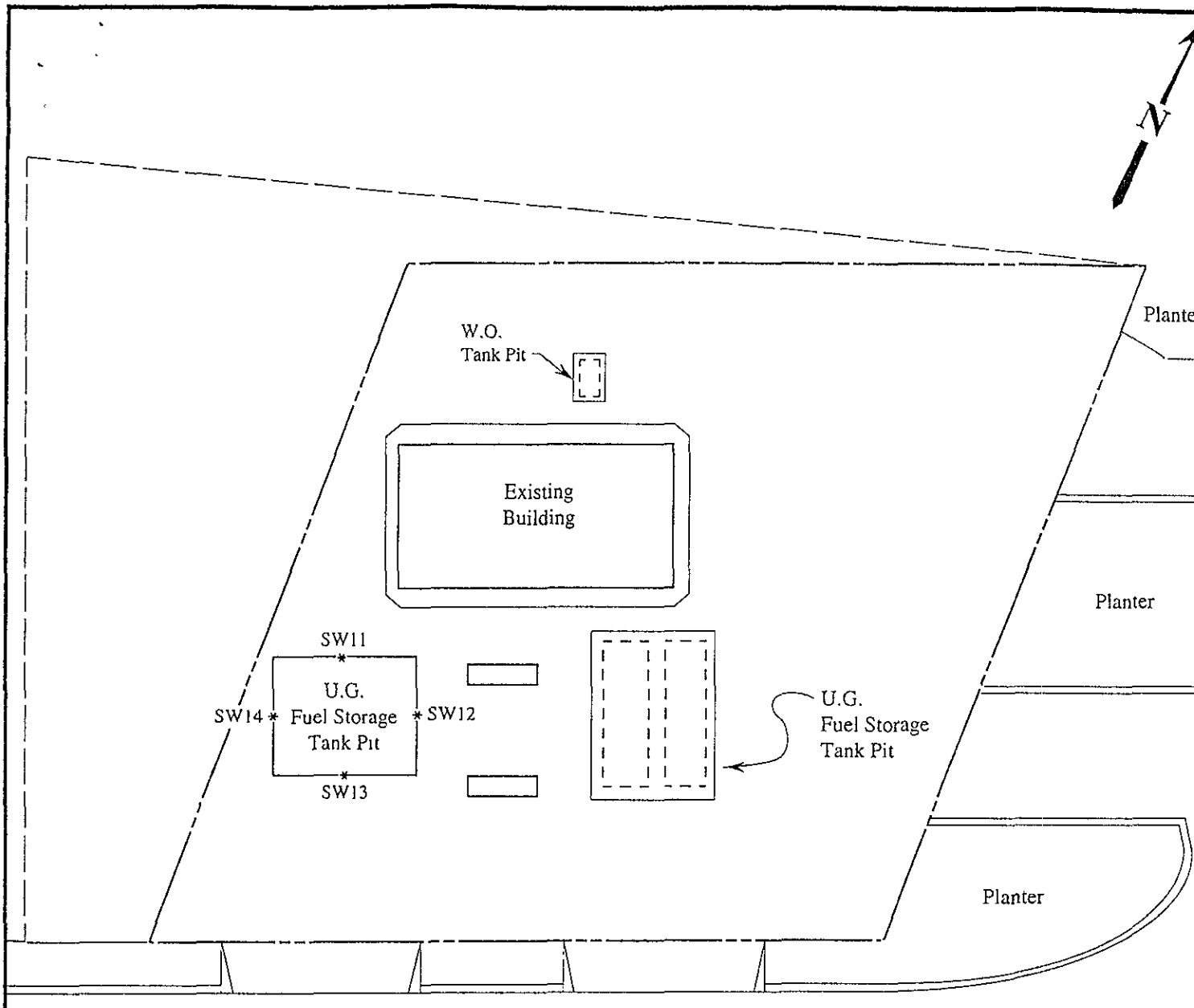
Approx. scale feet

SOIL SAMPLE POINT LOCATIONS MAP

KAPREALIAN ENGINEERING
INCORPORATED

FORMER UNOCAL S/S #5901
11976 DUBLIN BOULEVARD
DUBLIN, CALIFORNIA

FIGURE
4



LEGEND

* Sample point location

Samples collected on June 26, 1990

0 30 60

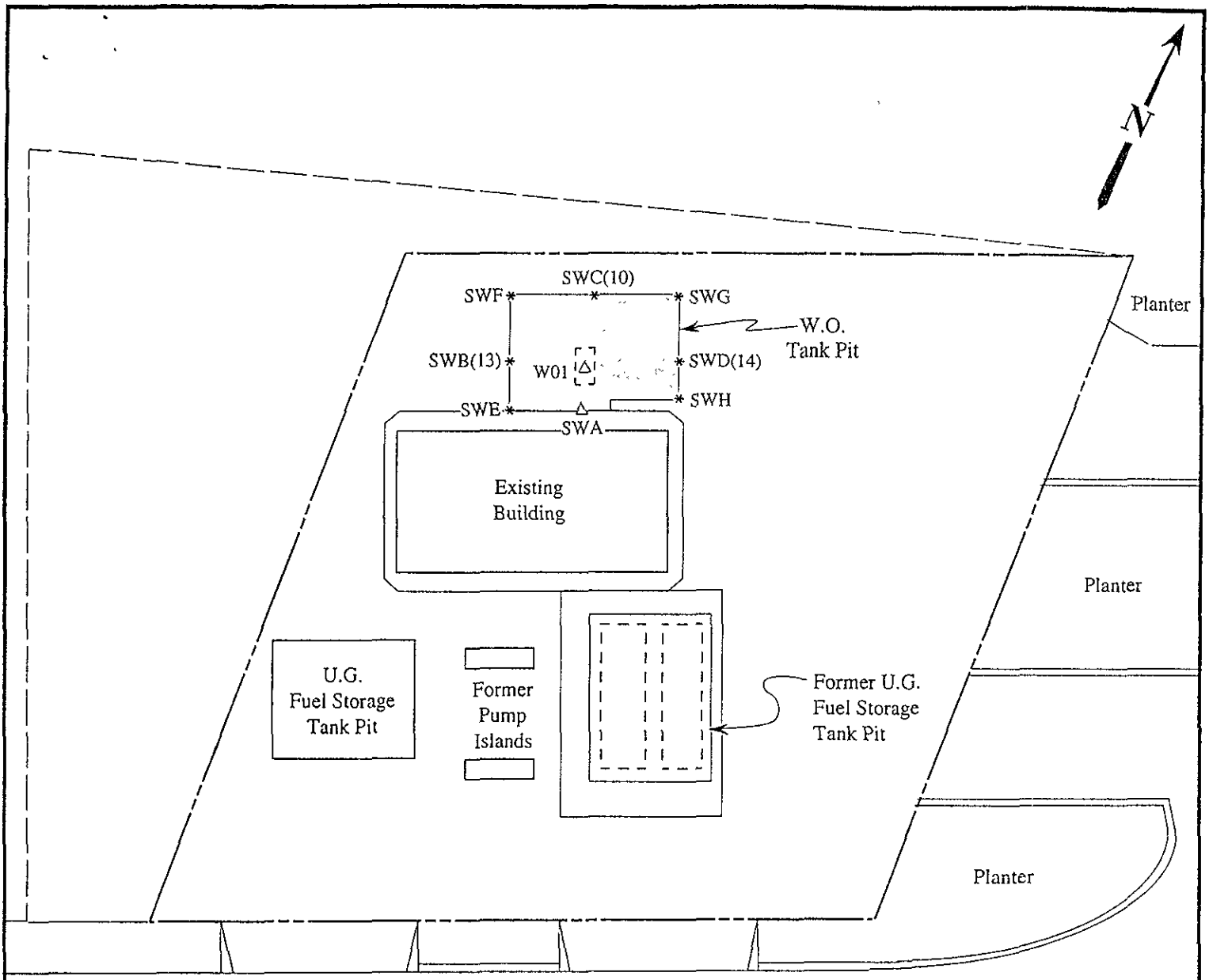
Approx. scale feet

SOIL SAMPLE POINT LOCATIONS MAP

KAPREALIAN ENGINEERING
INCORPORATED

FORMER UNOCAL S/S #5901
11976 DUBLIN BOULEVARD
DUBLIN, CALIFORNIA

FIGURE
5



LEGEND

* Sample point location

△ Previous sample point location

Area of additional Tank Pit excavation

Samples collected on July 16 & 20, 1990

0 30 60

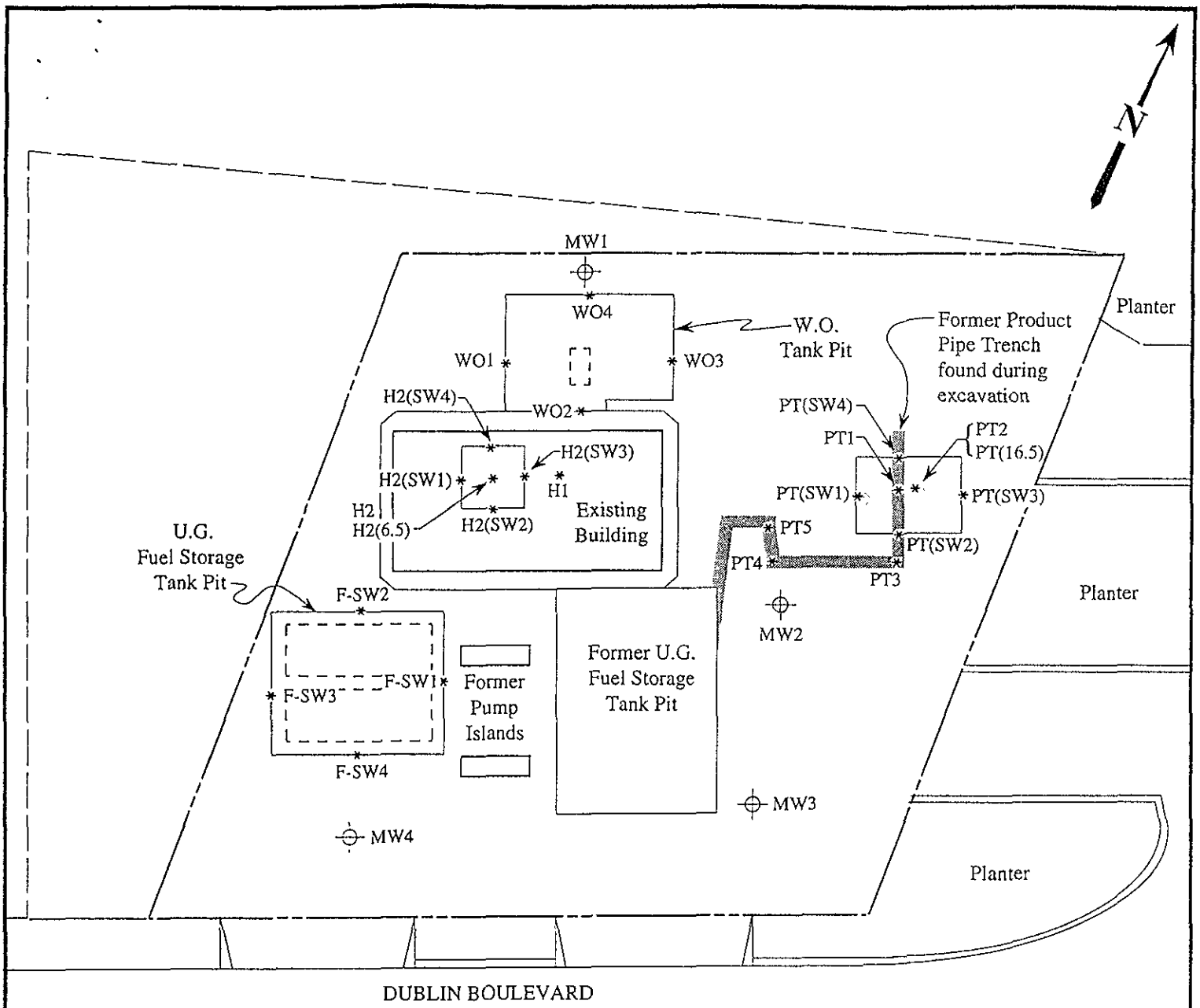
Approx. scale feet

SOIL SAMPLE POINT LOCATIONS MAP

KAPREALIAN ENGINEERING
INCORPORATED

FORMER UNOCAL S/S #5901
11976 DUBLIN BOULEVARD
DUBLIN, CALIFORNIA

FIGURE
6



LEGEND

- Monitoring well
- * Sample point location
- Area of additional excavation

Samples collected on May 21 and June 15, 1992

0 30 60

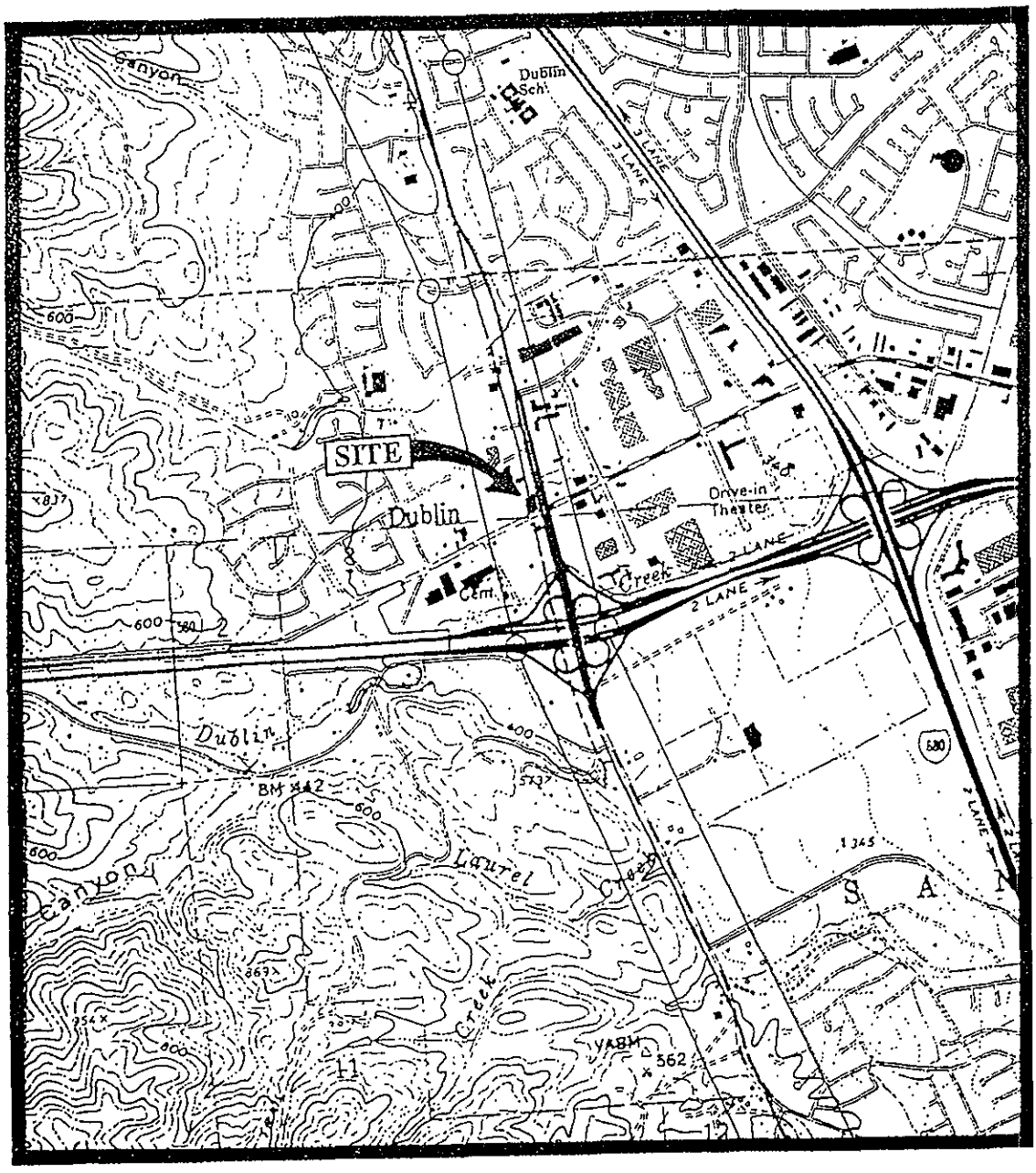
Approx. scale feet

SOIL SAMPLE POINT LOCATIONS MAP

KAPREALIAN ENGINEERING
INCORPORATED

FORMER UNOCAL S/S #5901
11976 DUBLIN BOULEVARD
DUBLIN, CALIFORNIA

FIGURE
7



MAP EXPLANATION

Potentially Active Faults

Faults considered to have been active during Holocene time and to have a relatively high potential for surface rupture; solid line where accurately located, long dash where approximately located, short dash where inferred.

Special Studies Zone Boundaries

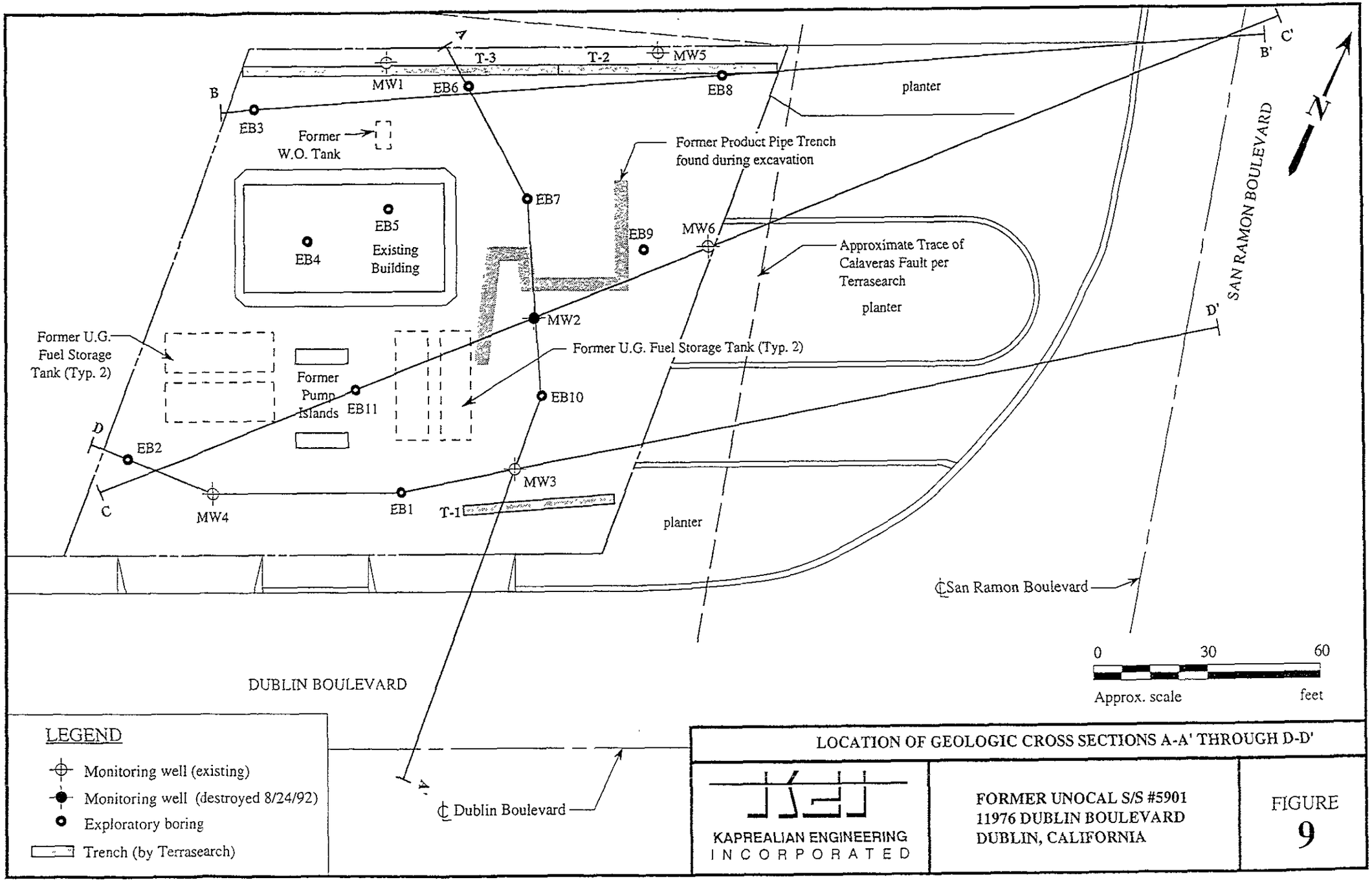
These are delineated as straight-line segments that connect encircled turning points so as to define special studies zone segments.

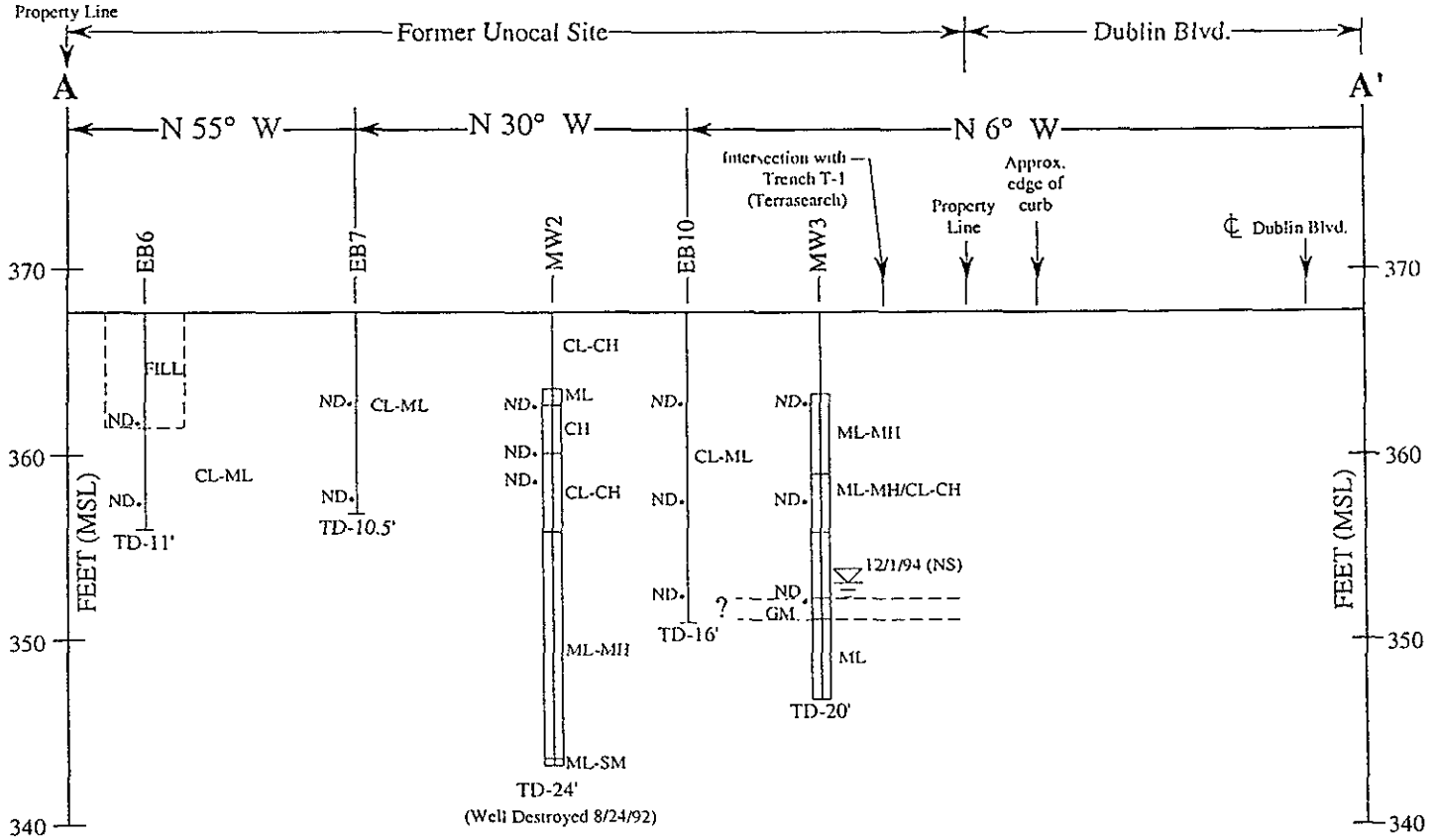
Base modified from a portion of a State of California Special Studies Zones, Dublin, Revised Official Map. (Alquist-Priolo Special Studies Act)

0 2000 4000

Approx. scale feet

LOCATION OF CALAVERAS FAULT (ZONED POTENTIALLY ACTIVE) IN RELATION TO SUBJECT SITE		
KAPREALIAN ENGINEERING INCORPORATED	UNOCAL SERVICE STATION #5901 11976 DUBLIN BOULEVARD DUBLIN, CALIFORNIA	FIGURE 8


A
A'
B
B'
C
C'
D
D'
T-3
T-2
MW5
MW1
EB6
EB8
EB3
Former
W.O. Tank
planter
Former Product Pipe Trench
found during excavation
EB7
EB5
EB4
Existing
Building
EB9
MW6
Approximate Trace of
Calaveras Fault per
Terrasearch
planter
SAN RAMON BOULEVARD
N
MW2
Former U.G.
Fuel Storage
Tank (Typ. 2)
Former U.G. Fuel Storage Tank (Typ. 2)
Former
Pump
Islands
EB11
EB10
EB2
MW3
C
MW4
EB1
T-1
planter
℄San Ramon Boulevard
0
30
60
Approx. scale
feet
DUBLIN BOULEVARD
LEGEND
Monitoring well (existing)
Monitoring well (destroyed 8/24/92)
Exploratory boring
Trench (by Terrasearch)
℄ Dublin Boulevard
LOCATION OF GEOLOGIC CROSS SECTIONS A-A' THROUGH D-D'
KAPREALIAN ENGINEERING
INCORPORATED
FORMER UNOCAL S/S #5901
11976 DUBLIN BOULEVARD
DUBLIN, CALIFORNIA
FIGURE
9



LEGEND

Soil classification symbols per USCS

- Ground water level on 12/1/94
- Screened interval of well
- ( ) Concentration of TPH as gasoline (µg/L) in ground water sample collected on date shown.
- • Concentration of TPH as gasoline (mg/kg) in soil sample collected at depth shown.

NS Not sampled

ND Non-detectable

0 30 60

Approx. horizontal scale feet

0 10 20

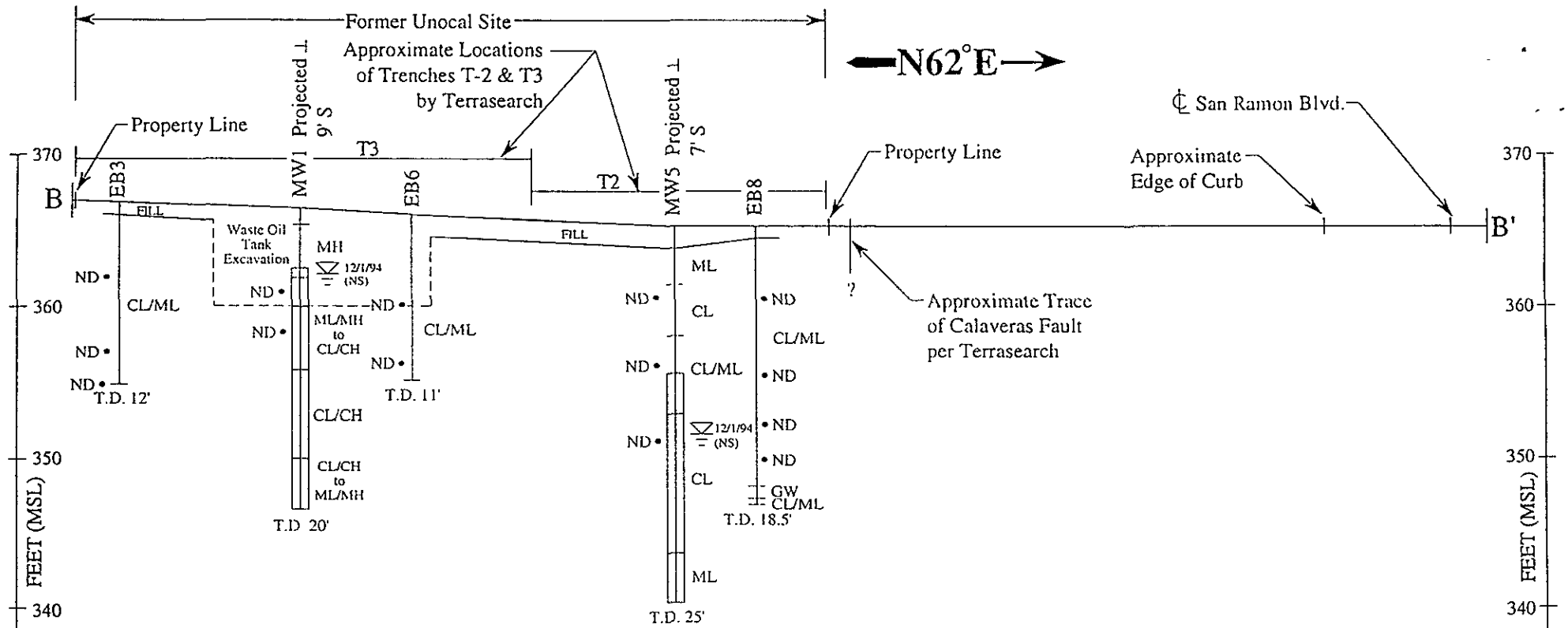
Approx. vertical scale feet

GEOLOGIC CROSS SECTION A–A'

KAPREALIAN ENGINEERING
INCORPORATED

FORMER UNOCAL S/S #5901
11976 DUBLIN BOULEVARD
DUBLIN, CALIFORNIA

FIGURE
10



LEGEND

Soil classification symbols per USCS

- Ground water level on 12/1/94
- Screened interval of well
- ( ) Concentration of TPH as gasoline (µg/L) in ground water sample collected on date shown.
- · Concentration of TPH as gasoline (mg/kg) in soil sample collected at depth shown.

NS Not sampled

ND Non-detectable

0 30 60

Approx. horizontal scale feet

0 10 20

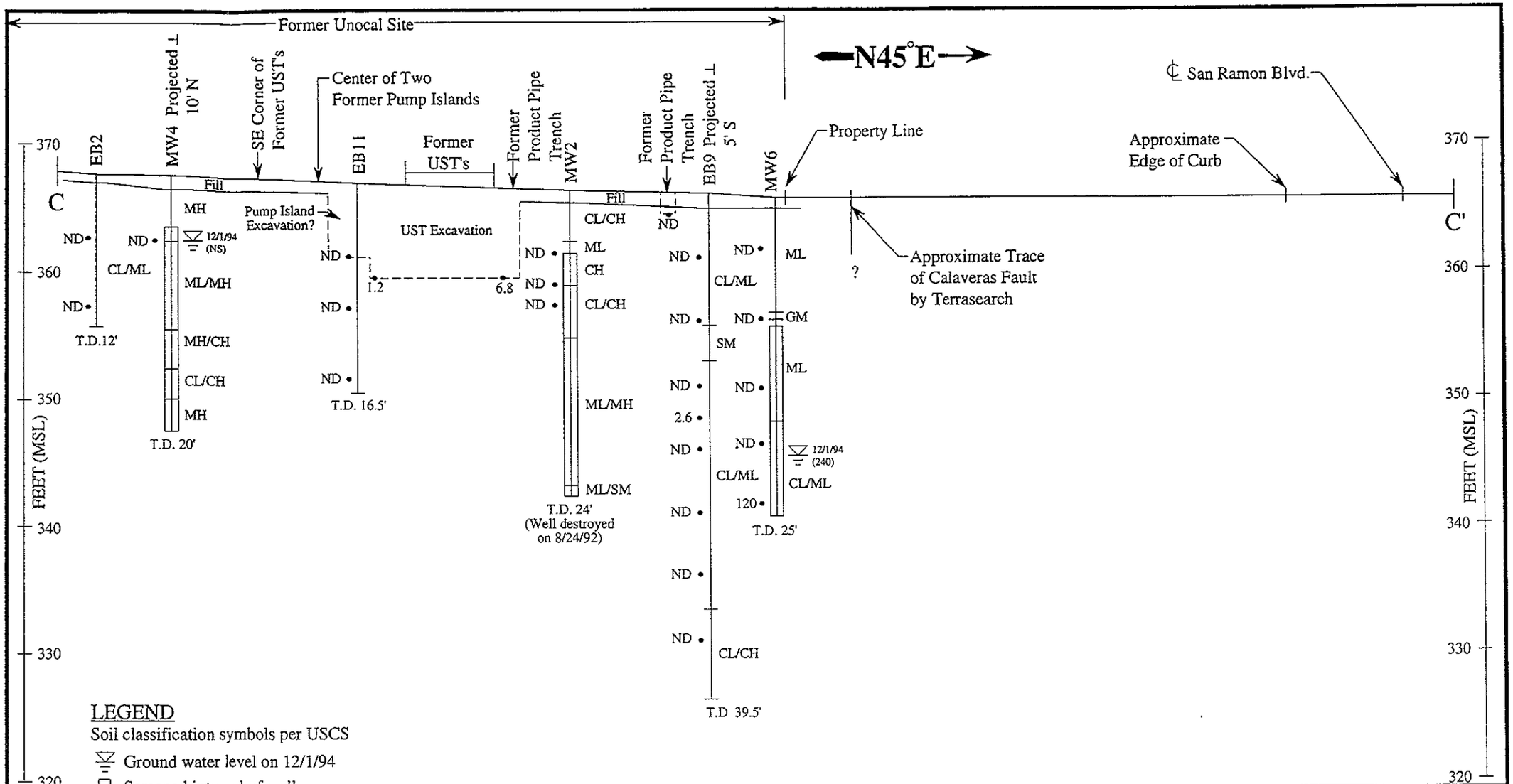
Approx. vertical scale feet

GEOLOGIC CROSS SECTION B-B'

KAPREALIAN ENGINEERING INCORPORATED

FORMER UNOCAL S/S #5901
11976 DUBLIN BOULEVARD
DUBLIN, CALIFORNIA

FIGURE
11



LEGEND

Soil classification symbols per USCS

- Ground water level on 12/1/94
- Screened interval of well
- ( ) Concentration of TPH as gasoline (µg/L) in ground water sample collected on date shown.
- • Concentration of TPH as gasoline (mg/kg) in soil sample collected at depth shown.
- ND Non-detectable
- NS Not sampled

0 30 60
Approx. horizontal scale feet

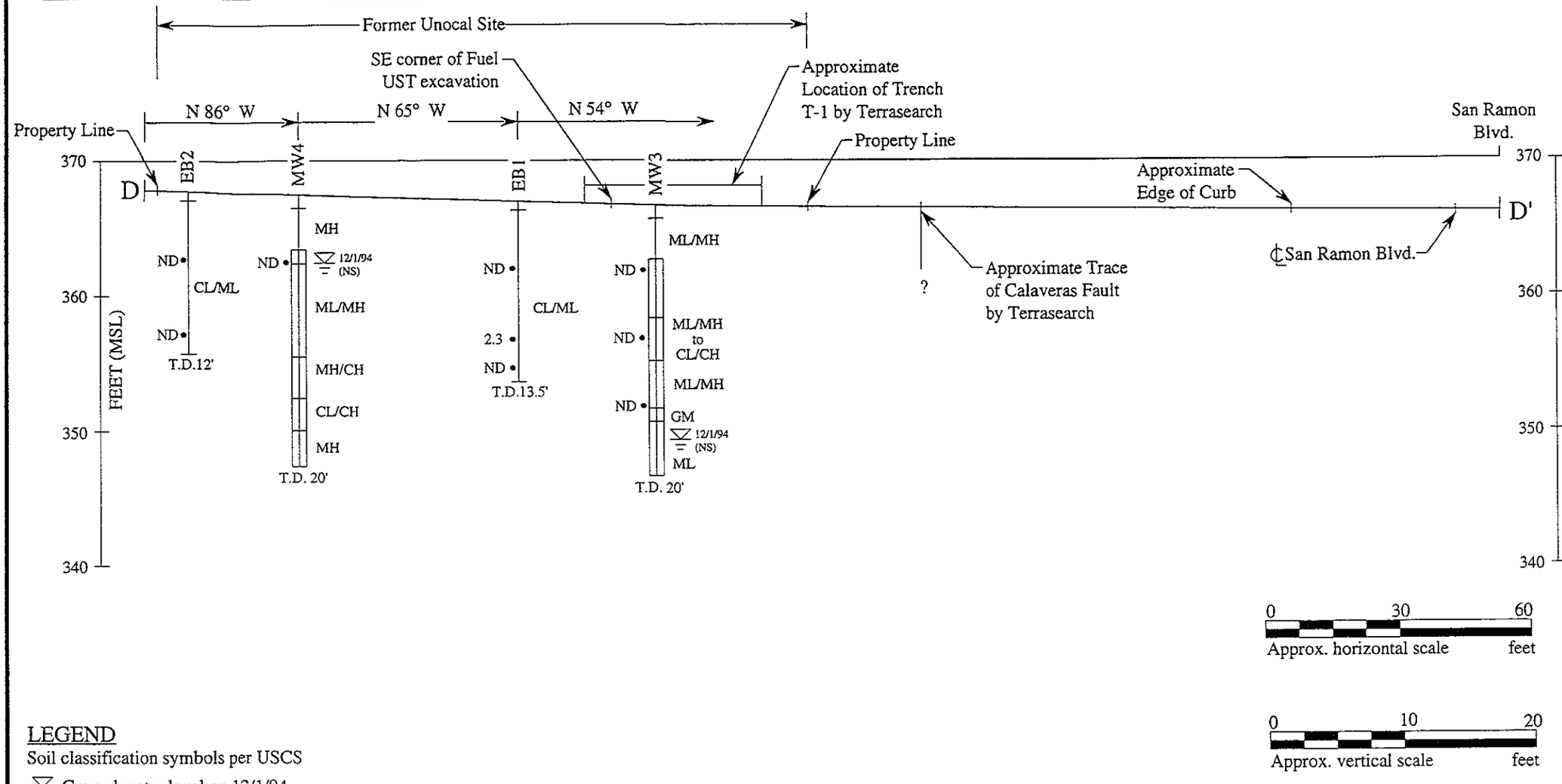
0 10 20
Approx. vertical scale feet

GEOLOGIC CROSS SECTION C – C'

KAPREALIAN ENGINEERING
INCORPORATED

FORMER UNOCAL S/S #5901
11976 DUBLIN BOULEVARD
DUBLIN, CALIFORNIA

FIGURE
12



LEGEND

Soil classification symbols per USCS

- Ground water level on 12/1/94
- Screened interval of well
- ( ) Concentration of TPH as gasoline (µg/L) in ground water sample collected on date shown.
- • Concentration of TPH as gasoline (mg/kg) in soil sample collected at depth shown.
- ND Non-detectable
- NS Not sampled

GEOLOGIC CROSS SECTION D-D'

KAPREALIAN ENGINEERING INCORPORATED

FORMER UNOCAL S/S #5901
11976 DUBLIN BOULEVARD
DUBLIN, CALIFORNIA

FIGURE **13**

KEI-P90-0606.R13
February 17, 1995

REPORTS REFERENCE LIST

REPORT TITLE	REPORT DESCRIPTION	REPORT NUMBER	REPORT DATE
Quarterly Data Report	December 1994 Monitoring and Sampling Results	MPDS-UN5901-05	12/21/94
Quarterly Data Report	September 1994 Monitoring and Sampling Results	MPDS-UN5901-04	9/29/94
Quarterly Data Report	June 1994 Monitoring and Sampling Results	MPDS-UN5901-03	7/07/94
Quarterly Data Report	March 1994 Monitoring and Sampling Results	MPDS-UN5901-02	4/04/94
Drill Cuttings Disposal	Drill Cuttings Disposal Monitoring Wells MW5 and MW6	KEI-P90-0606.R12	2/28/94
Quarterly Data Report	December 1993 Monitoring and Sampling Results	MPDS-UN5901-01	1/17/94
Continuing Ground Water Investigation	Installation of Monitoring Wells MW5 and MW6	KEI-P90-0606.R11	11/17/93
Quarterly Report	September 1993 Monitoring and Sampling Results	KEI-P90-0606.QR7	10/22/93
Quarterly Report	June 1993 Monitoring and Sampling Results	KEI-P90-0606.QR6	7/13/93
Proposal	Revised Work Plan/ Proposal for Installation of MW5 and MW6	KEI-P90-0606.P6	6/11/93
Proposal	Work Plan/Proposal for Installation of MW5 and MW6	KEI-P90-0606.P6	10/08/92

REPORTS REFERENCE LIST (Continued)

REPORT TITLE	REPORT DESCRIPTION	REPORT NUMBER	REPORT DATE
Continuing Subsurface Investigation	Drilling and Sampling of Exploratory Boring EB1 through EB11	KEI-P90-0606.R10	10/08/92
Waste Oil Stockpiled Soil Sampling	Sampling and Disposal of Stockpiled Soil Excavated during Waste Oil Tank Removal May - June 1992	KEI-J90-0606.R9	9/21/92
Stockpiled Soil Sampling Report	Sampling and Disposal of Stockpiled Soil Excavated during Tank Removal May - June 1992	KEI-J90-0606.R8	8/31/92
Soil Sampling	Collection of Soil Samples during Tank Removal Operations in May and June 1992	KEI-J90-0606.R7	8/31/92
Proposal	Drill and Sample 11 Exploratory Borings	KEI-P90-0606.P5	7/31/92
Proposal	Additional Soil Sampling and Additional Excavation 2 Former Product Pipe Trenches and Hydraulic Lifts	KEI-P90-0606.P4	5/29/92
Quarterly Report	April 1992 Monitoring and Sampling Results	KEI-P90-0606.QR5	4/27/92
Quarterly Report	November 1991 - January 1992 Monitoring and Sampling Results	KEI-P90-0606.QR4	2/28/92
Quarterly Report	August - October 1991 Monitoring and Sampling Results	KEI-P90-0606.QR3	11/12/91

KEI-P90-0606.R13
February 17, 1995

REPORTS REFERENCE LIST (Continued)

REPORT TITLE	REPORT DESCRIPTION	REPORT NUMBER	REPORT DATE
Quarterly Report	May - July 1991 Monitoring and Sampling Results	KEI-P90-0606.QR2	7/29/91
Quarterly Report	February - April 1991 Monitoring and Sampling Results	KEI-P90-0606.QR2	4/23/91
Preliminary Ground Water Investigation	Installation of Monitoring Wells MW1 through MW4	KEI-P90-0606.R6	12/17/90
Follow-Up Soil Sampling Report	Collection Soil and Water Samples from Waste Oil Tank Pit	KEI-J90-0606.R4	7/30/90
Proposal	Work Plan/Proposal for the Installation Monitoring Wells MW1 through MW4. Excavation of Waste Oil Tank Pit Sidewalls	KEI-J90-0606.P1	7/16/90
Soil Sampling Report	Collection of Soil Samples from Former and New Fuel Tank Pits, Waste Oil Tank Pit, and beneath Product Dispensers	KEI-J90-0606.R1	7/16/90
Stockpiled Soil Sampling	Sampling of Stockpiled Soil On-Site	KEI-J90-0606.R3	7/13/90
Waste Oil Stockpiled Soil Sampling	Sampling of Stockpiled Soil On-Site	KEI-J90-0606.R2	7/12/90